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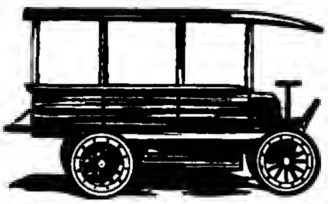
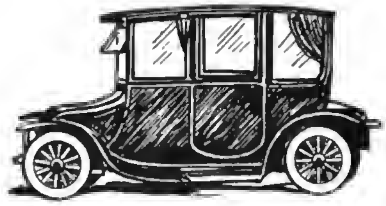
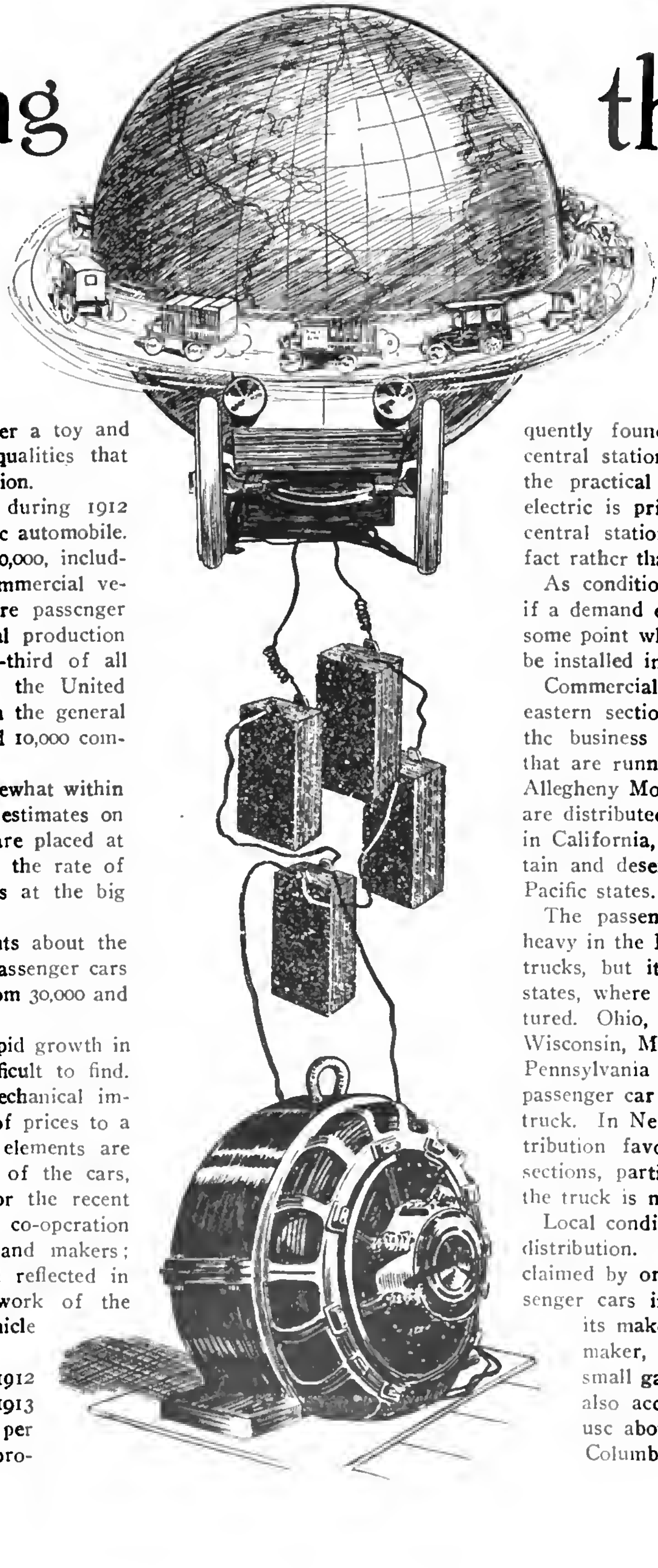
The Automobile



Electric Vehicle Issue



Surveying the Field



REACHING out into new territory; filled with virility; backed by the consumer and aided by the co-operation of central stations, the electric vehicle industry bounded into national prominence during the past year, particularly the past 6 months.

The passenger car is no longer a toy and the truck has shown service qualities that entitle it to respectful consideration.

Material progress was made during 1912 in the development of the electric automobile. Production was approximately 10,000, including both passenger cars and commercial vehicles, of which about 6000 were passenger cars and 4000 trucks. The total production of 1912 represents roughly one-third of all electric cars now in service in the United States, which may be divided on the general lines of 20,000 passenger cars and 10,000 commercial wagons.

These figures are probably somewhat within the actual facts, as are also the estimates on the production for 1913, which are placed at a total of 15,000, apportioned at the rate of two to one, with the passengers at the big end of the ratio.

In case that estimate represents about the actual output of 1913, the total passenger cars in the country will be not far from 30,000 and commercials 15,000.

The reasons underlying the rapid growth in the use of electrics are not difficult to find. Of course, there have been mechanical improvements and an adjustment of prices to a basis of value, both of which elements are important to the increased use of the cars, but the most potent reasons for the recent growth of the industry are the co-operation of central stations with users and makers; the acute demand for gasoline, reflected in its increased price, and the work of the national and local electric vehicle associations.

The electric vehicle output of 1912 and the estimated output for 1913 represent an increase of 125 per cent. in comparison with the production of 1911 and before.

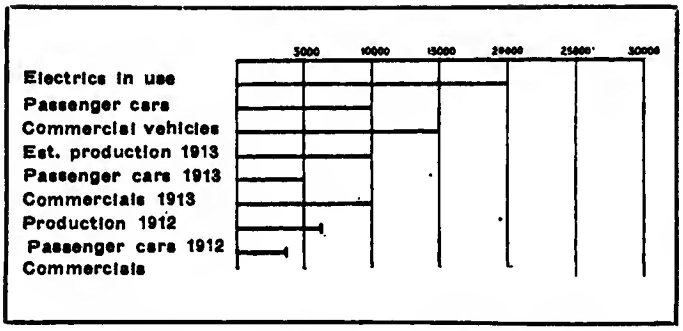
The distribution of electrics is almost as wide as that of gasoline automobiles, taking the states as a basis, but the electrics are limited in their use to the facilities for charging and consequently are most frequently found in the cities. Extension of central stations are being made steadily, but the practical demonstration shows that the electric is primarily a city car and that the central station situation is a result of that fact rather than a cause for it.

As conditions shape themselves at present, if a demand existed for a charging station at some point where there is none now, it would be installed immediately.

Commercial cars are in general use in the eastern section, probably 80 per cent. of all the business wagons manufactured to date that are running being in service east of the Allegheny Mountains. The other 20 per cent. are distributed through the central states and in California, with a scattering in the mountain and desert country, the south and north Pacific states.

The passenger car distribution is not so heavy in the East in proportion to that of the trucks, but it is far heavier in the central states, where most of the cars are manufactured. Ohio, Illinois, Indiana, Iowa, Missouri, Wisconsin, Michigan and the western part of Pennsylvania embrace the section where the passenger car is in larger proportion than the truck. In New England the proportional distribution favors the passenger car in some sections, particularly about Boston, although the truck is making progress now.

Local conditions have much to do with the distribution. For instance, in Cleveland, it is claimed by one manufacturer of electric passenger cars in that city that automobiles of its make outnumber those of any other maker, including the popular types of small gasoline cars. This tendency would also account for the large numbers in use about Detroit, Indianapolis, Chicago, Columbus, Denver and other centers.



Production and prediction in the electric field

According to central station data, the charging of trucks is by far the most profitable element of their business in proportion to the investment required. Figures have been produced showing that the truck business returns are 200 per cent. more in proportion than some other classes of business which the electric companies make determined efforts to secure.

In an effort to increase vehicle business generally, but specially with reference to the commercial trucks, the central station organization has taken up the matter of installing automobile departments at various points where there are considerable numbers of vehicles, or where the possibilities for introducing them are good. Separate departments for such work are conducted in New York, Chicago, Boston, St. Louis, Philadelphia, Newark and other large cities. The effect upon the industry has been astonishingly satisfactory.

The experience of the New Jersey Public Service Company is illustrative of the general situation. The automobile department has been in existence for 2 years. When it was installed there were a few trucks and about eighty passenger cars in its territory. Prior to that time the efforts to introduce the electric were only casual. The first effect of the initiation of the automobile department was to influence the manufacturers to increased efforts in marketing. On December 1, 1912, there were 191 commercial vehicles in service and forty more had been sold but not delivered, and the passenger cars had increased from eighty to 240. The kilowatt hour consumption for electric automobiles increased over 200 per cent. and the income over 100 per cent. The discrepancy between the consumption and the income is to be accounted for by the fact that large installations of automobiles owned by single interests or supplied from electric garages whose rates vary with the quantity of current used, get a lower rate for wholesale lots.

While the same proportionate showing has not been made in some of the other central station automobile departments, the general line results have been similar all over the country where tried.

The special value of the automobile to the central station is that it can be charged at times when other power requirements are small. Until such time as the automobile business shall constitute a constant load during the off-peak hours it will form an extra desirable element for the central stations. That limit is far in the future.

Vehicle Department To Educate Public

The efforts of the automobile departments have been directed largely toward educating the public to the advantages of the electric.

The Electric Vehicle Association of America, a national organization to encourage the use of the electric, has an active membership of eighty-three and a total membership of 317. Included on its rolls are seventeen manufacturers of electric vehicles; fifty-six central stations, and ten accessory manufacturers. Geographically the members are located as follows: Atlantic slope and gulf states, 228; middle states, seventy-two, and in the west, seventeen.

Headquarters are in New York, but active branches are maintained in Boston and Chicago.

Statistics on the electric industry as compiled in the past are fragmentary and of little practical value, but in the future the association announces that careful records are to be kept, tabulated and the results distributed where needed.

Standardization has occupied more attention during the past year than ever before. Particular attention has been given to the dimensions and type of the charging plugs. Uniformity in that particular is very important, as it is quite apparent that an electric automobile is valueless as a vehicle without a charge in its batteries, and the charge cannot be given if the standard plug of station will not fit the car in question. Limits of speed for pleasure and commercial cars have been advocated by some engineers, but as the speed quality is one of the superficial talking points of the salesman, it will be seen that standardization on that point will be difficult. During the year the most striking thing in the line of standardization has been toward battery capacity and wheelbase. A large majority of the manufacturers of passenger automobiles have centered attention on the 40-cell battery installed in a car with a 96-inch wheelbase. Several leading engineers think the 40-cell battery too large. Mechanically the tendency is to follow the recommended standards published by the Society of Automobile Engineers. Such standards have been followed by many of the designers.

The principal items in which efforts are being made to produce uniformity are: Battery arrangement to facilitate charging; the charging plug, receptacle and cable; lamp-capacity; speeds and tires, including fastenings.

Generally speaking, all these matters have been developed to a much greater extent in passenger car design than in commercial.

The work of the association is exemplified in what has been done in the matter of fire insurance. Prior to June the rate was $2 per $100 of insurance, including theft and valued feature clauses. A reduction of 25 cents per $100 was secured through the showing of the committees, and a further reduction of the same amount is now allowed where the theft element of the policy is waived. Liability insurance except in certain specified localities, covering personal injuries or death, can be had for $20, and property damage liability can be covered for $7.50.

Twenty-four Makers in Passenger Field

There are twenty-four manufacturers of passenger cars in the 1913 field. A majority of these manufacturers are grouped in and about Detroit, Cleveland and Chicago, and the electric passenger car propaganda has been preached more widely in those sections than anywhere else in the country. As a result of familiarity with the electric passenger car, its use is wider in the places where it is better known.

While the utmost luxury marks the construction and fittings of electrics, their advocates lay much stress upon their usefulness. Some of the main points urged by them are the following: The electric is a real horseless carriage. Therefore it can be used in excessive heat and in wintry weather without cruelty to horses. It can be left alone without causing worry to its owner. On account of the fact that the owner drives, he need waste no sympathy on the chauffeur, because there is none. No matter how many gasoline cars the business or professional man may have, his electric is most available for errands where waits are uncertain in length. For social service the fact that the car can stand without attendance and is ready for instant use is reckoned an advantage. Of course, all these things do not take into account the noiselessness, absence of dirt, ease of operation in traffic and the other things that have always been urged in favor of the electric.

Speed ranging from 18 miles an hour upward to 35 miles an hour is provided by the electric of 1913. Travel range is from 50 miles to 150 miles to the charge. The price of the average passenger car is $2,800.

The greatest emphasis is laid on the practical use of the electric in suburban service, and the men who make a business of selling say without exception that the electric has certain advantages in that field that are supreme. They do not say that the electric will displace the gasoline car for touring or distance work, but they do maintain that for certain classes of work their car is the best. In the large centers a new field of business has been opened up. During the past year considerable effort has been expended to place electrics with owners of one or more gasoline cars. The idea is that for social, theater and personal service the car fills a niche not completely occupied heretofore. Quite a measure of success has been achieved in this direction and fragmentary figures indicate that fully 50 per cent. of the electrics purchased this year were bought by owners or former owners of gasoline automobiles.

In the commercial vehicle field the chief development of the past year has been the extension of manufacturing. Aside from the increase in numbers, compared with preceding years, the most notable fact has been the introduction of larger models. There are now on the market five makes of 5-ton load capacity and numerous smaller trucks. These are used for transfer work by express companies, for delivery and transfer by breweries, etc. The range in load capacity at present runs from the small delivery wagon, capable of handling 1,000 pounds at a pinch, to ponderous trucks rated at 15,000 pounds capacity. The chief claims made for the electric truck are that it is certain and efficient in operation at moderate speed and cost and that for short haul work it fits well with almost any other type of transportation.

Seventeen Makers of Commercial Vehicles

There are seventeen principal makers of electric commercial wagons. They offer about sixty models of all kinds. The demand of users for particular bodies designed specially for their service has given rise to the practice of quoting chassis prices rather than prices for cars with bodies installed. Chassis prices range from about $1,000 to more than $5,000 and the bodies cost from $100 up to $1,000, depending upon size, type and style.

While some of the largest trucks made are equipped optionally with panel bodies and some of the 1,000-pound cars have open bodies, the general trend of practice is the opposite.

There are almost as many electric trucks of about 2-ton capacity in service as all other sizes together, according to estimates made by the Electric Vehicle Association of America. There are fully one-third of all the electric trucks in service, having a load capacity of about 3 tons. The remainder are divided between the large and small classes, with the latter in heavy majority.

The 1,000-pound wagon, meaning thereby the cars with carrying capacity of from 700 to 1,500 pounds are used for urban delivery service in growing numbers. The 1-ton electric has a wide variation of use. The standard 2-ton and 3-ton trucks are used mostly in transfer work, although city deliveries occupy much attention from these classes and express service in all its variety centers upon them. The larger sizes are freighters as a general thing, although deliveries by breweries, furniture removals and other heavy hauling with the retention of the delivery element claims many of them.

While the manufacturers usually make up some simple body style as a guide to the public, the widest sort of option is always given as to that type of equipment.

The length of the load platform is the best measure for the truck because the standard tread of the wheels limits width to the space between them except where the load platform is built out as far as the hubs, extending over the wheels. Often the main difference between trucks of 1,000-pound capacity and those of 1-ton load is in the greater length of the loading platform. In electric truck construction the power plant and running mechanism are so simple that it is possible to lengthen wheelbases to accommodate longer load platforms, without materially changing the chassis.

Of course, trucks designed to carry double the load of other trucks are built more strongly than the lighter type. In the matter of wheel and tire sizes this is particularly true. As an illustration of the point the practice of the General Vehicle Company, Lansden and Waverley shows that in the 1,000-pound truck these companies use 36 by 2 1-2-inch, 36 by 2 1-2-inch and 34 by 2 1-2-inch tires respectively. In each larger model they install a heavier tire until on the 5-ton truck the rear tire measurements are 36 by 5, 36 by 6 and 36 by 5 inches all dual.

There is a difference between batteries of the same number of cells, the rule being the smaller the truck the less ampere-hour capacity. Thus with the same number of lead cells in all models, the General Vehicle Company's ampere-hour range is between 104 and 324; the Lansden company with Edison cells, using the same number on all models ranges from 150 to 450 ampere-hours and the Waverley company's range is between 135 and 324.

The capacity of the batteries is by no means a guide as to the size of the trucks. With a very few exceptions the batteries of 1913 consist of forty-two or forty-four lead cells, or sixty cells of nickel-iron.

Amperage as a Measure for Truck Sizes

Regarding the operating range of the 1913 trucks it may be placed generally at between 30 and 60 miles to the charge. The average for the largest sizes is about 35 miles although 50 miles is claimed for one or two of the big fellows. In the small delivery cars 55 and 60 miles to the charge is claimed.

With one exception the cars of 1913 are equipped with left-hand steer. There is little new about the motors except the tendency to locate them at or near the axle, reducing the length of the driveshaft where drive by chain has been abandoned.

Chain drive is used by fourteen companies. Argo drives by bevel gear; C. T. uses worm gear on its two smaller models and spur gear on the remainder of its line; Walker drives by internal gears the motor being built as a unit with the rear axle; Waverley uses bevel gears for its small models and chains on the larger cars.

The use of I-beams for front axles increased largely since 1912, a clear majority of the makers now making use of such axles.

What has been said about individual needs in body construction applies as well to chassis and many companies make a specialty of filling orders for trucks of extra capacity. The General Motors Company and the General Vehicle Company each make a 15,000-pound wagon, while intermediate sizes can be had from almost any of the manufacturers in addition to their regular lines.

Summed up, it may be said that the commercial vehicle branch of the electric vehicle industry is better seasoned; that the few structural changes appearing this year are mechanical refinements; that the power is greater and range of operation wider in actual practice and prices are steady throughout the line. The tendency toward apportioning the load in direct ratio to the tire sizes of the front and rear wheels and between the right and left wheels, front and rear, together with the improved spring suspension will have its effect on tire service and the life of the mechanism generally.

Returns from fifteen cities taken at random throughout all sections of the country give the general trend of the distribution, covering over 25 per cent. of all the cars in use.

How the Cars Are Distributed

City	Passenger	Freight
Chattanooga, Tenn	..	4
New Orleans, La	10	10
Seattle, Wash	125	10
Dayton, O	150	12
Marlborough, Mass	1	..
New York City	498	1583
Newark, N. J	238	136
Minneapolis, Minn	525	45
Washington, D. C	654	255
Chicago, Ill	2200	460
Los Angeles, Cal	500	35
Wilmington, Del	15	6
Asheville, N. C	6	2
Providence, R. I	25	20
Denver, Colo	850	37
	5797	2615

Electric Vehicle Association of America

Brief History of the Organization, Its Aims, Activities and Methods — What It Has Accomplished

By Arthur Williams

President Electric Vehicle Association of America

THE Electric Vehicle Association of America was formally organized on September 1, 1910, for the purpose of promoting the adoption of electric trucks and pleasure vehicles. Up to that time manufacturers of current-propelled cars had found the cost of production high, owing to comparatively small sales; makers of batteries had, consequently, too small a market for their wares; while central stations, seeing but little demand for current for charging, had been setting the price for such supply at figures which tended to discourage the use of electric motor cars.

Accordingly, twenty-nine delegates of these three distinct interests, realizing that a co-operative campaign to bring the electric vehicle into greater public favor would be of far-reaching value, formed the Electric Vehicle Association. In 2 years its membership had swelled from twenty-nine to 335, and it at present represents companies having a combined capital account of more than $500,000,000. While in the beginning the activities of the association were confined principally to New York City, today its influence, as well as its membership, has spread all over the United States, manifesting itself in thriving branches at Boston and Chicago with newly formed centers at Philadelphia and San Francisco.

Having thus outlined briefly the formation and internal growth of the Electric Vehicle Association of America, it is best to turn at once to the more important questions: What has it accomplished? What methods have been employed? Why does the association believe in electric vehicles? What does the association hope to do in future?

First in importance comes the test query as to definite results already obtained. In New York City between July 1, 1911, and July 1, 1912, the number of electric vehicles in use increased 45 per cent. In St. Louis during the first 6 months of 1912 one central station reported a gain of nearly 37 per cent. in revenues from charging type of car; and in Chicago an authority on electrical affairs estimates that electric trucking has grown 400 per cent. in the last 2 years.

These examples, to which others might be added, serve to show the remarkable gains which the electric car has recently made; and these facts are all the more worthy of note, since it is well known that gasoline cars, especially for business uses, have been pushed forward rapidly during the same period. Now, for this spurt in the electric vehicle industry, the Electric Vehicle Association of America holds itself in a large measure responsible. The leap forward is, in the belief of many motor car builders and central station managers, a direct and comprehensive result of the association's activities.

Besides doing much to spread belief in current-driven vehicles, and thus hastening their adoption, the society has also turned its attention to making provisions for greater convenience in operating cars. As a step in this direction it has brought about the compiling of lists of charging stations so that car owners may find them without difficulty. It has also urged the adoption of a uniform sign throughout the country, to indicate battery-charging stations, and is at present designing such a sign. It has also counseled the multiplying of these replenishing stations so they may be within easy reach of all vehicle owners in large cities. The association has succeeded, besides, in standardizing the charging plug so that it may be used for various makes of cars.

We come next to methods of work. Those pursued by the Electric Vehicle Association may be summed up under the following heads: investigation; exchange of ideas; and publicity, this last term including both direct and indirect advertising.

In order to investigate various problems, members of the organization are divided into committees such as those on insurance, standardization, rates and charging stations, and operating records. A rapid interchange of ideas and information is brought about at the association's monthly meetings. At each of these a paper is read and discussed, being afterwards published in *The Central Station*, the association's official organ.

The publicity work of our organization is aimed directly at the general public. When the Electric Vehicle Association was formed people in general did not know enough about the advantages of electric vehicles. They were sceptical; they had heard that battery-driven cars and trucks were impractical. It was to combat this widespread ignorance that a co-operative educational and advertising campaign was planned in the fall of 1910. Its scope was to be the advertising of electric vehicles in general, without regard to special qualifications of various makes. The work thus started has been so emphatic a success that a sum of $50,000 is now being spent by the publicity committee, and further funds will be ready as soon as they are needed.

No society could push with enthusiasm a cause in which its members did not believe. It goes without saying, then, that the Electric Vehicle Association of America believes heartily in electric vehicles. However, it is exhibiting no blind, unreasoning faith, for it does not urge its wares upon the public for all purposes. It recognizes, for instance, that the gasoline car is preferable for long-distance hauling. But it also knows, from intimate experience, that electric trucks and pleasure vehicles, are fitted to excel other automobiles for city use, delivery service and short-distance hauling. For these purposes it has unlimited faith in the electric motor car, because of the latter's dependability, ease of operation in crowded thoroughfares, simple driving mechanism, economy of maintenance and the reduced fire-risk incurred.

In looking toward the future, the Electric Vehicle Association of America expects to bring about a stronger organization of its own forces with branches in many of the principal cities of the country. Besides working continually for the more general use of electric vehicles it will also bend its energies toward the further standardization of cars, toward improvements in batteries and the establishment of more charging stations, not only in cities but also on routes connecting large towns. Moreover, it prophesies an increasing urban and suburban use of electric vehicles, owing to more generally diffused knowledge of their merits. And this, it is expected, will lead to the gradual disappearance of the horse from city streets.

It has been estimated that the amount of trackless hauling in this country is sixteen times as much as that carried on by railways, and of this, 80 per cent. is done in cities, where electric propulsion could accomplish it more safely, quickly and economically than horse-power. When this becomes an established fact it ought materially to lessen the price of goods to the ultimate consumer.

Future Bright for Electric Automobile

Field of Usefulness Is Widening in City and Suburban Service with Greater Travel Radius

By Manufacturers

Sales Managers Express Views on Subjec

PREACHING the propaganda of the electric has proved to be the most efficient means adopted so far to widen the use of such automobiles. The simple fact that they are more widely used in territory adjacent to the places of manufacture proves that those who know them best like them best.

Of course, from the viewpoint of the manufacturer the other essentials have been developed and the following symposium by leaders in the industry indicates the uniformity of opinion.

They bring out the special elements covered by the electric and take an optimistic peep into the future.

Suburban pre-eminence is claimed throughout the industry. The attainment of the real horseless vehicle is asserted. The installation of fleets of electric trucks is pointed out as an indication of the attitude of large consumers toward the commercial vehicle. The elimination of the chauffeur generally in the passenger car field is reckoned as a credit item. But through all the statements runs the plea for more thorough education of the public; better garage facilities and concert of effort by all elements associated with the industry.

Fine for Suburbanites—Brand

IN reference to the future of the electric car covering a period of the next 5 years, this is rather in the realms of prophecy except as we analyze same from present and past conditions. The constantly increasing difficulty of transporting the street cars' patrons of the larger cities with comfort to the passengers is impressing the desirability of electric brougham ownership on an increasing number of people. There is no immediate remedy in sight for radically bettering public passenger conveyance conditions, even with material additions to surface and subway lines.

While the American business man of means may submit to discomfort in his own travel to and from his office instead of avoiding the discomforts of public conveyance travel by electric car ownership, as soon as it is impressed upon him that these discomforts as far as his family are concerned can be avoided, he is very likely to become numbered among the many satisfied owners of electric cars.

Suburban residence is more and more attracting people of means who are in position to afford electrics. A drawback, however, of suburban residence to those dependent upon public conveyance transportation, is the infrequency of the train or car service.

Good roads agitation that has been going on the last few years has resulted in splendid suburban roads for considerable distances around large cities, and over these roads an electric properly equipped with batteries is capable of traveling from 70 to 100 miles per charge. It is an admirable means of transportation for the suburban resident, making possible trips to and from the city at will, giving to suburban electric car owners means of keeping in touch with their circle of city friends and acquaintances, and permitting the advantage of city shopping and entertainment, all independent of train schedules and train service.

Professional men and women desiring a dignified conveyance of such simple mechanism as to permit of operation without mechanical skill, are rapidly becoming electric car owners.

The many city transportation uses for which an electric is adapted, make this type of car one whose ownership is a pleasure. All of the above conditions are with us to-day, and they all tend towards increased sale of electric cars.

With the rate of growth there has been in the sale of electrics during the last five years, and with the showing of utility and good service that is being made by them, the next 5 years will take care of themselves.

There is no doubt that there will be improvements in electrics and cars will be refined and bettered from time to time. Just what these improvements will be, the future will develop.

The establishment of better garage facilities and the increased number of men whose services can be obtained for intelligently taking care of electrics and advising owners in reference to taking care of batteries and operating parts of the car, insure better service of electrics in general, and a constantly increasing number of enthusiastic electric car owners.—FREDERICK A. BRAND—The Broc Electric Vehicle Company, Cleveland, O.

Field Limitless—Henderson

¶ The field of the electric for city and intercity use is practically limitless. Such a statement might have seemed absurd to the minds of most people 3 years ago, but so rapid have been the strides in the development of storage batteries, the manufacturer meanwhile keeping pace in the development of the mechanical parts of the car, that their use in city and suburb 5 years from now will be universal throughout the United States and Canada is a logical conclusion.

One of the most potent factors in promoting the greater popularity of the electric is the fact that the price of current is steadily decreasing, while the cost of gasoline is constantly soaring upwards. The electric at the present time is the most economical means known for city and suburban trackless transportation in both the commercial and pleasure fields. The most notable expression of confidence in the electric truck as an economical and efficient means of transportation is the purchase of the electric truck fleets in enormous quantities by the various express interests of the country. After the most searching investigation and long years of test and try-out, these large transportation interests have adopted the following rule for the introduction of motor equipment. For all city delivery purposes, the electric is used exclusively. For suburban service which involves the long hauls and rough road work the gas truck is being used. Nowhere have the two distinct fields of service for the gas and electric been made more apparent than by the use to which the two types have been put by the express companies.

It is the performance of the cars themselves which has won a greater popularity for the electric as a necessary adjunct to the social activities of the men and women of this country. In the first place its qualities of inherent simplicity and absolute reliability have won the confidence of everybody. The older members of the family who use an electric know that it is a car which is as safe to operate, and even safer, than the old family horse. It has the added advantages that it is no plug and can go as far in a day as one cares to ride.

Charging facilities are readily installed and at no very great expense, so that it is perfectly possible for the purchaser of an electric to take complete care of the car himself, charging apparatus being so designed that it automatically shuts off when the battery has been given sufficient charge. The electric becoming more universal in the large centers of population has afforded the opportunity to the manufacturers to give a more perfect service to the owners so that nowadays there is scarcely a city of any consequence in the United States which has not complete power facilities and at least one electric service station which renders complete service to a large number of users at a nominal monthly cost. This system relieves the owner of all responsibility for the proper operation of his car.

In conversation the other day with a man who is closely in touch with the development and plans of the larger electric current producers in the country, he made the statement that he confidently looked forward to the time within five or six years when electric power companies would have the principal highways of the United States spotted with power sub-stations at frequent intervals where it would be possible for the electric car tourist to exchange his discharged battery for one freshly charged and proceed on his way. This statement at first sounded to me somewhat highly colored and imaginative, but upon sober second thought I can conjure up no really plausible argument why such a system could not be very actively worked out in the next few years to come to the great profit of all concerned.—O. B. Henderson—The Baker Motor Vehicle Company, Cleveland, O.

Perfect the Batteries—Woodward

¶ A very wide field of usefulness awaits the electric pleasure vehicle, and one which it is ready to meet just as soon as the public wakes up to the modern electric's adaptability to its requirements. When people realize how far an electric car will travel on a charge, how reliable it is, how free from disorders of all sorts, how simple and easily handled, and withal how speedy and efficient under all conditions, the electric pleasure car will quickly come into its own.

City women have always been the largest users of the electric. There is bound to come a still greater demand from this source with a better understanding of the convenience and simplicity of the modern electric car.

Business and professional men are sure to take advantage of the great facility offered by electrics for their trips about the city. There is a tremendous field in this direction when we can overcome the prejudiced belief that the electric is only a woman's car.

At its present stage, selling electrics is largely a matter of education. The public do not know what an electric car of modern design will do, nor how easily it will do it. When they find out, we will not be able to build electrics fast enough.

The future field of the electric pleasure vehicle, outside of the larger cities and towns, will depend largely upon the men who are perfecting the storage battery. With lighter and more powerful batteries, there is almost no limit to the field which the electric vehicle of the future may rightfully claim as its own.—O. J. Woodward—Woods Motor Vehicle Company, Chicago, Ill.

Future Is Bright—Krueger

¶ If the last 20 months can be in any way considered a barometer as to the possible growth of the electric car business, it certainly is destined to become a very important factor in social and industrial life in cities. The field of the electric today is practically confined to cities of 7,500 or above in population, although with the advent of popular-priced cars, the smaller cities have shown a remarkable demand. Cities are now buying cars, where very few if any were in use before. The fact that the prices in some have been reduced, and popular-priced cars have been marketed, opens up a new and undeveloped field in the smaller cities. Of course there is a natural increase that comes with the general increased understanding of electrics, but there are three elements which have probably contributed more to the increase in the electric business than anything else, and they are as follows:

1—The general understanding on the part of the public as to the care and operation of electrics.

2—The decrease in the first cost of electrics.

3—Revisions and improvements in mechanical construction with corresponding increase in efficiency.

The possible field for inter-city use for electrics where the roads are good, and the radius does not exceed 20 miles is almost unlimited. Farmers are booking with the electric for farm-to-city use.—C. F. Krueger—Standard Electric Car Company, Jackson, Mich.

To Be Supreme City Car—Reed

¶ The electric automobile was looked upon by the public as a somewhat expensive toy 5 years ago, a luxury without any well defined place or purpose. Today it occupies a prominent place in industrial and social life.

And its future?—A comprehensive study of the evolution of the electric, the development of public opinion, the growth of distribution and sales, leads the writer to believe that in the future this vehicle is destined to be the supreme city car.

Statistics taken in twenty-five of the largest distributing points in the United States show that out of the total number of electric cars running in these localities, 25 per cent. to 60 per cent. have been sold during the past 15 to 18 months. Everywhere manufacturers and distributors are enthusiastic over the future possibilities of this industry.

The gratifying future of the electric is due to the present success in destroying dangerous prejudices. Until 2 years ago, the general public and a large proportion of the automobile dealers who play a very important part in ultimate distribution, were not acquainted with the tremendous advantages of the electric. They voiced imaginary objections, among which were: "It will not climb hills"; "It will not give enough mileage"; "It has no speed"; "Its cost of maintenance is too high." These charges are disproved by fact and experience.

No better evidence can be given of the ability of electric cars to climb hills than the electrics now running in such cities as Seattle, Cincinnati, Pittsburgh, Kansas City and other towns of similar topography. In these cities 45 per cent. of the total number of cars in operation were sold during the past year. Today the electric motors and batteries used are a vast improvement over the designs of 6 or 8 years ago. Motors are now built to withstand the most severe road conditions, excessive overloading and to perform at a high efficiency above their normal rating.

The modern electric will render an eminently satisfactory mileage. We must remember this vehicle is strictly a convenience and is designed with reference thereto. The designing of an electric for mileage in excess of what is actually required for its purpose is simply wasted.

High speed is obtainable in modern electrics. It will be of interest to the reader to know that the fastest automobile mile, some years ago, was made by an electric. It has the speed and power proportionate to its use and natural service.

The operating cost of a well-equipped electric is considerably less than is usually thought to be the case. There is an economic feature to be considered. It eliminates the necessity of a chauffeur. You have all the convenience and luxuries of a limousine without its attendant expense.

The barriers have been swept away. The electric car is no longer a victim of misunderstanding. When a product has killed prejudice and enlightened public opinion, its future success is assured. The electrically-propelled vehicle has won its first and greatest battle. The next decade will see the electric pleasure car holding unchallenged its position as the ideal city car.—Penrose Reed—Chicago Electric Motor Car Company, Chicago, Ill.

Insurance from the Electric Viewpoint

Rates Recently Cut by Companies As Result of Decreased Liability To Accidents of All Kinds

By Carl H. Clark
Insurance Adjuster

WHEN the matter of insurance of automobiles was first brought out some years ago, it was treated rather lightly by owners, dealers, and even by those insurance companies which did not at that time write it. Conditions at present are, however, far different. There has been a great increase in the number of insurance companies writing it, and an enormous increase in the number of cars insured.

It was once a very common saying that there is nothing about an automobile to burn, but experience has shown both owners and underwriters that cars of all descriptions can and do burn. The saying is therefore rarely heard now, and the insurance of automobiles has become very firmly established. It is almost the exception to see a car of recent make and of some value which is uninsured, and, in fact, so general has insurance become, that cars are offered for insurance continually, which, from their type, age, ownership or other conditions, are not insurable.

While it is not possible to describe in detail within the limits of a short article all of the various forms which the policy may take, the general terms and intent of the policy may be described. The automobile fire policy may be divided into two general classes, namely, (a) the full value form, and (b) the non-valued form. Under the former (a), the value of the car insured is determined and agreed upon when the policy is issued, and remains without reduction during the life of the policy. In the event of the destruction of the car there can be no question as to the amount payable, this being the insured value, without regard to the actual value at the time of the fire. The policy covers against fire in the general sense, arising from any cause whatever, whether external or internal. In case of damage this form of policy allows the replacement of destroyed parts with new without regard to any depreciation from use. Damage to the car while being transported upon any conveyance upon land or water is also provided for, as well as the loss by theft of the car or any of its equipment in excess of $25 in value. The theft clause is also construed to cover damage to the car while in the hands of unauthorized parties. Losses under this clause are very numerous, especially in the large cities; some cases occur where a car disappears completely, and there are frequent cases where cars are recovered in a damaged condition.

In the non-valued form (b), the value of the car and the parts thereof is not stated, but is left to be determined at the time of the loss. Losses are presumably adjusted on the basis of the value at the time of loss, taking account of depreciation. As the automobile is probably the least stable in value of any kind of property, there are naturally some difficulties in determining its value at a particular time. This form of policy does not as a rule carry the theft and transportation features, although custom differs somewhat in different States. The latter form of policy, as might be expected, costs less than the former.

Attached to the fire policy there may be a collision clause, as it is termed, which covers the car against damage sustained by collision with a moving or stationary object. This, again, may appear in two forms, the full coverage, which pays for all claims in full, and the $25 deductible, in which this amount is deducted from each claim. In other words, only the excess over $25 is payable. The latter form is the less expensive, as it has the effect of eliminating a large number of small claims, which would total to a large amount. In some States there may be attached an additional clause covering against collision damage done. This protects the owner of the car against liability for damage done by the car to the property of others, or the property damage.

There is also the liability policy, covering the liability of the owner for personal injuries inflicted on others by the car. This form of policy, as usually written, covers injuries to one person up to the amount of $5,000, and up to $10,000 if two or more persons are injured. These limits may be doubled if desired. The insurance company also pays the cost of defending all suits for damages. The property damage clause above mentioned is very often written in connection with the liability policy, as it is of the same general nature.

With reference to the rates of insurance, those for gasoline cars are figured on a sliding scale, which is based on the age of the car, original price, and amount insured. The rate for electric vehicles is a flat rate. Without quoting figures, it may be said in a general way, that the rate on electric vehicles is about one-half that charged for the gasoline car. Since the rates are based on experience, this may be understood to mean that the losses have been less in proportion than on gasoline cars. In fact, there has been a reduction of the rate on electric cars within the last few months. On the other hand, if with the increased use of electric cars, both for pleasure and business, the losses should proportionately increase, it might be expected that the rate would also increase.

The favorable experience with electric vehicles may be accounted for by several reasons. First, and probably of greatest importance, the nature and construction of the electric render it much less liable to fire than in the gasoline car, where inflammable gasoline is used. The electric is generally used for a certain definite purpose and over short distances, and it is thus less exposed to fire risks, and on this account also it is less likely to be driven by careless or inexperienced persons. On account of its low speed, it is less shaken up, with the consequent loosening of joints and connections. The low speed and the ease with which it can be controlled also make it a favorable proposition as regards the collision and liability insurance.

It may be of interest to note some of the most common causes of fires in electric cars. These seem to fall somewhat naturally into a few definite classes:

The most common cause seems to be the overheating of the resistance coils by the throwing on of the current while the car is at rest. The primary cause is the accidental movement of the control lever after the car has been stopped and the brakes set. Sometimes the control lever is thrown from neutral into the first speed by catching in the sleeve or skirts as the operator is leaving the car. The low-tension current used in the electric car has great heating effect, and the current under the above circumstances soon overheats the resistance coil, causing damage. Cars have been known to travel a few feet unobserved after the current had been accidentally turned on, bringing up against a wall or snowbank, with the same result. Care should be taken in leaving the car to see that the control lever is in neutral, and the plug removed. This latter precaution will in a large degree prevent also the theft of the car.

Engineers View Electric Standardization

ALEXANDER CHURCHWARD, H. H. Rice and E. W. Gough summarize what has been done, and outline some of the things that ought to be accomplished to produce passenger and commercial electrics in conformance with some established basis of uniformity. Mr. Churchward says that to-day standardizing the speed of the electric is the aim. For commercials he believes it should range from 13 miles an hour to 6.5 miles an hour in decreasing ratio to the load capacity. Mr. Rice holds that voltage, batteries, lights and plugs limit the field for uniformity, while Mr. Gough takes the position that parts and equipment of all sorts are susceptible to standardization which is required with more force even than in gasoline practice. He specially points out that electric current distribution is uniform and that the vital parts of car equipment should be harmonized with the established rules.

STANDARDIZATION in the electric pleasure and commercial field is an important factor. I advanced the cause of standardizing voltage of various sizes and types of vehicles 1 year ago, and much progress has been made. Today nearly all of the 1912-13 vehicles will be equipped with batteries the charging voltage of which will be from 78 on the smaller pleasure or passenger cars to 110 on the various sizes of commercial vehicles and the larger types of pleasure or passenger cars.

Today standardizing the speed of the electric vehicle is the aim. The speed of these vehicles has been increased from year to year, and the real cause of this is not that the engineer of any one company has found some new battery, motor or tire, but because the salesman finds it easier to sell a car that will travel faster than that of his nearest competitor. Now the real claim for the electric pleasure vehicle is that it is so simple, reliable and easy to operate that any woman can operate it. But when you stop to consider that one of these glass-inclosed vehicles weighs approximately 1.5 tons with passengers, and is capable in some cases of making 25 miles an hour on good level roads, do you think that the speed is too high for the vehicle to be properly controlled by a woman? I consider 20 miles an hour very fast, yet the braking strain is 56 per cent. greater at 25 miles an hour than at 20. And I have noticed that in many cases the braking mechanism has not been increased in proportion to the increase in the speed of which the vehicle is capable.

I suggest the following speeds as standard for electric pleasure vehicles, and in presenting these would say that I have talked the matter over with the different manufacturers and the following speeds have been selected as an outcome of these conversations:

Closed types, Coupé	Open Victoria types
19 M.P.H. pneumatic tires	20 M.P.H. pneumatic tires
18 M.P.H. solid cushion tires	19 M.P.H. solid cushion tires

In order to determine the amount of electric current consumed by electric vehicles operating at different speeds, I conducted a series of tests and to obtain the desired accuracy attached a special graphic recording instrument to the vehicle which registered simultaneously the amperage and voltage at the motor or battery terminals, depending upon connections made; revolutions of the front wheels and a chronograph-meter attachment so that the time and number of revolutions are recorded. This instrument, in addition to giving the exact reading at any one time, is valuable for making acceleration tests as it shows the variations in volts, amperes and speed during the time required to move the vehicle from rest to full speed. From these tests it is apparent that the power required to drive an electric pleasure vehicle rises very rapidly as the speed is increased over 17 or 18 miles per hour.

It is equally essential in the commercial vehicle field to take recognition of speeds, and I have recently taken this matter up with a number of manufacturers and a compilation of the speeds they suggested for electric commercial vehicles of various capacities is given herewith:

Vehicle Capacity	Speed M.P.H.
1000 Pounds	12 to 13
2000 Pounds	10 to 11
3000 Pounds	10
2 Tons	8 to 9
3 Tons	7 to 8
4 Tons	6.5 to 7.5
5 Tons	6 to 7
6 Tons	6.5

A 3-ton truck, to compete successfully with horses, does not have to run at touring car speeds. The average speed of a 3-ton horse-drawn truck is 2.5 miles per hour, and the mileage not over 12 to 15 per day. Therefore a 3-ton truck running at 7.5 miles per hour will compete very successfully with a horse-drawn vehicle and its maintenance cost will be low. Therefore the maximum speeds must be kept down to such a point that the electric vehicle will continue to hold the enviable position it does today; namely, that for city work and short hauls it is the cheapest and most reliable method of mechanical traction.—ALEXANDER CHURCHWARD, Boston, Mass.

Standardize Voltages—Rice

¶ The standardization of electric pleasure and commercial vehicles has been considered at several meetings of the standardization committee of the Electric Vehicle Association of America.

Standardization is a good thing, but it is, I should say, of necessity, limited in its mechanical side to the adoption of the standard sizes of bolts, nuts, threads, etc., already adopted as standard by the A. L. A. M. and the S. A. E. committees. **Electrical standardization is limited, I believe, to the voltage of motors, batteries, and lights, to the charging plug, and perhaps to the running plug,** provided the car has other means of individual locking, such as a Yale key.

The voltage standard is necessarily regulated by the voltage supplied by the central stations and by the physical properties of the battery. The standard direct voltage is 110 or multiples of it, hence one standard, at least, would be approximately forty to forty-two cells as a maximum number which can be charged from a 110-volt direct current. This would require, naturally, a motor of the same voltage.

For those engineers who feel that the best compromise in designing is to use a smaller number of cells, I think thirty is a good stopping point, and might be standardized, giving the engineer that option. This is a good standard too, because the motor to go with this lead battery voltage could be used with a sixty-cell Edison battery, which is about the highest voltage Edison which can be charged off 110-volt circuit.

If it were thought that other standards were needed where indoor trucks or light pleasure vehicles did not require so much power, still other standards might be set of twenty-four and sixteen cells, the motor voltages for all being correspondingly 80, 60, 48 and 32 volts.

It will be understood, of course, that it would be quite possible to keep the 110-volt standard on a car requiring a very small battery, but this would make it necessary for the battery people to build very small cells and increase the variety of battery plate and jar sizes to such a number that an attempt to standardize solely on 110 volts would increase the confusion in the batteries.

With Edison, voltage standards would be the same as above, but would, of course, require different number of cells than the lead battery for the corresponding voltage.

The desirability of a standard charging plug and receptacle, so that any make of car could be charged without difficulty, or any make of car in a strange garage when in another part of the city or going across country, is too apparent to need comment.

The running plug or switch key, if not used in combination with a definite lock for protection against meddling, might very well also be standardized, principally for the sake of garages where various makes of cars are stored. This latter, however, is of minor importance, and in fact it would be probably difficult to get uniform adoption of such a key.

Lamps, of a necessity, would be standardized if the battery voltages are standardized, but the standards might and should prescribe certain approved makes of sockets and size of sockets, as for instance, Ediswan candelabra base, so that the owner could readily find globes to fit his lamp.—Herbert H. Rice—The Waverley Company, Indianapolis, Ind.

Standardization Is Necessary—Gough

¶ **The necessity for the standardization of parts and equipment of electric vehicles, both pleasure and commercial, is even more apparent than the standardization of gas car apparatus,** now being so admirably conducted by the S. A. E. Each vehicle propelled by a gasoline engine is in a sense independent, provided parts can be obtained from its maker, as fuel, oil, etc., are obtainable almost universally. The electric vehicle, however, must of necessity come back to general charging points, and this in its broadest sense need not be public garages, but eventually they must be charged from common electrical distribution systems.

Since practically all the electrical distribution systems are standardized in this country it is evident that the heart of the electrical vehicle, namely, the battery, should readily adapt itself to this standardized service.

Treating broadly the various elements in the electric vehicle which could be standardized to advantage, I submit the following:

Batteries—The arrangement of the battery should be such that it is easily charged from the ordinary 110 to 115 volt circuit, this voltage being almost universal. To obtain economy it is obvious that the largest number of cells of battery permissible with this charging voltage should be used, otherwise energy is wasted as heat in rheostats, etc.

Charging Apparatus—The charging plug, receptacle and cable should, as far as possible, be uniform. While it may not be possible at this time to adapt a universal charging plug suitable for both small pleasure vehicles and very heavy trucks, it should be possible to cover the entire field with not more than two plugs, etc. Under such an arrangement any garage could care for any make or size of vehicle as far as charging is concerned.

Lamps—The electric lamps should be standardized, particularly as to the base and voltage. The adoption of standard lamps will enormously reduce confusion and disappointments to the owner.

Speeds—The ultimate speed of any electric vehicle, being largely a fixed quantity for a given road and load condition, it would seem highly desirable to standardize for various sizes, capacities, etc., bearing in mind that a vehicle which is too slow may interfere with congested traffic as much as one which is too fast. Much able work has already been done along these lines by the Electric Vehicle Association of America.

Tires—For pleasure vehicle work this subject has already been largely covered by the S. A. E. as the general mounting of the pneumatic tires is the same for both gas and electric vehicles.

For **commercial vehicles, however, there has been practically nothing done which could be considered standard.** Since the tire has a very great bearing on the electrical energy required from the battery, too much effort cannot be exercised toward the use of a standard tire having high efficiency universally obtainable, easily mounted and easily maintained.

There are many other parts of refinement which can hardly be taken up in detail in this space, such, for example, as the standardization in commercial vehicles of weight ratio to draw bar pull, ratio of weight to capacity, etc.

The electric vehicle industry is only in its infancy, and a few years more will show vast changes in details tending toward standardization of all classes of vehicles and consequent bettering general service.—E. W. Gough—General Vehicle Company, Long Island City, N. Y.

What the Distributors Say About the Field

"A WELL-EQUIPPED centrally located general garage for electric cars would do more to educate the New York public to the advantages of the electric automobile than anything else," said W. R. Chandler, vice-president of the Holt-Chandler Company, handling the Flanders in the metropolitan section. "I favor the selection of a large plot of land in upper Broadway and the erection of an adequate garage building so located that the passing throng shall be able to see cars entering and emerging from the building; cars standing on the floors; cars being charged, all visible through large expanses of plate glass. The fact of the matter is that the New York public knows little about the electric passenger car and what little it thinks it knows is largely erroneous. The actual, physical sight of electrics at the source of power supply would frequently raise the one question in the minds of possible buyers that the electric fraternity wishes to implant: If the electric in use can be handled, run and charged like that; why should not I have one?"

"The electric passenger car is not a rival of its gasoline prototype in the field of touring and distance work," said Nathaniel Platt, sales manager of the Baker Motor Vehicle Company in New York. "It is, however, the best automobile vehicle for suburban work; for service in heavy traffic and for social and individual use where the chauffeur is not required. There are about 2,000 electric automobiles of all sorts in operation in New York, the charging of which is a valuable element in the business of the central stations. The peak of the load usually occurs about 5 o'clock in the afternoon."

"In direct competition with the gasoline car, the electric is now bidding for city and suburban business," said Cloyd Y. Kenworthy, representing Rauch & Lang in New York and vicinity. "The electric is not simply a woman's car. It is an automobile of general usefulness. Physicians are taking it up for professional service and I need not recount the established facts concerning the electric further than to say that if the car is good for the doctor's purposes, the last futile argument against such automobiles disappears."

Electric *for*

GREATER-CAPACITY batteries; longer wheelbases; larger and lower bodies; together with a host of minor improvements mark the difference between the electric passenger vehicle of 1913 and its predecessors. Shaft drive has made some progress, as distinguished from the use of chains or the combination of means for reducing from motor speed in transmission, in connection with final shaft drive.

Taken as a whole, the past year has been the best ever enjoyed in the industry. The total production of electric passenger cars was not far from 6,000 and the demand generally in excess of production.

For 1913 plans have been laid to make about 10,000 cars, and the orders booked since autumn and still unfilled make such a figure look reasonable. The current orders are fully 10 weeks ahead of several of the factories.

The chief tendency to be noted in the electric passenger car field is toward the centralization of effort upon one chassis type, no matter how many body styles are used. This is the same tendency that has been found in current gasoline practice and is in line with the progressive ideas that permeate the whole structure of American manufacturing.

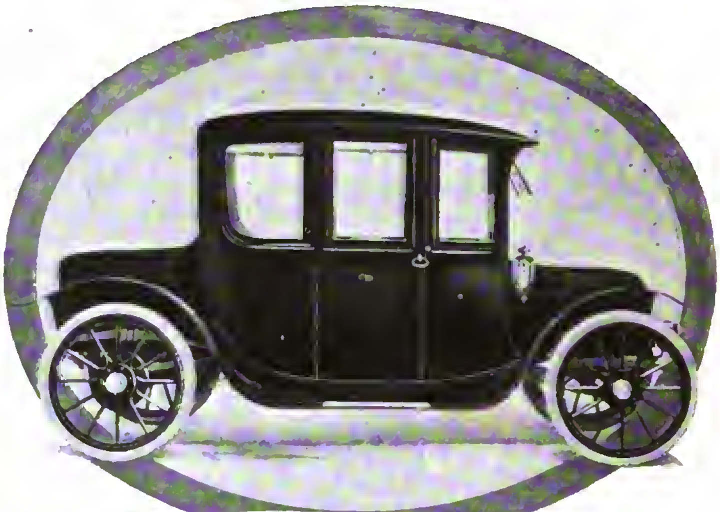
Judging from the changes announced for this year, the most serious fault of electrics generally in the past was lack of power. Last year several of the major manufacturers increased the battery equipment and this year the 40-cell, 11-plate lead battery or the 60 or 64-plate nickel-iron battery have been made standard equipment or first option by the more prominent manufacturers.

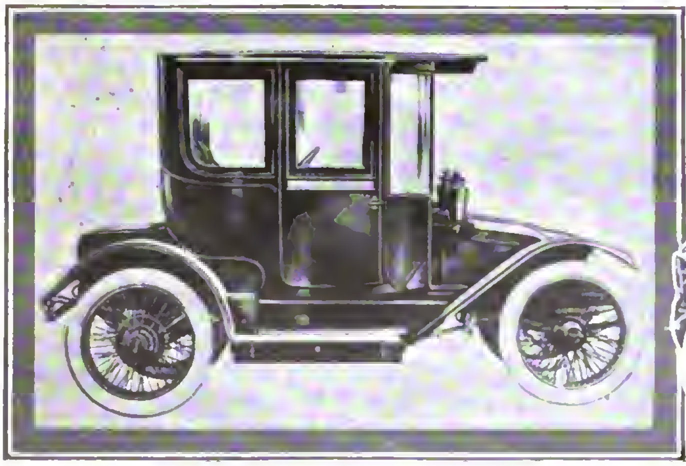
In order to use the extra supply of current due to the enlarged batteries, larger motors have been installed. Several companies have substituted 80-volt motors for the 60-volt ones formerly used. It would be inaccurate to say that the average figure is represented by that difference, but in general the 1913 motors are considerably larger than those of 1912.

Electric passenger vehicles keep pace with the gasoline section of the automobile industry according to announcements made by the various factories as to production.

There are twenty-four companies engaged in manufacturing passenger vehicles this year. In 1912 the output was about 6,000 cars, but this year the factories will make 10,000 or more.

Fully 80 per cent. of the 20,000 passenger electrics now in use are distributed west of the Allegheny Mountains, east of the Rockies and



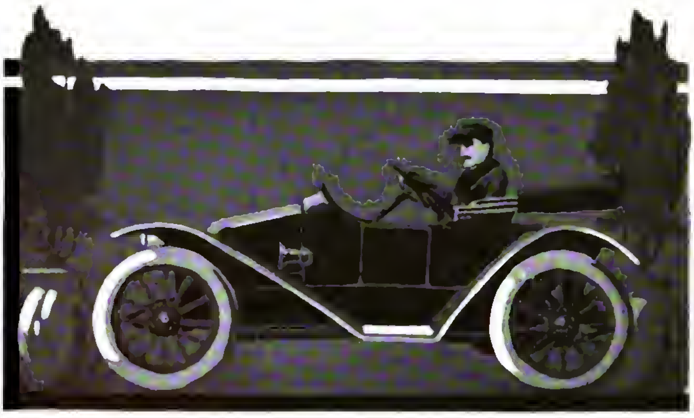


Waverley fore-drive brougham, showing curved lines, model 101, $2,800

Buffalo coupé, model 30, showing wire wheel equipment, price $2,600

Baker brougham, curved roof and graceful body lines, $3,100

Vehicles 1913



north of the Arkansas line. Fifty per cent. of the whole number are in Illinois, Michigan, Ohio and Indiana.

Popular use of the electric is in direct proportion to familiarity with it; therefore the cars have their greatest vogue in and about the cities where they are made.

The chief element in the recent growth of the industry has been the active co-operation of the central stations.

The object of increasing the capacity of the battery and motor is to afford more mileage and the effect may be traced in the largely increased figures in estimated miles per charge. Last year the average claimed mileage was around 70 per charge, with actual performance below that figure due to the difference between general operation on all kinds of pavements and under all sorts of conditions and the expert operation of the skilled driver on smooth pavements. The claims for 1913 range above 75 miles to the charge. Some of the large, prominent companies are chary on mileage claims, and the lower figures on estimated mileage come from concerns that in the past have exceeded advertised figures in real service of their cars.

Deducing from the list of specifications herewith, the 100-mile electric has arrived. That maximum mileage is claimed for certain models by fourteen out of the twenty-four makes tabulated. Naturally, such an extraordinary mileage cannot be delivered under all conditions of road and weather.

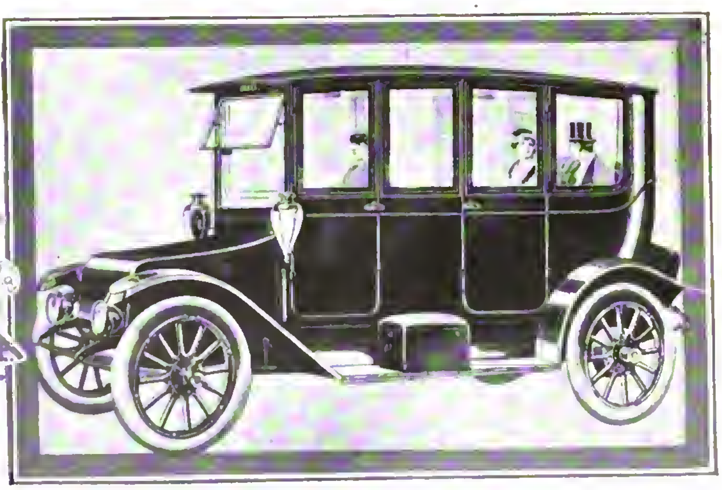
The transmission of power from the motor to the rear road wheels has been the subject of much development work during the year, although actual changes have not been so radical as those that were noted in 1912. Shaft drive has made some progress. Two-thirds of the passenger vehicles are fitted with it, using either the straight-shaft principle or speed reductions between the motor and the propeller shaft. Only two retain chain drive. The final drive in all cases but the two using chains is through bevel spurs or worm gears in the rear axle.

Early in the industry chain drive was used universally and the change to shaft drive or some of its modifications and variations has been accomplished largely within the past 3 years.

During 1912, two companies abandoned silent-chain reduction between motor and propeller shaft to adopt the straight shaft-drive principle. Two more chain-using companies dropped out of competition and those who were added to the industry

Rauch & Lang coach, model J, price $3,100, showing typical construction and graceful appearance given to body design in current practice

Woods, five-passenger, fore-drive brougham, $3,600—one of the characteristic electric passenger types that have been developed during the past year



Detroit limousine equipped with 60-cell Edison battery, $5,000 total reduction between the motor and rear wheels is 11.6 to 1.

The Century is shaft-drive with 4-to-1 bevel-gear reduction in the axle. There is only one universal joint, which is located in rear of the motor.

The Waverley has a characteristic shaft-drive arrangement in that the shaft parallels the rear axle. There is a silent-chain reduction between the motor and propeller shaft of 1.76 to 1, and there is a second reduction in the rear axle by herring-bone gear of 4 to 1. The propeller shaft has two universals.

The Bailey, an example of side chain-drive, transmits from the motor to the jackshaft by chain and from the shaft to the rear wheels by side chains. The reduction between the motor and jackshaft is from twenty-one or twenty-three teeth on the armature sprocket to eighty-seven teeth on the jackshaft. The reduction between the jackshaft sprockets and the rear wheel sprockets is twenty-four teeth to fifty-seven. This gives a total reduction of 9.84 to 1 and 8.99 to 1, the difference in ratio being due to the different number of teeth on the armature sprockets.

Woods uses a shaft drive with double reduction. There is a reduction by herring-bone gear between the motor and propeller shaft and a second reduction in the bevel transmission at the rear axle.

The Rauch & Lang uses shaft drive with double reduction. Reduction No. 1 between the motor and propeller shaft by silent-chain drive is 2 11-28 to 1 and at the rear axle by bevel gear 3 6-13 to 1.

In the Baker chassis the shaft drive is combined with two reductions, the first by silent chain between the motor and propeller shaft and the second by bevel gear in the rear axle. The total reduction amounts to about 10 to 1, but varies in the different models between 9 to 1 and 11 to 1 in connection with a high speed motor, the difference being in the chain reduction.

The Broc uses silent-chain and bevel-gear reduction, the former between the motor and propeller shaft and the latter in the rear axle. These reductions are: silent chain 37 to 21 and bevel pinion 4 to 1.

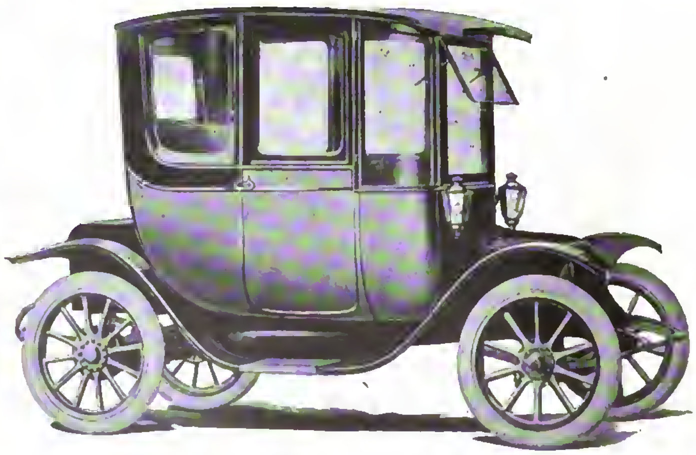
The Standard uses a direct drive without universal joints, and has a double reduction in the rear axle, the first reduction by bevel, the second by spur gears.

It is to be regretted that it is impossible to give the exact methods of reduction, whether double or single employed on one or two of the other cars.

The newcomers this year are the Buffalo, which succeeds the Babcock; the Chicago, Electra and Phipps. Those which have withdrawn are the Babcock, Studebaker, Brunn and several of the small makers. Three of the four new companies use straight shaft drive and those that withdrew used chains either in the regular equipment or as an option.

In the matter of wheelbase there is a decided tendency toward increase. Last year the average wheelbase was a trifle over 90 inches. This has been increased an average of 6 inches,

Fritchle brougham with body designed for family use, $3,600
Grinnell clear-vision brougham, showing long windshield, $2,950
Rauch & Lang brougham, model BB, five-passenger, $2,900
Argo, model A, four-passenger brougham, with curved hood, $2,800



Standard, model M, deep extension and U panel door, $1,885 but the bald statement does not tell the whole truth. By averaging all the 1913 models, the figure appears to be accurate, but it should be less than 96 inches, using the whole production as a basis because the most popular models are not those that are represented by extremely long wheelbases. A more exact figure would be about 94 inches. As a rule, the model upon which the manufacturer has put forth the most effort is the one that most closely approximates the average figure in his line.

The reason for lengthening the wheelbase of the electric passenger vehicle is to provide greater luxury and comfort as well as to provide more space for mechanical developments. This points first to enlargement of bodies and the increased size of passenger compartments in the inclosed cars. In several of the makes, notably Rauch & Lang, Detroit, Waverley, Baker and Woods, some of the bodies are materially larger than they were last year. The drop-frame emphasized in Woods construction lends itself to more room inside and more latitude in seating arrangements.

The additional wheelbase means that nearly all the manufacturers have cars with seating accommodations for five or more passengers, which would have been uncomfortable without the extra inches that have been added.

Despite this general enlargement of bodies, the cars of 1913 do not have a top-heavy appearance. This is due to a certain extent to the lowering of the bodies, but to a much larger extent to the art of the body builder who has striven to do his work in such a way that while the actual additional space is used in length, height and width, the visual impression is not that of increased size. Naturally, in order to be harmonious, some appearance of increase might be expected from the actual increase in chassis length, but that impression is not given by the cars themselves.

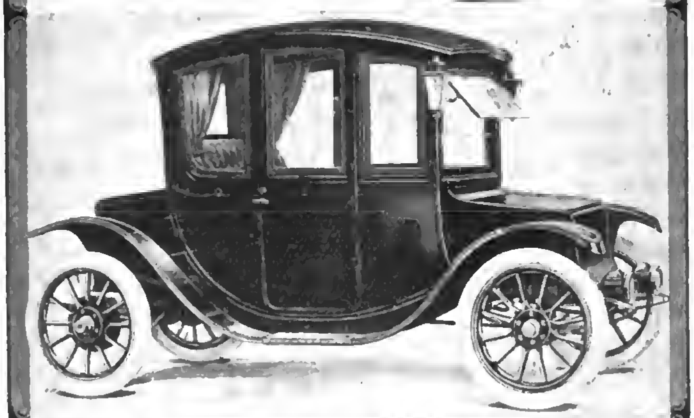
The fore-drive idea which developed rather suddenly last year has made some progress in the current models. Almost all the leaders have one or more models embodying this idea.

Colonial coupé bodies, embodying the type of body structure and fittings associated with the term, are continued for 1913 by the companies that introduced them heretofore. The colonial idea in body construction is worked out in a variety of ways in the brougham types. Curved lines in the tops are used more frequently this season. This is the same tendency that has been noted in gasoline automobile bodies of high class, but it is still uncommon.

The roof of the extreme type of the curved-top body is the arc of a circle having a radius of about 50 feet. This type is more frequently used with cars of low suspension.

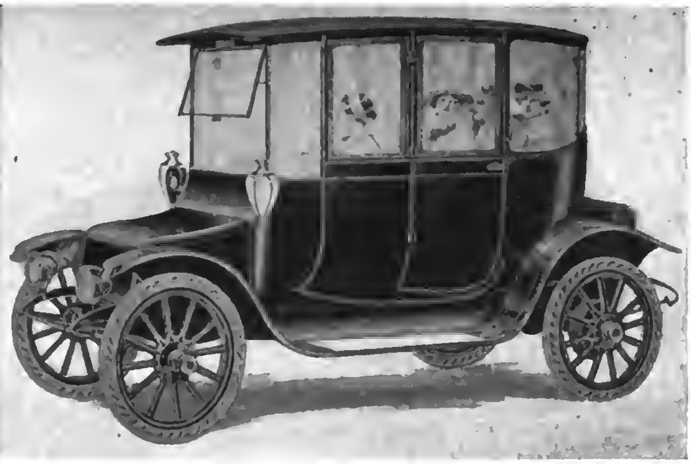
The elimination of sharp angles in body work is quite a feature. While a few models are equipped with bodies, the exterior outlines of which show no angles, being rounded in the rear, front and sides where the roof joins the sides; with

Chicago brougham model, showing appearance of arched door, $2,800



Hupp-Yeats Regent, upon which makers centered effort, $1,750
Columbus brougham with curved roof and arched door sashes
Waverley colonial brougham embodying numerous improvements
Ohio fore-door car designed for social service, $2,900

Detroit clear-vision fore-drive model in city and suburban type



Detroit brougham, showing windows in rear corner panels, $3,600

Fritchie roadster, four-passenger, with large battery capacity, $2,500

Bailey victoria-phaeton, similar to 1912 model, $2,600

curved roof and rounded rear, such practice is not to be regarded as representing a standard type. Some one or two elements of the non-angular type are used in a majority of the bodies. Rounded corners at the junction of the rear and side panels is all but universal and the elimination of angles in the lower rear portions is steadily growing in popularity. Upholstery is of neutral-tinted whipcord in the highest-priced cars.

Improvements in the fittings for windows have been made in several important lines of manufacture. These consist of fastenings and frames to check the tendency to rattle and to facilitate raising and lowering.

Open-bodied types of electric passenger vehicles developed only slowly during 1912. The roadster type is continued and the victoria and phaeton are in demand, but the high-pressure business has been done in the inclosed cars.

All over the country the effort has been made to bring out prominently the service of the electric towncar, brougham, coupé and limousine as a supplement to gasoline equipment or as a substitute for it. The immediate effect of this campaign is to be seen in New York, which up to now has been a regrettably poor market for the electric. During 1912 the dealers in the metropolis disposed of about 200 cars, and as nearly as can be estimated half of the sales were to persons already owning gasoline automobiles, or who had owned them in the past. As the electric lends itself readily to feminine handling and is peculiarly available for service in the city, the conclusion is that the women of the family use the electric for town service. This alone is sufficient to warrant the emphasis laid on the inclosed car by the manufacturers and it also accounts for the general lukewarmness toward the open cars.

Equalizing the weight carried by each axle, and in some cases, the apportionment of load to each of the four wheels has occupied some attention by designers and engineers during the past year. The tendency is growing toward equalizing the load between the axles and the division of the battery is more generally made than last year. It used to be considered good practice to place the battery between the axles, but the washing of the electrolyte and the extra strain imposed upon the frame were two definite disadvantages about such arrangements and now the accepted idea is to make each wheel carry an equal load. This is accomplished in various ways to meet the ideas of the engineers.

One of the practical effects of the redistribution of load is to be seen in the improved spring equipment that has been developed within the past 2 years. Another is in the increased mileage delivered by the tires. The tire companies have gradually extended their mileage guarantees under the influence of the intelligent revision of the load. Today several of the tire companies guarantee 10,000 miles for their tires.

In the line of minor improvements every manufacturer has added something to the 1912 models. Broadly speaking, every improvement that has been made is patented. This applies to the signal device installed in the new Rauch & Lang cars to warn the operator when the current still flows after the car has been stopped and the foot brake applied; to the body designs of the Waverley product, as well as other concerns; to the new rain-vision shield and numerous other details. No radical, basic patented devices were developed in 1912. They were all matters of detail.

The subject of tires is one of the most important in motoring generally. Tires for electric pleasure vehicles depend largely upon the locality where used. Solids can be used where vibration is minimized; cushions have a wider field. There is a wide variation between the solid dual-tread tires used on some of the Woods models and the new MacNaul pneumatic furnished with the Rauch & Lang line.

The Motz tire is in general demand. The new tires placed on the market this year are few. The Woods solid is one of them. This tire is made by the Firestone company and is in effect a cushion. The base of the tire is no wider than the standard rim, but it is divided longitudinally around the circumference so that there are two surfaces bearing upon the pavement. This gives something the effect of a non-skid tread. The cushion clincher, made by the same company, is simply a cushion tire made in such form as will fit a clincher rim. The side-wire tire is what its name implies. All are guaranteed for 10,000 miles, limited to 2 years' service. Goodyear, Goodrich, United States, Republic and other companies make electric pneumatics the same as in former years. The MacNaul tire is the most radical development of 1913. This tire is oval in shape and has a tread 7-8 inch thick. It is of the ordinary pneumatic type in some respects, but requires an air pressure of but 50 pounds to the inch to give its best service. The guarantee is for 6,000 miles.

The question of speed enters into the situation this year more than ever before. This is due to the increased possibilities for speed in the 1913 cars. The tire makers have united in limiting the effect of their guarantee to the use of their tires at an outside limit of 20 miles an hour. It has been only a short time since the first electric, equipped with a closed body and not intended specially for racing could make 20 miles an hour, but this year any of the stock cars can touch that rate of speed, and some of them can exceed it.

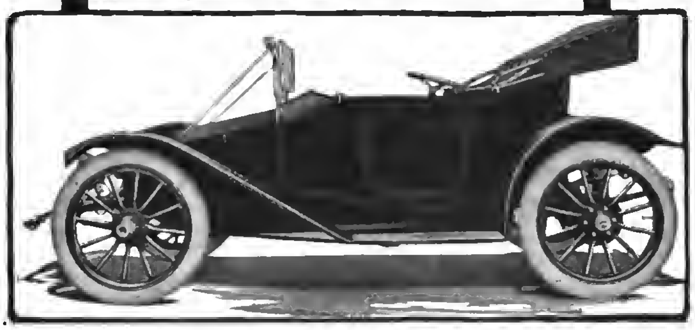
Little change from last year is to be noted in the matter of steering gear. The wheel is used almost exclusively for the outside drive cars, although there are some exceptions. The wheel is also used in some of the fore-drive models, but lever steer is still the prevailing practice in a majority of models. The large companies either make cars with both types of steering gear or will furnish either optionally.

Two changes from magnetic to mechanical brakes appear among the 1913 cars as compared with those of 1912, and one has substituted the magnetic brake for the type formerly used.

The average price of the electric is $2,800. The range extends from under $2,000 to over $5,000. On a strict basis of comparison with the cars of last year, model for model, the 1913 price is higher by about $150 per car. But the story told by averages is incomplete. In 1913 there are fewer cars selling under $2,000 but more at $2,500 or less. At the same time those selling from $3,6co up have increased in number of models. The medium-priced cars are lower in price than last year, but the comparison should not end there. In the same price class as 1912, the 1913 cars offer much more value. They are larger, more powerful and more luxuriously fitted. In other words, where prices have not been slightly reduced, more value is offered for the customer's dollar than before. Thus while the average price for 1913 is higher, it is due more to the elimination of some of the cheaper cars than to a raise all around.

One of the most interesting announcements made this season is that of the Anderson Electric Car Company that its models for the next 3 years will not show any material change from the current offerings. This indicates that in the opinion of one prominent manufacturer at least the present type of electric automobile has a degree of permanence. If this conclusion should prove to be correct and well based the future of the electric will be limited only to its development. If the main principles of the electric are now well-established, the manufacturers can devote more energy to details and to the enlargement of their market.

Following is a brief outline of the various lines of manufacture noting the changes made in comparison with former years:



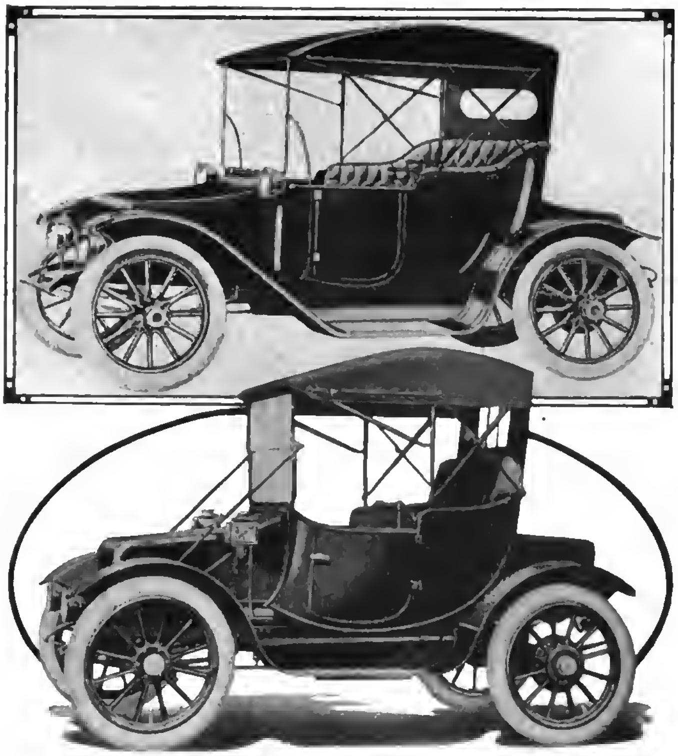
Woods roadster, model 1320, price $2,400
Argo torpedo, which might be taken for gasoline car, $2,500

Argo

Three models are presented for 1913, two of which are new. These are a roadster and a fore-drive limousine. The roadster model has a passenger capacity of four and is equipped with a forty-cell Exide battery designed to give a speed of 25 miles an hour. All the Argo models are shaft driven, using two reductions, the first being by herring-bone gear at 2 to 1, located between the motor and propeller-shaft and the second through bevel gears at 4 to 1 between the propellershaft and the rear wheels. The batteries are 33 1-3 per cent. larger than in 1912 and the estimated mileage of the roadster is given as 100 miles on a single charge, while those of the limousine and brougham are placed at 85 miles. The tire sizes are 38 by 4 and 36 by 4 inches for the front and rear wheels, respectively, and the tire equip-

Ohio, four-passenger car, with only one straight line, $3,200

Columbus, model 1234, illustrating new body type



Detroit roadster, with adjustable top and windshield, $2,350
Rauch & Lang roadster, showing different phase of same idea, $2,600

ment is pneumatic, although certain options are offered. Aside from the increased size of the batteries, the chief changes for 1913 consist of improved support for the motor; detailed refinements in body and fender design and added luxury in upholstery and equipment.

Baker

The Baker line is equipped throughout with bevel-gear, rear axles and shaft drive, using silent-chain reduction from the motor to the countershaft. The line offered includes a victoria, colonial brougham and extension brougham. Two extension coupé types are continued. The extension brougham is fitted with seats all facing forward and is a five-passenger car design for family, social and theater work. It embodies all the established Baker features of sumptuousness and is in the high-price class. The passenger compartment has been enlarged and is now 75 inches from glass to glass. The wheelbase of this model is 107 inches. The car has a battery of forty-two cells. Wheel steer is used on this model. The regular Baker brougham has a wheelbase of 92 inches with the same battery equipment as the longer car. Special emphasis is laid on the completeness of the equipment furnished with these cars, which includes besides the full lighting outfit a set of recording and measuring instruments, tools, flower vase and toilet set.

Bailey

Changes in the Bailey vehicles consist in lengthening the wheelbase of the phaeton model from 81 to 82 inches to give a little more ease to its riding qualities. The long roadster presented last year has not been continued. An option of cushion tires is offered with the phaeton model. Chain drive is retained. Morse silent chains being used to the countershaft and roller chains to the rear-axle sprockets. the reductions being 9.84 to 1 and 8.99 to 1, respectively, for the two chassis.

Borland-Grannis

An outside-drive coupé, equipped with an Exide battery of forty-four cells, with a maximum speed estimated at 25 miles an hour, is the feature of the Borland line. The wheelbase has been lengthened 4 inches to 96 inches in the new models and for the particular model, pneumatic tires are furnished. The cars have six forward speeds, and this model has an estimated mileage of 100 per charge. The three other types offered include a roadster with similar battery equipment; a colonial coupé and brougham with forty-cell batteries. The drive is by shaft with silent-chain reduction. The coupé is equipped with a steering wheel.

Broc

Longer wheelbase in the standard models, improvements in the passenger compartments of the inclosed cars, a forty-cell battery in all the larger cars, and 4-inch drop frames to compensate for the enlargement of the bodies are the chief variants in the 1913 Broc line of manufacture. The open types are fitted on chassis with wheelbase of 84 inches, but the inclosed cars all have a length between the axles of 96 inches. Structurally and mechanically the new models are similar to those that have been established previously by the company. But in the body details there have been a number of changes. The upholstery of the rear seats is 8 1-2 inches deep and the seats are sloped to permit of more luxury in settling against the cushioned backs. Slip pockets in the doors, sliding tool boxes in the rear seat heel board, 24-inch doors, and a system of window fastening designed to prevent rattling are some of the improvements. The fore-drive idea has been developed in some of the models.

Buffalo

The Buffalo is a new name in the list of electric vehicles, but it is in reality the successor of the veteran Babcock. The 1913 line consists of a coupé and roadster on the same chassis. The cars are equipped with Philadelphia batteries of forty-two cells and the estimated extreme speed of the roadster is 35 miles an hour, with 100 miles on a single charge. Of course, it does not mean that the car will go 100 miles at 35 miles an hour on a single charge, but that operated at the most economical rate of speed the maximum mileage will be about that distance. Optional tire equipment is offered with the preference on pneumatics. The drive is by shaft to bevel gears with a single reduction in the rear axle. The gear ratio between the bevel pinion of the shaft and the bevel on the differential is 4 to 1. Universal joints are dispensed with and three-point suspension

Colonial brougham with few right-angles showing in body lines, $2,700

is accomplished by two trunnion joints, one on each side of the motor with a ball-and-socket joint fastened to the middle frame cross-bar. The forward end of the drive is thus allowed to move in any direction.

Chicago

The Chicago electric makes its bow to the public by offering a coupé and limousine equipped with a forty-cell Exide battery. The cars have a seating capacity of five and their mileage is estimated at 100 on a single charge. The maximum speed is placed at 23 miles an hour. The car has five speeds and is equipped with 36-inch cushion tires all around. The shaft-drive principle is followed without intermediate reduction between motor and propeller shaft. Options are given as to the choice of steering, either by wheel or lever. One of the distinctive features of the line is the new arched door designed to prevent the destruction of aigrettes, plumes and dress hats. The curve allows rain to drain off on both sides of the door and eliminates the danger of ruin to dresses by reason of a deluge of water from the top of the door when it is suddenly opened. It is also graceful in appearance. Special stress is laid on the body design, which is stylish and comfortable, and the interior is laid out for the all-

Columbus four-passenger car with adjustable top, front and sides

face-forward type if desired. The controller is from a special design intended to operate with continuous torque and equipped with a magnetic blowout to increase its working efficiency. Much of the usual wiring is rendered unnecessary by reason of the fact that the controller is located directly against the motor. Two universal joints are used with the propellershaft, one just behind the motor and the other immediately in front of the axle. The ratio of reduction provided by the bevels is 5 1-3 to 1. The car is designed by Frederick J. Newman.

Century

A new brougham to carry five passengers is the feature of the current line of Century vehicles. The wheelbase has been extended to 98 inches, allowing more space for body improvements. The battery is a thirty-cell Exide with an ampere-hour capacity of 150. With the improved type of Westinghouse motor the car has a mileage estimated at between 65 and 100 on a single charge. Much latitude is allowed in the selection of wheel sizes and tires to compensate for variation of service conditions in different localities. The Century drive is to bevel gear in the rear axle with universal joint behind the motor and bevel-gear reduction at 4 to 1. The car has six forward speeds. Changes from 1912 construction are really refinements and developments rather than anything radical. Lever steer is used.

Church-Field

Another comparative newcomer is the Church-Field company. The 1913 line consists of two models, a roadster and a colonial coupé. The structural feature lies in the two-speed gearset, which serves to give ten speeds forward in place of the usual five. The car is the only one before the American public thus equipped. The shifting is done mechanically through the controlling lever without adding materially to the complexity of that device. The torpedo roadster has a steering wheel. The drive is by shaft. Reduction ratios are 4 and 8 to 1.

Columbus

Five new models are presented by the Columbus company. The main changes are enlargement of the batteries all around, the stanhope having thirty-two cells of Exide battery against thirty cells last year, while the heavier types have forty cells in place of thirty-six. The drive is by shaft with first reduction by silent chain and the second by bevel gear, the total reduction ratio being 11.6 to 1. Lever steering gear is used on the inside-drive cars. The theater coupé is the feature of the line. This is a four-passenger car, heavily batteried with speed ranging from 7 to 22 miles an hour and a range of from 60 to 100 miles on a charge. The seats are arranged so that all may face forward, although one of the front seats revolves at pleasure. Safety of operation is enhanced by the new brake equipment which consists of four internal expanding brakes on the rear wheels and one contracting brake on the driving shaft. The rear tires on this model are 34 by 4 1-2 inches. Otherwise the tire sizes for all models are 34 by 4 inches.

Colonial

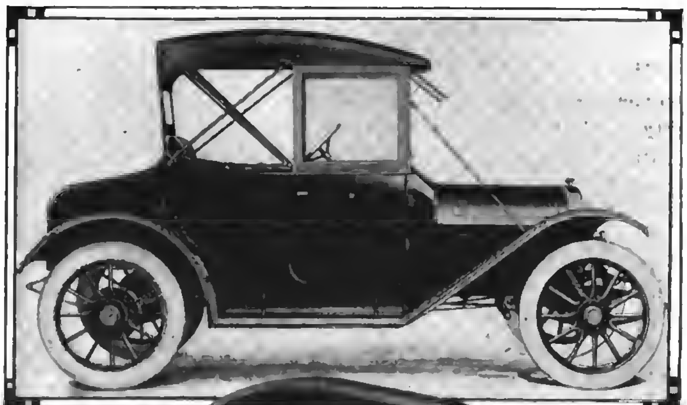
A standard four-pasenger coupé, 96-inch wheelbase and equipped with a Willard battery of forty cells, are the features of the Colonial. A particularly graceful body design is used, the lines being unusually pleasing. The mechanical features of the car are much the same as in former practice with final drive through bevel gear. The charge mileage is estimated at 70. The car has the conventional six-speed controller.

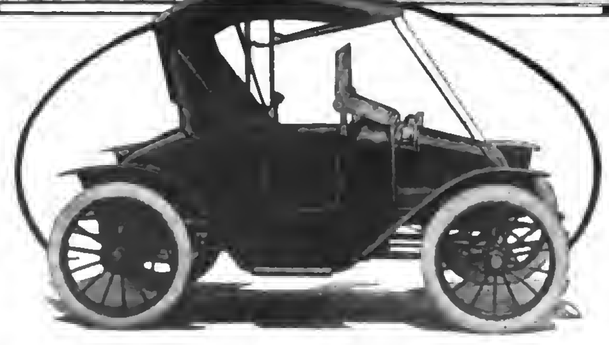
Dayton

The new model of the Dayton line is an extension coupé equipped with a thirty-cell Exide battery giving a maximum speed of 22 miles an hour. The operating mileage on a single charge is estimated at from 75 to 90. The chief improvement in the mechanical sense is the automatic cut-out in connection with the emergency brake, designed for the purpose of preventing fires or overheating of the motor when the car is not in motion. When the brake pedal is pressed down the current supply is disconnected from the motor. The car is shaft driven. It has a passenger capacity of four and the interior of the body is arranged in several styles to meet a variety of demands.

Detroit

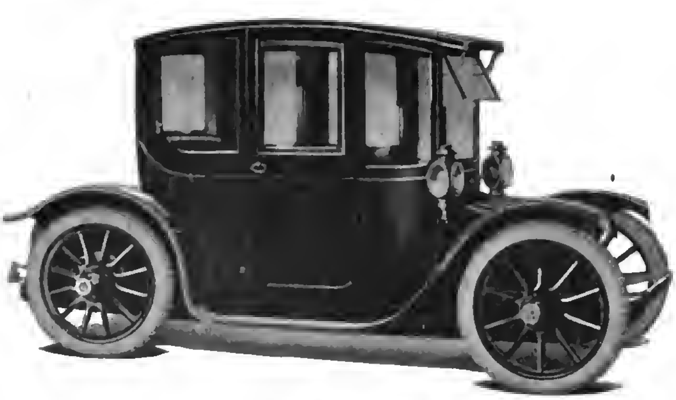
Additional battery equipment, larger wheels on some of the models, a clear-vision car and refinements of details are all the

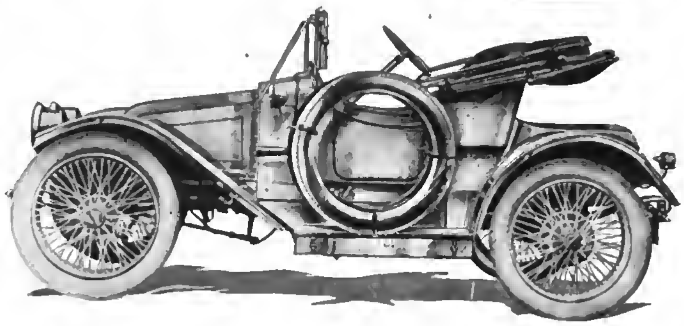




Waverley protected roadster, showing method of enclosing, $2,250
Fritchie torpedo, with battery box in rear, low and rounded, $2,400

changes made by the Anderson company, in fact, the company has announced in definite terms that for the next 2 or 3 years the changes would probably be of minor character. The batteries for 1913 are Detroit electric lead batteries of forty cells, or Edison batteries of sixty-four cells of the A-4 size. The exception is the limousine, which has a sixty-cell Edison of A-6 size. The limousine is steered with a wheel, while the stock equipment of the other models is lever steer. As compared with the 1912, the Detroit cars have two more cells of lead battery or four additional cells of Edison. The mileage figures are increased by reason of the addition. The direct shaft drive adopted by the company, using a universal joint behind the motor and geared in the rear axle at a reduction of 5 to 1, is continued throughout the line. The clear-vision car, which is being featured this year has glass panels in the rear corners of the body. This gives the driver a chance to watch traffic and avoid accidents with more facility than if some opaque substance were used. One of the new details in body construction is the substitution of aluminum for wood in the roofs of the closed cars. Several of the cars are equipped with seats all facing forward. Another change that will be noted is the abandonment of the type of hood formerly used in the roadster. In 1912 this hood gave the impression of a gasoline car, but for 1913 the graceful lines of the hood could not be mistaken for those of a gasoline automobile.





Century brougham, a typical car of 1913 in body design, $2,550
Buffalo wire-wheeled roadster equipped like gasoline car, $2,600

Electra

The feature of this new line is a torpedo roadster with a 90-inch wheelbase and equipped with a Haschke twenty-cell battery. All the usual battery options are allowed at the various prices charged for them. The car simulates a small gasoline roadster very closely in appearance. Shaft drive without intermediate reduction between motor and propeller shaft is used. The rear axle is worm driven. Control lever is located under the steering wheel, which is on the left side of the car. Pneumatic tires are favored, but the usual options are given. The company also lists a larger car with a 96-inch wheelbase.

Flanders

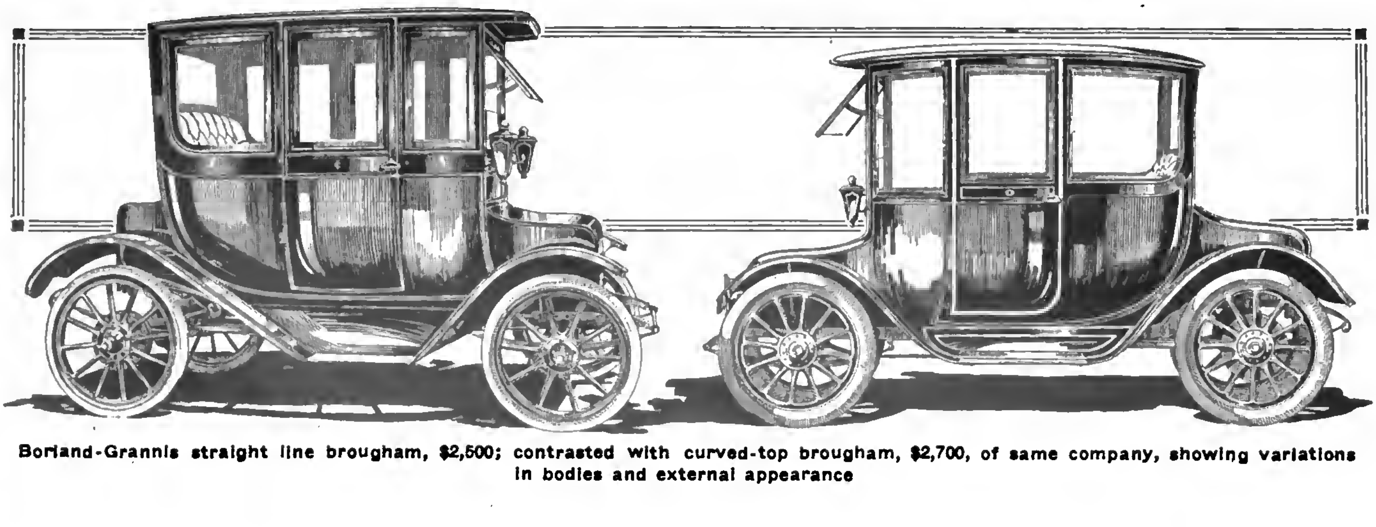
A single chassis fitted with victoria or colonial bodies is the Flanders line. The coupé is the featured car and this year it has a passenger capacity for five persons. The main changes are in the size of the battery, which is a thirty-cell Flanders as against a twenty-four cell-battery in 1912; the Timmerman motor, which had not been definitely adopted last year, and the rearrangement of the seats. The worm-gear drive is continued, as well as the other typical features of the mechanism. With the additional battery capacity, the car is now rated at 20 miles an hour and has a range of travel of from 75 to 100 miles on a single charge.

Fritchle

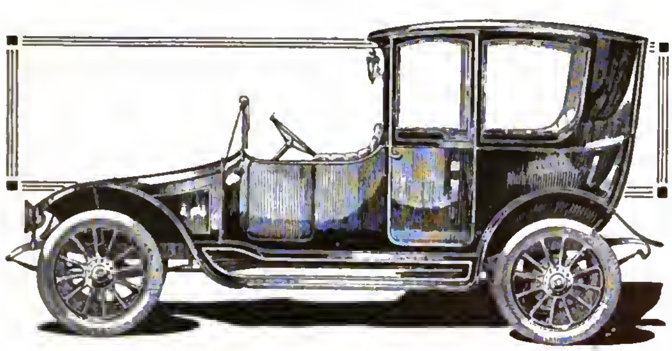
Besides adding a luxurious brougham, dropping its touring car and increasing the battery capacity of two models, the Fritchle vehicle is similar to its 1912 line. The new brougham has capacity for five passengers. The operator's seat is to the left and within the passenger compartment. The opposite seat faces the rear. The back seat is wide enough for three adults. The car is compactly built, the wheelbase of the brougham being only 86 inches. The motors are rated at 4 horsepower and are driven by Fritchle batteries of thirty-two cells. The Fritchle construction, embodying reach-rods between the axles, lends itself to the elliptic type of springs all around, which are used. Wooden sills are used in the frame with the idea of imparting flexibility and to avoid the chance of acid corrosion. These things are not new so far as the Fritchle is concerned, but they differ in some respects from ordinary practice. The drive is by shaft. The brakes act directly on the rear hubs.

Grinnell

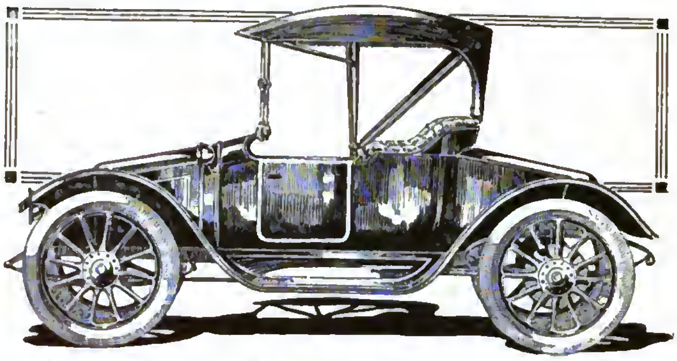
An all-forward drive, clear-vision brougham and a five-passenger coupé are the new things brought out by Grinnell. Structurally the cars are somewhat different from previous models. The shaft-drive principle, using two universal joints between the motor and rear axle, the reduction ratio being 4 1-4 to 1 through bevel gears has been adopted. The braking system has been changed slightly so that the new cars have



Borland-Grannis straight line brougham, $2,500; contrasted with curved-top brougham, $2,700, of same company, showing variations in bodies and external appearance



Luxurious limousine put out by Borland-Grannis—note unique design, $5,500



Roadster of same company—curved lines predominate in body and mudguards

service brakes operated with the controller by hand and the emergency brakes are pedal-operated and work by internal expansion to the hubs. A thirty-cell battery, optional in type, is furnished. This is a trifle larger than formerly and the company estimates that a maximum of 125 miles can be delivered by a single charge. The normal motor speed is 900 revolutions per minute.

Ohio

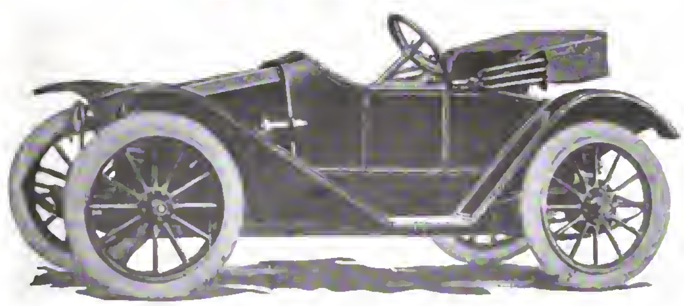
Centralizing effort upon a single chassis type, this company has announced four new models, differing from one another only in the style of bodies. Battery capacity has been increased; the wheelbase of all models is lengthened to 96 inches. The 102-inch coupé has been discontinued; the chain reduction between motor and propeller shaft formerly used has been eliminated and the drive is direct shaft; Crocker-Wheeler motors delivering 800 revolutions per minute at 75 volts, 30 amperes, have been installed in place of the former equipment, and a magnetic brake operated by button-actuated switch has been installed. No universal joints are used in the drive. The armature of the motor is a hollow sleeve mounted on annular bearings. The propeller shaft passes through this sleeve and engages the forward part by a squared end. The shaft itself is short and the ratio between the beveled pinion and the bevel in the differential is 4 to 1. The motor is now attached directly to the end of the shaft. The size of the batteries has been raised from thirty or thirty-two cells to forty cells. This has led to a revision of the mileage figures as 100 miles is now estimated for a single charge. The new body styles include a colonial brougham, straight-line brougham and semi-colonial in two variations. The control of all cars is magnetic and is accomplished by the turning of a disk. Steer is by lever. An electric heater, operated by button switch, is a new feature of the regular equipment.

Phipps

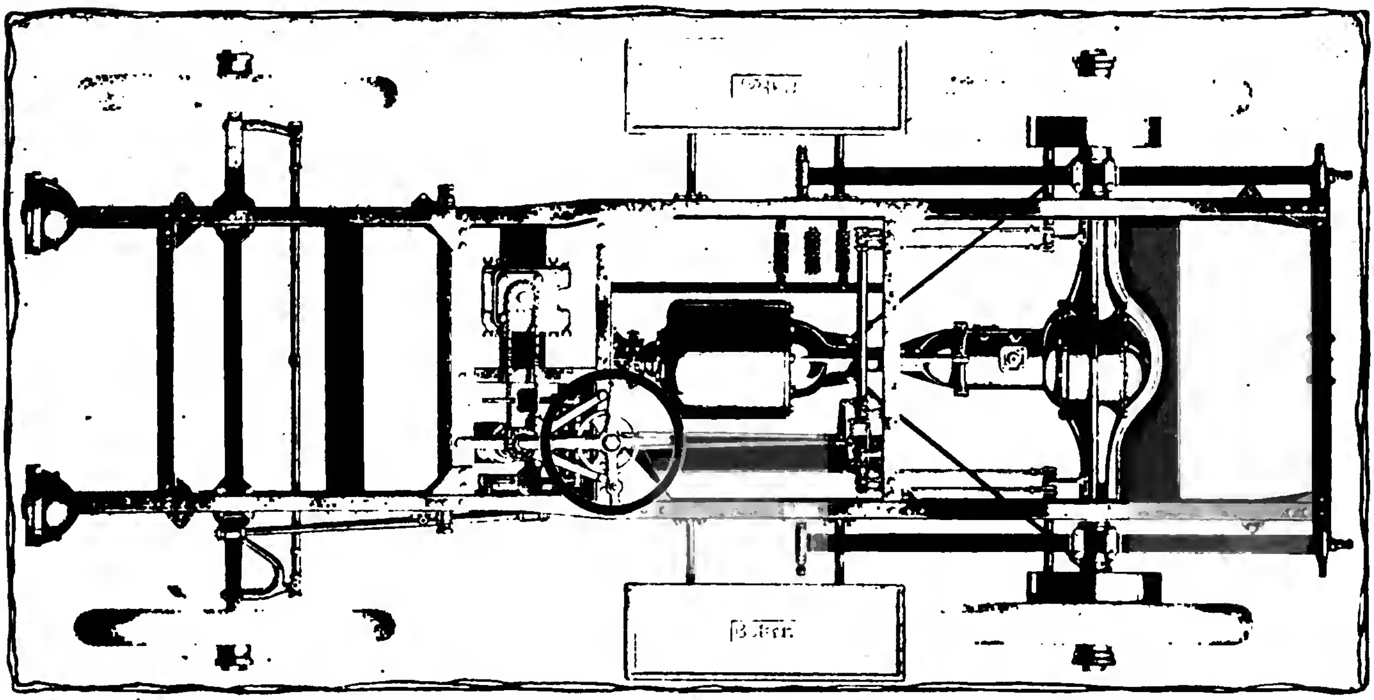
A coupé, equipped with a forty-cell Exide battery, on a chassis with a wheelbase of 107 inches and fitted with wheels to take any standard type of tires 36 by 4 inches all around, is the initial offering of the Phipps company. The motor is of Westinghouse manufacture. The drive is by bevel gear. The car has a seating capacity of five adults. The control gives five forward speeds.

Rauch & Lang

The standard battery for the Rauch & Lang vehicles consists of forty cells, Exide, although sixty cells of Edison A-4 or A-6 and Ironclad are furnished at higher prices. Last year some of the smaller cars had only twenty-four cells. The changes for the coming season are rather numerous. Whereas last year seventeen models were announced, many of them being only variations in body types, this year but seven models are listed. The chief changes consist of the following: The wheelbase of six models has been lengthened 1 1-2 inches to 92 1-2 inches, and in the largest of the broughams the wheelbase is 103 inches; all bodies are lower hung, and the size of the compartment in all inclosed cars has been increased; wide option is allowed in selecting the size of wheels and tires. The size of the brake drums has been increased. The controller is now equipped with a device to prevent accidental burning of the mechanism when not in service. An automatic bell signal sounds when the foot brake is set if the current is still connected with the motor. Disconnection of the current is provided in the controller and the whole device is so arranged that the operator may know that the current is not running if the bell is silent. On the other hand, if the bell rings, it is to show that a small trigger in the controller should be set, disconnecting the batteries. The Hertner motor is used on all models and with the augmented batteries the mileage is now estimated at from 60 to 90. The maximum speed of the Rauch & Lang cars is placed at 20 miles an hour. One other feature of the bodies that will attract attention is the special type of auxiliary rain-vision shield with which the cars are equipped. This consists of a plate of glass placed at an angle to the front of the car just under the roof sill and held by appropriate adjustable frames. The shield extends sufficiently from the front window of the car to protect the glass from rain and conse-



Woods brougham—a roomy car designed for theater service—$3,100
Church-Field roadster which follows lines of gasoline models, $2,300



Looking down on the Baker stripped chassis, showing structural details and mechanical principles of the car

quently affords the operator a clearer view of the road than he would have without such protection. The complete line consists of four broughams, including a demi-brougham and a colonial; towncar, coach and roadster. Several variations of bodies are furnished, chief among which are a landaulet, chauffeur-driven towncar, club roadster and some others. Shaft drive with silent-chain reduction is retained throughout the line. The ratio of reduction by silent chain is 2 11-28 to 1 and that at the rear axle 3 6-13 to 1.

Standard

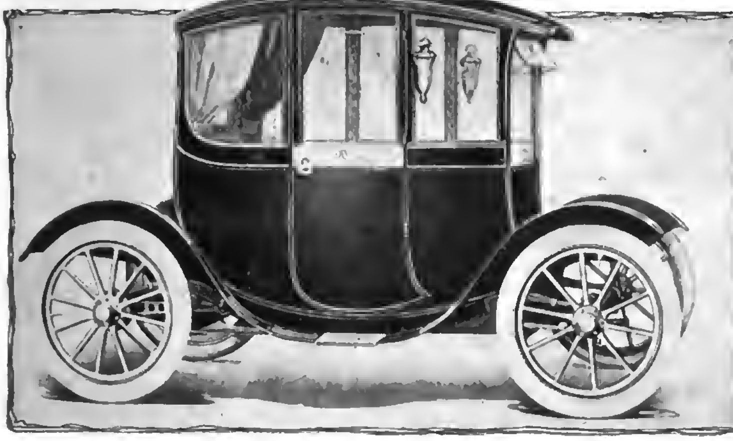
The coupé model of this company is considerably changed from last year's offering. The wheelbase is 5 inches longer and the passenger compartment has been enlarged 4 inches in width and 3 inches in height. The seating scheme has been rearranged so that the occupant of the front seat can sit at an angle of 45 degrees, facing the opposite rear corner, instead of sitting with his or her back to the front of the car. A divided, clear-vision windshield and a ventilator over the front window have been added. The springs have been lengthened 10 inches. The wheelbase is 96 inches. The drive is by shaft without universal joints. Double reduction gears are built into the rear axle. The battery equipment is a thirty-cell Exide, with options at higher prices.

Waverley

Four new models, one materially changed style and the continuation of one model with minor changes are announced by the Waverley company. The new cars are a limousine, Georgian brougham, Empire brougham and colonial brougham. The model that has been sharply changed is the limousine that was featured last year and the one in which minor changes have been made is the sheltered roadster. Generally it may be said that the most noticeable change in all the models is the greater-capacity batteries furnished. Last year the standard cars had thirty-two cells Exide with thirty-four cells in the limousine. This year the standard is forty cells Exide with thirty-four cells in the roadster and optional equipment of Edison or other types of batteries at appropriate increases in price. Eighty-volt motors have been installed in all the heavier cars. The transverse shaft drive, first reduction being in the ratio of 1.76 to 1 and the bevel ratio being 4 to 1, unique in this make, is retained, as are all the essential features of 1912. The new limousine has a divided rear seat, making three spaces, with the middle space or seat slightly in rear of the other two. The car is driven from the left rear seat, while a cozy-corner seat in the right front corner does not interfere with the operator's view ahead. This car has a wheelbase of 106 inches and an estimated range of 75 miles on a charge. The Georgian brougham is 3 inches longer,

Broc stanhope model 20, price $2,100; also in victoria

Broc fore-drive brougham, model 31, price $3,500



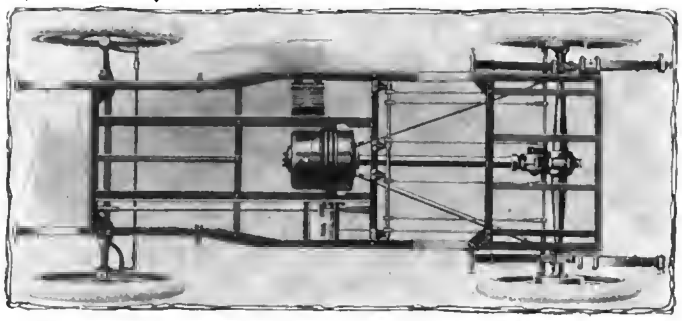
Flanders colonial coupé, listed at $2,500

Broc curved top brougham, model 29, price $3,100

but otherwise structurally the same as the limousine. The passenger compartment is arranged so that the person who sits in front of the driver sits with his or her back to the side of the car. The rear battery box is separate from the body. The Empire brougham has the same seating arrangements as the foregoing, but the wheelbase is 106 inches and the battery box behind is connected with the body. The colonial brougham is 2 inches shorter than the Empire and is equipped with the typical characteristics of the colonial style of coach building. The five-passenger limousine continued from 1912 has 5 inches more wheelbase, 5 inches wider rear seat, lower sill, larger battery, bigger motor and semi-irreversible steering mechanism. Several of the former models that proved popular are continued without radical change. Lever steer, wooden trussed frames, I-beam front axles and the other established features of the Waverley product are continued.

Woods

Elimination of weight, drop frames, giving lower suspension of bodies, more graceful lines, heavier and larger batteries with a meter on the charging plug, two-point motor suspension, reinforced rear axle having radius rods to the torsion tube, and a system of fastening the batteries in place are the improvements announced for the Woods line. The shaft drive with herringbone gear reduction and other structural and mechanical features are retained. The standard Woods battery is forty-cell Exide, but in the 102-inch brougham a Woods battery of forty-two cells is installed. Dual-tread solid tires of a different type than any used before on an electric passenger car are stock equipment for several of the models, although other options are offered. The motor and mechanical changes are designed to give easy riding qualities and greater mileage

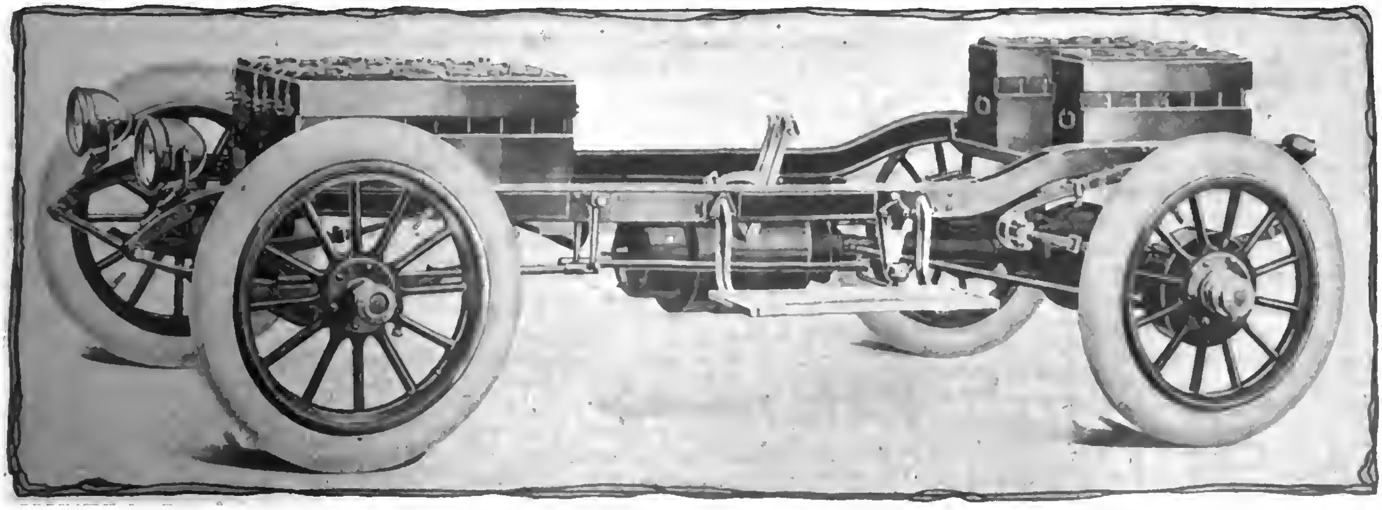


Looking down upon chassis of Standard, showing mechanical details

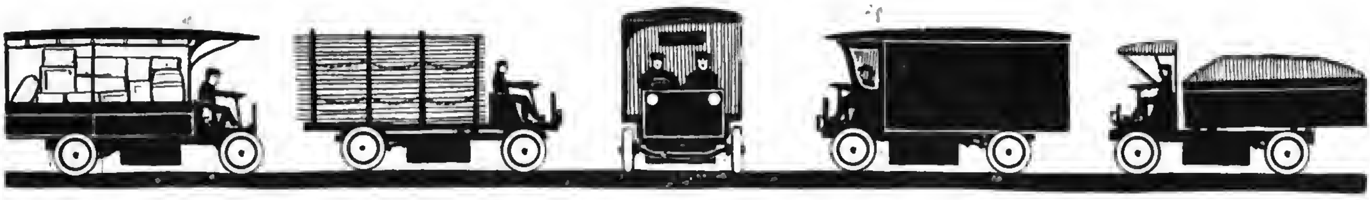
through the elimination of vibration. The two-point suspension and the bracing of the torsion tube by radius rods are all part of the plan to further adapt shaft drive to solid or cushion-tire equipment, which has been worked out with so much success by this company.

Hupp-Yeats

The Regent model is the special element of this line emphasized this year. This is a coupé similar in every way to the foregoing model of the same type. It has a twenty-seven cell Exide battery, ranged in three trays. The motor is located upon the rear axle, driving by bevel-spur gear at a reduction of 4 to 1. The car is very low slung but the frame has a rise of 9 inches at the rear. The interior of the car is roomy and lends itself to a rather wide latitude in the matter of seating arrangements, despite the fact that the wheelbase is only 86 inches. The motor is of Westinghouse design. The rear axle is of the semi-floating type. Lever steer is regular equipment. The car seats four.



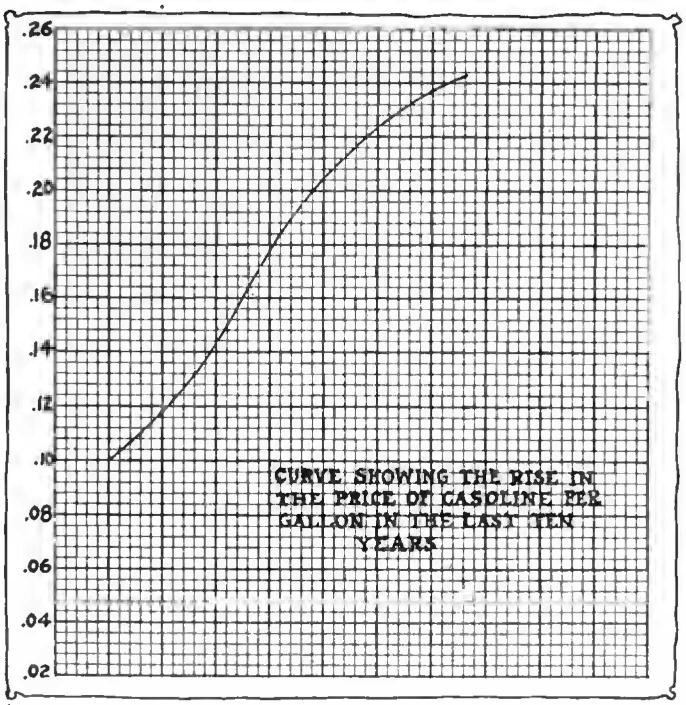
Detroit chassis, showing division of battery and structural particulars of frame, suspension, motor and drive



The Electric Commercial Vehicle

Two-Thirds of Those in Use at Present Are of 2 to 3-Ton Type
Field Is Rapidly Enlarging and Future of Industry Is Bright

STATISTICIANS estimate that about two-thirds of the electric trucks in use at the present time are of the 2 to 3-ton size. The past year has seen many new concerns which have never owned or operated electric vehicles buying one or two trucks, endeavoring to find out which is the best suited for their business, before installing a large fleet. The forecast for this season's models does not show any radical departure from present practice. Minor improvements or changes will be made from lessons learned. One of the pronounced trends is to increase the types of vehicles manufactured by building one or more heavier models. Included in this class are such concerns as the Baker that has added a new model, Type C C, with a carrying capacity of 7,000 pounds; Detroit, Model 7, 7,000 pounds; Ward, with an entire new line, including a 2 and 4-ton chassis in addition to smaller ones; Waverley, with three new chassis of 4,000, 7,000 and 10,000 pounds capacity; and the Victor, which purposes giving up smaller vehicles and confining itself to the 3.5 and 5-ton chassis. The Atlantic Vehicle Company, which offered its product to the public about the middle of last year, also caters to the heavy class with 3.5 and 5-ton trucks, and, being a newcomer, the line that it offers is somewhat indicative of the general demand.



Silent chain of the inverted tooth type is very popular as a method of transmitting the power from the motor to the differential, where final chain drive is used, offering as it does a certain degree of flexibility of drive coupled with silence, while its efficiency is materially enhanced by protecting it from foreign matter by inclosing it in an oil-tight and dust-proof casing. Among the concerns that use this method of drive are Detroit, Baker, General Vehicle, Urban, Ward and Atlantic.

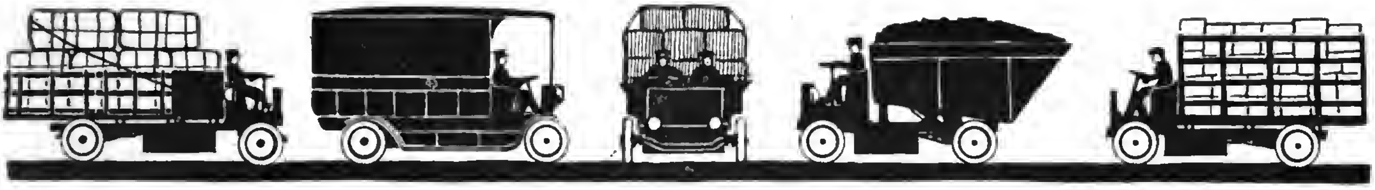
As a contrast to this type there is the Lansden company, which couples the motor direct to the differential, an extension of the differential casing being bolted direct to the motor housing, with chains as a final drive.

Other concerns such as the G. M. C. and the Waverley, in their new models, interpose a shaft between the motor and the countershaft, thereby locating the motor over the rear axle and driving forward. M. & P. reverse this method by placing the motor forward under the seat and transmitting to the differential through a universal-jointed shaft.

Left-hand steering, adopted several years ago, remains as standard. Some concerns have given a slight rake to the steering column, but there is no marked departure from last year's practice.

The wooden or metal-lined battery cradle is giving way to the

Left—Commercial Truck Company's 500-pound wagon. Center—Kentucky 1,000-pound wagon. Right—Waverley 1,000 pounds vehicle

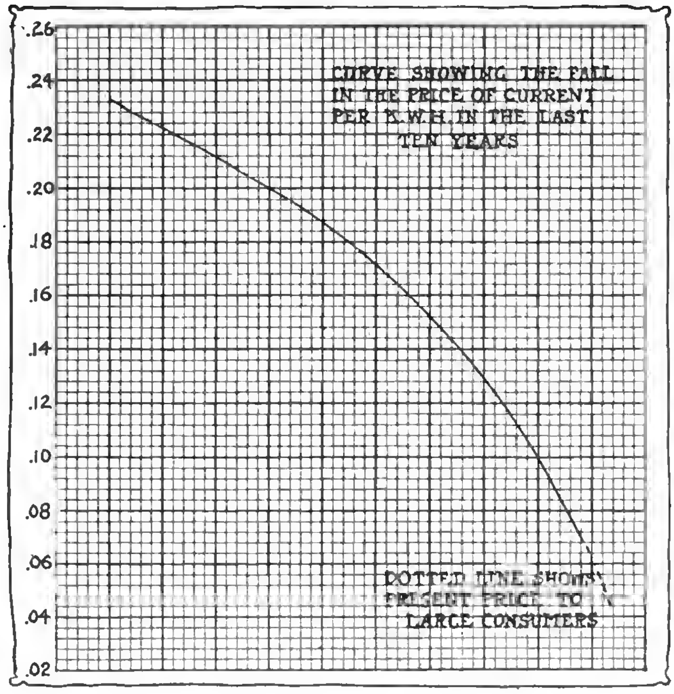


Tendencies and Constructional Details

Many Companies Are Adding Heavier Machines to Their 1913 Lines Considerable Progress Made in Battery Equipment Standardization

all-steel construction. Some manufacturers, such as the Lansden and Detroit, hinge the sides at the bottom so that when they are swung open they form, with the aid of supports, a tray upon which the battery can be withdrawn to afford inspection, leaving the top hermetically sealed, thus excluding all foreign matter. To facilitate the withdrawal in some cases the battery is made to slide on rollers in grooves.

Battery equipment has become considerably more standardized during the last year, and the new models show a tendency towards 42 or 44 cells lead type, or 60 cells Edison. The number of plates per cell depends upon the vehicle capacity. With perhaps the exception of the G. M. C. and the Champion, practice is to suspend the battery below the frame forward of the center.



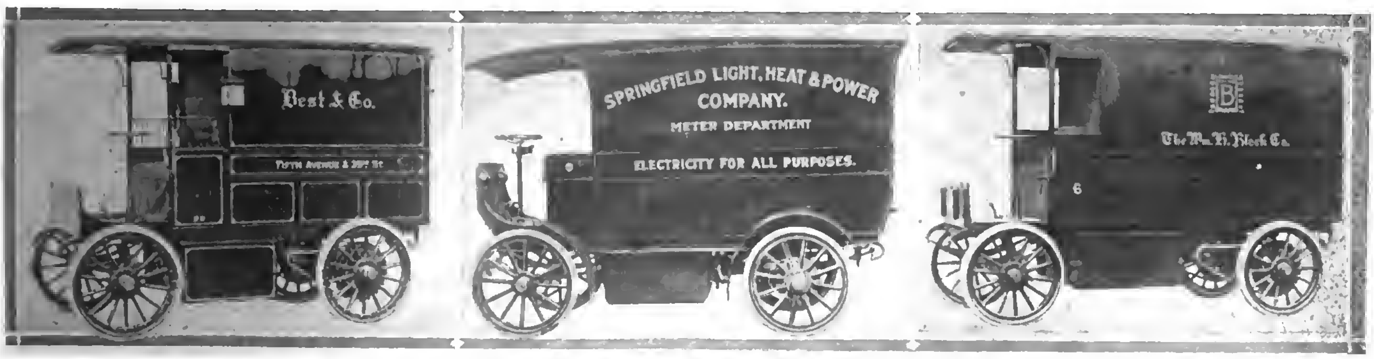
One of the greatest points in favor of the electric is that it is self-governing as to speed. The maximum speed cannot be exceeded unless the driver deliberately permits the power to add to momentum when going down hill. As there are no gears to mesh, the power should be cut off and the vehicle allowed to coast at a moderate speed, thereby saving current. If this is done the mileage radius of the battery will be so much more increased if only the driver would ease off the power when he sees that he must make a stop several feet ahead. Some drivers have a bad habit of keeping their feet constantly upon the brake pedal, bringing the shoes in constant contact with the brake drums and thus throwing additional work upon the motor and unnecessarily consuming current.

The following is a table compiled by averaging the speeds as given by several of the principal makers in their instructions, with a table compiled by Alexander Churchward.

Load Capacity in Pounds	Maximum Speed in Miles Per Hour	Mr. Churchward's Table, Miles Per Hour
500	16-20	.. ..
1,000	13	12 to 13
2,000	11	10 to 11
3,000	10	10
4,000	9	8 to 9
7,000	8	7 to 8
8,000	7	6.5 to 7.5
10,000	5.5	6 to 7

Each maker has his own idea of the speed at which his vehicle should travel, and while it might be perfectly safe for one truck to be driven at 10 miles per hour without any harm, another with different suspension would suffer materially from the results of excessive vibration.

It stands to reason that the same speed cannot be attained with a full load as when the vehicle is running empty, consequently it behooves the person in charge to see that the driver does not take advantage of this fact and make fast time in returning from deliveries. More harm is accomplished in driv-



Left—General Vehicle of 1,000-pound type. Center—1,000-pound Argo with distinctive body. Right—2,000-pound General Vehicle ing an electric truck fast without a load than when it is driven to the maximum with a load. The load relieves the frame of part of the vibrations, and although solid rubber tires are capable of absorbing part of the road shocks, nevertheless a major portion is transmitted throughout the entire vehicle.

There has been a healthy impetus given to the electric vehicle business in general through the whole-hearted co-operation of the various central stations and electric power companies throughout the country. These companies not only set the good example by using electric vehicles themselves, but also offer attractive rates to current consumers, and in some cases are catering to the charging of electric trucks in special garages erected for the purpose.

The rate for charging current has dropped in the last few years and some stations have notified their intention of still further reducing the cost to both small and large consumers. Reference to the curves on pages 24 and 25, will make it apparent that the cost of electrical current has dropped in almost direct proportion to the rise in the price of gasoline. The cost of current worked against the electric in the early days, but now this objection has been removed.

The present efficiency of the electric is in no small measure due to the general advances that have been made in automobile construction, tending to simplicity and comparative lightness of design, thus rendering this type of vehicle more efficient in the few working parts that it possesses.

The standard tire and wheel dimensions for solid tires as recommended by the Society of Automobile Engineers have been generally adopted by the makers, and this has brought about a much better state of affairs, cutting down the idle time caused by tire replacements.

The average wheelbase of all models of electric trucks has

Tabulated Review of 1913 Electric Trucks, Giving Mechanical and Electrical Details

Name and Model	Price, Chassis Only	Body Style	Price With Body	Body Style	Price	Body Style	Price	Load, Capacity in Lbs.	Width of Load Space in Feet	Height of Load Space in Feet	Length of Load Platform in Feet	Overall Length in Feet	Wheelbase, Inches	Tires Front	Tires Rear	Body Weight in Lbs.	Chassis Weight in Lbs.	Turning Radius in Feet
Argo, K-10	$1700	Opt'l		Express	$1800			1000	3.5		6.6		86	34x3	34x3	400	2400	
Argo, K-20	2100	Opt'l		Express	2200			2000	3.5		7.5		96	35x3½	35x3½	400	3000	
Atlantic, 1 ton	2400*	Opt'l						2000	5.0		8.0		102	34x3½	34x4		4400	
Atlantic, 2 ton	3000*	Opt'l						4000	5.0		10.5		114	34x4	36x3		5700	
Atlantic, 3½ ton	3500*	Opt'l						7000	6.0		12.0		135	36x5	40x4		7700	
Atlantic, 5 ton	4000*	Opt'l						10000	6.0		12.0		144	36x6	40x5		9200	
Bailey, Service		Deliv'y						300	3.6	3.3	4.0		106	33x4	33x4			
Baker, W	1700*	Open		Panel				500	Opt.								2085	
Baker, X	1900*	Opt'l						1000	Opt.								2650	
Baker, O	2300*	Opt'l						2000	Opt.								3125	
Baker, U	3100*	Opt'l						4000	Opt.								5200	
Baker, CC	3500*	Opt'l						7000	Opt.								7500	
Borland, Open Type		Op. Tr'k.	$2100	Closed	2250			1500	4.8	6.0			93	34x4	34x4			
C.T., 500-pound	1800	Panel	2000					500	3.5		5.5		85	36x2½	36x2½	350	2600	19
C.T., 1,000-lb.	2000	Panel	2200					1000	3.5		6.0		90or100	36x3½	36x3	400	3100	20
C.T., 1 ton		Panel	2600					2000	4.0		8.0		100	36x3½	36x4	600	3900	21
C.T., 2 ton	3200	Express	3500	Stake	3500			4000	4.2		11.0		116	36x5	36x3½	1000	5250	24
C.T., 3½ ton	4200	Express	4500	Stake	4500			7000	5.0		12.0		115	36x3½	36x3½	1250	7000	24
C.T., 5 ton	4650	Express	5000	Stake	5000			10000	5.5		15.0		132	36x4	36x4	1500	8000	26
Detroit, 1	2345	Express	2520	Can.Top.	2590	Panel	$2730	1000	3.8	4.6	6.5	11.0	80	32x2½	34x3		2400	
Detroit, 2	2870	Express	3080	Can.Top.	3150	Panel	3310	2000	3.9	4.6	6.9	11.5	84	32x3	34x3½		2900	
Detroit, 3	3132	Opt'l						3000	4.3	Opt.	Opt.		96	34x3½	36x4		3700	
Detroit, 7	5000	Opt'l						7000	Opt.	Opt.	Opt.	19.0	132	36x5	36x4		8115	
Fritchle, Com.	2000	Deliv'y						1000					100	32x3½	32x3½			
G.V., 750-pound	1080	Deliv'y						750	3.3	4.4	4.9	9.9	76	32x2½	32x2½		2460	
G.V., 1,000-lb.	1370	Deliv'y						1000	3.4	5.0	6.0	10.9	87	36x2½	36x2½		3090	
G.V., 1 ton	1710	Deliv'y						2000	4.0	5.5	8.0	12.5	102	36x3½	36x3½		3985	
G.V., 3½ ton	2620	Express						7000	5.0	6.0	13.0	16.5	128	36x6	36x3½		7500	
G.V., 5 ton	2950	Express						10000	6.0	6.0	15.0	18.5	139	36x7	36x5		8450	
Jatco, C	1800	Express	2000	Panel	2100			2000	3.9		7.3	10.9	84	32x3	32x3	250	2600	
Jatco, D	1400	Express	1500	Panel	1600			1000	3.9		7.3	10.9	84	34x3½	34x3½	300	3000	
Lansden, 1,000-lb.	2300	Platf'm	2450	Express	2500	Panel	2675	1000	3.9	5.5	7.6	11.8	96	36x2½	36x2½	550	2200	16
Lansden, 1 ton	2775	Platf'm	2925	Express	3050	Panel	3175	2000	3.9	5.6	9.5	13.9	106	36x3	36x3	600	3400	17
Lansden, 2 ton	3570	Platf'm	3820	Express	3920	Panel	3995	4000	4.1	5.8	11.0	15.3	120	36x4	36x3	800	5200	18
Lansden, 3½ ton	4390	Platf'm	4690	Express	4790	Panel	4890	7000	4.5	6.0	12.0	16.5	130	36x5	36x3½	1200	6800	20
Lansden, 5 ton	5090	Platf'm	5390	Express	5490	Panel	5640	10000	4.8	6.0	13.5	17.3	142	36x6	36x6	1500	8500	23½
M. & P., 1500-lb.	1450	Express	1500	Closed	1600			1500	3.5		6.7	11.3	100	30x3	30x3	700	2700	
M. & P., 2500-lb.	1850	Open	1900	Closed	2000			2500	3.8		7.7	12.5	112	34x3	34x3	900	3200	
Urban, 10	1250	Express	1800	Panel	1900			1000	3.5	4.8	6.0		86	36x3	36x3	500	1900d	38
Urban, 20	1600	Express	2300	Panel	2400			2000	4.2		8.0		100	36x3½	36x4	750	3300d	44
Urban, 40	2200	Platf'm	3000	Express	3100	Panel	3200	4000	5.7		10.9		118	36x4	36x3	1000	4200d	50
Urban, 70	2800	Platf'm	3600	Express	3900	Panel	4000	7000	6.3		12.0		130	36x5	36x4	1200	5600d	54
Walker, G. & F.		Opt'l						1000										
Walker, C		Opt'l						1500										
Walker, B		Opt'l						3500										
Walker, D		Opt'l						5000										
Walker, E		Opt'l						7000										
Ward, E. B		Express		Panel		Screen		2000	3.8	5.0	8.0	11.5	96	34x4	34x4	800	4800	20
Ward, E. D		Express		Panel		Screen		8000	4.5	6.5	12.0	15.5	132	36x6	36x4	2300	8000	28
Ward, E. C		Express		Panel		Screen		4000	4.0	5.5	9.5	13.0	114	36x5	36x3	1200	5500	24
Ward, E. A		Express		Panel		Screen		1000	3.5	4.5	6.5	10.0	84	34x3	34x3	500	2500	17
Waverley, 1,000-lb		Panel						1000	3.6	4.6	6.0		91	34x2½	34x2½	450	2975	32
Waverley, 2000-lb.		Opt'l						2000					108	34x3½	34x3½	1000	3400	36
Waverley, 2 ton		Opt'l						4000				16.0	114	36x4	36x3	1500	6300	44
Waverley, 3½ ton		Opt'l						7000				6.5	127	36x6	36x3½	1750	7250	50
Waverley, 5 ton		Opt'l						10000				18.0	136	36x7	36x5	2000	9700	52

Note.—*Price with lead battery; Opt., Optional loading space.

increased several inches, with the exception of the 2-ton chassis, which remains about the same. The following table gives the average wheelbases for the various sizes of trucks for 1912 and 1913:

Carrying Capacity, Pounds	Average 1912 Wheelbase, Inches	Average 1913 Wheelbase, Inches
1,000	85	90
2,000	93	100
4,000	118	117
7,000	125	130
10,000	132	140

In the compilation of this table the standard wheelbases have been taken as the basis of the calculations, but in special designs built to order the standard is not always adhered to.

There is at present some lack of standard as to the type of lamp, and at the recent meeting of the Electric Vehicle Association it was proposed to adopt the Edison bayonet-type of fitting in preference to the screw type. A consensus of opinion among those present at the meeting was in favor of the bayonet type.

The following table has been compiled from statistics obtained by THE AUTOMOBILE, and shows the number of manufacturers engaged in the manufacture of vehicles of various capacities:

Capacity, Pounds	Number of Manufacturers	Capacity, Pounds	Number of Manufacturers
500 pounds	4	5,000 pounds	1
1,000 pounds	13	6,000 pounds	1
2,000 pounds	13	7,000 pounds	8
3,000 pounds	2	8,000 pounds	1
4,000 pounds	8	10,000 pounds	6

The following is a brief resumé of the general features of the different electric commercial vehicles offered by the various makers for the coming year. Such points as battery equipment and suspension, control, motor location and method of drive have been handled. In addition to these items more specific information concerning weights, prices and other useful information is contained in the detailed tabulation given herewith.

# of All Vehicles, as Well as Body Styles, Prices and Chief Points of Equipment

BATTERY			MOTOR								SPRINGS				
Make and No. of Cells	Ampere Hour Cap.	Miles per Charge	Make	Type	Location	Right or Left Steer	Location of Control Lever	Number For'd Speeds	Drive	Total W'ght Chassis and Body	Front	Rear	Front Axle	W'ght Over Front Wheels	W'ght Over Rear Wheels
Opt., 28, 40, 60	135 or 162	40–50	Westinghouse	Series	Unit with r'r axle	Left	Under wheel	4	Bevel	2800	½ Ell.	½ Ell.	Tubular	....	....
Opt., 30, 40, 60	162 or 185	40–50	Westinghouse	Series	Unit with r'r axle	Left	Under wheel	4	Bevel	3400	½ Ell.	½ Ell.	Tubular	2000	3000
Opt., 44, 60	....	55–60	Gen. Electric	Series	Over rear axle	Left	Left of seat	4	Chain	....	½ Ell.	½ Ell.	I-Beam	....	....
Opt., 44, 60	....	50	Gen. Electric	....	Over rear axle	Left	Left of seat	4	Chain	....	½ Ell.	½ Ell.	I-Beam	....	....
Opt., 44, 60	....	....	Gen. Electric	....	Over rear axle	Left	Left of seat	4	Chain	....	½ Ell.	½ Ell.	I-Beam	....	....
Opt., 44, 60	....	....	Gen. Electric	....	Over rear axle	Left	Left of seat	4	Chain	....	½ Ell.	½ Ell.	I-Beam	....	....
Edison, 60	150	60–80	Gen. Electric	Series	....	Left	Top of wheel	6	Chain	2200	½ Ell.	Ell	I-Beam	....	....
Lead, 30	....	75	Gen. Electric	Series	Under chassis	Left	Under wheel	6	Chain	....	½ Ell.	Ell	Tubular	....	....
Opt., 42, 60	....	50	Gen. Electric	Series	Under chassis	Left	Under wheel	5	Chain	....	½ Ell.	½ Ell.	I-Beam	....	....
Opt., 42, 60	....	50	Gen. Electric	Series	Under chassis	Left	Under wheel	5	Chain	....	½ Ell.	½ Ell.	I-Beam	....	....
Opt., 42, 64	....	50	Gen. Electric	Series	Under chassis	Left	Under wheel	5	Chain	....	½ Ell.	½ Ell.	I-Beam	....	....
Opt., 42, 60	....	50	Gen. Electric	Series	Under chassis	Left	Under wheel	5	Chain	....	½ Ell.	½ Ell.	I-Beam	....	....
Exide, 40	116	50	Gen. Electric	Series	Amidships	Left	....	6	Chain	....	½ Ell.	½ Ell.	I-Beam	750	750
Opt., 42, 60	....	....	Gen. Electric	Series	Under chassis	Left	Under wheel	3	Worm	....	¾ Ell.	½ Ell.	Box	1840	2760
Opt., 42, 60	....	....	Gen. Electric	Series	Under chassis	Left	Under wheel	3	Worm	....	¾ Ell.	½ Ell.	Box	1840	2760
Opt., 42, 60	....	....	Gen. Electric	Series	On axle	Left	Under wheel	4	Spur	4500	½ Ell.	½ Ell.	Box	2600	3900
Opt., 42, 60	....	....	Gen. Electric	Series	On axle	Left	Under wheel	4	Spur	6800	½ Ell.	½ Ell.	Box	4200	6300
Opt., 42, 60	....	....	Gen. Electric	Series	On axle	Left	Under wheel	4	Spur	....	½ Ell.	½ Ell.	....	10000	10000
Opt., 42, 60	....	....	Gen. Electric	Series	On axle	Left	Under wheel	4	Spur	10000	½ Ell.	½ Ell.	....	10000	10000
Edison, 60	150	55	Own	Series	Rear of battery	Left	On wheel	5	Chain	....	½ Ell.	½ Ell.	I-Beam	1350	2650
Edison, 60	225	55	Own	Series	Rear of hattery	Left	On wheel	5	Chain	....	½ Ell.	½ Ell.	I-Beam	1140	2385
Edison, 60	225	50	Own	Series	Rear of battery	Left	On wheel	5	Chain	....	½ Ell.	½ Ell.	I-Beam	3080	4620
Edison, 60	375	40	Own	Series	Rear of battery	Left	On wheel	5	Chain	....	½ Ell.	½ Ell.	I-Beam	6956	10434
Own, 32	....	....	Own	Comp	Under chassis	Left	Left of seat	5	Chain	....	Ell	Ell	Solid	....	....
Opt., 44	104	....	Gen. Electric	Series	Amidships	Center	Left	4	Chain	....	½ Ell.	½ Ell.	....	....	....
Own, 44	138	....	Gen. Electric	Series	Amidships	Center	Left	4	Chain	....	½ Ell.	½ Ell.	....	....	....
Own, 44	162	....	Gen. Electric	Series	Amidships	Center	Left	4	Chain	....	½ Ell.	½ Ell.	....	....	....
Own, 44	270	....	Gen. Electric	Series	Amidships	Center	Left	4	Chain	....	½ Ell.	½ Ell.	....	....	....
Own, 44	324	....	Gen. Electric	Series	Amidships	Center	Left	4	Chain	....	½ Ell.	½ Ell.	....	....	....
Opt., 30	165	50	Westinghouse	Series	Under chassis	Left	Top of wheel	4	Chain	2850	½ Ell.	½ Ell.	I-Beam	....	....
Opt., 40	165	40	Westinghouse	Series	Under chassis	Left	Right of seat	4	Chain	3300	½ Ell.	½ Ell.	I-Beam	....	....
Edison, 60	150	60	Gen. Electric	Series	Under frame	Left	Under wheel	4	Chain	2750	½ Ell.	½ Ell.	I-Beam	1500	2250
Edison, 60	225	60	Gen. Electric	Series	Under frame	Left	Under wheel	4	Chain	4000	½ Ell.	½ Ell.	I-Beam	2700	3500
Edison, 60	300	50	Gen. Electric	Series	Under frame	Left	Under wheel	4	Chain	6000	½ Ell.	½ Ell.	I-Beam	4500	5500
Edison, 60	375	50	Gen. Electric	Series	Under frame	Left	Under wheel	4	Chain	8000	½ Ell.	½ Ell.	I-Beam	6750	8250
Edison, 60	450	50	Gen. Electric	Series	Under frame	Left	Under wheel	4	Chain	10000	½ Ell.	½ Ell.	I-Beam	9000	11000
Gould, 40	130	40	Westinghouse	....	Under seat	Left	Left	4	Chain	3400	Ell	Ell	I-Beam	....	....
Gould, 40	170	50	Westinghouse	....	Under seat	Left	Left	4	Chain	4100	Ell	Ell	I-Beam	....	....
Exide, 30	165	40	Gen. Electric	Series	Under chassis	Left	Under wheel	4	Chain	2400	½ Ell.	½ Ell.	I-Beam	1850	2550
Exide, 44	165	40	Gen. Electric	Series	Under chassis	Left	Under wheel	4	Chain	4050	½ Ell.	½ Ell.	I-Beam	2800	4848
Exide, 44	220	35	Gen. Electric	Series	Under chassis	Left	Under wheel	4	Chain	5200	½ Ell.	½ Ell.	I-Beam	3800	7975
Exide, 44	275	35	Gen. Electric	Series	Under chassis	Left	Under wheel	4	Chain	6800	½ Ell.	½ Ell.	I-Beam	5500	11500
Opt., 40, 60	....	....	....	Series	Unit with r'r axle	Left	Left of seat	4	Int G	....	½ Ell.	¾ Plat.	I-Beam	....	....
Opt., 42, 60	....	....	....	Series	Unit with r'r axle	Left	Left of seat	4	Int G	....	½ Ell.	¾ Plat.	I-Beam	....	....
Opt., 42, 60	....	....	....	Series	Unit with r'r axle	Left	Left of seat	4	Int G	....	½ Ell.	¾ Plat.	I-Beam	....	....
Opt., 44, 60	....	....	....	Series	Unit with r'r axle	Left	Left	6	Int G	....	½ Ell.	¾ Plat.	I-Beam	....	....
Opt., 44, 60	....	....	....	Series	Unit with r'r axle	Left	Left	6	Int G	....	½ Ell.	¾ Plat.	I-Beam	....	....
Opt., 42, 60	140	40–50	Gen. Electric	Series	Rear	Left	Left	4	Chain	5600	½ Ell.	½ Ell.	Solid	2900	4800
Opt., 42, 60	252	30–35	Gen. Electric	Series	Rear	Left	Left	4	Chain	10300	½ Ell.	½ Ell.	Soild	5900	12600
Optional, 42, 60	196	35–45	Gen. Electric	Series	Rear	Left	Left	4	Chain	6700	½ Ell.	½ Ell.	Solid	3700	8000
Opt., 42, 60	112	45–60	Gen. Electric	Series	Rear	Left	Left	4	Chain	3000	½ Ell.	½ Ell.	Solid	1500	2500
Opt., 42	135	50	Own	Series	Under chassis	Left	Left	4	Bevel	3425	Ell	Ell	I-Beam	1740	2685
Opt., 42	189	50	Own	Series	Under chassis	Left	Left	4	Bevel	4400	½ Ell.	½ Ell.	I-Beam	2400	4000
Opt., 42	216	45	Optional	Series	Under chassis	Left	Left	4	Chain	7800	½ Ell.	½ Ell.	I-Beam	3900	7900
Opt., 42	270	40	Optional	Series	Under chassis	Left	Left	5	Chain	9000	½ Ell.	½ Ell.	I-Beam	6000	10000
Opt., 42	324	35	Optional	Series	Under chassis	Left	Left	5	Chain	11700	½ Ell.	½ Ell.	I-Beam	8070	13610

ABBREVIATIONS.—Opt. either lead or Edison battery; Comp, compound-wound generator; ½ Ell. semi-elliptic springs; Ell, elliptic springs; ¾ Ell, three-quarter elliptic springs; Bevel, shaft drive with bevel gear reduction; Worm, shaft drive with worm gear reduction; Spur, direct drive from armature shaft through spur gear in wheel.

The following brief reviews of the various makes of electric commercial cars will serve to indicate the progress made by each during the past year as well as to give an idea of each company's line for the season of 1913:

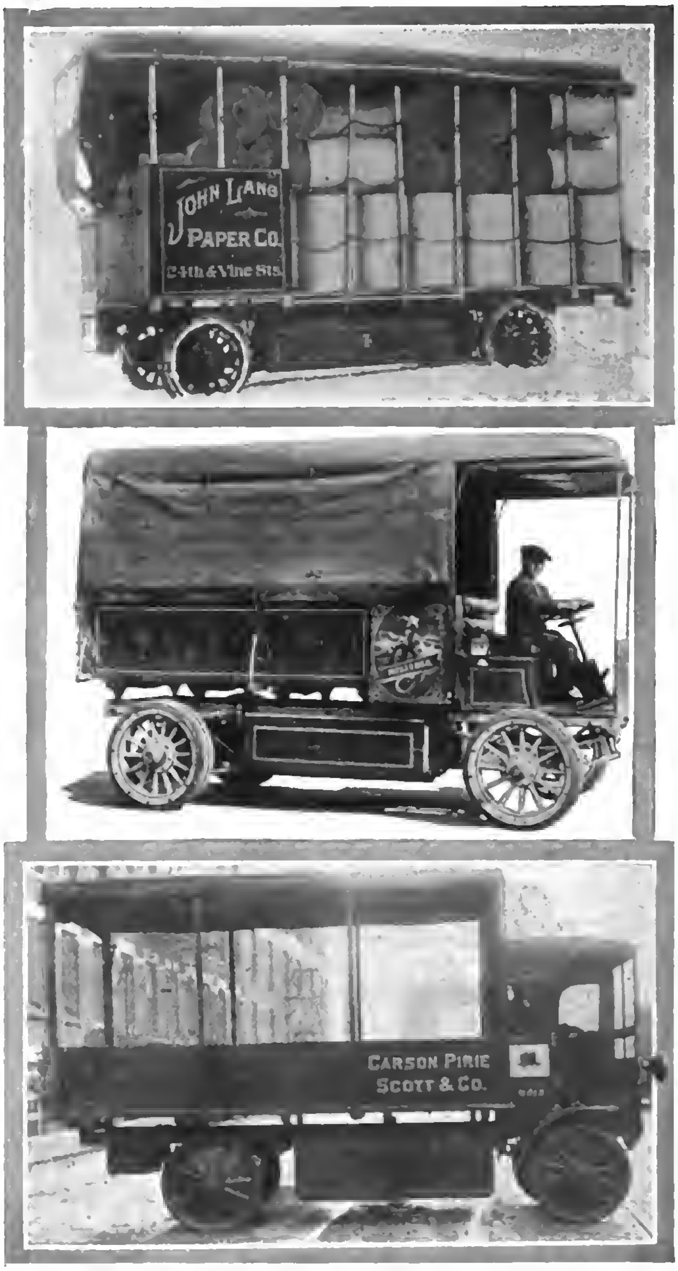
Argo

¶ These vehicles are made in two models, namely, 1,000 and 2,000 pounds. The battery equipment for both is forty cells M. V. Exide with eleven plates each for one and thirteen plates for the other. Four speeds are provided in both cases, giving a graduation of 2, 4, 8 and 12 miles per hour. The battery box is suspended from the main frame by a subframe with side doors. A separate door in the truck platform is provided above the battery to facilitate flushing. No material change has been contemplated for the ensuing year either as to battery location or on any mechanical points. Final drive is by bevel gear, the motor being coupled to the rear axle, forming a single unit. The armature shaft runs parallel with the side members of the chassis and is slightly up-tilted at the forward end, where it is attached to a cross-member of the frame. A feature of these trucks lies in the rear suspension; the semi-elliptic springs are attached to the rear axle in the ordinary way, but the distance between the springs is less than the width of the chassis, owing to the shackle brackets being attached slightly inboard. The available loading space of the smaller model is 7 feet 6 inches, while the larger model is 10 inches longer for the same width. The overall length of the K10 type is 129.5 inches, extreme width 68 inches, and can be turned in a circle 40 feet in diameter. The smaller type is 10 inches longer overall than the other, this being accounted for by the extra loading space, with the same width, namely, 68 inches, and can be turned in a 48-foot circle.

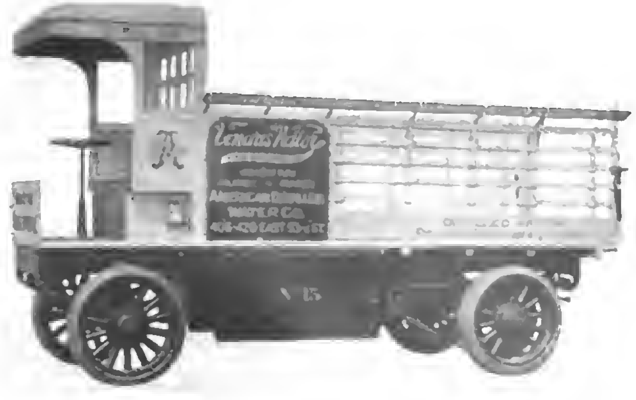
Atlantic

¶ Atlantic trucks are made in four sizes with a carrying capacity of 1, 2, 3.5 and 5 tons, respectively. This company started to manufacture last March. The four chassis are similar in design and only such necessary variations have been made, taking into consideration the difference in weight and loading capacity. No radical feature of design is incorporated.

The batteries, composed in all models of forty-four cells of the Hycap Exide make or sixty cells of the Edison type, are carried in cradles suspended beneath the frame, permitting of loading and unloading from either side. The controller is situated beneath the driver's seat, the operating lever being placed within easy reach of his left hand. The accessibility thus obtained renders inspection and renewal at any time a very simple matter, the current from the battery being fed through well-insulated wires of liberal carrying capacity. Four forward and two reverse speeds are provided. The motor is suspended from a frame cross-member back of the jackshafts, which are situated amidships, the final drive being effected from the sprockets on the jackshafts to the rear wheel hubs by means of roller chains. The motor shaft, which runs on ball bearings, is fitted with a sprocket, and the power is transmitted to the differential sprocket by an inclosed Morse silent chain. Particular attention has been paid to the suspension of the vehicles, imported silico manganese being used for the springs, which are of the semi-elliptic type and are composed of a comparatively large number of thin, highly-tempered leaves. Two independent brakes are provided, the service brake of the expanding type operating on the rear wheel drums and the emergency brake of the contracting type fitted to the center of the countershaft. Both are pedal operated.



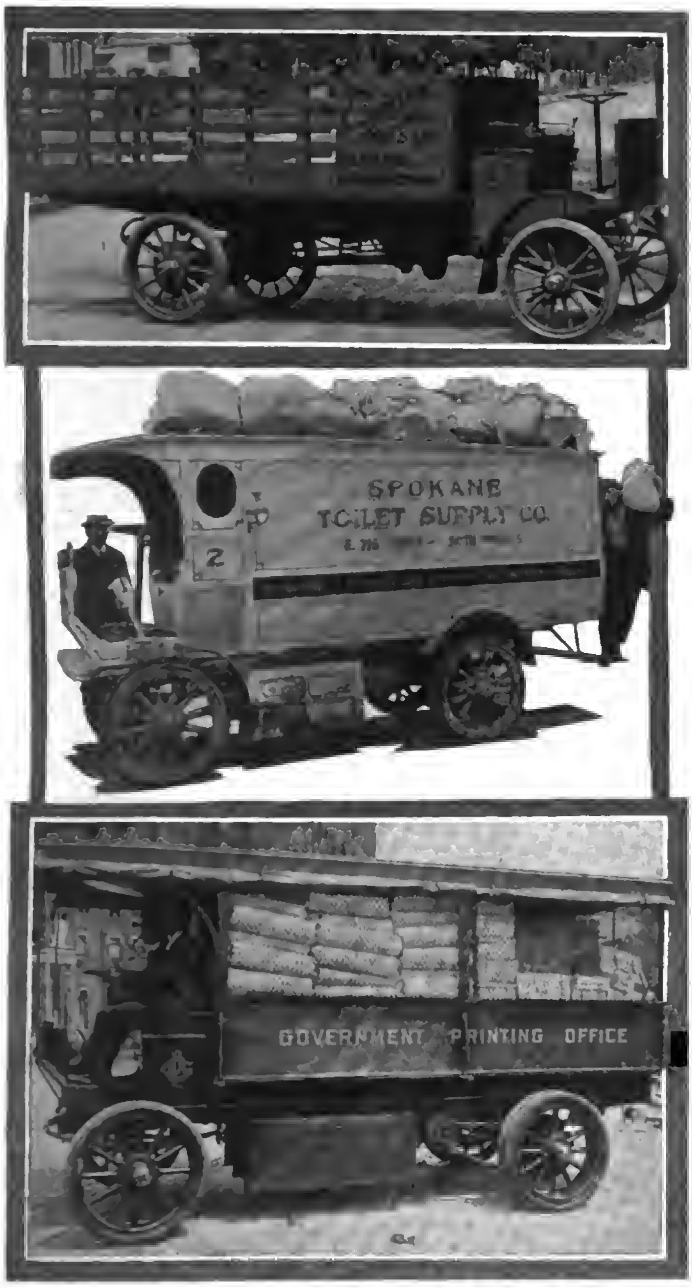
Upper—C. T. 5-ton vehicle with deep stake body and canopy
Center—Example of the C. T. 2-ton type for delivery purposes
Lower—2½-ton Walker wagon for department store delivery



3½-ton General Vehicle with deep express body

Baker

¶ These trucks, manufactured by the Baker Motor Vehicle Company, are made in five models ranging from the 500-pound to the 3.5-ton truck. The five models are as follows: Type W, 500 pounds; Type X, 1,000 pounds; Type O, 2,000 pounds; Type U, 4,000 pounds, and Type C C, 7,000 pounds. Perhaps the most conspicuous model is the C C type, intended to carry 7,000 pounds. The detailed construction of this chassis does not show any radical departure from standard practice, with the exception that the side driving chains are inclosed in oil baths, which keep the chain running free from the abrasive effects of dust and



Upper—Ohio 1-ton truck for general contracting work

Center—Baker 1-ton vehicle with body suitable for special laundry work

Lower—Baker 2-ton truck with body suited to work in government printing service

mud. The batteries in all vehicles are underslung in a substantially braced cradle and consist of forty-two cells for standard equipment, subdivided into small trays, or when Edison batteries are specified sixty cells of this type are used.

The controller, of the continuous-torque drum type, is inclosed in an aluminum case attached to the front part of the chassis under the floor-boards, and is operated by a lever beneath the steering wheel. A special safety device prevents accidental slipping into reverse. All models from 1,000 pounds upward have five forward speeds and three reverse. In these models the motors are suspended from a tubular cross-member of the frame. The power is transmitted to the inclosed differential by a Renold silent chain, inclosed in an extension of the differential cover. The final drive is by two roller chains from the jackshaft sprockets to the rear wheels, the alignment of the rear axle being taken care of by means of radius rods with easy adjustment. Two brakes outfitted, one of the internal expansion type working on the rear wheel hub drums and operated by a lever, and the other, also internal expanding, on the countershaft and drums, pedal operated. In order to facilitate lubrication of the various working parts, provision has been made whereby this operation can be performed from the exterior of the chassis without disturbing the body or load.

Champion

¶ These vehicles, manufactured by the Champion Electric Vehicle Company, are offered in two capacities, 750-1,000 pounds and 2,000 pounds. The batteries of these trucks are carried upon the chassis frame under the driver's seat. The battery equipment of the 1,000-pound chassis is twenty-six cells lead, eleven plates, or forty cells Edison A4, and that of the 2,000-pound chassis forty-four cells lead, thirteen plates, or sixty cells Edison A4 or A6 type.

The motor is suspended from a cross-member of the frame about the center of the chassis, and the power is transmitted to a pressed-steel rear axle, the first reduction being obtained by bevel gear and the second by spur gears. This type is common to both models. The purchased has the option, however, in the larger model of chain drive. In this case the first reduction is by silent Morse chain from the motor to countershaft, and thence to the road wheels by roller chains. The wheelbase of the small model is 86 inches, and 100 inches for the larger. The maximum speed of both trucks is 12 miles per hour.

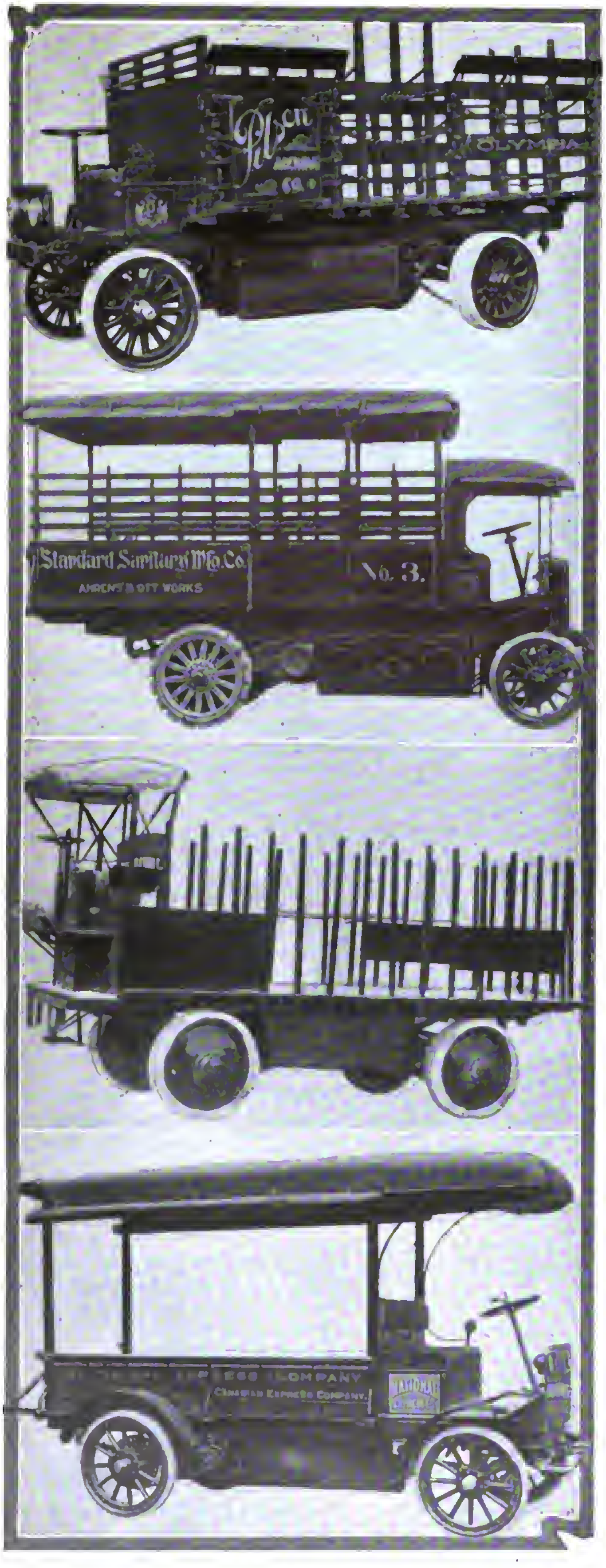
Commercial Truck

¶ The trucks manufactured by the Commercial Truck Company of America comprise models for the following carrying capacities: 500 pounds, 1,000 pounds, 2,000 pounds, 4,000 pounds, 7,000 pounds and 10,000 pounds. The battery equipment of all models consists of forty-two lead or sixty Edison cells, the number of plates and type depending upon the service requirements and the size of the truck. The battery unit is suspended on all models from the main frame in a cradle suitably trussed both front and rear.

A feature of these trucks lies in the location of the controller, which is situated at the base of the steering column and operated by a wheel immediately below the steering wheel. Three forward speeds are furnished on the 500 and 1,000-pound chassis, while all the larger models are fitted with four speeds forward; two reverse speeds are provided in all cases.

There are three distinct types of drive represented in this line of trucks, the differences being such as to necessitate a separate description of each. Dealing with the lightest model first, comprising the 500 and 1,000-pound wagons, the final drive is by Hindley worm. The motor and rear axle form one unit, the power being transmitted to the jackshafts with one single reduction. The entire mechanism is completely inclosed, running in oil. The rear axle is of the floating type, the road wheels being mounted on Timken bearings. In the event that some repairs may be found necessary at any time, such as when it is proposed to overhaul the power plant, the entire rear construction can be removed in a very short space of time and a new

General vehicle 5-ton truck for varied services



Waverley 5-ton truck with brewery stake body. Note wide rear tires and strong wheels
Kentucky 3.5-ton vehicle, suitable for various industries. Note long overhang
Couple-Gear with stake body; each wheel carries a motor
National Express Company's Detroit wagon with canopy top

or spare one substituted, thereby avoiding the necessity of laying up the truck. Internal expansion brakes are fitted to drums on the driving wheels controlled by a pedal. An electrical emergency brake is provided. The mileage claimed for these models ranges from 40 to 60 miles on a charge.

The points of variance between the preceding type and the 1 and 2-ton chassis lie in the form of drive. The rear axle is in the form of a double U-beam structure, the two beams being parallel to each other with the motors, of which there are two, placed between the beams and supported by them. The motors are geared directly to each of the rear wheels by a spur gear. The claim for this type of drive is that equal driving power is available at both wheels, thus obviating one of the drawbacks of differentially-driven wheels. The wheel that has the stronger footing in the case of the double-motor drive will revolve equally as well as the one that has the poorer footing. The motors are attached to gear-cases of crucible steel, the chassis springs finding a seat upon the top of the cases and the extension of the cases form the axle spindles. The armature shaft has a pinion attached at one end which meshes with three spur gears, these latter being carried on studs integral with the drive sbaft, which passes through the axle spindle and engages with the wheel hub by means of a square coupling.

The 3.5 and 5-ton types are fitted with four-motor, four-wheel drive. The two axles are steel forgings, made in two parts, separated by a spacer. The motors are held in position between the axle arms by means of bosses bored out to receive the trunnions which are part of tbe motor casing. Suitable bracing is provided to keep the motors in line. Each motor shaft is furnished with a driving pinion, whicb engages with a larger pinion upon a common axis with the main driving pinion. This latter engages with an integral bolt bolted direct to the wheel.

Detroit Electric

¶ The Anderson Electric Carriage Company's line consists of four types. The three types manufactured heretofore are continued, namely, 1,000, 2,000 and 3,000-pound vehicles, to which has been added a 7,000-pound model known as No. 7. The No. 7 truck is equipped with Edison batteries only, there being sixty cells of the A10 type. These cells are carried in four roller cradles, in a sheet steel compartment so arranged as to pull out at the sides on a special metal track. The operation can be performed by one man by taking off the cover on the side, attaching the metal tracks to slots in the lower corners and suspending them with hooks at the upper corners, thereby providing a shelf for carrying the batteries when withdrawn for inspection.

The disposition of the cells on the 1,000, 2,000 and 3,000 chassis is by placing eight trays parallel to one another with eight cells in each tray, except one, in which there are only four. In model No. 7 there are twelve trays with five cells in each.

The controller is of the continuous-torque type, operated by a lever carried below the steering wheel. In all models the motor housing is formed integral with two strap arms resting on two cross-members of the frame. The power is transmitted to the differential by means of inclosed Renold silent chain. Tbe final drive is through sprockets and double roller chains, S. K. F. self-aligning ball bearings being used in the countershaft brackets.

The frame on the new No. 7 model is 6-inch channel pressed steel, tapering from just in front of the center cross-member to a point immediately behind the driver's seat, at which point another cross-member is attached. This gradual sweep eliminates abrupt bends in the frame, thereby adding greatly to its solidity. The two brakes are operated by pedals, the service on the rear hubs and the emergency on drums attached to the jackshafts.

Fritchle

¶ These vehicles are manufactured by the Fritchle Automobile & Battery Company in one model for commercial purposes, with a carrying capacity of 1,000 pounds. The batteries, which are of Fritchle manufacture, are suspended amidships, consisting of thirty-two cells. The controller, placed under the driver's seat, is operated by a lever, giving five forward speeds. The motor is placed across the chassis and suspended from a cross-member, driving the large sprocket, attached to the differential in the rear axle, by single roller chain. The chassis frame is made of wood sills and treated so as to render them impervious to acids, the suspension being taken care of by elliptic springs, front and rear. with two reach rods connecting the front and rear axles holding them in line. The wheelbase is 100 inches. Two contracting band brakes are provided on the rear wheel hubs in addition to an electric brake.

Detroit electric with typical express body and good driver's protection

Atlantic 5-ton vehicle in brewery service

Atlantic 3.5-ton type with body suitable for the paper trade

Waverley 2-ton model with side doors

G. M. C. Electrics

¶ These vehicles are manufactured by the General Motor Truck Company in the following sizes: 1,000 pounds, 2,000 pounds, 3,000 pounds, 4,000 pounds, 6,000 pounds, 8,000 pounds, 10,000 pounds and 12,000 pounds, respectively described as Models 1, 2, 3, 4, 6, 8, 10 and 12. These again are subdivided each into three types according to the length of the wheelbase, the shortest being type A, the medium type B and the long wheelbase type C.

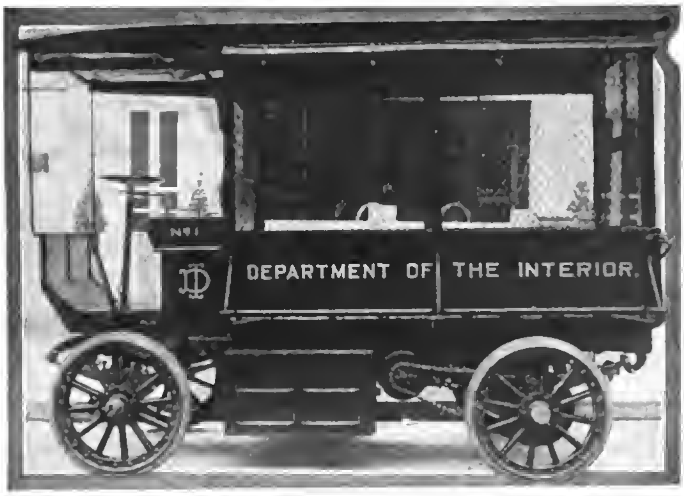
Three outstanding features distinguish these trucks from others on the market. One is a spring steel tempered blade propeller shaft to transmit the power from the motor to countershaft. The second is a short hood in front of the vehicle, inclosing the controller, ampere-hour meter, safety switch and light switches. The third is that the storage battery is placed on the chassis under the driver's seat. The battery, consisting in all cases of forty-four lead or 60 Edison cells, is carried above the frame, access to which is obtained by raising the seat cover. The cells are carried in single or multiple trays removable through the side panels. The steering pillar is inclined towards the rear, and carries a rod connected at the lower end with the controller and at the upper extremity with a lever above the steering wheel. The movement of the lever forward produces the five forward speeds and two reverse is obtained by moving the lever in the opposite direction. The motor is suspended from cross-members of the frame at the rear of the countershaft, the drive being transmitted as has already been explained by means of a spring steel blade. An expanding brake is fitted to the drive shaft and the conventional internal expansion brakes are fitted in the rear wheel hub drums. The semi-elliptic springs are supplemented at the rear of the chassis by coil springs being interposed between the chassis frame and the axle seats.

General Vehicle

¶ The General Vehicle Company manufactures six models; including chassis capable of carrying 750 pounds, 1,000 pounds, 2,000 pounds, 4,000 pounds, 7,000 pounds and 10,000 pounds. This season's models will not be marked by any material changes in design. The same general features are incorporated in all of the models, only small alterations in design being made to take care of the differences in load capacities. The batteries, consisting of forty-four cells, are suspended amidships under the main frame by stout section supports, loading and unloading being effected from either side. The controller is placed under the driver's seat, operated by a lever to the left of the driver. The motor is centrally located towards the rear of the chassis, the power being transmitted to the countershaft by an inclosed Morse silent chain, and thence to the rear wheels by double roller chains. An internal expansion brake is located in the drums of the rear wheels, which run on roller bearings.

Jatco

¶ Jatco vehicles, manufactured by the Joliet Auto Truck Company, are made in two models, one a 1,000-pound chassis, Model C, and the other a 1-tonner, Model D. The two are identical in dimensions as regards loading space, wheelbase and total overall length. The smaller chassis weighs 2,600 pounds and the larger model 3,000 pounds. Motive power is transmitted to the differential by silent chain and from the jackshafts by roller chain. Batteries with a 165-ampere-hour capacity, containing thirty and forty cells respectively for the model C and D, and suspended under the chassis. They are capable of supplying sufficient current for 50 miles for the smaller and 40 miles for the larger truck on a single charge. The control lever of the 1,000-pound



Baker 1-ton wagon for government service

chassis is located on the top of the steering wheel, and in the 1-ton chassis it is situated on the right of the driver's seat. Two independent pedal-operated brakes are fitted.

Lansden

¶ The Lansden Company builds five models, ranging from 1,000 pounds to 5 tons. The design of all the models is identical, the only differences being in the sizes of the parts, which are proportionate to the carrying capacity. The new models carry the following loads: 1,000 pounds, 1 ton, 2 tons, 3.5 tons and 5 tons.

Edison batteries, used on all models, are suspended from the frame in a steel cradle with aluminoid covering, suitably lined with insulating material. The side doors are hinged at the bottom and when lowered form an extension tray to permit the batteries being partially withdrawn. The trays are mounted upon steel rollers, which run in channels. With the exception of the 1,000-pound wagon, in which the cells are arranged in ten rows with six cells in a row, the four models have the cells arranged in twelve rows with five cells in a row.

The controller is fitted in front of the chassis below the floorboards and is of the eight-finger continuous-torque type, the operation of changing the four forward and two reverse speeds being effected by a lever under the steering wheel. Around the inclined steering post there is a tube, connected at the top end with the control lever, and at the bottom to an arm carrying an arc-shaped gear which engages with its mate on the controller shaft. Each speed is determined by notches in the quadrant upon which the change-speed lever works, and to prevent an inadvertent dropping into reverse it is necessary to slightly raise the lever. The maximum speeds of the respective models, starting with the smallest, are: 14, 12, 10, 9 and 8 miles per hour. The 1,000-pound and 1-ton chassis are capable of covering 60 miles per charge under normal conditions, and the three larger types average approximately 50 miles.

A series-wound General Electric motor is suspended from a U-section pressed steel cross-member, slightly forward of the rear axle, with the armature shaft parallel with the side members of the frame. The motor housing is bolted to an extension of the differential casing, by which means the motor and differential are held in alignment. The armature shaft, carrying the driving bevel pinion, is extended forward into the differential housing and a brake drum is attached to the shaft between the two units. In order to prevent any lubricant leaking from the differential and finding its way into the brake mechanism, a stuffing box is used. Side strains are obviated by the three-point suspension. It is claimed that the motor is capable of withstanding a 300 per cent. overload for a period of 30 minutes. Ball bearings are employed in the motor and roller bearings in the differential. The final drive from the inclosed jackshaft is by chains. The service brake on the armature shaft is operated by a pedal which is connected with the controller, so that the act of braking automatically cuts off the current to the motor. The emergency brake, pedal operated, is placed in the drums of the rear wheels, and can be held in any desired position by means of a ratchet.

M. & P.

¶ Two chassis models are manufactured by the M. & P. Electrical Vehicle Company, resembling each other in general characteristics and intended to carry 1,000 and 2,000 pounds. A resumé of one of these chassis will therefore be indicative of the other. The Westinghouse motor is suspended beneath the chassis frame directly under the driver's seat. In order to make room for the drive shaft from the motor to the differential, the battery box is made in two compartments, suspended from the side-members of the chassis frame. The Gould batteries are assembled in four trays, with ten cells per tray and are reached through a door in the floor. A rubber curtain protects them. Battery removal is from the sides. The controller of the continuous-torque type, operated by a lever on the left, gives four forward speeds and two reverse. The drive shaft from the motor to the differential is fitted with universal joints at each end to relieve any strains due to frame distortion. Final drive is effected by roller chains. Internal expansion brakes are fitted to the extremities of the jackshafts as well as to the rear wheel hubs, each set being operated by independent pedals. The chassis is of standard steel channel, with channel steel cross-members, hot riveted, and the suspension is by elliptic springs. The length of the loading space is 80 inches on the 1,000-pound chassis and 90 inches on the 2,000-pound chassis; the wheelbase is correspondingly longer for the larger chassis, namely, 112 inches, while that of the smaller type is 100 inches. Solid tires, fitted to standard S. A. E. rims, are supplied as part of the regular equipment.

Urban

¶ The Kentucky Wagon Manufacturing Company builds trucks in four sizes—of 1,000, 2,000, 4,000 and 7,000-pound capacity. All models are similar. The batteries are carried forward of the jackshaft beneath the frame. Access to the cells may be had from either side of the car or from the top. The steering column is inclined 30 degrees and the controller is operated by means of a lever mounted just beneath the steering wheel. This lever operates in the lower slot of a gate for the four forward speeds and in an upper slot for the two reverses, accidental movement of the lever being prevented by means of a thumb latch. The controller handle serves to rotate a tube, concentric with the steering column, being coupled to the controller at the lower extremity by a drag link. The controller, lighting and emergency switches, ampere meter, etc., are mounted in a short shroud, which is part of the chassis. The switches are mounted upon a panel at the rear of the shroud, forming as it does a dashboard, and by removing an aluminum panel the controller is readily accessible.

A General Electric motor is supported under the chassis immediately forward of the rear axle, whence the power is transmitted to the differential by silent chain, inclosed in an oil-tight aluminum casing. A cast steel housing is provided for the jackshaft unit. Nickel steel heat-treated gears and shafts are used to convey the power to the sprockets at the ends of the jackshafts, the final drive being effected by roller chains. The radius rods are arranged to provide for universal movement of the axle in relation to the chassis frame, thereby relieving the latter of undue torsion strains. Service brakes placed on the extremities of the jackshafts are operated by pedal, and emergency brakes expanding in drums on the rear wheels are operated by a ratchet-retained lever.

Walker

¶ The vehicles made by the Walker Vehicle Company are distinctive in design. Five models are listed, namely, Model F, 750 to 1,000 pounds; Model 7, 1,500 to 2,000 pounds; Model B, 3,000 to 4,000 pounds; Model D, 4,000 to 5,000 pounds, and Model E, 7,000 pounds. The general appearance of the vehicles is distinctive through the wheels, both front and rear being made of pressed steel disks with radial corrugations in the form of spokes.

The battery, the number of cells depending upon the size of the truck, is suspended by means of substantial cradles of T-section steel, the removal being effected from either side. Provision is also made for inspection from above through a trapdoor and cover. The rear axle houses the entire power-transmitting mechanism, the whole unit being known as the Walker balance gear. The power is furnished by a single motor having a hollow armature shaft mounted on ball bearings. The armature shaft drives the differential, which in turn drives the jackshafts. These carry at their outside extremities pinions which transmit the power through idler gears to large internal gears fastened to the driving wheels at a point near the outside periphery.

A U-shaped cover over the rear axle casing affords ready access to the motor at any time. By removing the hub caps, withdrawing the jackshafts and unbolting the saddles that hold the armature shaft in position, it is possible to remove the armature with a minimum of trouble. The suspension of these trucks is worthy of mention. The forward end of Models F, C and B is suspended by means of reverse semi-elliptic springs placed transversely across the chassis, the alignment and distancing of the front axle being maintained by a triangular reach extending from the extremities of the axle to the rear support of the battery box, where the two ends unite in a ball joint, permitting the axle to assume any angle with the road surface without being subjected to twisting strains. The rear suspension on all models is of the three-quarter platform type. The steering is vertical and the speed control is operated by a lever to the driver's left. The braking mechanism is entirely confined to the rear wheel drums.

Waverley

¶ Electric commercial vehicles manufactured by the Waverley Company include a 1,000-pound delivery wagon, 1, 2, 3.5 and 5-ton trucks. The 1,000-pound wagon is an enlarged model of last year's 600-pound chassis. Some minor changes have been made in the 1-ton model. The 2, 3.5 and 5-ton models are all new.

The battery in all models consists of forty-two cells, the number of plates varying according to the size of truck and is suspended from the chassis in a steel cradle, strengthened by T-section hoops and steadied by the guy rods between the front and rear of the base and the main frame.

The method of drive on the 1,000 and 2,000-pound trucks is identical, being the Waverley patented shaft drive with two reductions, the motor being hung slightly forward of the rear axle. The armature shaft is extended at both ends, one end carrying a brake drum and the other the driving pinion. The motor housing is also extended to inclose the silent chain which drives the secondary shaft. The latter is parallel with the rear axle and carries at its opposite extremity a herringbone gear which meshes with the main differential pinion, the power being transmitted to the rear wheels by dogs interposed between the ends of the jackshafts and the castellated hub ends.

Turning to the larger models, these possess all the earmarks of carefully studied construction, having a clean-cut, substantial appearance. The chassis are of channel section steel with cross-members of like material, securely riveted together and reinforced by angle and flitch plates. The motor is supported behind the rear axle by two semi-circular brackets passing below, while steel bands hold the unit in position above. These upper brackets are hinged, thus facilitating the removal of the motor at any time. An intermediate shaft fitted with universal joints at either end transmits the power to the differential, which is housed in a pressed steel casing. Back and front covers are fitted to the casing, permitting the removal of the entire differential without disturbing the anchorage of the casing. A truss bracket is fitted slightly off center, connecting the differential casing to a cross-member of the frame, in addition to two radius rods, which take the thrust of the rear axle and maintain the distance necessary for the final chain drive. All the power wiring is carried in a frame especially for the purpose, running the entire length of the chassis, thus preventing it from deteriorating through friction, vibration, etc. The controller, located under the driver's seat in all the larger models, is of the continuous-torque type and permits of an equal number of speeds forward and reverse. As this works in a quadrant there is no likelihood of the driver inadvertently passing from forward into reverse. Two pedals, one on either side of the steering pillar, control a set of brakes, the service brake being housed in the rear wheel drums and the emergency at the extremities of the jackshafts. The front end of the chassis is protected by a bumper of stout U-section.

Ward

¶ Ward cars are built in four sizes by the Ward Motor Vehicle Company. These four chassis are entirely new models and are known by letters, which denote the carrying capacity as follows: EA, 1,000 pounds; EB, 2,000 pounds; EC, 3,000 pounds, and ED, 8,000 pounds, the capacity being exclusive of body and driver. The main idea has been to develop a line of trucks of uniform design, the appearance and design of the smaller vehicles being replicas of the larger models on a smaller scale. By this means each part can be numbered, and by stating the model it is possible for a customer to easily obtain new parts when needed.

The battery crade is substantially constructed of steel, the base being formed by cross-members of T-section steel on which the battery tray slides. The standard battery equipment consists of forty-two cells of the lead plate type or sixty cells of the Edison. The continuous-torque type of controller is located beneath the driver's seat. It gives four forward and two reverse speeds and is operated by a handle placed at his left.

The motor is a shunt-wound General Electric, suspended over the rear axle by suitable braces to two cross-members of the main chassis frame. The power is transmitted to the countershaft by a silent chain of the inverted tooth type, inclosed in a dustproof casing, and thence through double roller chains to the rear wheels. The speeds at which these vehicles are intended to travel have been set so as to keep the cost of upkeep low. Suspension is by semi-elliptic springs front and rear. U-section steel is used for the side-members of the chassis frame. This is being slotted midships to allow the compensating cross-rod operated by the brake rod and pedal to pass through and thus equalize the braking effort while taking care of any inequality of wear or adjustment.

The wheelbase of the respective models, starting with the smallest, is 84, 96, 114 and 132 inches, and the platform lengths 78, 96, 117 and 144 inches. Ward special electric tires are fitted to standard S. A. E. wheels, which give the purchaser an opportunity of having any tires fitted that he may desire.

Lansden vehicle for the express field

Motor-Generators and Rectifiers

Enable Private Owners of Electrics To Charge Batteries at Home from Alternating Current Mains; Are Also Used in the Public Garage

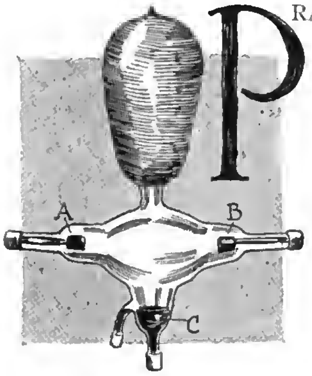


Fig. 1—Mercury bulb on Westinghouse rectifier

PRACTICALLY all the electrical energy produced by power stations at the present time is in the alternating form, that is, the current, instead of flowing continuously in one direction, is given alternate impulses in both directions. The electric vehicle, on the other hand, owing to the fact that it has to carry its energy in the form of a storage battery which only deals with direct current, requires that a direct current source of supply be available when recharging is necessary. In many of the smaller cities the use of the electric vehicle is almost entirely unknown, owing to the absence of public garages where battery charging can be done. Few garages for gasoline propelled pleasure or commercial vehicles have the equipment for renewing the energy of the electric vehicle. In every city of 5,000 population or over in the United States is at least one garage for the gasoline vehicle; in every city of 5,000 population or over there is a central station for the generation of electrical power; some of these central stations have facilities for charging electric vehicle batteries; most have none.

Various devices are in use for the conversion of alternating current to direct current, the most important being the motor-generator or converter, the mercury-arc rectifier, the electrolytic and the electro-magnetic rectifiers. All except the electro-magnetic rectifier, which, owing to its construction, is capable of dealing only with very small quantities of current, can be used for charging the batteries of electric vehicles.

The motor-generator consists of an alternating-current motor mounted alongside a direct-current dynamo or generator and coupled directly to it. When in use the motor is connected up to the alternating-current mains and, once started, there is a constant generation of direct current at the dynamo end of the combined set. Mechanically this type of converter is reliable, but there is a considerable loss of power in the process of conversion, especially in small models, resulting in a rather low electrical efficiency. Nevertheless the motor-generator, or rotary converter, which is the same machine in a different form, is the only practical method of converting alternating current on a large scale. Some efficiency is gained in the rotary converter over the motor-generator in that the former has only one magnet casing and armature. This armature has a winding fitted with collector rings at one end to take the alternating supply, and a commutator at the other end to deliver the direct current. This construction also does away with the difficulty of aligning the two shafts and four bearings of the two units of a motor generator.

The mercury-arc rectifier belongs to the static order of alternating-current converters, having no mechanically moving parts. The first of these devices were sold nearly 10 years ago, and since that time they have been in constantly increasing demand, the chief reasons for this demand being their high efficiency, absence of moving parts requiring oil and grease, and lack of vibration. This type of rectifier is also the cheapest reliable device for charging that has so far been produced. One of the objections raised against it was the presence of the glass tube which contains the mercury arc. It was predicted that this tube would not last, but as cases are known where the same tube has been in operation for 5 years, and the manufacturers of these tubes guarantee an average life of 600 operating hours, the slight cost of renewals need not be feared.

The mercury rectifier in its practical form consists of a glass vacuum chamber shaped very much like the ordinary electric

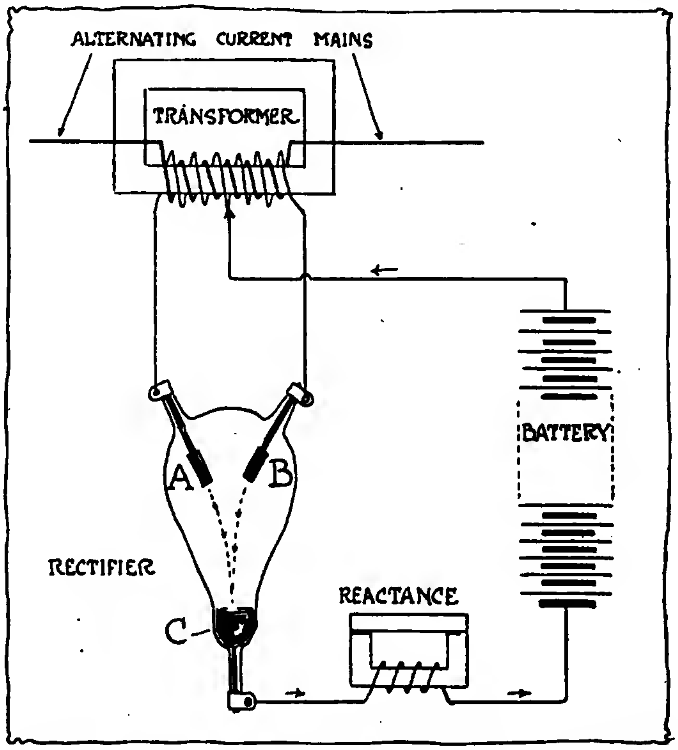


Fig. 2—Wiring diagram of mercury-arc battery-charging apparatus

light bulb except that it is larger, containing two anodes A and B, Figs. 1 and 2, and a cathode C at the base. This latter is the negative pole and consists of a pool of mercury with outer terminal connections. Graphite or iron is generally used for the anodes. The operation of the device depends on the peculiar property of mercury vapor, when of a certain rarefied density to permit current to flow from an anode or positive terminal across the vapor to a mercury cathode, but not in the reverse direction. Why this is so and exactly what happens in the process is not definitely known, but the theory of operation generally held is as follows: All gases are supposed to contain numerous electrically charged particles or atoms called ions. Some of these ions are positively charged and others negatively, and when a high degree of electrical pressure or potential exists between two conductors of electricity separated by a gas or gases such as air, these ions assume a directional flow between the conductors which becomes more rapid as the electrical stress increases, until a point is reached when an arc is formed permitting the current to bridge the gap. The ease with which an arc is formed depends not only on the voltage or pressure of the electrified conductors and the distance separating them but also on the density of the surrounding gas. When in a rarefied state a comparatively low electrical stress can break through. This is what occurs between clouds when lightning appears. The neighboring atmosphere is always rarefied, permitting an arc discharge between the oppositely electrified clouds. When this arc takes place in rarefied mercury vapor it allows current to pass only in one direction, and it was the discovery of this fact which led to its utilization as a sort of separator of the two alternate impulses which constitute alternating current, sending only the impulses of one direction to the battery or for whatever purpose the direct current was required.

When fitted up for battery charging the connections are as shown in Fig. 2. The alternating-current mains are connected to one winding of a transformer and the two anodes of the rectifier are wired across the second transformer winding. A reactance coil is introduced between the cathode at the base of the rectifier and the positive terminal of the battery, and the return wire from the other pole of the battery connects to the center of the transformer winding. Once the arc is formed the following action is taking place: The main alternating current passing around the first coil of the transformer sets up a magnetic state in the rectangular iron frame on which the coil is wound, which in turn induces a flow of current, also alternating, in the second transformer coil connected to the rectifier. The purpose of the transformer is to reduce the voltage of the mains to that which, after being rectified, is suitable for charging the battery. The induced current is now in communication with the mercury vapor through the two anodes A and B. These anodes are alternately positively charged at a rate corresponding with the periodicity or rate of impulses in the main supply, and at each instant of positive charge the current flows through the arc to the mercury cathode and thence to the battery. It will be seen, then, that virtually the arc is oscillating between the two anodes and the cathode, and that the resultant current supply, though unidirectional, is not absolutely "smooth." To neutralize the intermittent character of the current a reactance coil is inserted in the circuit.

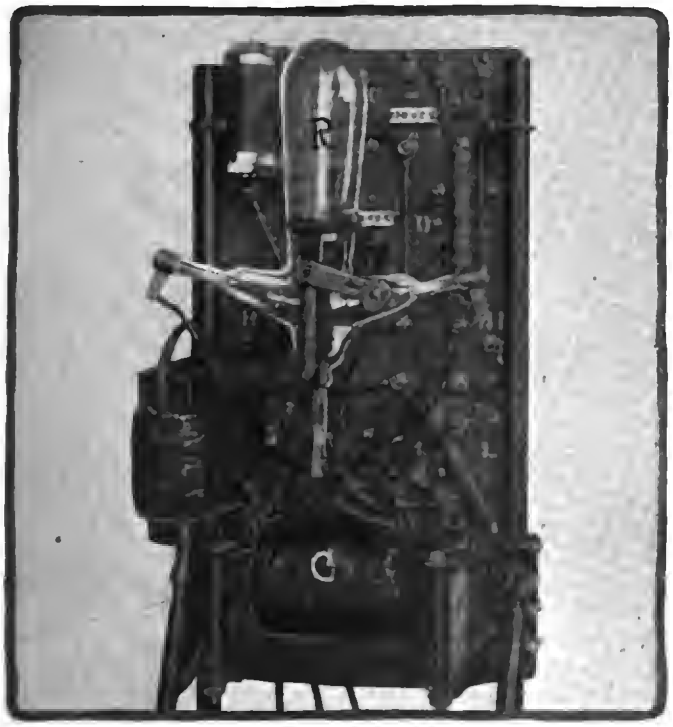


Fig. 3—Swivel-mounting of mercury bulb behind panel of General Electric Company's rectifier

It should be noted that there is a considerable drop of voltage during the process of rectification in the mercury bulb, varying in ordinary sized tubes from 15 to 25 volts. This drop is practically constant with a particular tube, and hence the efficiency of the rectifier can be said to vary with the voltage of the direct current delivered. The higher this voltage the less in proportion is the potential drop of the rectifier.

A line of motor-generator sets made by the General Electric Company and suitable for battery charging is shown in Fig. 3. The motors of these sets may be driven by either single, two or three-phase alternating current, at 60 cycles, and various standard commercial voltages. The capacities range from 0.2 to 10 kilowatts. Standard generators are shunt-wound, designed to deliver 125 volts at full load.

By a novel method of attaching motor and generator frames solidly together, these sets are made very compact and the necessity of a sub-base eliminated. This construction also allows the motor and generator armatures to be mounted on a common shaft, requiring only two end bearings. In all except the smaller sizes provision is made for thorough ventilation of the field coils, armatures and commutators, by a well-directed current of air, thus securing uniform, cool operating temperatures throughout, with consequent improved life of insulation.

Fig. 5 shows the Lincoln motor-generator set, a machine possessing an unusual feature in its ability to supply direct current at two distinct voltages. The low voltage is 75 and the high 115, being designed respectively to charge from twenty-four to twenty-eight-cell lead batteries or forty-cell Edison batteries from the 75-volt terminals, and from thirty-eight to forty-two-cell batteries or sixty-cell Edison from the high voltage end.

The Wagner rotary converter, made by the Wagner Electric Company, St. Louis, Mo., adapted for single-phase work, is shown in Fig. 4. It is a strong, compact design, suitable for fitting at any convenient point in the garage. The armature shaft runs on ball bearings and a belt pulley is provided so that the converter can be used as a motor for power purposes in the

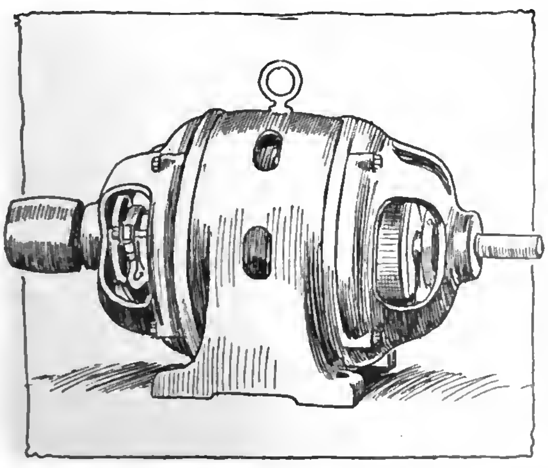


Fig. 4—Wagner rotary converter

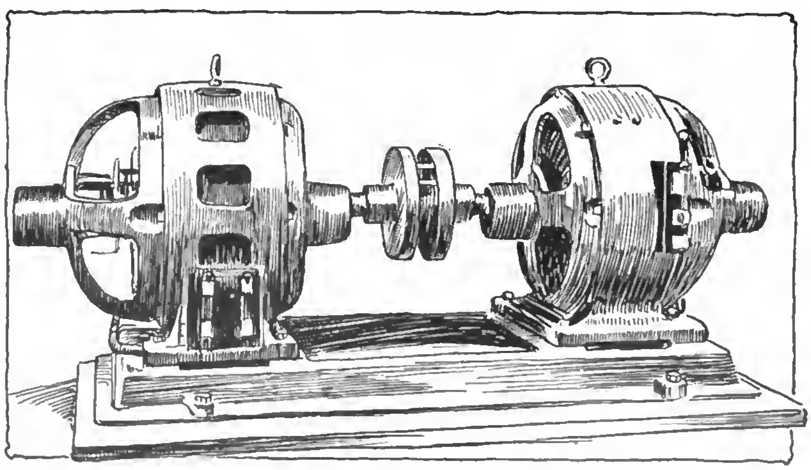
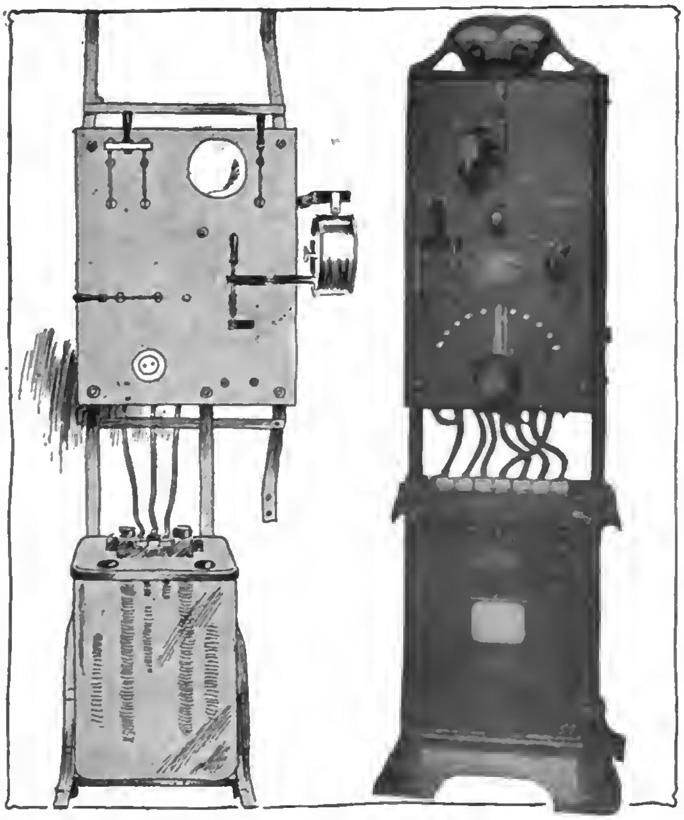


Fig. 5—Lincoln motor-generator set for battery-charging



Figs. 6 and 7—Sirch electrolytic rectifier, and mercury-arc outfit by General Electric Company

garage, such as driving a tire pump, polishing wheel or lathe. As supplied, the equipment includes a control panel fitted with switches which control the amount of direct current delivered to the battery. When required, the makers supply automatic devices for cutting out the battery when fully charged.

Mercury-arc rectifiers are made in two standardized types by the General Electric Company. One of these, called the Runabout type, is shown in Fig. 7. As will be noted, the complete equipment consists of a panel with controlling switches and a main reactance forming a base on which the panel is mounted. The rectifier bulb is supported behind the panel in the manner shown at R, Fig. 3. On the main reactance are various connections to parts of the winding coil, which make it possible to connect the rectifier for various direct-current voltages which cover a range sufficient to charge all ordinary lighter "electrics." The main or compensating reactance stands on the floor and has two receptacles at the top for receiving the pipe supports of the rectifier panel. On the back of the panel is mounted a suitable tube holder for holding the mercury tube. In order to slightly rock the tube, which is necessary in starting, a small handle is provided on the front of the panel, which is connected to a small shaking rod. The panel is equipped with a main or alternating current line switch and single-pole circuit-breaker for protection against overload, and a starting switch for connecting the rectifier temporarily to a resistance load, due to the fact that it is difficult to start a rectifier against the counter electro-motive force of a battery. To start the rectifier the starting switch is held down with one hand while the tube is rocked with the other, and as soon as the tube starts, which is indicated by a greenish-blue light, the starting switch is released, and by means of a spring is transferred to the upper position, and the storage battery, to which the rectifier is connected, is automatically thrown on.

To obtain a regulation of the charging current a reactance coil C, Fig. 3, is connected in series with the alternating-current supply. This coil has eleven taps connected to as many buttons of a semi-dial switch, similar in many respects to the ordinary rheostat switch. This makes it possible to efficiently vary the charging current and voltage over the entire range required by any battery which the rectifier is designed to charge.

This rectifier is designed for operation on 60-cycle, 110 or 220-volt alternating-currernt supply. It may by slight modifications, however, be operated on lower frequencies than 60 cycles. From 220 volts the rectifier will charge from sixteen to forty-four cells of lead plate battery or twenty-five to sixty cells of Edison battery, and from 110 volts it will charge from fifteen to thirty-two cells of lead battery or twenty-five to forty cells of Edison, at a maximum charging rate, depending upon the capacity of the rectifier, which may be 30, 40 or 50 amperes.

Where more than one voltage battery is to be charged in a private garage and it is not convenient to change the connections frequently, the Universal or standard battery charging rectifier is supplied by the General Electric Company. This set is made in five sizes, or 10, 20, 30, 40 and 50 amperes capacity, and in direct-currrent voltages ranging from 10 to 100 when operated from 110 volts alternating current, and from 10 to 175 volts when operated on 220 volts alternating current. This rectifier is suitable for operation on 60 cycles or higher, but special sets of the same design can be furnished for lower frequencies.

The efficiency of these rectifiers at 60 volts direct current is about 70 per cent.; at 70 volts, 75 per cent.; at 100 volts, 78 per cent., and at 175 volts, 80 per cent.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., builds mercury rectifier outfits in three models suitable for the private owner's garage. Each of these models consists of a special Cooper-Hewitt mercury bulb shown in Fig. 1, and stationary regulating apparatus, all contained in a ventilated iron case. At the top of the case two dial switches are fitted for regulating the charging current. The types are listed as Type AN, Type AA and Type AE. In Type AN an automatic switch is included, which cuts down the charging current as the charge proceeds, producing the "tapering current characteristic" desirable for lead batteries. Type AE is specially designed for charging Edison batteries which require a more constant rate of charge called the "flat current characteristic." The two first types are made in two sizes, either for ten to twenty-four cells or for twenty to forty-four cells. The maximum charging current is No. 0 amperes. The outfit for Edison battery charging is suitable for twenty to fifty-four cells, with a maximum current of 50 amperes. All these outfits are suitable for alternating-current circuits of 110 or 220 volts.

The Sirch rectifier shown in the drawing, Fig. 6, belongs to the class of electrolytic rectifiers. Here the unidirectional current is obtained by the chemical action between electrodes suspended in a special aqueous electrolyte contained in the glass cell at the base. No rheostat or transformer is employed. Back-discharging of the battery is impossible with this device, and should the main line current be interrupted at any time, charging of the battery is automatically taken up as soon as the main current is resumed.

Fig. 8—Motor-generator set by General Electric Company

Rheostats for Battery Charging

Safety Devices a Feature of Latest Designs—Solenoid-Operated Rheostat for Automatic Regulation of Current—Cast Iron Grid Type of Resistance Predominates—Other Types Are Enameled Wire and Compressed Graphite

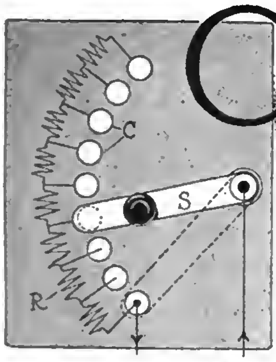


Fig. 1—Outline of rheostat

ONE of the requirements of efficient battery charging is that the charging current be of a certain voltage, determined by the number of cells forming the battery to be charged. And as most direct current supplied by electric power stations is higher than that required for this purpose it is necessary to adopt some means of reducing the main voltage to the desired amount.

There are two ways of accomplishing this reduction. A motor generator may be used, having a motor to take the higher voltage driving a generator to supply the lower; or resistances may be inserted in the circuit. Where the voltage of the supply mains is high, over 200 for example, the motor generator is the more economical method. Below this figure resistances are suitable. Either method represents a loss of energy depending on the voltage drop and may be considered therefore as an undesirable necessity.

The charging of batteries also requires that provision be made for varying the current throughout the charge. When a battery is connected up to a circuit and charging proceeded with, the gradual rise in the battery voltage causes the charging rate to decrease. In some cases this is desirable but the charging of Edison batteries and the periodic boosting or soaking charges which are beneficial to lead batteries demand a more constant charging rate and this can only be obtained by the use of regulating resistances or rheostats inserted in the circuit.

Lead batteries in use on electric vehicles range in size from 24 cells to 40 cells while Edison batteries are generally either of 40 cells or 60 cells. The voltage of the charging current required for all sizes extends from 62 volts in the smallest battery to about 110 volts in the largest. A lead battery of 24 cells requires a charging voltage of 62 volts; 28 cells require 72 volts, and 86 cells 104 volts. The current to charge 40 cells of the Edison type should be at 74 volts and for 60 cells at 110 volts. It will be seen, therefore, that a public garage, in order to accommodate its charging outfit to all these sizes and types of battery must, if only one voltage of supply is available, be provided with a large number of rheostatic resistances.

Fig. 1 shows diagrammatically one of these devices in its essential form. It consists of a switch arm S, the pivot of which is in electrical connection with the circuit and a series of contacts C arranged radially in the path of the switch arm, connected to a number of resistances R. The lowest of these contacts forms the other connection with the main circuit. By moving the switch arm downward over the contacts the resistances are cut out step by step until the final contact is reached when the current supply crosses the switch arm and no resistance is in circuit.

The capacity of a rheostat depends on the ohmic resistance of its units and the amount of amperes it can carry without overheating. Various metals are used for resistance material, iron being, perhaps, the most common. Iron or alloys may be used in the form of wire wound on an insulating core or simply suspended as a spiral in the air; but this method has been largely superseded by the use of flat grids of cast iron which present a large surface to the air for the dissipation of heat and are also constructionally convenient.

The Electric Products Company, Cleveland, O., manufacture automatic rheostats which are suited to the requirements of the private owner. Two of their standard types are shown in Fig. 2. Each outfit consists of a control panel supported on angle-iron uprights, behind which is mounted resistances of the castiron grid type. The instruments on both types are: A, a volt ammeter fitted with automatic cut-off mechanism; B, the main hand switch; C, automatic circuit breaker; and D, the charging rheostat. The automatic cut-off A is provided with two pointers. One of these is set at a point on the scale representing the fully charged condition of the battery and as the charge progresses the other pointer moves over until the two coincide when the charging circuit is automatically cut off. The two pointers remain in contact as a sign to the user that the batteries are fully charged. The battery-charging outfit shown to the right of Fig. 1 has been specially designed to produce automatically a constant charging current, such as is required by Edison batteries, by means of the solenoid-operated rheostat E. This switch automatically raises the charging rate as the battery voltage increases in such a ratio that the resulting current is constant. These charging sets occupy a floor space of 18 inches by 20 inches and are built for 30 or 50 amperes at 110 or 220 volts and charge from 10 to 44 cells of lead battery or from 20 to 70 cells of Edison batteries.

Another type of rheostat suitable for the private garage is shown in Fig. 3. These sets are made by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., and consist of two

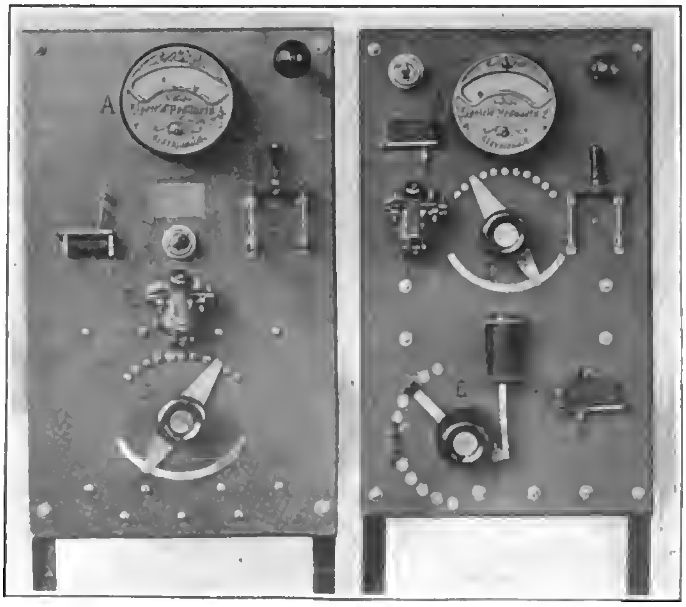


Fig. 2—Two types of Wotton battery-charging panels, that on the right being fitted with automatic solenoid-operated rheostat

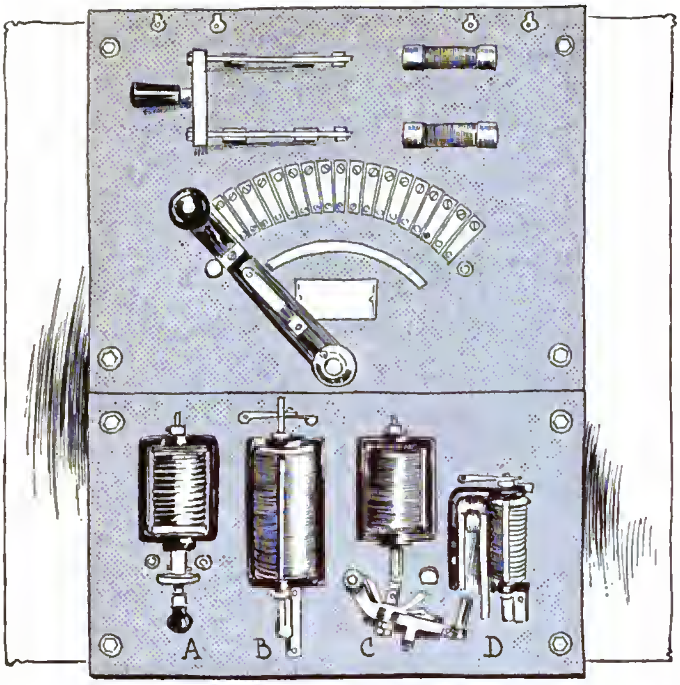


Fig. 3—Cutler-Hammer rheostat with automatic protective devices

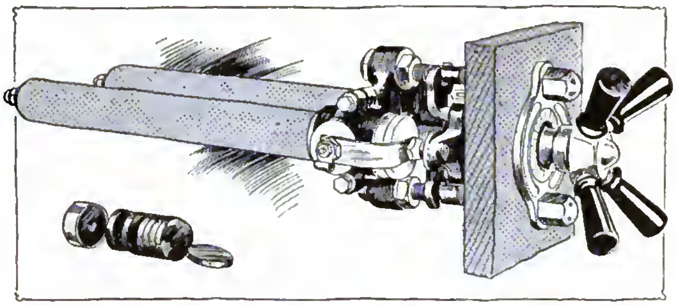


Fig. 4—Allen Bradley compression rheostat in which graphite discs form the resistance

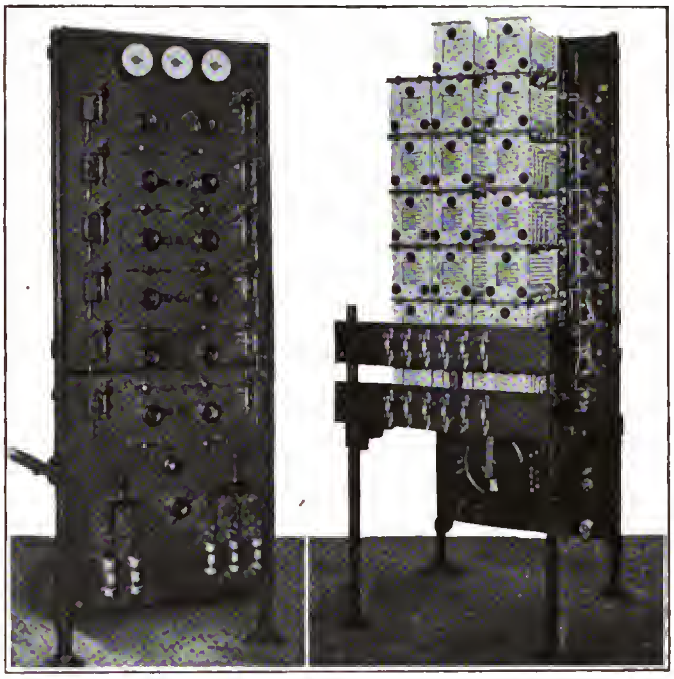


Fig. 5—Twelve-circuit rheostat set for a public garage, by the Westinghouse Electric Company

panels mounted together, one containing the main switch and the rheostat proper and the other the automatic protective devices. A is a low current cut-out which automatically opens the circuit if the current drops to a predetermined minimum. This prevents the battery from discharging into the line should the line voltage drop below that of the battery. B is a maximum voltage cut-out which opens the circuit when the battery voltage reaches the point at which the device is set to operate. C is a solenoid switch for opening or closing the main charging circuit. D is an overload circuit breaker to insure the battery against an excessive charging rate.

The operation of this type of battery-charging rheostat is as follows: After the battery and line connections have been made the operator first closes the knife switch and then moves the rheostat lever to the third contact segment, at the same time raising the plunger on the low-current cut-out A, thus energizing the solenoid switch C which closes the charging circuit and permits the current to flow through the resistance to the battery. As an additional protection the rheostat lever is provided with an electrical interlock which prevents the operator from closing the circuit to the battery except when the lever is in the off position, that is, with all resistance in circuit.

The same concern also builds these rheostats in multiple sets for public garage work. Fig. 9 shows a panel arranged with six rheostats, the two lower ones being discharge rheostats. This particular panel is for use with a motor-generator and the hand wheel and meter at the top are for the generator circuit. The two meters on the projection at the left, are for determining the rate of charge and the voltage of the batteries, any one of which can be switched on to the instruments when a reading is wanted. The instrument switch of each rheostat is situated directly to the right of the row of contacts, avoiding trouble and confusion in operation. When meter readings are taken the instrument switch does not break the charging circuit so that arcing at the blade is avoided.

The discharge rheostats at the base are a means of testing the electrical equipment of a car. For instance, in case of a vehicle not giving its rated average mileage and where some doubt exists as to whether the mechanical or the electrical equipment is at fault, the discharge rheostats can be used to determine whether the battery is capable of giving its rated ampere-hour capacity. If it does, then the fault lies elsewhere.

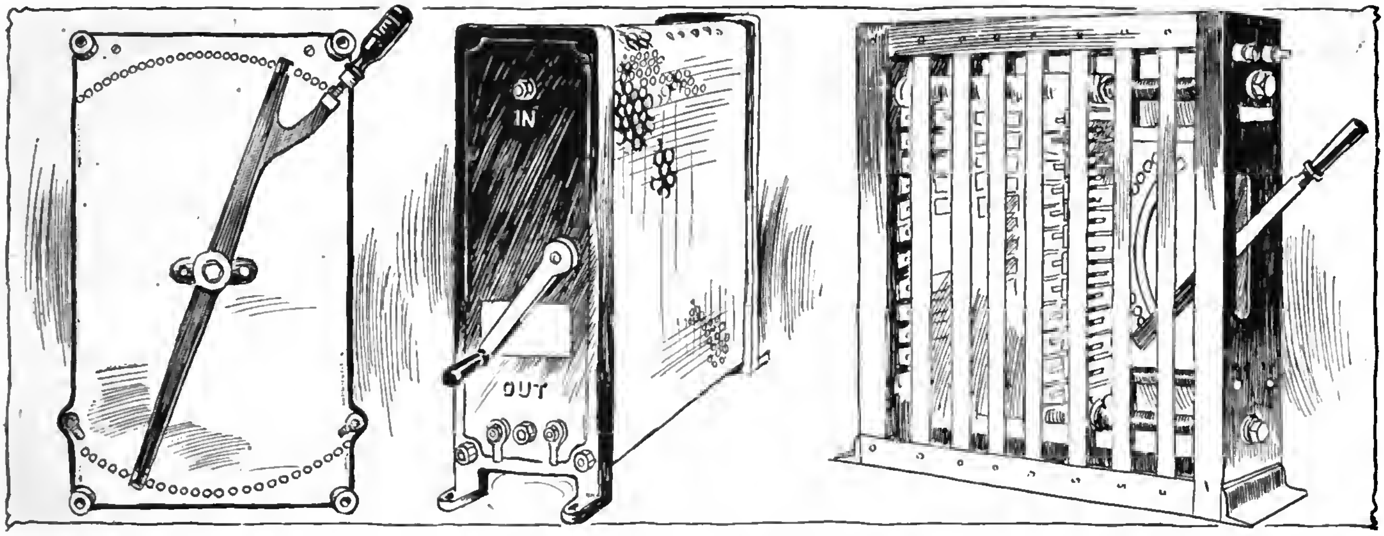
Front and rear views of a still larger charging set by the Westinghouse Electric Company, East Pittsburgh, Pa., are shown in Fig. 5. Grid resistances are used and the method of mounting these behind the panel is shown in the illustration. This board is equipped for twelve circuits, the rheostats being mounted behind the panel with the hand wheels only on the front.

The switches and regulator at the base of the panel are for controlling the motor-generator with which the charging set is designed to operate. The switchboard is equipped with a generator ammeter, a battery ammeter and a direct-current voltmeter; and for each charging equipment there is mounted alongside the rheostat wheel a single pole circuit breaker, a voltmeter receptacle for reading the individual voltage of each battery, and a single pole double-throw switch which throws the battery ammeter in and out of the individual circuit so that the charging current can be noted at any time.

The floor space required for this charging set is 36 inches by 30 inches.

Three types of rheostat units specially designed for banking in sets for large installations in public garages are shown in Figs. 6, 7 and 8. Each is self-contained and can, therefore, be used singly also, but they are made in a specially compact form suitable for arranging in a row, generally under the power switchboard.

Fig. 6 shows the Ward Leonard enameled plate type of rheostat. In this the resistance wire is embedded in enamel and cannot, therefore, suffer any depreciation by exposure to the elements. A flat switch arm provided with a projecting handle



Figs. 6, 7 and 8—Ward Leonard enameled plate resistance unit, and two types of grid resistance units by the General Electric Company and the Cutler-Hammer Manufacturing Company

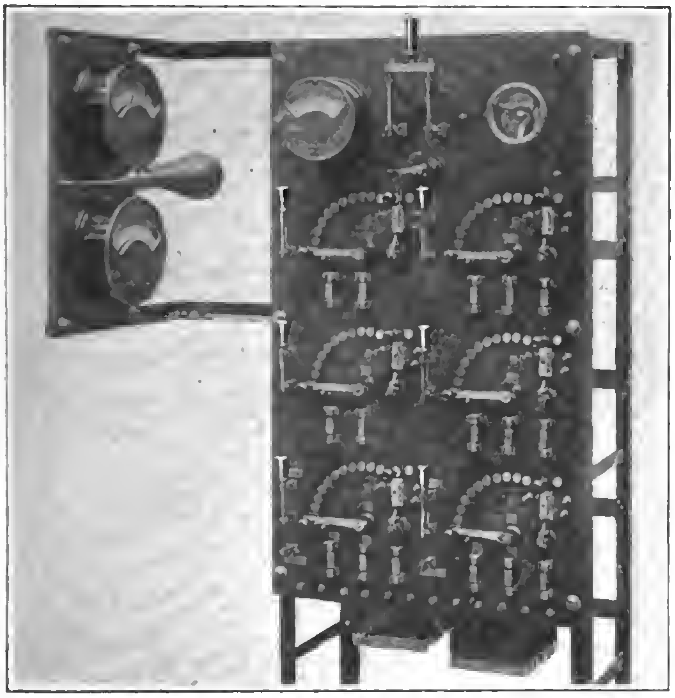


Fig. 9—Cutler-Hammer rheostat panel for six circuits provided with discharge rheostats

is strongly pivoted at the center of the plate and it will be noted that there are a great number of contacts permitting close adjustments of the current. The plates are 15 inches by 24 inches. When banked in sets they are spaced on tie rods passing through the four corners. A fixed resistance of a similar plate type is also made by this company, to be used in conjunction with the rheostat or variable resistance. By this means it is impossible to overload the rheostat if an operator should have too little resistance of the rheostat in circuit when the counter volts of the cells are low. The rheostat provides all the necessary variation.

The General Electric Company's CR211 rheostat, Fig. 7, is built in any capacity up to 90 amperes. It consists of two cast-iron end frames 16 inches high by 6 1-2 inches wide, connected by tie rods. These rods support the grid-type resistances in a vertical position and vary in length according to the capacity of the rheostat. The switch is mounted on a slate base immediately behind the front-end casting in such a manner that only the handle is exposed. Fifteen steps of resistances are provided. A perforated sheet metal cover, easily removable, extends from front to back and prevents accidental contact with live parts, without interfering with the ventilation.

Before charging, the handle should be moved up to its top position thereby inserting all the resistances into the circuit and preventing a large rush of current through the battery.

Fig. 8 shows one of the types of compact rheostats manufactured by the Cutler-Hammer Company. The resistances used are of the grid type and the rheostat panel is mounted inside with the handle projecting through a slot in the front plate. A standard height of 22 inches is adopted and the widths are 5, 7 or 10 inches according to capacity.

A rheostat which differs from all those previously described is the Allen Bradley compression rheostat, Fig. 4. Here the resistance is secured through the imperfect contact between the surfaces of prepared graphite disks piled in a column. This contact resistance varies with pressure, and the resistance changes are caused by subjecting the column to various degrees of pressure. The columns of disks are inclosed within an insulated steel tube, which is provided with suitable terminals and plungers for transmitting the pressure to the disks. Such inclosed columns constitute a complete resistance unit. The illustration shows a quantity of graphite disks such as is used and a complete rheostat of 1,000 watts capacity arranged for switchboard mounting. The graphite disks are well adapted for rheostatic service, as they will not crush or break, are not affected by any temperature that they have to encounter, cannot be fused, will not corrode and are not changed materially by years of service. These rheostats can be mounted directly on the back of the switchboard and take up very little space.

Harking Back a Decade

FROM THE AUTOMOBILE, January 3, 1903:

With New Year greetings to its readers *The Automobile and Motor Review* this week opens a new volume under the abbreviated title of THE AUTOMOBILE. The change in name will probably be welcomed by all. When THE AUTOMOBILE and the *Motor Review* were consolidated last June, it was thought best to incorporate both names in the title until the identity of the publication should have been thoroughly established. This, we believe, has now been done.—Editorial announcement.

Motorists in Chicago are up in arms over a proposed ordinance which, if passed, will compel them to carry an official number on the face of each lamp and also a number in 8-inch figures on the rear of the machine. A similar measure was passed recently by council, but was vetoed, and now it is bobbing up again with much apparent show of strength.

Charging a Battery

Being a Practical Outline of the Best Method

OWNERS of electric passenger and commercial vehicles are, when driving the car, careful to note the voltage and amperage readings on the measuring instruments of the vehicle; they have also read the varied instructions regarding care and maintenance of batteries; but **do these owners know what should happen to the battery when being recharged in the garage?**

To gain a clear concept of the modus operandi of charging a battery, consider a battery of twenty-four cells for a passenger vehicle. For convenience consider this battery an acid-type, lead-cell one (not an Edison cell), and that it is being charged from a 110-volt circuit direct-current supply, or should alternating current be the only available one then a rectifier would have to be used. For convenience throughout this article this current source of 110 volts will be known as the impressed voltage.

Example I—(These calculations are done with the number of cells in the battery and not the number of batteries.) The battery has twenty-four cells. A cell discharged to 1.8 volts is practically empty, or discharged as you may prefer to term it. With your battery so discharged the voltage available to run your vehicle is 1.8 volts × 24, a product of 43.2 volts. In equation this is

$$1.8 \text{ volts} \times 24 = 43.2 \text{ volts.}$$

This voltage is so low that you must recharge. The impressed voltage from the charging circuit is 110 and the battery voltage, which will buck or act counter to this impressed voltage during charging, is 43.2, so that your effective charging voltage is the difference between the impressed voltage and the counter voltage, or in equation

$$110 \text{ volts} - 43.2 \text{ volts} = 66.8 \text{ volts.}$$

Next consider the net result of this effective voltage on the battery: the internal resistance of the battery is so low as to be negligible. The equation is

$$\text{Current (amperes)} = \frac{\text{E (volts)}}{\text{Resistance (ohms)}}$$

From this equation it is evident that unless some form of resistance is inserted between the charging current and the battery the equivalent of a short circuit will result and such a large current or amperage will flow into the battery that it will be destroyed.

How much resistance is needed?

To determine this resistance assume that the data supplied you by the vehicle maker covering battery charging says, **"Maximum charging rate is 40 amperes."**

To charge at a constant maximum rate of 40 amperes we must have such a resistance as will not at any time permit more than 40 amperes current to enter the battery. Calculate as follows:

Impressed volts	110 volts
Counter volts	43.2 volts
Effective charging volts	66.8 volts
Maximum charging rate	40 amperes

With this information calculation is based on the equation

$$\text{Current} = \frac{\text{E (volts)}}{\text{R (resistance ohms)}}$$

$$\text{Or } 40 = \frac{66.8}{\text{R (in ohms)}} \qquad \text{or } R = \frac{66.8}{40}$$

$$\text{Or } R = 66.8 \div 40 = 1.67 \text{ ohms}$$

Example II—Consider that 40 amperes are entering the battery: instantly the voltage begins to rise and soon reaches 2 volts per cell, or a total for the twenty-four cells of 2 volts × 24 = 48 volts, which are counter volts. Now to calculate the requisite resistance proceed as follows:

Impressed voltage	110 volts
Counter voltage	48 volts
Net effective charging voltage	62 volts

But we still desire a charging rate of 40 amperes and must again use the equation (current = voltage ÷ resistance; or in other words resistance = voltage ÷ current) and we get

$$\text{Resistance (ohms)} = \frac{62}{40} = 1.55 \text{ ohms}$$

But we had 1.67 ohms in resistance, which is too much, and we must cut out the difference, namely (1.67 ohms — 1.55 ohms) .12 ohm, or, in other words, the resistance of the battery rheostat must be cut down this amount.

Example III—With this reduced resistance in circuit and 40 amperes flowing the battery voltage soon increases to 2.2 volts per cell, or a total voltage for the battery of (22 volts × 24) 52.8 volts, which of course is a counter or bucking voltage to further recharging. To determine the necessary resistance to allow 40 amperes to flow proceed as followed in Examples I and II, namely:

Impressed voltage	110.0 volts
Counter voltage	52.8 volts
Net effective charging voltage	57.2 volts

Using these figures in the equation (resistance = voltage ÷ current) we get

$$\text{Resistance (ohms)} = \frac{57.2}{40} = 1.43 \text{ ohms}$$

The present resistance, from Example II is 1.55 ohms, so that it is necessary to still further reduce this by (1.55 ohms — 1.43) .12 ohm.

Example IV—With this reduced resistance and the current flowing at 40 amperes the voltage per cell increases to 2.5 volts, giving a total for the battery of

$$2.5 \text{ volts} \times 24 = 60 \text{ volts (counter volts)}$$

To get the necessary resistance for this increased counter voltage we again proceed as in Examples I, II and III and get results as follows:

Impressed volts	110 volts
Counter volts	60 volts
Net effective charging voltage	50 volts

The necessary resistance is 50 divided by 40 or 1.25 ohms.

Deduction—From these four examples which show why a constantly reducing resistance is necessary in battery charging work, it is a natural deduction to infer the more steps in the reductions of resistance offered by the rheostat the better in making the reduction from 1.67 ohms to 1.25 ohms. **For charging a twenty-four cell battery at a 40-ampere rate practically all that is needed in a rheostat is to take care of a resistance reduction between 1.67 and 1.25 ohms in as many steps as possible, the more the better. Such a rheostat should be built to carry a 40-ampere current without overheating.**

Example V—Consider this case in which your battery has been fully charged to 2.5 volts per cell with 1.25 ohms resistance in the charging circuit; the car is taken out on the road and the next time it is charged the battery voltage is down to 1.8 volts per cell, giving a counter voltage for twenty-four cells of 43.2 volts or a net effective charging voltage of 66.8 volts, but your charging man was careless and only had 1.25 ohms in resistance instead of 1.67 ohms.

What would be the result?

Here it is: The current that will flow is 53.4 amperes instead of 40, the maximum charging rate of your battery, and with this current flowing unless the rheostat is designed for such it will overheat and burn out. This 53.4 amperes is obtained as follows: Current flowing = voltage ÷ resistance, which is 66.8 ÷ 1.25 = 53.4. This example teaches the first rule of good practice in battery charging, to wit: **"Always insert all of the resistance of the charging rheostat before closing the switch to begin charging the battery, or else the battery will be charged at too high a rate and the rheostat overloaded."**

This example demonstrates that unless a single-step resistance is used, permitting of not more than 40 amperes to pass at any time, some indicating instrument, such as ammeter or current indicator must be used. By watching such instrument the current is seen to be automatically cut below the 40-ampere rate, at which time the rheostat lever must be moved to cut out resistance until the meter reading shows 40 amperes flowing.

Overload Circuit Breakers—As a precaution against short circuits overload circuit breakers are often used as a wise precaution. Fuses as a precaution against overload are necessary, being required by law, but they are slow to act and are not always reliable. In our problem a circuit breaker set at 41 amperes is preferable and will give protection against short-circuits and the neglect mentioned.

For a given job of this kind the best rheostat at lowest cost is one designed for 40 amperes capacity throughout. It might be supposed that in a 40-ampere rheostat 1.25 ohms resistance should carry 53 amperes until an attendant notices his ammeter and corrects the resistance to be such that 40 amperes will pass. It must be borne in mind that the heat varies as the square of the amperage and that the overload is 13 amperes. But in heat it is $13^2 \times 1.25$ (the resistance), or 211 watts, which you note is a high figure. It actually is only 33 per cent. increase in amperes, but 75 per cent. increase in watts, which is heat.

However, it is often desired that instead of charging at the maximum 40-ampere rate for a short time the battery be charged at a low rate for a long time. For example, we want to set a rheostat for all-night charging and start with, say, 10 amperes, and as the counter volts of the battery increase allow the charging rate to be automatically reduced. It is then necessary to have such a resistance that the counter voltage in the battery rises to the value given in the following table:

Impressed volts	110 volts
Counter volts	43.2 volts
Net effective volts	66.8 volts

To allow 10 amperes to pass, then, 6.68 ohms resistance is required in the rheostat (66.8 ÷ 10 = 6.68). The rheostat is then designed to have a total of 6.68 ohms resistance, and of this 1.67 ohms must have 40 ampere capacity and the rest have a tapered capacity of from 40 down to 10 amperes of charging current.

Automatic Underload Circuit Breakers—You may here ask the question: Is it possible to leave a battery on charge and have it automatically become disconnected from the circuit when the battery is fully charged? Yes, this can be arranged by having an automatic underload ampere circuit-breaker in the circuit. **Calculate as follows:**

Impressed volts	110 volts
Counter volts at beginning of charge	43.2 volts
Net effective volts	66.8 volts

and 10 amperes are to pass—then 6.68 ohms resistance is in circuit. But the counter volts increase to be 2.5 volts × 24 = 60 volts and the net effective volts are reduced to 50. Then with 6.68 ohms resistance in current 7.4 amperes will pass (50 ÷ 6.68 = 7.4). Then a circuit-breaker set to automatically open the circut when the current is automatically reduced to 7.5 amperes will disconnect the battery and stop the charge.

Now consider that you have two cars—to be extreme I will say a pleasure car twenty-four cells, 40-ampere maximum rate, and a truck of forty cells, 60-ampere charging rate. We have the figures in the twenty-four-cell car. The figures on the forty-cell, 60-ampere maximum charging rate are:

Impressed volts	110 volts
Counter volts	72 volts
Net effective volts	28 volts

and allow 60 amperes to pass .466 ohms (28 ÷ 60 = .46) resistance is needed, which must be reduced to

Impressed volts	110 volts
Counter volts (2.5 per cell)	100 volts
Net effective volts	10 volts

Sixty amperes to pass requires .166 ohms resistance (10 ÷ 60 = .166).

Now let us assume that .16 ohms of this rheostat is in circuit, and the twenty-four-cell battery discharged is connected in circuit; then

Impressed volts	110 volts
Counter volts	43.2 volts
Net effective volts	66.8 volts

The resistance in circuit is .16 ohms; then 417 amperes (66.8 ÷ 16 = 417) will pass which would immediately tend to ruin the battery and burn out the rheostat. If the circuit is protected with a circuit-breaker, the breaker would operate and save the fuses. If no breaker were used, the fuses would blow out, but probably not in time to save the battery and rheostat from injury. Therefore **note that the breaker would have to be set for the truck at 60 amperes; yet the maximum allowable charging current for the pleasure car is 40 amperes, so the circuit-breaker is not a proper protection for it between these limits.**

The above figures show that if a battery rheostat is to be used with a fixed number of cells it can be made economically, also the battery can be charged properly without fear of injury, and it can even be set to charge and it will automatically stop its charge when full. The circuit can be properly protected against damage by automatic circuit-breakers. For proper charging an ammeter is necessary. The one on the car can be used and often is used.

Advice—These figures show that when the same battery rheostat is to be used to charge two cars or more with different numbers of cells then a rheostat must be made of a great number of steps so that the resistance can be greatly reduced and increased and also that overload protection by fuses and circuit-breakers is not readily obtained, the only way to properly charge the battery and protect the battery and entire circuit from abuse or destruction being to have skilled workmen who will always insert all of the resistance of the rheostat in circuit before closing the switch and who will then watch the ammeter carefully and adjust the resistance of the rheostat closely and often for proper charging.

The garageman who has cars carrying from twenty to forty cells per vehicle must install rheostats that will cover this range and have capacity from 60 down to 10 amperes. Such rheostats are very expensive compared to a single rheostat for a fixed number of cells; they must be protected against short-circuit and brains are needed to handle them.

With a proper knowledge of why the increased amperage will pass, perhaps some great care and attention in garages will cause proper charging and a greatly increased life of the batteries will result.

For Garagemen—Always insert all of the resistance of a charging rheostat before closing the switch.

Always watch your ammeter closely and maintain charging rates as recommended by the car manufacturer.

Occasionally trip and open the automatic overload and underload circuit-breaker to see that they are in proper operating condition.

Never charge a battery at too high a rate, even for a short time. Never overload a rheostat.—D. J. Burns, Ward Leonard Electric Company.

1913 Vehicle Batteries

Edison and Lead Batteries Continue with Few Alterations, But Developments Awaited for Near Future

Manufacturers Are Busy Improving the Electro-Chemical Qualities to Increase Life and Capacity of Product

BATTERIES constructed for the work of propelling electric vehicles have not experienced any radical development during the year just closed.. Whatever improvements have been made have been in the nature of small changes which tend to strengthen the battery and to lengthen its life. A great deal of chemical experimentation has been going on, as it always is, in this branch of electrical work, but few mechanical changes have been made. In this respect more than one step forward is expected to be taken by several companies during 1913.

One of the principal problems of the battery field is the guarantee situation. No settled position has been adopted by the host of makers, but several companies have made advances toward that goal. While some companies do not guarantee their product on the reasoning that once it leaves the hands of the makers and is subjected to the careless treatment of a driver, it is impossible for the maker to stand behind it, several concerns give a 1-year guarantee. The Ironclad Exide battery is even guaranteed for 2 years, or rather a period of 600 cycles during that time. In all probability this problem will be solved in the near future.

The Edison battery for vehicle-propulsion purposes is made in five sizes designated respectively A4, A6, A8, A10 and A12. The numeral in each designates the number of positive plates per cell, thus A6 has six positive plates and seven negative plates giving a total of 13 plates. There is always one more negative per cell than positive plates, thus A12 has twenty-five plates, twelve positive and thirteen negatives.

The Edison vehicle battery differs from all other storage batteries in that it is a non-acid type, in other words it is an alkali battery, but is more generally known as the nickel-iron battery because these elements are used as filling materials in the plates.

Another characteristic of the Edison battery is that the active material in the positive plates is filled into little perforated steel tubes so that with the vibration that the vehicle is subjected to when in operation this filling material cannot be shaken out and so the battery capacity is preserved, because whenever this active material is shaken out in any battery the battery capacity drops. The material in the negative plate is also put into little compartments, not tubes, but long, rectangular-shaped perforated pockets made of cold-rolled steel, nickel-plated, the same material as used in the tubes of the positive plate.

Look for a moment at each of these little tubes for a positive plate. Each tube is 4.25 inches long and approximately .375 inch in diameter. There are thirty of them in each plate. They are mounted vertically in two rows, one row across the top half of the plate and the other in the bottom half. These little tubes are made with the utmost accuracy. The tube is made from cold-rolled nickel-plated steel ribbon most carefully prepared for the job. It is then wound spirally by machinery, specially designed for this work, and when in tube form there are eight little steel rings slipped over the outside and spaced equidistantly, to add strength and to prevent any explosion.

Next comes the filling of this little tube, which is carried out with the utmost accuracy, for their must not be any variation, one must be filled identically with all others. In filling two substances are put in, one is pure metallic nickel in the thinnest flake form and the other is nickel hydroxide. These two are put in in layers, first nickel hydroxide and then the pure nickel flake. There are exactly 350 layers of each, 700 in all. This filling is done by specially designed automatic machinery. Each tube has exactly 700 layers. Tubes are regularly taken from each filling machine, cut in half longitudinally and examined with a microscope to see that this filling has been accurately done. When filled the tubes are carefully inspected, measured for length and the ends closed.

Next the negative plate: This is made up of long, rectangular-shaped pockets and each is filled with finely powdered iron oxide, which is put in with practically as great accuracy as to quantity as the filling in the little tubes of the positive plate. Twenty-four of these little pockets make up a negative plate.

In each cell of the battery the negative and positive plates are alternated, with narrowest strips of hard-rubber insulation between them. The jar into which the plates are placed is a cold-rolled steel one with all joints autogenously welded. The jar walls are corrugated to add strength. The jars or cells are in turn assembled in very light trays for convenience in battery handling.

The leading virtue of the Edison battery is its long life, due to the tube-and-pocket construction of the positive and negative plates which prevents falling out of active material because of vibration, and of heat in charging and discharging. The battery is also much lighter than the other types. The battery will stand very high charging rates and can be discharged at any rate to meet the service without injury. The tube-and-pocket construction permits of this. The battery is sold with a 4-year guarantee on cell capacity and a 1-year guarantee covering the defects in workmanship or material. When fully charged the voltage per cell is 1.85 and to get the required voltage for charging a battery it is necessary to multiply this by the number of cells in the battery. A twenty-four-cell battery requires 45 volts; a sixty-cell battery 111 volts.

Four Types of Exide Batteries

The Electric Storage Battery Company, Philadelphia, Pa., for 1913 offers four types of storage batteries for vehicle propulsion, namely, the Exide, Hycap Exide, Thin Exide and Ironclad Exide. Each type is furnished in various sizes, which depend on the numbers of plates used in each cell of the battery, the various models are classified under the heads MV and PV, according to the plate sizes. Taking up these four types in turn, the exide MV battery comes in eight sizes having seven, nine, eleven, thirteen, fifteen, seventeen, nineteen and twenty-one plates, respectively. No matter how many plates are used the voltage of each cell is the same only the amperage being subject to change, increasing with the total surface of the plates in the cell. The Exide MV sizes just enumerated have respective capacities of 84, 112, 140, 168, 196, 224, 252 and 280 ampere-hours. Exide PV comes in four sizes with five, seven, nine and eleven plates, respectively, the capacities of these batteries being 48, 72, 96 and 120 ampere-hours, respectively. The Exide type of battery is heavier than the Hycap and the Thin Exide types; it is more economical for trips of small mileage, especially if it is to be used on trucks and subjected to hard work. The Hycap Exide type has somewhat thinner plates than the Exide type, but like the latter comes in two plates sizes MV and PV. Nine sizes of MV cells are available, having nine, eleven, thirteen, fifteen, seventeen, nineteen, twenty-one, twenty-three and twenty-five plates, respectively, with capacities of 110, 138, 165, 193, 220, 248, 275, 303 and 330 ampere-hours. The PV cells come in three sizes with nine, eleven and thirteen plates, respectively, resulting in capacities of 93, 115 and 128 ampere-hours. The Thin Exides having, as its name implies, thinner plates than the two preceding types, is furnished in eleven MV sizes, which have from eleven to thirty-one plates, each type having two more plates than the preceding one. The capacities of these batteries vary from 130 to 390 ampere-hours.

The three Exide types just described are of conventional design in many respects. They have the staggered type of grid for both positive and negative plates, the former containing peroxide of lead in pasty form while the latter contain paste lead. To keep positive and negative plates properly spaced at all times separators of rubber and wood are used. The rubber is in form of a thin sheet perforated to permit of passage of the acid through it, while the wood plates are formed with projections on one side; these projections face the rubber sheets, one of which is in place on either side of each positive plate. Likewise, a wooden separator is arranged with one plain side at each side of every negative plate and has projections on the other side which hold the entire system properly spaced and insure also acid spaces adjacent to both sides of every plate. No provisions have been made to facilitate flushing of the jars as the plates rest on the high bridge under which there is plenty of space for dead material which has dropped from the plates.

The Ironclad Exide type of battery is, in a way, the leader of the line, being adaptable for all sorts of service and designed for a much longer life. It comes in eight MV sizes, having from seven to twenty-one plates with battery capacities of 94, 126, 158, 190, 220, 252, 283 and 316 ampere-hours, respectively. The Ironclad type differs from all others by the construction of the positive plates which are not built up on a staggered frame but are formed of a number of hard-rubber tubes with small passage for the acid in them; in these hard-rubber tubes the oxide paste is carried around a conductive core which is connected to a transverse contact rod in the top of the plate. All four sides of the plates are fitted with rubber strips vulcanized on to them to shield the hard-rubber tubes from shocks by too rough handling. The hard-rubber serves as insulator for the positive plates so that the rubber sheets used in the other types are not necessary in the Ironclad type; furthermore, a thinner wooden separator is used which affords more ample acid space between each two plates. Another improvement which has been incorporated in this type is the use of a special wood for these separators, which is called Gulf wood and placed in the jars with its grain arranged horizontally. Experiments of the Exide company show this to prolong the life of the separators.

The Geiszler Bros. Storage Battery Company, New York City, manufactures vehicle batteries to order although it has no standard product in this line. The vehicle batteries are of the non-sulphating type, and in construction very similar to the other Geiszler batteries, the sizes being determined by the specific requirements of the user of the battery.

U. S. L. Batteries Have Thick Plates

The United States Light & Heating Company of Niagara Falls, N. Y., and New York City make three principal classes of vehicle batteries distinguished by the thicknesses of their plates as WB, WBH and WBT. WB is the heaviest plate, being .210-inch thick, while WBH is of medium thickness, and WBT the thin type. In each case positive and negative plates are of the same thickness. The types CB and CBH of this company are not used extensively and we therefore will limit our attention to the three types first mentioned. The type WB comes in eight sizes, having from seven to twenty-one plates with an ampere-hour capacity from 84 to 280 if charges at a four-hour rate from 90 to 300 at a 5-hour rate, or from 97 to 324 at a 6-hour rate, likewise the capacity for work depends on the time in which the batteries are discharged. The WBH batteries include eight sizes, having from eleven to twenty-five plates, and ampere-hour capacities from 140 to 336 at a 4-hour charging rate, from 150 to 360 at a 5-hour rate and from 162 to 388 at a 6-hour rate. As to the WBT type, there are eleven sizes of cells having from eleven to thirty-one plates and capacities ranging from 125 to 375 ampere-hours at a 4-hour rate of charging, from 135 to 405 at a 5-hour rate and from 144 to 435 at a 6-hour rate. As in the case of the Exide batteries the heaviest types of plates should be used where a vehicle is designed to travel a small number of miles per day, but do so at a very low cost, whereas high mileage with somewhat higher cost per mile may be obtained from the thinner plate types. The plate frames are in all cases of the staggered type, being pressed of lead to which a small trace of antimony has been added to increase its hardness and strength. The positive plate is filled with peroxide of lead and the negative with paste lead which is substantially the general practice with lead batteries. Wooden and rubber-veneer separators are used to keep the positive and negative plates from contacting with one another and to afford definite spaces for the acid between the plates. The company furnishes the batteries with either high or low bridges on which the plates rest, but it advocates the use of a high bridge so as to prevent short circuiting of the cells by an accumulation of dead matter between the bottom parts of the cells. The covers are sealed and a soft rubber vent affords a means for flushing the battery and refilling the water evaporated and decomposed in service. If a sufficiently high bridge is used flushing of the battery does not become necessary at any time. No specific improvements have been announced so far.

Five types of vehicle-propulsion batteries are the offering of the Gould Storage Battery Company, New York City, for 1913. Two of these types use thin plates and are designed for high capacity, whereas two others are styled medium-capacity types and use thick plates; the fifth type is named semi-high capacity. Type TH or the high-capacity, thin-plate type comes in eleven sizes, fitted with 9 to 29 plates, respectively, and ranging in capacity from 110 to 385 ampere-hours. If discharged in the course of 5.5 hours, the amperage obtained from these batteries varies from 20 to 70 amperes. The other high-capacity, thin-plate type has plates considerably smaller than the type TH. This small-plate type is named NH and comes in five sizes, from seven to fifteen plates, and capacities from 68 to 158 ampere-hours. The amperage varies from 13.5 to 31.5 for a 5-hour discharge rate. The larger medium-capacity, thick-plate type is known as RP and is furnished in eight sizes having from 7 to 21 plates and capacities ranging from 84 to 280 ampere-hours. This battery is designed for 4-hour charge and discharge the current obtainable varying from 21 to 70 amperes for the eight sizes of battery. The fourth type of battery is a smaller medium-capacity, thick-plate design and comes in four sizes having from 5 to 11 plates. The ampere-hour capacities of these sizes are 48, 72, 96 and 120, and if discharged in 4 hours these batteries furnish currents of 12, 18, 24 and 30 amperes. The last type MC is referred to as a semi-high capacity design and its nine models have from 9 to 25 plates with total capacities of the batteries from 112 to 336 amperes. This type is designed for a discharge rate of 5 hours and a current obtained under this condition ranges from 22.4 to 67.2 amperes. The positive as well as negative plates in all Gould types are of a staggered design and are spaced by wooden separators which bear against the faces of the negative plates and by perforated hard-rubber sheets contacting with both sides of the positive plates. The wooden separators are formed with projections as in the case of the foregoing makes of batteries and for the same purpose. The jar is of hard rubber and fitted with a soft rubber vent permitting hydrogen and oxygen which are formed during the operation of the battery to escape.

Willard Plates Differ in Thickness

The 1913 products of the Willard Storage Battery Company, Cleveland, O., include two sizes of plates, each of which is made in three degrees of thickness: J and K correspond in thickness to the Exide plate, L and M to the Hycap Exide and N and O to the Thin Exide type, the second plate mentioned being the larger size. The capacities vary from 120 to 250 ampere-hours. Staggered grids with more but thinner bars than found in other batteries are used, the active material is practically the same as in other makes and the separator scheme roughly identical with others. Bass wood cellulose and perforated rubber form the separating materials. Standard high bridges are used to prevent short-circuiting.

Digest of the Leading Foreign Journals

Petit Shows How Considerable Aid in the Designing of a Water-Cooling System May Be Obtained from a Theoretical Study of the Temperatures Involved—An Interesting Motor Booster—Advance View of Panhard New Carbureter

THEORY of the Water-Cooling of Gasoline Motors.—With a view to the problems which arise for designers when motors must be built just large enough for the work required of them (when the motors, in other words, are to be operated a large part of the time up to their full capacity while the vehicle runs slowly), Henri Petit presents the theoretical considerations which should be guiding in the planning of the water-cooling system for such motors, the results in each case being subject to correction, of course, as practical experiments and testing may dictate. [An account of a searching practical testing method was given in THE AUTOMOBILE of last week. The practical value of the following exposition lies perhaps mainly in the fact that it compels the reader to reason exhaustively and with precision on a subject which is usually treated experimentally or imitatively only. The author shows at least that all factors involved are within reach through the science of physics. A still more substantial value can probably be realized by working it over in English terms and accompanied by an analysis of Fourier's and Ser's formulas or equivalents for the same. It might perhaps be found that the factor lambda (λ) should represent something more than the mere linear speed of the water circulation, if not exactly the pump capacity.—ED.]

According to Fourier's theory of conductivity, the heat transmitted through the cylinder wall is determined by the equation:

$$(1) \qquad q_1 = Ks\frac{V_o - V_1}{e}$$

in which q_1 is the heat transmitted; V_o the temperature of the internal wall of the cylinder; V_1 the temperature of the external wall; V_2 the temperature of the water; s the area of the internal wall; e the thickness of the wall; and K the coefficient of absolute conductivity of the material of the cylinder. The units chosen are centimeter, second and degree C. For iron at a temperature of 100 deg. C. the value of K was found by Forbes to be 0.156 which may be abbreviated to 0.15, this giving a margin of safety for the assumption that the coefficient is the same for cast iron.

The heat transmitted to the water from the wall in contact with the water must be:

$$(2) \qquad q_2 = \lambda s_1 (V_1 - V_2)$$

in which lambda (λ) is a coefficient varying with the speed of the water circulation, and s_1 the area of the external cylinder wall (inside of the jacket).

But as all the heat, q_1, transmitted through the wall is evidently transmitted to the water, q_1 must equal q_2, and we have:

$$V_o - V_1 = \frac{eq_1}{K_s} \text{ and } V_1 - V_2 = \frac{q_1}{\lambda s_1}$$

By addition of these equations one gets:

$$V_o - V_2 = q_1\left(\frac{e}{K_s} + \frac{1}{\lambda s_1}\right)$$

and as s_1 can be taken as equal to s without appreciable error, this can be simplified and written:

$$(3) \qquad V_o - V_2 = \frac{q_1}{s}\left(\frac{e}{K} + \frac{1}{\lambda}\right)$$

On the other hand, the speed of the water in the jacket is given by the formula

$$V = \frac{n}{S}$$

in which V is the speed in centimeters per second; n the delivery of the pump in cubic centimeters per second, and S the cross-sectional area of the water jacket. The water which is carried into the jacket at the temperature tau-$_o$ (τ_o) and is raised to the temperature of tau-$_1$ (τ_1) while there, takes away in one second a number of calories equal to

$$n(\tau_1 - \tau_2).$$

On the other hand it is also known that the number of calories ceded to the water is expressed in the formula:

$$(4) \qquad q_1 = \frac{s(V_o - V_2)}{\frac{e}{K} + \frac{1}{\lambda}},$$

which is derived from equation (3). The temperature of the water in the jacket may be taken as the mean between the temperatures at entering and at leaving the jacket; hence

$$V_2 = \frac{\tau_1 + \tau_o}{2}$$

And from this we get the equation which expresses a condition which can be maintained constant:

$$(5) \qquad n(\tau_1 - \tau_o) = \frac{s\left(V_o - \frac{\tau_1 + \tau_o}{2}\right)}{\frac{e}{K} + \frac{1}{\lambda}}$$

This equation cannot be solved with reference to the value of n, because λ and τ_o are both functions of n, (τ_o depending on the speed of the water in the radiator), but n can be determined from it by a series of approximations, trial values being put into the equation—which is considerably more time-saving and less costly than building trial values into the cooling system.

The cooling in the radiator.—Having established a condition under which the water when it has entered at the temperature of τ_o always departs from the jacket at the temperature of τ_1 and enters again at τ_o, we know that this water while it is away from the jacket gives up $n(\tau_1 - \tau_o)$ calories, the same number which it absorbed from the cylinders.

Let sigma (Σ) be the ventilated surface of the radiator and v the speed of the air in passing through the radiator, and let theta-$_o$ (Θ_o) and theta-$_1$ (Θ_1) be the temperatures of the air entering and of that leaving the radiator. According to the tests of Mr. Ser the heat Q given up by the hot water to the air should have the value:

$$Q = \Sigma f \sqrt{v}\,(\tau_m - \Theta_m)$$

in which τ_m is taken as the mean of τ_1 and τ_o and Θ_m as the mean of Θ_1 and Θ_o. In this equation f is a coefficient which according to Ser should take the value of 0.19403 when v varies from 67 centimeters to 461 centimeters and when $(\tau_m - \Theta_m)$ varies from 65 deg. C. to 75 deg. C. If $(\tau_m - \Theta_m)$ varies from 35 deg. C. to 45 deg. C., f equals 0.17678.

In practice τ_m is usually 70 deg. C. and Θ_m is 20 deg. C., and we can therefore take the value of f as about 0.1800.

Ser's formula can then be written:

(6) $$n(\tau_1 - \tau_0) = 0.18\sqrt{v} \times (\tau_m - \Theta_m)\,\Sigma,$$

but according to Ser's data this equation is justified only if the temperature of the air is raised about 50 deg. C in passing through the radiator. A condition of this nature should be effected. To this end, let omega (ω) be the cross-section area of the air passage in the radiator. There will then pass in each second $v\omega$ cubic centimeters of air and this air will weigh:

$$\frac{v\omega a}{1 + \dfrac{\Theta_0}{273}}$$

By ignoring the fraction Θ_0 divided by 273, we have then for the heat absorbed in the air: $v\omega a \times \gamma(\Theta_1 - \Theta_0)$, in which gamma ($\gamma$) is the specific heat of the air, or 0.237, and by accepting alpha (a) as equalling 1.293, as the textbooks have it, the quantity of heat absorbed can be written: $0.342 \times v\omega(\Theta_1 - \Theta_0)$ and from this we get:

(7) $$n(\tau_1 - \tau_0) = 0.342\, v\omega(\Theta_1 - \Theta_0).$$

And by combining with equation (5):

(8) $$0.342\, v\omega(\Theta_1 - \Theta_0) = s\,\frac{\left(V_0 - \dfrac{\tau_1 + \tau_0}{2}\right)}{\dfrac{e}{K} + \dfrac{1}{\lambda}}$$

while also keeping in mind the relation derived from equations (6) and (7):

$$f\,\Sigma(\tau_m - \Theta_m) = 0.342\sqrt{v} \times \omega(\Theta_1 - \Theta_0)$$

which can now be put in the form:

$$\frac{\Sigma}{\omega} = \frac{0.342\sqrt{v}\,(\Theta_1 - \Theta_0)}{f\left(\tau_m - \dfrac{\Theta_1 + \Theta_0}{2}\right)}$$

This equation permits us to follow the variations of $(\Theta_1 - \Theta_0)$ when $(\Sigma + \omega)$ varies.

Equation (8) shows plainly that the cooling takes place solely by virtue of the amount of air brought into contact with the radiator surface. The quantity of water, which is the intermediary agent, enters in the formula only by the variable λ which expresses its speed.

By testing the formulas in practice the following values for λ according to variations in the speed of the water are found:

Speed of the Water in Meters per Second	Value of λ	Speed of the Water in Meters per Second	Value of λ
0.10	4.2	0.60	10.
0.15	5.8	0.70	10.7
0.20	7.	0.80	11.25
0.30	8.2	0.90	12.
0.40	8.8	1.00	12.6
0.50	9.4	1.10	13.3

Cooling by the Thermo-Siphon System—Circulation of the cooling-water is frequently of late, in small motors, effected by utilizing the difference in the density of hot and cold water on the plan illustrated in Fig. 1. The reservoir A is in communication on one side with the motor M and on the other with the radiator R. A collector G is placed below the latter. It is necessary to have the reservoir at a higher level than the motor. The water heated by the cylinder walls rises into the reservoir, and the cooled water in the collector is driven by the pressure upon it into the lower portions of the water jackets.

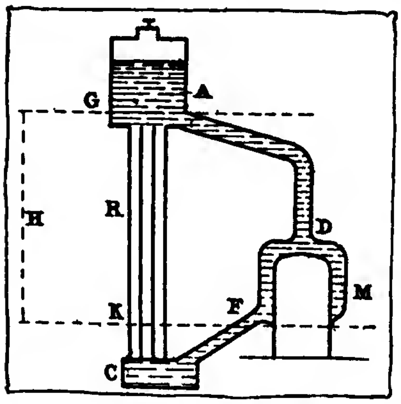


Fig. 1—Diagram of thermo-siphon system of water-cooling

Let H be the difference in levels between the reservoir and the entrances to the jackets. It may now be supposed that th water in the channel FDG is at one temperature t and that the rest of it, filling the portion GRKCF, is at the temperature t'.

The pressure per unit of surface which pushes the fluid in its direction of motion is equal to H $(\omega_t' - \omega_t)$; ω_t and ω_t' being the specific gravity of the water at the two different temperatures.

Utilizing the formula for the expansion of water volumes V_0 and V_1, according to which

$$V_1 - V_0 = (at + bt^2 + ct^3)\,V_0$$

a value for ω_t is obtained by determining V_0 divided by V_t, giving

$$\omega_t = \frac{1}{1 + at + bt^2 + ct^3}$$

in which the coefficients a, b and c have different values according to the limits between which the temperature varies.

Let it be supposed that the temperature in the collector C is lower than 50 deg. and that in the jacket it is close to 100 deg. The established coefficients give then:

$$\omega_t = \frac{1}{1 + 0.00004788t + 0.0000054628t^2 + 0.0000000175t^3}$$

and

$$\omega_t = \frac{1}{1 - 0.000063230t + 0.0000077385t^2 - 0.0000000363 75t^3}$$

By inserting the values of 90 degrees for t and 40 degrees for t', these equations give:

$$\omega_t = \frac{1}{1 + 9 \times 0.00004788 + 81 \times 0.00054628 + 729 \times 0.0000175}$$

and

$$\omega_t' = \frac{1}{1 - 4 \times 0.0006322 + 16 \times 0.00077385 - 64 \times 0.000036375}$$

and, by finishing the figuring:

$$\omega_t' - \omega_t = 0.023$$

For a height of one-half meter for H the pressure should thus be only 1.15 grams per square centimeter, equal to a head of a little more than one centimeter of water.

This pressure, it will be noticed, is very small and is in all cases proportionate to the height of H.

It is therefore necessary, if it is desired to cool by the thermo-siphon system, (1) to raise the reservoir and the radiator and to lower the motor, in order to make H as large as possible, (2) to make the water pipes of very large section, in order to maintain a sufficient speed in the water jacket and (3) to avoid all sudden turns in the piping as well as all contractions which would cause harmful friction in the system.

[Of which the moral is that the thermo-siphon system is not well adapted for large long-stroke motors.—ED.]—From *La Technique Automobile*, August 15.

COMPRESSED-AIR Motor Booster—By trials over two kilometers of a road near Paris it was demonstrated last summer that a car which could be driven at a speed of 39.6 kilometers per hour when equipped with an ordinary carbureter could reach a speed of 54 kilometers when equipped with the *Décupli* which is a device comprising a double carbureter, an air pump and a mechanism by which the air pump can be engaged and disengaged. When the air pump is working, it sends compressed air through the closed carbureter at such a rate that the motor cylinders filled up with air and fuel vapor at about twice as high a pressure as ordinarily. The fuel under this condition is fed from a special nozzle and, to make it flow, the float chamber is connected with the compressed air in the carbureter instead of with the atmosphere.

The two-cylinder air pump mechanism is operated by pulleys and belt, the power being taken from the transmission shaft of the vehicle, and the air is piped to the carbureter. This part presents no features of unusual interest, though the use of the same pump for the inflation of tires and the starting of the motor (by adding an air tank) is suggested. A section through the carbureter portion of the *Décupli* is shown in Fig. 2, and the float chamber may be imagined as located adjacently to the space between the two nozzles A and B. In this illustration G is the throttle which is connected by rod *g* with the air valve F in such manner that when G is closed F is open and supplies the air for running slowly and for starting, but when the compressed air mechanism is in action F affords an exit for the surplus air which enters at H, this arrangement admitting of operating the throttle even without first disengaging the booster device. L is the induction pipe joint, and A the nozzle for normal operation. B is the nozzle for operation with the booster in action; it is held closed by means of piston *b* until the air pressure becomes sufficient to raise this piston against the resistance of the spring which holds it against the nozzle. C is a valve letting air in at J unless it is held closed by a higher interior pressure. D is a similar valve fitted with a stronger spring and admitting additional air at K when the motor is running at high speed, but is also inoperative when the booster device is at work. E is a safety valve limiting the air pressure to the maximum desired.

The road tests of the device were timed by the official timers of the Automobile Club of France, and the laboratory trials were supervised at the Institute for Arts and Trades. A fifty per cent. increase of the motor power was uniformly demonstrated. The device is looked upon as a "reserve horse" to be used in emergencies in connection with small motors of otherwise insufficient power and has also been mentioned as a means for enabling vehicles to compete in racing events with other vehicles equipped with motors of larger cylinder volume. It is not stated whether it has been used for experimenting with other fuels than gasoline, for which purpose it apparently might be adapted. The inventors are Crouan and Huillier, 15 *bis* Rue Saint Didier, Paris.—From *Omnia*, Dec. 7.

CARBURETER in New 10-HP. Panhard.—The resemblance of the carbureter in the new small Panhard cars with poppet valve motor to the Zenith carbureter is only superficial. When the throttle, R in the accompanying illustration, Fig. 2, is closed or approximately closed the groove Y in the wall of the throttle chamber is laid open and allows the suction from the motor to act upon the secondary jet MJ instead of the main jet G, but there is established a play of interaction between these two jets which is not found in other carbureters. When the throttle is opened a little and the suction begins to act on the main jet G the gasoline feed to the secondary jet is thereby cut down, and when the opening up of the throttle continues the secondary jet runs dry and begins to feed air backwards into the interior of the main jet, acting as auxiliary air duct. The air, managed in this way, assists in atomizing the spray while also reducing the richness of the mixture. The proportions of the mixture are regulated by means of a second auxiliary jet F at the base of the main jet. It is by means of F that the gasoline, which enters from the float chamber through the channel U, is fed downward to jet MJ when the latter is in action. V is the screw for adjusting the channel YM to the slow-speed jet M. E is the air intake.—From *Omnia*, December 14.

[The description does not reveal the exact manner in which the jet F operates or how the air is introduced which finds its way from jet MJ to the interior of jet G—unless it be taken directly from the induction channel. Neither does the illustration give any clue on this point, unless the lateral openings shown at T in MJ may be taken as an indication in this respect. The idea of mixing air with the fuel in the interior of the jet has been tried in other carbureters and seems to be gaining ground.—ED.]

INVENTOR of Gas-Accumulator Honored.—The Nobel Prize for physics was awarded this year to Gustav Dalen, a practical Swedish engineer, who unfortunately lost his eyesight by a gas explosion in September, 1911. He invented modifications in gas-accumulator systems which have resulted in the development of the acetylene gas tanks used as a light-source in automobiles, and also for buoys and lighthouses which give intermittent flashes during the night and in murky or foggy weather. These are in use along the entire coast of South America and along the Panama Canal. His acetylene gas-accumulator consists of a steel receiver filled with a porous substance prepared with asbestos and soaked with acetone. This forms a mass of capillary cells which prevent the acetylene molecules from being pressed hard together and thereby obviate an otherwise possible explosion. The Dalen gas-accumulator can absorb gas to the extent of a hundred times its own volume.

When these tanks are used for buoys or lighthouses they are equipped with a sun-valve, also invented by Dalen, which shuts off the gas when the sun is shining and turns it on and lights it when darkness sets in for any cause. These buoys therefore require no attendance except for renewal of the gas supply. The sun-valve operates by the unequal expansion of two bars of different metals, one black, so as to heat up in the sunshine, and the other bright.—From *Engineering*, Dec. 6.

Strength of River Joints.—An article on tests of nickel-steel riveted joints, based upon tests made with rivets and plates of different alloys—as well as plain carbon steel—at the University of Illinois, is found in *Engineering* (London) of Sept. 6.

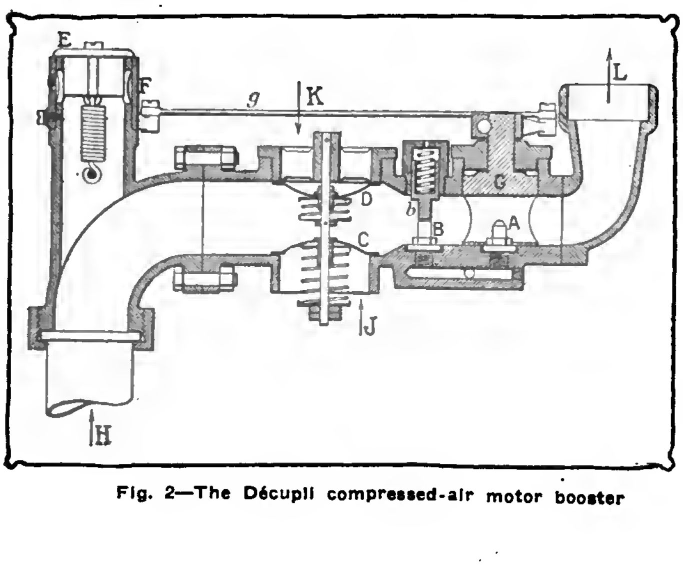


Fig. 2—The Décupli compressed-air motor booster

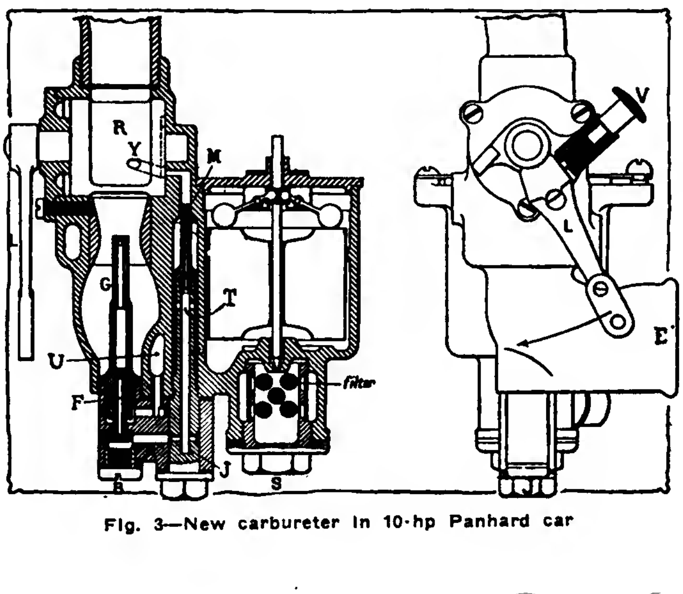


Fig. 3—New carbureter in 10-hp Panhard car

The Engineers' Forum

combustion chamber of the cylinder. The greater the rush from the fuel nozzle, the more thorough the breaking and scattering of the fuel.

A Theory of Carburetion

Forrest A. Heath Considers Complete Breaking Up of Fuel Particles Into Small Globules Most Important

NEW YORK CITY—Editor THE AUTOMOBILE—The interest you are stirring up in the carburetion problem is very valuable. There is no department of hydrocarbon engineering so little understood and so greatly in need of illumination.

What the engineer wants is a simple mechanism that will furnish the required amounts of fuel and air, carburet the air with fuel, and supply the resulting mixture in varying volume **without variation as to its combustibility.**

A lump of coal burns slowly until consumed. Gasoline burns in the same manner. The lump of coal, broken into small pieces, burns more rapidly. The gasoline, separated into drops, acts similarly. Coal, converted into powder and scattered through the air, will exhibit the explosive characteristics of gasoline vapor. Gasoline vapor is composed of minute particles scattered through the air. In each case the fuel, when converted from the lump into the powder, changes its state of aggregation. The change makes it possible for more of the oxygen of the air to come in contact with more of the carbon and hydrogen of the fuel.

The axiom that the actual power of a hydrocarbon motor depends upon the speed with which the fuel burns, means that the more rapid the expansion of the gases, the greater the duration and extent of the pressure on the piston.

In the operation of a motor the gasoline is drawn from the carbureter float chamber through a nozzle, where it comes in contact with a current of air which carries it to the combustion chamber of the cylinder. The greater the rush from the fuel nozzle, the more thorough the breaking and scattering of the fuel.

Each suction impulse starts a spurt of spray from the nozzle. Instead of a column of homogeneous mist there is a column of air carrying intermittent jets of fuel, and at high piston speeds a stream of gasoline spray. The column of air, with its entrained spurts of gasoline streaking through it in parabolic curves, is drawn first to one cylinder, then to another. The inlet valves are opening and closing in accordance with the speed of the motor, but without regard to the time of arrival of the fuel spurts. Except at very high piston speeds the mixture distributed to the cylinders is of varying density.

Fig. 1 shows a jet of fuel from a carbureter nozzle under low vacuum. Fig. 2 shows the changed condition of the fuel under high vacuum.

Fig. 3 is a magnified representation of a fuel particle from Fig. 1. Fig. 4 represents the particle broken up into eight smaller globules, as in Fig. 2. While the mass is the same in both cases, the surface area exposed to the heat of the air for evaporation, or to the oxygen of the air for combustion, is twice as great in Fig. 4 as in Fig. 3. Evaporation may be said to be the result of attraction exerted by the heat of the air upon the surface of the fuel globules, drawing minute particles away from the mass. A B and A' B' represent equal sections of fuel surface, as shown by X and Y, upon which equal attraction is exerted. But molecular attraction within the mass of the Fig. 3 globule is twice as great as that of the Fig. 4 globule, as shown by the cone surface areas A O B and A' O' B'. Hence, the 100 per cent. advantage in evaporation surface possessed by the Fig. 4 globule is augmented by 50 per cent. less resistance to evaporation. Therefore, in the condition represented by Fig. 4 only one-half as much fuel is required for combustion as in Fig. 3, the amount of air being constant. And, moreover, as the waste is greater in the case of Fig. 3, because of the greater quantity of carbon coking out under the heat of compression, the saving of 50 per cent. in fuel is accompanied by an increase in power.

With the carbureter adjusted properly for speed, the motor will not pull a full load satisfactorily when running slowly. In the latter case the fuel is not only less combustible, as shown above, but the air is carbureted in splotches. Therefore the walls of the carbureter, intake pipe and manifold must be drenched with an excess of fuel to provide additional vapor to fill up the uncarbureted zones.

What is required is **a thorough breaking up of the fuel and an intimate mixing with the air and a means of maintaining constancy in this operation under varying vacua.**—FORREST A. HEATH, The Aristos Company.

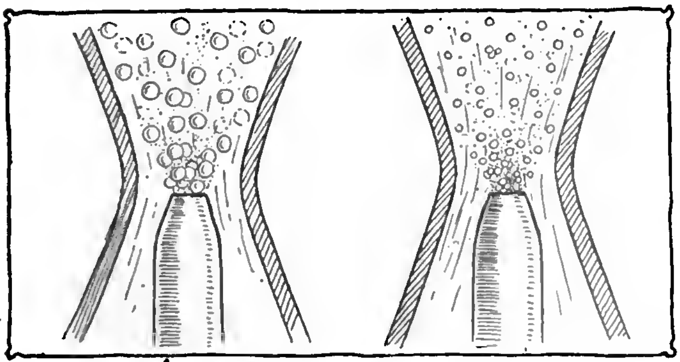


Fig. 1—Appearance of fuel under low vacuum
Fig. 2—Condition of fuel under high vacuum

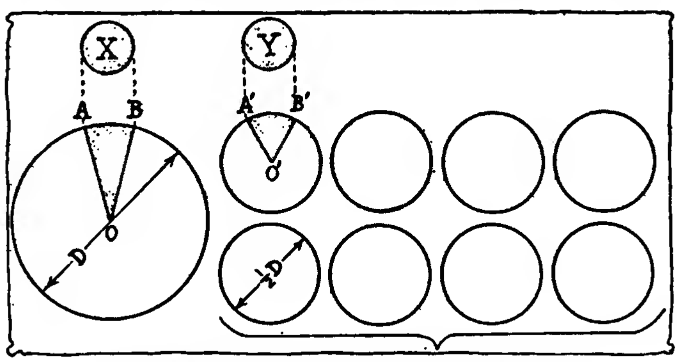


Fig. 3—Particle shown in Fig. 1 greatly magnified
Fig. 4—Showing particle broken up into globules

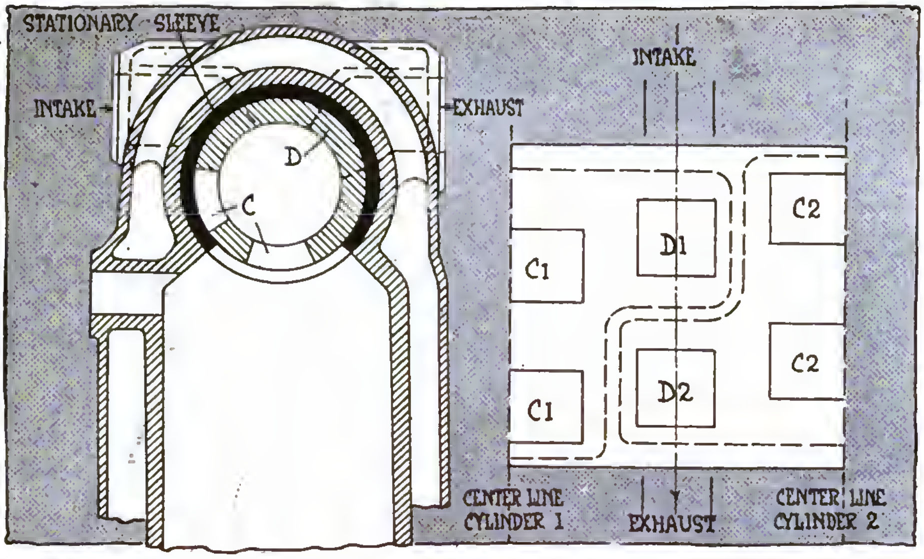


Fig. 13—Type of valve in which the interior forms part of the combustion chamber.

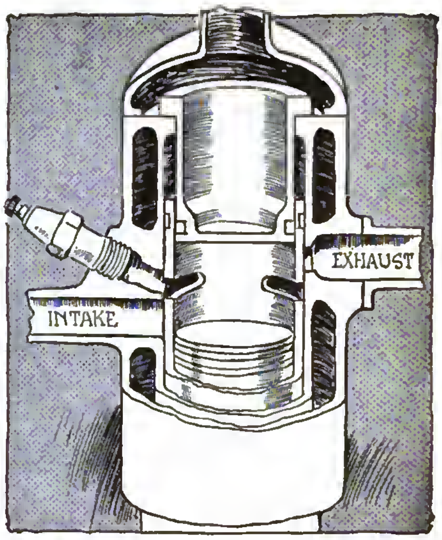


Fig. 14—Rolland-Pilain sleeve valve

Criticisms of Non-Poppet Valves To-Date

Rotary Valve Type as Yet Comparatively Undeveloped, This Group in the Non-Poppet Class Presenting An Extensive Field for the Designers—Excellent Results May Be Expected From Future Research

By Eugene P. Batzell Installment III

THE English valve construction, Fig. 13, is not the only one using the interior of the valve for the combustion chamber. Everything stated in regard to the foregoing valve type applies in a still greater degree to this design. The inside of the valve communicates with the cylinder through ports C and with the inlet or exhaust passages by means of a port D for each cylinder. In the state as represented by Fig. 13 this type of valve should be condemned as entirely inoperative, but energetic shell cooling would improve it.

Though this criticism is impartial, I regret my inability to indicate notable merits in the criticised rotary-valve systems and my standpoint in this respect has been confirmed by the practical experience with those few systems which have been actually built and tried. None of them has yet shown convincing proof of its superiority over other systems and of its reliable functioning. Here is meant a functioning satisfactory to the would-be customer. **This branch of non-poppet valve motors is still in its infancy and subject to much research and development work, but there is a reasonable prospect of good results being achieved.**

Concluding the discussion concerning rotary-valve systems, I wish to draw attention to a combination which has received very little consideration thus far, but which may have future value, namely, external air cooling of the barrel-type valve seats, omitting water cooling entirely. The requirements of proper valve operation are chiefly the permanency of clearance and valve shape, and as exterior air cooling would leave the temperature of the valve seat nearer to the temperature of the valve proper less change in their clearance would result. In addition the valve could be preserved from distortion by using a proper design and annealing it thoroughly, as well as annealing the cylinders. Lubrication

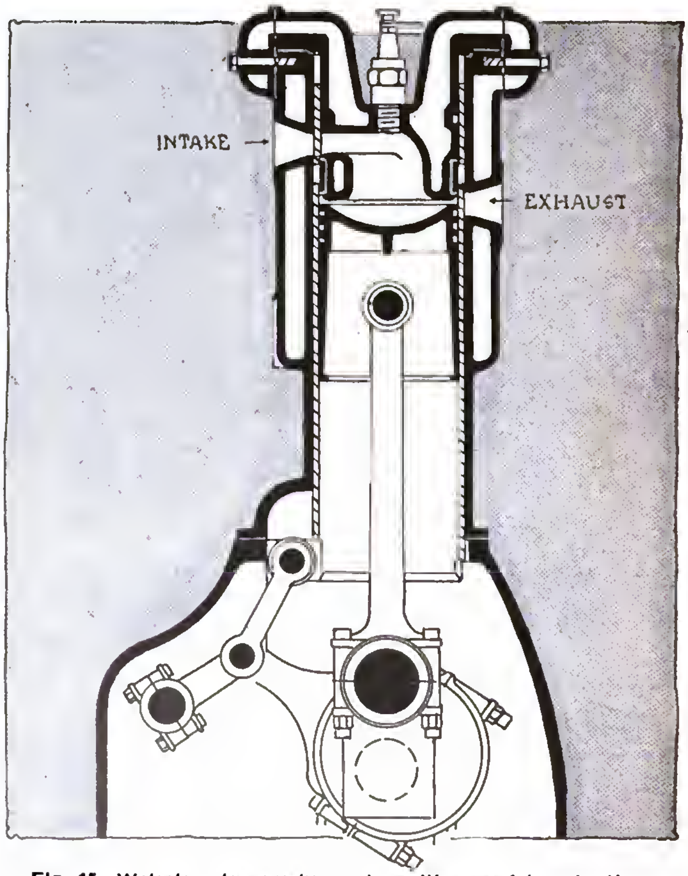


Fig. 15—Wolseley sleeve-valve motor with eccentric actuating mechanism

should not be very difficult because some oils can stand higher temperatures than would be possible in the valve seat.

If the rotary valve has been popular with individual inventors, the reciprocating-sleeve valve has received the attention of quite a number of established automobile manufacturers. Generally this valve gear is more complicated in construction and manufacturing than the rotary type, but the success which has followed the Knight motor and also the experience gained through its use explains this attitude of the manufacturers. In their patents and constructions these other sleeve-valve designers have aimed at more simplicity than the double-sleeve Knight motor offers, and in consequence of this as well as for avoiding interference with the Knight patents, the single-sleeve valve motor predominates in the latest patent issues. It is significant that years ago, at the time of the first rumors of the achievement with the Knight motor, various sleeve-valve patents were taken out covering many kinds of arrangements with two sleeves, differing from the Knight construction in the manner of actuating mechanism and motor cooling, whereas the single-sleeve variety received attention later. To obtain the necessary motor timing with a single reciprocating-sleeve valve the latter must have an irregular motion, and at present this is chiefly obtained by means of a link mechanism with two eccentrics or with one eccentric and one fixed point. Examples representing the above are the Wolseley motor, Fig. 15, for the first and the A. E. G. (German-General Electric Company), Fig. 16, for the second type of link motion. Other characteristic single-sleeve motions are found in the Argyll, Fig. 17, and the Diehl, Fig. 18.

The Rolland-Pilain, Fig. 14, and the Wolseley are very much alike as to the nature and construction of the valve mechanism and some advantage of the second over the first motor can be seen only in the type of cylinder head construction, inasmuch as its sleeve ports are protected from the high explosion temperatures. This has always been considered a good point in the Knight system. Fig. 15 shows the Wolseley motor at the firing moment and it is self-explanatory in regard to the above statement. On the other hand, the original Rolland-Pilain construction, Fig. 14, not only keeps the sleeve ports in the combustion space continuously, but still more, it fires the charge through the intake port by passing it opposite the spark-plug, which is located in the side of the cylinder. The intake port becomes exposed to the highest temperature and also to the action of the initial flame of combustion directed from the spark-plug into the cylinder. It will be remembered that burning out of the ports was a defect sought in the Knight motor which may have caused much of the audible port whistling notwithstanding its port protection.

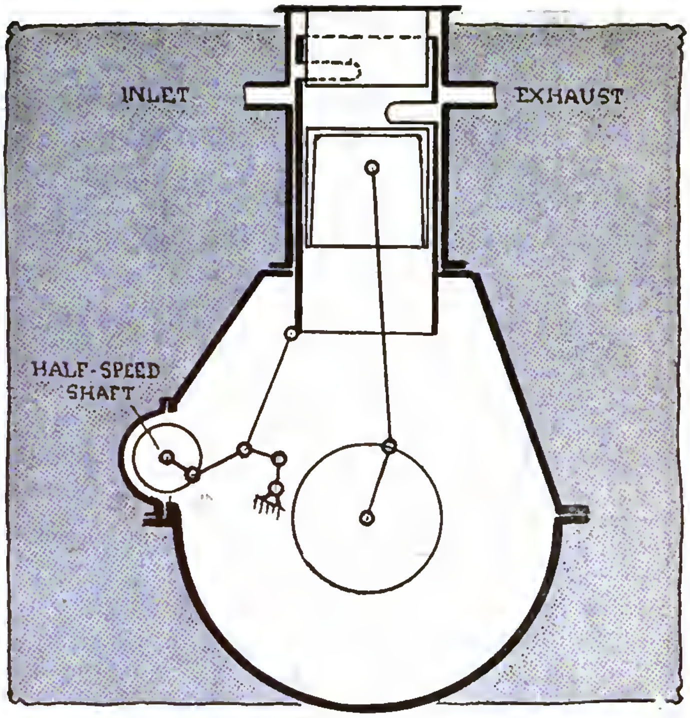


Fig. 16—A. E. G. link motion for actuating sleeve valve

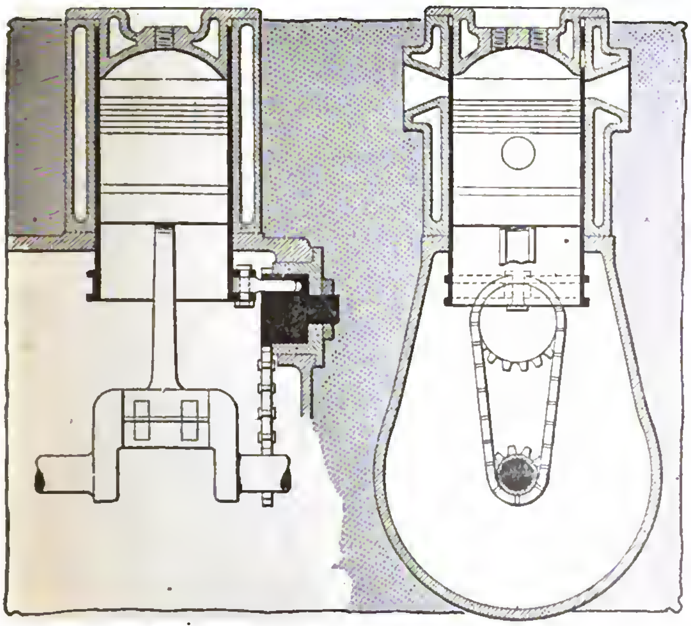


Fig. 17—Argyll single-sleeve valve motor

The A. E. G. link motion, Fig. 16, substitutes an eccentric by a fixed point, thus gaining in constructive simplicity. At the same time it affords material improvement in the shape of the valve opening interval over that of the double-sleeve scheme which has a pointed valve opening curve characteristic of the Knight motor. On the other hand, its mechanism has a number of joints in series whereby any wear will affect the valve motion considerably.

The Argyll system, Fig. 17, is an ingenious example of a combination valve motion being equivalent to a rotary motion of the valve ports in the cylindrical surface, but here again one of the sleeve ports is exposed in the combustion chamber during the explosion. If that is the inlet-port it can be covered by the piston for some duration at and near its upper dead center. It remains to be proven by practical use of this motor, how reliable its valve mechanism is, as some doubt in this respect can be freely attached to the present arrangement with its number of cantilever pin-bearing joints.

(To be continued.)

Loss of Water by Evaporation

Evaporation occurs, for the most part, where alcohol is used as an anti-freezing mixture. Where the alcohol is used in this manner it generally occupies from one-third to one-half the volume of the whole compound. It can readily be seen that this mixture will have a great tendency to be reduced very rapidly. It so happens, however, that the anti-freezing solution is only used at that time when the cooling system is in reality more efficient than is required. On account of the temperature of the air, the motor is not very apt to become overheated. The radiator is generally reduced in effective area during the season of the year that the anti-freezing solution is used, by covering it in some manner. Evaporation in the summer is the only way in which the quantity of water in the cooling system is reduced, if it is in good condition; therefore, loss of water by evaporation becomes merely a matter of watchfulness on the part of the operator.

Bad Valve Adjustment—Carbureter Formula—Painting the Ca[...]r—Explaining Rotary Valves—Soldering Cast Iron—Civil War Book Gives Roads[...] Five-Cylinder Question Again—Defining Oversize Bearing—Hup Oiling [...] System

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Case of Adjustment Trouble

EDITOR THE AUTOMOBILE:—I have an E. M. F. car which has been causing some trouble for the last few weeks. The engine does not have very good compression. I have just ground the valves and fitted new piston rings. It will fire all right when it is running slow and pulling, but as soon as it is speeded up it will miss. It will also miss when running idle. I have changed the spark plugs, but the missing occurs as before. I have changed the air adjustment on the carbureter.

2.—Why does the small bevel gearwheel in the differential break?

Saylorsburg, Pa. READER.

—It would appear that the cause of your trouble is that the valve tappets are adjusted too tightly. In these motors the clearance has to be .006 inch at least in order to get the power. The machinist who ground your valves has probably left but .003 or .004 inch clearance, and this is insufficient in the case of the E. M. F. motor. If you have a car dated previous to 1909 there are no tappet adjustments, and your trouble is elsewhere. The only other place it could be, unless it is due to a break in the wiring concealed by the insulation, is in the carbureter. The first would cause a misfire that would appear and disappear, and which could only be found by a close examination of the wiring. The carbureter trouble is in the adjustment, which seems to give too lean a mixture. A dirty carbureter causes trouble of a recurring nature and may be remedied by giving the instrument a thorough cleaning. Drain the float chamber two or three times to remove all sediment. Poor gasoline will also cause the trouble you mention. It may be well to try another place for your fuel supply before doing anything else.

2. Because it is not in proper mesh with the large gear. This should be attended to at once by a machinist.

Correct Carbureter for 4-Inch Motor

Editor THE AUTOMOBILE:—What is the proper size carbureter for 4 by 4, four-cylinder, four-cycle motor?

New York City, N. Y. F. M. DOBBS.

—In THE AUTOMOBILE for December 26 a formula for the correct size carbureter is given. This formula is as follows:

$$\text{Size in inches} = \sqrt{\frac{D^2 \times S \times R}{C}}$$

In this formula D is the diameter of the cylinder, S the stroke, R the revolutions per minute, and C a constant which is equal to 50,000 for automobile motors of the four-cycle type. Figuring by this formula, and assuming a maximum revolution of 1600 per minute, the correct size carbureter would be 1.5 inches. The nearest size above that given by the formula should be used in every case. The diameter and stroke of the motor effect the carbureter size; the number of cylinders does not affect the size, but does affect the manifold.

Rejuvenating the Ext[...]erior

Editor THE AUTOMOBILE:—I have an auto[...]mobile that needs considerable touching up in the way of paint. [...] I cannot afford to have the work done by a carriage painter an[...]d yet I would like the car to look well. It does not require a v[...]ery thorough job, and I would like to know through THE AUTO[...]MOBILE how to go about the work myself. The body is metal.

Saratoga Springs, N. Y. J. G. K[...]

—The complete outward renovation of a car is sometim[...]es too costly an operation as outlined. Those who may desi[...]re a cheaper and quicker method can begin with the body, pres[...]umably of aluminum or some other metal, and have it gone o[...]ver with a patch of emery cloth, or emery paper, or a fine w[...]ire brush, and, in the absence of these mediums, with some coars[...]e sandpaper. Thus rid the surface of foreign substances and con[...]dition it to receive and hold the pigment applied to it.

As to the best available primer. Use, if opportunity affords, a purchased ready-to-use metal primer, to be applied with a soft point round or oval bristle brush, the coat being brushed out smooth and uniform. If shop-prepared, use 2 parts raw linseed oil and 3 parts pure turpentine, to a pint of which mixture add a teaspoonful of pale drying japan. For coloring matter and to give body to the primer add enough oil ground lead colored in the direction of the to be finally chosen color. Another primer that some painters have found to work out very strong and well upon the metal surface consists simply of elastic finishing varnish brushed out thinly over the surface.

As soon as the primer is dry, good and secure, beat up some keg lead in 1 part raw linseed oil and 6 parts turpentine, give it the proper coloring, and apply with a soft chisel point brush.

After allowing for secure drying proceed either with a ready prepared knifing material, of which there are numerous makes, or with a shop-mixed one prepared of 3 parts dry white lead and 1 part best bolted whiting, worked into a plastic glazing condition in equal parts of rubbing varnish and coach japan, letting the mass down a bit with a little pure turpentine. Apply with a broad 1-2-inch French scraping knife, half elastic, working the pigment out so uniformly smooth and fine as to necessitate little if any sandpapering.

Permit this coat of knifed-in surface to dry for 48 hours, at which time using first No. 1 sandpaper and last No. 0 to polish with, fetch the work up to a smooth, glassy condition.

Over this foundation lay a coat of color ground work, or, in other words, a coat of color to serve as the ground or foundation color. Prepare this color by using 1 part raw linseed oil to 5 parts turpentine, which, in case of a japan ground color, will furnish requisite elasticity, durability, and a ground color devoid of gloss yet not drying out to a dead appearance—the latter to be avoided at this point in the finish.

In the event of using lake pigments for the final color the next coat over this preparatory ground color should be a coat of the lake whipped in turpentine to dry flat. Then over this use the lake floated in elastic rubbing varnish. When the color is of the ordinary opaque pigment, or, at most, semi-opaque, such as, for example, ultramarine blue, wine color or carmine, make a varnish color for the opaque pigments, consisting of 1-4 pound of color to 2 pounds of varnish, and for the semi-opaque or transparent pigments, following a solid ground, use 3-4 ounce of color to 1-8 gallon of varnish.

After 36 hours this varnish color, or the transparent glaze, will have dried so that it may be lightly rubbed with water and pumice stone flour to the extent of flicking away any dirt nibs, an elastic body-finishing varnish of the very best grade obtainable should be applied.

For the next coat reduce by one-half the amount of color used in the varnish and apply freely to the surface. Let this coat stand two days, at the expiration of which time again rub with water and pumice stone flour, wash up, stripe and apply such other ornamentation as may be desired. Then apply a coat of clean rubbing varnish. After three days rub this coat moderately with water and pumice stone flour, wash up and finish with an elastic body-finishing varnish of the very best grade obtainable.

Bring the chassis meantime along practically the same lines, using one coat of primer, then a coat of surfacing pigment containing enough raw linseed oil to insure adequate elasticity, upon which foundation use the knifing putty to level up the inequalities of the surface and to "face up" any other existing defects. Sandpaper this body of pigment down sleek and smooth, after which apply one coat of flat color, then one coat of transparent glaze or one coat of varnish color as the requirements of the work may indicate, upon which, in due time, after breaking down the gloss with a light rub-over with a soft sponge, moist and saturated with pumice stone flour, stripe, and apply one coat of clean rubbing varnish.

Give this coat plenty of time to dry, three days or more if possible, then surface thoroughly with water and pumice stone flour, wash up sleek and clean and finish with an elastic chassis finishing varnish.

Duryea Explains Rotary Motor

Editor THE AUTOMOBILE:—Your recent reply to the question of Mr. Lefler in THE AUTOMOBILE December 19, noted. Doubtless you have mixed my present production, which uses engines of the two-cycle type, with the engine which Mr. Lefler refers to. If you will look through reports of the shows 6 years ago you will find that I exhibited at the New York show of 1907 a rotary valve engine having three cylinders, 5 by 5 in a single block, and also a sectioned engine showing just the operation of this new style. I also showed a valve that had been in the hands of a customer for more than 6 months and was in perfect order. My patent on this device is about to issue and antedates other constructions of this kind. It antedates the patent application of the foreign engine mentioned by some years. It is interesting to note that the foreign patent on the engine mentioned was not applied for until some months after the New York show above mentioned.

The two valves are practically the same. In my engines the valve was far enough down the side of the cylinders to permit the piston overrunning the ports slightly, the idea being to oil the valve from the pistons. The engines built by my associates during the present year have had the valve directly on top of the cylinders and fitted with oil cups for taking care of the lubrication. This makes a very symmetric engine. It is interesting to note that I not only originated that type of valve for auto use, but was the first also to use silent chains for driving it; a clear lead of some years over the present silent chain advocates.

The rotary valve is a very sweet running device and well adapted to high speeds. It seems to me well adapted to displace the more common poppet, and the more complicated other forms.

Saginaw, Mich. CHAS. DURYEA.

Best Flux for Cast Iron

Editor THE AUTOMOBILE:—In soldering the cast iron water jacket on the cylinder of a motor what would be the best flux to use?

2. How is the piston displacement of a motor calculated? Also the radiator cooling surface?

3. What was the result of the fifth annual reliability trials of the Scottish Automobile Club in the Summer of 1909? Is it true that the cup was won by a Knight motorcar?

Detroit, Mich. C. G. WILLIAMS.

—1. A flux which can be used to solder the water jacket of a cast iron cylinder is cut muriatic acid, that is, hydrochloric acid in which zinc has been dissolved. For tinning, use four parts of salammoniac solution in water and one part of hot hydrochloric acid. The action can be improved somewhat by sprinkling a little powdered salammoniac on the surface.

2. The rule for finding the piston displacement of a motor cylinder is that of finding the cubic contents of a cylinder, which is as follows: Multiply the area of one end by the length of the cylinder, the product will be the cubic contents of the cylinder. The rule for finding the area of a circle, consists in multiplying the square of the diameter by .7854. The formula for finding piston displacement is: D^2 .7854 S N = piston displacement, in which D is the diameter of the cylinder, S length of stroke, N number of cylinders.

Therefore, to find the piston displacement of a motor with 5-inch bore, 6-inch stroke, and four cylinders, substituting the numbers for the letters of the formula, it would read: 5^2 (five square) $\times .7854 \times 6 \times 4 = 471.2$ cubic inches.

There is no formula for finding the radiator cooling surface necessary for any four-cylinder motor that is applicable to all types and makes of motors or radiators. This is because of the great variation in the cooling efficiency of the various designs of motors and radiators made. Each radiator maker, however, will be able to very closely approximate the amount of surface of its own design most suitable for any particular motor.

3. In the fifth annual reliability trials, held in the summer of 1909 under the auspices of the Scottish Automobile Club, there were sixty-five starters, out of which fifty-eight finished. The trials, which consisted of a combined reliability and economy test, included three hill-climbs and a brake test, lasted 6 days and

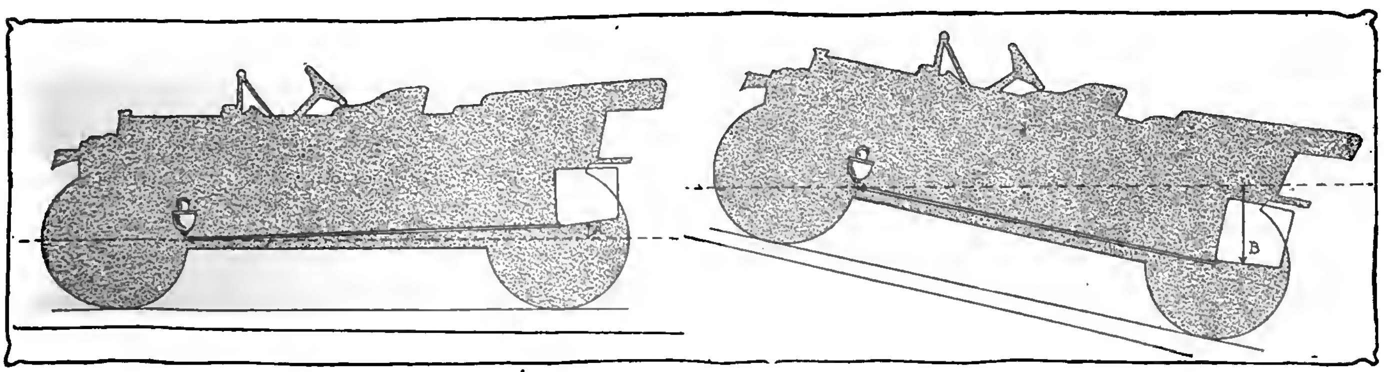

Fig. 1—Showing difference in carbureter and tank relationship when car is on level and hill

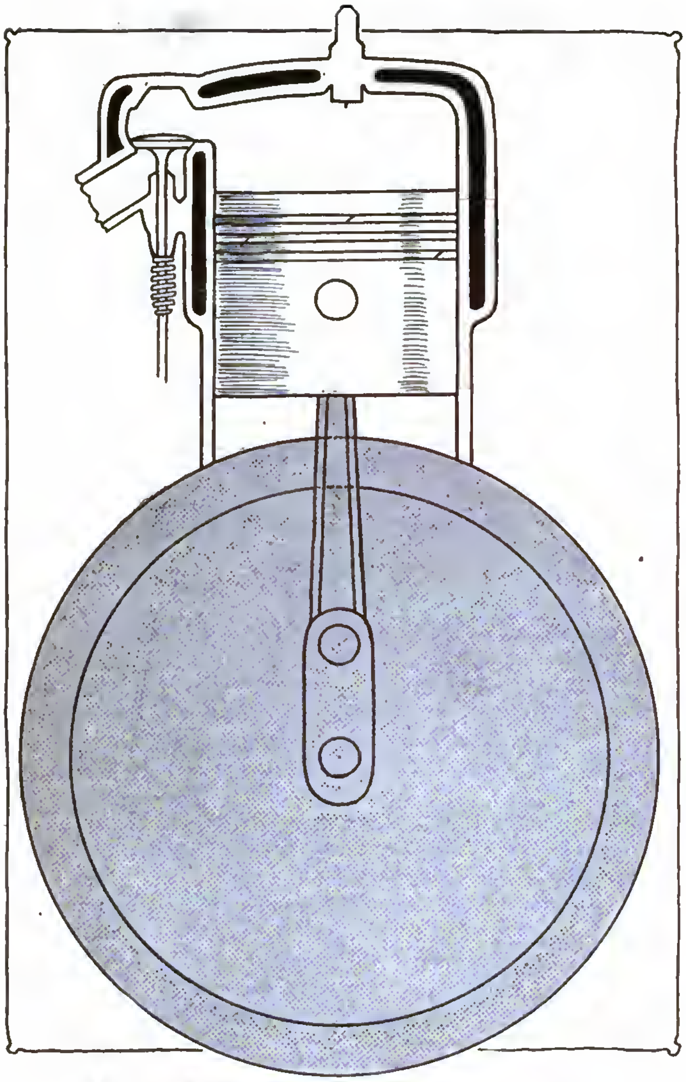

Fig. 2—Flywheel is necessary to carry piston past this point

covered a distance of over 1,007 miles, in stages averaging 170 miles per day at a scheduled speed of not less than 17 miles per hour and not more than 20 miles per hour. The entries were divided into eight classes according to price, and the winner in each class was awarded a gold medal, while bronze medals were awarded each class having the best hill-climbing results. The Scottish cup was awarded to a 38-horsepower Minerva car equipped with a Knight engine. This car also received a bronze medal. No official tests of the Knight motor in its present stage of development are recorded.

Finds Routes in Old Book

Editor THE AUTOMOBILE:—Four or five years ago, when I was devoting considerable time to the laying out of touring routes in the Southern States, I had practically no data at all to use as a basis in laying out my trips. At that time I could not procure anywhere any maps of the Southern States which showed the location of the main roads, and in planning my trips I had to rely on ordinary maps, and to take it for granted that where I saw a number of towns in a line, that there would be a highroad connecting these towns.

In other cases, as, for example, in seeking a road from Macon, Georgia, to Savannah, I simply noted on an ordinary map the general course of the rivers and streams, and laid out a road along what I considered would be high and dry land, and where, as later proved to be the case, there would most likely be found the most "navigable" road.

Recently I ran across a book which contains the best and most complete road maps of the Southern States I have ever seen, and, had I had this work before me when I was touring in the Southern States, I would have saved myself a tremendous amount of miscellaneous investigation, and also a great deal of guesswork.

Nevertheless, to those who wish to cover routes which are not yet included in the Blue Book, I wish to recommend my recent topographical "find." The book I have reference to is "The Rise and Fall of the Southern Confederacy," by Jefferson Davis, published in two volumes, by Appleton & Company in 1881.

In the back of the second volume of this work will be found very accurate and well printed maps which give the exact location of every important highway which existed at the time of the Civil War.

It is almost unnecessary to state that the older a road is, the more likely it is to be the most important in any given locality, for reasons which every tourist will appreciate.

The books referred to above are now out of print, and I have found it impossible to procure a set for my own library, although I have had two of our most important booksellers on the lookout for copies. The books may be found, however, in all the important public libraries, and the maps above referred to are well worth the inspection of every one who is interested in touring in the Southern States.

New York City. R. H. JOHNSTON.

More on Five-Cylinder Motors

Editor THE AUTOMOBILE:—It is very evident that I failed to make myself clear in a previous article on five-cylinder motors, and I would like to have it understood that I did not intend to convey the meaning that such motors were not successful. In my comparison of five and six-cylinder motors (which was based on facts and not on my opinion), I picked out the advantages of one over the other in their most important points, and although I found the former a successful motor and just as superior to a lesser number of cylinders as one would expect, I take exception to any statement that puts it on an equal with the six. One cannot fairly take into consideration the consumption of fuel and oil, in these two motors when comparing their superior qualities for motor car propulsion. If so we would have to admit the single cylinder as the most successful.

In the issue of THE AUTOMOBILE of November 28 I gave an illustration of motors operating without flywheels, and I did this for the purpose of showing that only theoretically do five cylinders produce a constant torque. A motor that requires a balance wheel to carry it over certain dead or slack portions does not produce a practical constant torque. In this motor (five-cylinder) the explosions overlap each other to the extent of 36 degrees, and as the actual working stroke of a gasoline motor starts not sooner than 10 degrees past top center and ends not later than 150 degrees, it shows an interval of 6 degrees when no power is being generated. Some manufacturers confine this working stroke to 120 degrees. In the cost of manufacturing the crankshaft of these motors there would be a difference of about one hundred dollars, the five costing that much more than the six, and it would be necessary to eliminate more than one cylinder and its parts to make up this difference.

Certain approved methods such as casting cylinders in pairs and four bearing crankshafts, would have to be abandoned for the unapproved or obsolete in order to adopt the five-cylinder motor.

In regard to the motor being lighter and allowing the hood to be shortened, I will say that the average engineer will not consider such attempts at the expense of the smooth and silent operation of the car, especially when the saving in weight would hardly be noticeable either in the life of the tires or the operation of the car.

Portland, Me. GROVER C. RICHARDS.

What Is an Oversize Bearing?

Editor THE AUTOMOBILE:—What is an oversize bearing? I should like to have you decide a question which I have argued with a friend. I had occasion to have a cut taken off a crankshaft which had been scored and stated I wanted an oversize new bearing put in. Issue was taken with me for calling it an oversize bearing, he stating that as the crank hole diameter was smaller in the new bearing and consequently its bearing surface smaller, it should be called an undersized bearing.

I maintain that as the radius center of crankshaft to outside of bearing is fixed in any particular engine the mere fact of taking a cut off the crankshaft makes it undersize and consequently the new bearing becomes oversize. In other words, you cannot fit an undersize bearing to an undersize crank when the radius center of crankshaft to outside bearing is fixed and remains so.

Cincinnati, O. A SUBSCRIBER.

—An oversized bearing on the crankshaft is one in which the fit is too loose. That is to say, the bearing with the greatest internal radius is a larger bearing. Therefore, your friend is right and you are wrong. The size of the bearing is measured by the diameter of the circle which would be formed by a section through the bearing at right angles to the axes of the shaft. You are thinking of the thickness of the bearing metal, which does not affect the size of the bearing.

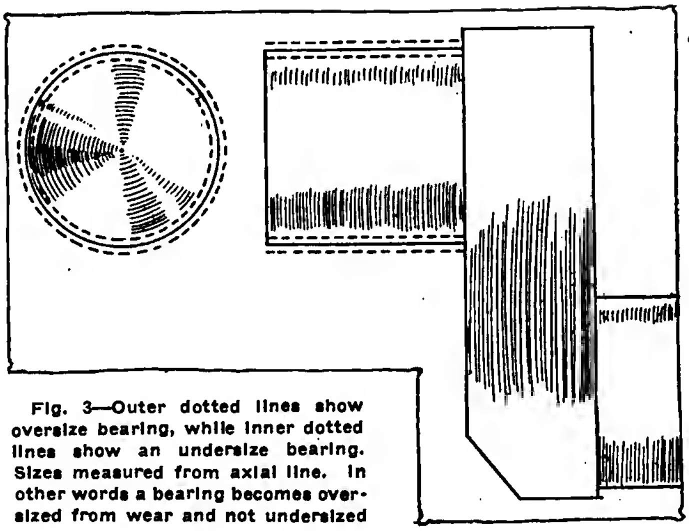

Fig. 3—Outer dotted lines show oversize bearing, while inner dotted lines show an undersize bearing. Sizes measured from axial line. In other words a bearing becomes oversized from wear and not undersized

Getting the Car Weighed

Editor THE AUTOMOBILE:—I notice in the tire tables that the different loads are given for the front and rear axles separately to determine the correct size of tire. Would you tell me how to get these weights correctly.

2. Why is it that pressure feed is used when the tank is flung at the rear? Cannot the carbureter be placed low enough for gravity?

New York City. J. E. S.

—The correct method of weighing a car given in Fig. 4.

2. In order to make the carbureter high enough to be accessible it is necessary to use pressure feed when the tank is carried at the rear. This is brought out in Fig. 1. When the car is on level ground the feed may be by gravity but while on a slope pressure would be necessary.

Oiling System on New Hup

Editor THE AUTOMOBILE:—Would you kindly tell me if the same oiling system is used in the new Hup 32 as in the Hup 20-horsepower runabout? The latter, as you will remember, used a gravity-feed system by which oil is fed to the crankcase by gravity, the amount fed being governed by a cam arrangement on the throttle control.

Denver, Col. L. C. SMYTH.

—The automatic oiler on the Hupmobile 32 makes use of a flywheel of the motor and of centrifugal force. The lower part of the crankcase and the flywheel housing are integral. The crankcase slopes downward toward the flywheel compartment, and oil runs into this lowest point which is designed as the oil pan. The flywheel rim is close to the bottom of this oil pan at its deepest part. When the flywheel revolves, some of the oil in this pan or sump through which the rim travel, adheres to the rim and is carried around with it. Half way up on the right inside of the flywheel case there is a horizontal rib which is machined to just clear the rim of the flywheel. The oil adhering to it is thrown with considerable force against this rib and into a tube which enters the housing just below the rib. The oil passes through the tube to a strainer contained in the filling tube casting. This strainer is 3 inches in diameter and is set vertically so that all grit and sediment collect at the bottom, where they may be washed out by opening a pet cock while the engine is running. From the strainer the oil passes into a 1-2-inch horizontal duct cast in the crankcase. Three 1-4-inch tubes conduct the oil under pressure of the flywheel's centrifugal force to the centers of the main bearings of the crankshaft.

Quarter-inch holes drilled in the crankshaft allow the oil to flow to the crankpin bearings. The oil spray flung from the ends of these bearings is sufficient to lubricate the cylinders under ordinary conditions, but as an additional precaution, oil leads are provided direct from the distributer pipe to the points between cylinders Nos. 1 and 2, and Nos. 3 and 4. These force oil into the hollow piston pins and fill the grooves around the pistons. The camshaft bearings are lubricated by the splash of the connecting-rod ends in the sumps at the bottom of the crankcase. Oil thrown from the flywheel toward the rear goes into the gear case and maintains the proper level for the gears. The excess oil is returned to the crankshaft, due to the sloping construction of the housing. Grit and sediment from the gears are retained in a settling basin, and may be removed by taking out the large drain plug.

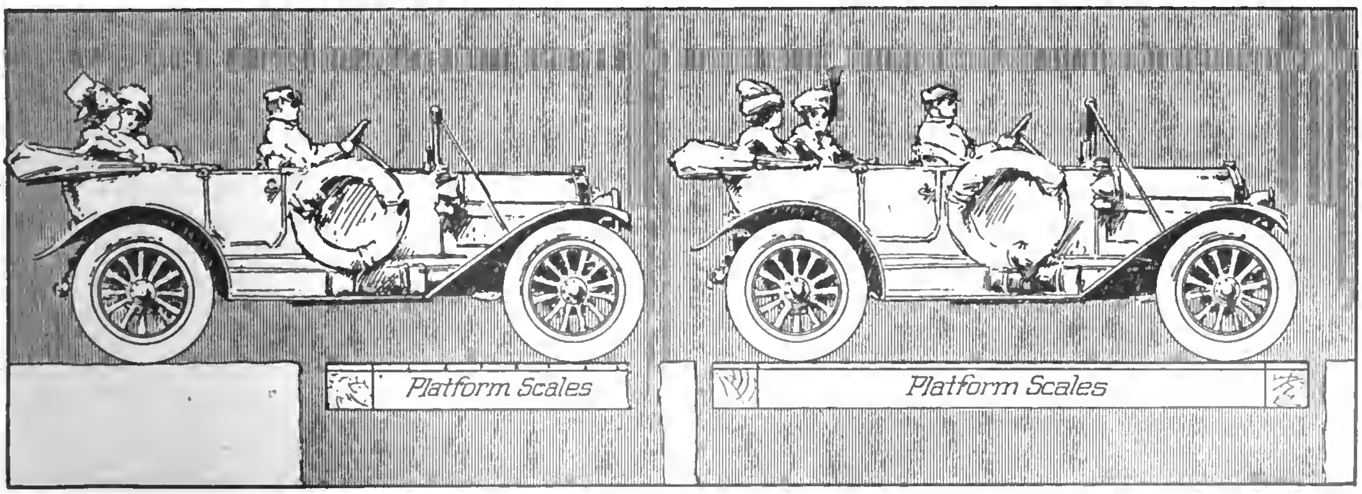

Fig. 4—Method of weighing car. First, to get load on front axle; second, total load; third, rear axle load

The AUTOMOBILE

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The Strength of Union

IS it better for both passenger and commercial electric vehicle makers to stand aloof from gasoline makers of passenger and commercial vehicles, or to work hand in hand with them?

There is only one answer to this question, namely, "Get together, it is the motor-vehicle-against-the-horse problem that has to be solved and not whether it shall be electric or gasoline vehicles."

Makers of electric passenger vehicles recognize that they cannot compete with the gasoline passenger vehicle except in city and intercity work where the distances are not too great. Makers of gasoline passenger vehicles recognize in the electric passenger car a vehicle of general utility for such services; and they further recognize the extent to which the closed type of electric supplements the open type gasoline vehicle, where the two are in the hands of the same owner, one for fine-weather country or city use and the other for all-weather city and suburban service.

Makers of electric commercial vehicles recognize the limitations of their vehicle as compared with the gasoline type for long-distance work; and on the other side of the fence the gasoline maker gives due heed to the ideal adaptation of the electric for city use with short-distance hauls and the varied conditions of traffic congestion.

What is the net result? Get together. Combat the common enemy. Work hand in hand for better traffic control; for improved city railway and steamboat terminals; for necessary renovation of internal systems in business houses which will reduce lost time in loading or unloading; and work for the rational education of the buyer.

Beyond the Horizon

WHEN will the day come when the owner of an electric passenger vehicle can start from his New England home and tour to Denver, Col., without more loss of time than required to remove the discharged battery at convenient charging stations along the road anad install a full-charged one?

When that day arrives the electric passenger and electric commercial vehicles will have attained their maturity.

Such a conception of affairs is not entirely utopian. There are many fibers of rationalism in its warp and woof. It presupposes very considerable progress. It can only be achieved when batteries and other parts have been well standardized. It can only be achieved when central stations or other interests have installed charging plants at intervals of 75 to 100 miles distance from one another over the country; it can only be attained when batteries are owned and controlled by some combination of the central station and battery-manufacturing or other interests; and it can only be attained after the adoption of some general plan whereby the purchaser of a vehicle buys it without a battery and when using two dozen different batteries between Boston and Denver pays in addition to the cost of current a rental for the use of the different batteries.

A looked-for condition of this nature is in the minds of nearly every maker of electric vehicles. True, the conception is embryonic, vague, undefined; but in every case the feeling is one of certainty as to its eventual evolution. The question of battery ownership is the major element calling for solution.

If battery ownership rests with the owner and he or she starts with a new battery from Boston he or she has it but for a single day, and may never see it again on the 2,000-mile trip. Instead of a new battery every day he or she may have to use old batteries of reduced capacity.

Should the battery ownership rest with the chain of charging depots then the owner would have to pay for current and battery rent and would have the privilege of purchasing the vehicle without a battery. Such a free exchange of batteries would call for requisite standardizing of battery trays, and control features, motors, etc.

Climbing the Ladder

LIMOUSINE body types, longer wheelbases, more accessible batteries, more fool-proof control, approaching battery standards, attempted regulation of vehicle speeds or recommended practice in such, dropped frames, improved springs, shaft drive or inclosed methods, etc., are a few of the new rungs added to the ladder of electric vehicle progress.

All indicate that the electric vehicle maker is aiming to impress on the buyer the paramount fact that the electric passenger vehicle is a general utility vehicle the same as the gasoline machine.

With the electric commercial vehicle there is a pronounced movement to enlarge the number of models to take in the varied requirements of every industry.

Salon Breaks World's Record for Exhibitors

PARIS, Dec. 22—With the record number of 550,000 persons having paid for admission, the thirteenth French automobile show closed its doors this evening after having been open 16 consecutive days. No accurate record has been kept of the number of persons having entered the big hall with free tickets, these persons comprising stand attendants, agents, officials, pressmen, and persons having received invitations on the opening day. It is estimated that altogether nearly one million persons must have entered the Grand Palais while the show has been in progress.

It is evident that the show which has just been brought to a close is the most successful ever held in France. Gate receipts are about $6,000 in excess of the best previous year; the amount paid for the rental of stands is $40,000 in excess of the previous record, and the 568 exhibitors is the highest number recorded in any show in any part of the world. These 568 exhibitors occupied 260,000 feet of floorspace, paid at rates varying from $50 to $60 per square yard.

In an interview with THE AUTOMOBILE representative, Henri Cezanne, general secretary of the show committee, stated that the organization of the show had cost from $250,000 to $300,000, this being the largest amount ever spent on any automobile show. The electric light bill worked out at the rate of $500 an hour.

"It has been decided," declared M. Cezanne, "to hold an automobile show in Paris next year, most probably during the month of October instead of the month of November. This change of date will be adopted in order to diminish as far as possible the present annual slack season. It is found that there is a falling off in the amount of business done from the month of July, and the increase in business is not felt until after the show. If the show is not held until the month of December the slack season is felt more or less for 4 months. If the show is held in October, this period of slackness will only last for 2 months."

Up to the present the London show has opened the European series, and the British trade has always laid emphasis on the fact that London was the centre of the European automobile trade. The unprecedented success of this year's Paris show has begun to shake the Englishman's belief in the impregnability of Olympia, and with such natural facilities as the French enjoy in the Grand Palais and the determined effort they are now making to retrieve their former mistakes, it hardly seems possible that London can remain more important than Paris as a trading centre.

"Personally I do not consider that an annual show is worth while," explained M. Cezanne, "and there are plenty of manufacturers who are of my opinion. Experience has shown us that the annual show does not increase the volume of business. It undoubtedly helps the small firms to come to the front, and it enables foreigners to get on our market. It is really more advantageous for us to take part in shows in foreign countries than to exhibit at home. The settled condition of automobile design is another reason why shows should not be held every year. Although 2 years have elapsed since a show was held in Paris, the mechanical changes are not of sufficient importance to necessitate such a costly demonstration as the Paris Salon.

"Until we can come to an agreement with the English manufacturers, by which the two shows will be held every 2 years—not alternatively—we shall be obliged to hold a show in Paris every year. A show in Paris one year and in London on the following year is not desirable, for practically the same preparations have to be made by our manufacturers to exhibit in London as to participate in the Paris show. This arrangement therefore amounts, practically, to an annual show. As soon as the English declare that they are ready to work with us in the organization of shows every 2 years we shall abandon the annual exhibition."

"Business has been excellent," declared M. Cezanne. "It is obviously impossible to state what amount of business has been transacted with the Grand Palais, but in every section of the show—car manufacturers, body makers, tire makers and dealers, accessory dealers—the statement is made that business has been decidedly brisk."

Out of the profits of the show 40 per cent. is returned to the exhibitors in proportion to the amount paid by them for the rental of stands; 40 per cent. is returned to the exhibitors who for 6 months have been members of one of the organizing trade associations, and 20 per cent. is paid over to the 5 organizing associations in proportion to the amount paid by their members for stand rental.

The Paris salon is admittedly the most important social function of its kind. The decorations and illuminations are designed to attract the attention of the wealthy classes, yet the price of admission is kept sufficiently low to suit practically everybody, being only 20 cents on all days but Fridays and the opening day, when it is increased to 60 cents and $1, respectively. The Republican Guards military band is secured for the opening day, this band being recognized as the finest of its kind in Europe. On all other days a very high class orchestra is secured, and on Fridays there is in addition a short concert with singers from the National Opera House. It cannot be denied that these attractions bring into the hall the right class of prospective automobile buyers.

The show has always closed its doors at 6 o'clock. This year, by special request, they were kept open until 6.30 o'clock, but on a careful account being taken it was found that the number of people entering during this last half hour was only 31. As the additional half hour entailed an additional expenditure of $300 for light and attendance, the experiment was naturally looked upon as a failure.

One of the most valuable conveniences in the hall was a system of electric lights to indicate the position of stands. On large boards near the main entrance a plan of the entire show had been prepared, and in the center of each stand marked on the plan a small electric lamp had been fitted. By the side of the board was a complete list of firms exhibiting, with an electric light button immediately after the name. By pressing this button a red light was made to appear on the stand shown on the plan. As a rapid means of finding the location of any stand it was most valuable and was highly appreciated by the visitors.

Philadelphia Show Has Sixty Exhibitors

PHILADELPHIA, PA., Dec. 28.—Drawings for the allotment of exhibition space to local pleasure car and accessories dealers, to hold forth during the first week of the twelfth annual Philadelphia Automobile Show at the Automobile Club of Philadelphia's building, Twenty-third and Market streets, January 18 to February 1, were held on Thursday and show a total of over sixty different makes of gasoline and electric cars, handled by dealers affiliated with the Philadelphia Automobile Trade Association, under whose auspices the exhibition will be conducted. This number will be considerably augmented next week when dealers not members of the association will draw for space. The opposition show to be conducted by the Philadelphia Automobile Board of Trade, Ltd., at the First Regiment Armory, Broad and Callowhill streets, during the week of January 18 to 25, will make a feature of foreign-built cars in addition to representative American cars.

After Big Races for 1913

Both Milwaukee and Savannah Want the Grand Prix and Vanderbilt Cup Contests This Year

Committees To Visit New York Regarding the Matter in the Early Part of This Month

BOTH Milwaukee and Savannah want the big cup races for 1913. They have not been awarded so far but the following items show the interest and hope of the cities actively campaigning for them.

MILWAUKEE, WIS., Jan. 1—It is announced today on the very best of authority that Milwaukee will stand sponsor for the international road races, the grand prix, Vanderbilt cup, Pabst trophy and Wisconsin Challenge cup races in 1913, if the governing bodies, the Automobile Club of America and the American Automobile Association will again consider its tenders favorably. Immediately after the fifth annual Milwaukee motor show, which is to be given in the Auditorium from January 11 to 17 inclusive, the Milwaukee Automobile Dealers' Association, will begin preparations for its campaign to land the classics a second time, and a delegation will leave for New York to make its tender to the governing body.

SAVANNAH, GA., Dec. 30—The date and other details of the Grand Prix and Vanderbilt cup automobile races, which will in all probability be held in Savannah, over the famous Chatham County course, either in the fall of 1913 or early in 1914, will be arranged at a meeting to be held in New York on January 6 between the Motor Cups Holding Company and a sub-committee from the executive committee of the Savannah Automobile Club.

The committee will leave Savannah Saturday night, January 4, reaching New York the following day. The meeting will be held at the Waldorf-Astoria on Monday, January 6.

It is stated by President Granger that there is a possibility of the races being held on February 22, 1914, instead of Thanksgiving Day, 1913, as heretofore, the former date being favored by the Automobile Club of America.

Records Broken in Iowa Road Run

DAVENPORT, IA., Dec. 29—All records were shattered for daylight run across Iowa yesterday when Don McClure, Oskaloosa, driving two-passenger Oakland torpedo, won the 321-mile race by 35 minutes over Pete Petersen, Davenport, driving five-passenger Pope-Hartford. McClure's total time on the road was 10 hours and 43 minutes while Petersen took 11 hours and 18 minutes. McClure's running time was 9:20 and Petersen's 9:24.

The race was arranged by the Tri-City Ocean-to-Ocean Official Highway Association to determine whether the River-to-River road or Great White Way was the better route between Davenport and Council Bluffs. Petersen drove over former and Oskaloosa man took the southern route. The River-to-River road is 346 miles and the Great White Way 321 long but drivers raced on equal terms. Average time of winner 37.8 miles per hour.

More Space Available for Chicago Show

Many belated applicants for space at the Chicago Automobile Show, who have been greatly disappointed by the fact that no more exhibition space was to be had in the Coliseum, Annex or First Regiment Armory during either the first or second week of the show, will, after all, be given exhibition space. By one of his customary enterprising business deals, Manager S. A. Miles has secured the use of the Wilson building, adjoining the Coliseum Annex on the South, for the show period. This building is practically the same size as the Annex and the floors are free from obstructions of any sort. This will enable the largest passenger cars and motor trucks to be shown to advantage without any interference by posts or low ceilings. The building has a main entrance on Wabash Avenue, but by opening passage ways through the south wall of the Annex, it can be made to all intents one building with the Coliseum, so that space in it will be even more desirable than in the Annex.

With these additions the count of exhibitors in the show will be as follows:

Passenger car manufacturers, 102; commercial vehicle builders, 77; accessories manufacturers, 244. Most of the accessory exhibits will remain in place throughout both weeks.

Spaces in the Wilson building have been taken by the Mercer Automobile Co., and Midland Motor Car Co., previously allotted Annex basement spaces; Paige-Detroit Motor Car Co., allotted space in the Armory; and the W. H. McIntyre Co. The Republic Motor Car Co., of Hamilton, O., and Century Electric Car Co., of Detroit, Mich., have accepted the basement spaces thus made vacant.

The new motor truck exhibitors who have accepted offers of space are the Grand Rapids Motor Truck Company, of Grand Rapids, Mich., Driggs-Seabury Ordnance Corp., Sharon, Pa., Randolph Motor Car Co., Chicago, Edwards Motor Car Co., New York, and the O. Armleder Co., Cincinnati.

Notice to New York Show Exhibitors

Merle L. Downs, secretary for the coming automobile shows at New York, has issued the following statement:

In order that there may be no misunderstanding in regard to shipment of exhibits, or delay in receiving same at this end, we call your attention at this time to paragraph 11, of the rules, copy of which has been sent you, and which is included in your contract for space, with reference to shipments, and especially to that portion of the same, which states all freight and express charges must be prepaid, or the goods will not be accepted by the management.

This is important, so kindly see that the necessary instructions are given your shipping department at this time.

We also desire to remind you that in view of the prevailing freight situation, and the fact that it is not always possible to get freight cars on short notice, that after a consultation with the traffic department, would suggest that you place orders promptly with the railroad for cars to take care of your usual shipments in ample time, so that there will be no delay in getting your exhibits here in time for the opening. We bring this matter to your attention, owing to the numerous inquiries that have been made from exhibitors on the subject.

Lanchester Brings Out Vibration Absorber

BIRMINGHAM, ENG., Dec. 21—F. W. Lanchester, consulting engineer of the Daimler Company, has recently brought out a vibration absorber for four-cylinder motors. It consists of a twin cross-shaft driven from the motor crankshaft and carrying balance weights, which revolve at double crankshaft speed. Mr. Lanchester in speaking of the necessity for such a device on a four-cylinder motor recently stated: "The orthodox form of four-cylinder engine is correctly balanced so far as the primary reciprocating forces are concerned, but the secondary balance is appreciably bad, and at high speeds causes much vibration. This lack of secondary balance is due to the effect of the comparatively short connecting rods which cause the motion of the piston to differ from the ideal harmonic. In a four-cylinder engine with 4-inch stroke and pistons weighing two pounds each this secondary unbalanced force at a speed of 2000 revolutions per minute exceeds 400 pounds."

Tire Plant for Louisville

Speedway Tire Company Organized by Louisville Men To Make Three Standard Types of Vehicle Tire

Willys Elected President of Gramm Truck Company—Car Census of the United Kingdom

WITHIN the next 90 days Louisville expects to boast of the only tire factory south of the Ohio River. The concern is the Speedway Tire Company, which has on hand $250,000.

All money is in and more than 65 per cent. of the capital stock is held in Louisville. The officers of the new company are Harry L. Lewman, of the Lewman-Cox Realty Company, president; L. D. Lewman, of Atlanta, president of the Manhattan Construction Company of New York, vice-president; Fred Haupt, of Louisville, second vice-president; W. N. Cox, president of the Louisville Public Warehouse Company, treasurer; and Dr. Fred L. Koontz, secretary. G. W. Greene, a tire expert of Massachusetts, will have charge of the new plant.

Two sites for the factory are now under consideration. The plant, according to present plans, will be placed in a factory building, which will be altered to suit present needs. A lease with a buying option will be taken. As soon as it is known what are the needs of the new company, the concern expects to build a modern tire factory eight stories high of concrete, steel and glass construction.

At first only motor vehicle tires of three standard types will be manufactured. The output will be about 100 tires per day. Pneumatic and solid automobile tires will be the principal product, but the firm will also make rubber mechanical goods and druggist supplies. About 300 men will be employed in the plant.

Willys Elected President of Gramm

TOLEDO, Dec., 27.—John N. Willys, president of the Willys-Overland Company, Toledo, was elected president of the Gramm Motor Truck Company, at the annual meeting of the stockholders of the corporation in Lima, O., Thursday evening, December 26. Mr. Willys has announced that the facilities of the plant will be doubled early in the new year and that the company will install special equipment for the building of a .75-ton truck to be placed on the market at a moderate price. The plant is now turning out 5-ton trucks. It is also announced that H. H. Doehring, for several years general sales manager of the Ohio Electric Car Company, has been made sales manager of the Gramm Motor Truck Company, with headquarters at Lima.

N. A. A. M. Establishes Office in Detroit

DETROIT, MICH., Dec. 30—The National Association of Automobile Manufacturers has established a traffic office in Detroit, in charge of J. A. Gardner, formerly traveling manager for the Brush and later with the Stoddard-Dayton, of Dayton, Ohio. Some of the work of the New York office will be transferred here and the local office will take up the matter of securing better transportation facilities for Detroit automobile manufacturers.

Car Census of United Kingdom

LONDON, ENG., Dec. 21—Among other interesting information contained in Lord Montagu's weekly journal, *The Car*, the car census reveals in a convincing manner the growth of the motor-car in these islands. To begin with there are 320,119 motor vehicles of all types in the United Kingdom, compared with 266,258 of last year, representing an increase of 53,861, while the total number of persons holding driving licenses is 284,799, of which 19,635 hail from Scotland and 10,626 from Ireland. With regard to the distribution of the cars throughout the United Kingdom, England and Wales, including the county boroughs, possess 156,573 motor carriages and pleasure cars, 116,248 motor-cycles, and 11,771 heavy commercial motor vehicles. The actual figures for the city of London are not only interesting but also instructive and convey to the lay mind the increase that is taking place annually. There are 55,912 motorcars, 20,654 motorcycles, while there are no fewer than 4,868 industrial motor vehicles registered in the metropolis. The London County Council have issued 49,482 licenses to drivers during the past twelve months, while the metropolitan police issued up to October 31 licenses for 7,896 motor-cabs, and 2,677 motor-omnibuses, as compared with 7,476 cabs and 1,883 motor omnibuses at that date 12 months previously.

Flanders Mfg. Co. Creditors to Present Claims

DETROIT, MICH., Dec. 30—*Special Telegram*—The Detroit Trust Company, receiver for the Flanders Manufacturing Company of Pontiac, has notified creditors to present their claims within 90 days, at which time an attempt will be made to have the property appraised. The factory is running at present. At the end of 90 days the creditors will hold a meeting, with the receiver, for the purpose of determining the future of the concern.

Winton Chauffeurs Get Cash Awards

The annual award by the Winton Motor Carriage Company to chauffeurs of Winton cars whose mileage was high during the past year with a minimum of repair expense has been made. The first prize of $1,000 went to a Boston chauffeur who submitted sworn affidavits by himself and his employer that he had driven the car 26,987 miles with no repair expense.

Nineteen other awards were made ranging from $500 to $100.

The plan followed by the company in determining who should receive the awards is to have the chauffeurs and owners report monthly to the company and the reports and affidavits are submitted to a committee of five which makes the awards.

Award	Driver	Place	Mileage	Repair Expense
$1,000	J. L. Dondero	Cleveland, O.	26,987	...
500	W. J. Green	Chicago, Ill.	22,928.8	...
250	Thomas Murren	Medford, Mass.	16,477	$0.95
150	Albert Bedard	Providence, R. I.	18,245.3	18.01
100	E. P. Bruhaker	Chicago, Ill.	15,729	...
100	J. W. Tracy	Crafton, Pa.	14,022	...
100	J. F. Folger	San Francisco, Cal.	14,474	.75
100	F. Schneider	New York City	14,431	...
100	H. Decker	Newburgh, N. Y.	12,541.8	...
100	L. V. Wright	New York City	12,716	.15
100	A. N. Peters	Brighton, Mass.	13,845	.95
100	E. A. Hodge	Milford, N. H.	13,441	21.22
100	Harry Batch	N. Braddock, Pa.	15,333	53.65
100	S. J. Meneely	Newburgh, N. Y.	11,743.3	25.35
100	J. L. Scott	Philadelphia, Pa.	12,271	25.35
100	J. H. Gallo	New York City	11,307	...
100	Wm. Ahrens	Brooklyn, N. Y.	11,150	...
100	E. E. Stokes	Philadelphia, Pa.	11,126	...
100	Clarence Finley	Chicago, Ill.	11,119.5	1.25
100	Wm. J. Armstrong	Philadelphia, Pa.	10,870	.85

Date Set for Du Brie Hearing

DETROIT, MICH., Dec. 30—The DuBrie Motor Company, adjudged bankrupt October 4, has filed a petition in the United States court, asking a full discharge of all debts provable against it under the bankruptcy acts. Judge Arthur S. Tuttle has set February 3 as the date for a hearing and has notified creditors to appear at that time and show cause, if any, why the prayer of the petitioner should not be granted. The company declares it has surrendered all its property and rights of property and has fully complied with the requirements of the bankruptcy acts.

Pelletier and Smith Leave Flanders Co.

Advertising and Sales Managers Suddenly Sever Their Connection with New Subsidiary of U. S. Motors

Flanders Company Files $600,000 Mortgage to Secure Bond Issue—Speedwell Issue Subscribed

DETROIT, MICH., Dec. 30—*Special Telegram*—E. Leroy Pelletier, advertising manager, Flanders Motor Car Company, and Paul Smith, sales manager, severed their connections with that concern on December 28. No statement from the parties concerned nor from the officers of the Flanders Company could be obtained today relative to the reasons for the move. Since the merger of the Flanders Motor Car Company with United States Motors, there has been considerable speculation as to whether these men would assume the same positions with the parent organization, and Saturday's move is the answer.

A newspaper report here today states that Pelletier and Smith were advertising and sales manager, respectively, of the United States Motors Company at the time of their resignations, but this is incorrect. They were connected with the Flanders subsidiary only and were not in the employ of the United States Motors in any capacity.

Semi-official confirmation of the fact that Smith and Pelletier have quit the Flanders Motor Company has been received in New York. It is also stated that while they were slated for the positions of sales manager and advertising manager of the contemplated reorganization of the United States Motor Company, their appointments had not been made officially.

The report from Detroit states that the split occurred last Saturday but the reasons underlying it were not outlined.

The whole industry as represented in New York displayed the keenest interest in the report but could add nothing to it.

Flanders Files $600,000 Mortgage

DETROIT, MICH., Dec. 30—The Flanders Motor Company has filed with the city clerk copies of a $600,000 chattel mortgage, running to the Central Trust Company to secure an issue of 6 per cent. 3-year gold bonds, arrangements for which were made with the New York concern some time ago.

Speedwell Bond Issue Subscribed

DAYTON, O., Dec. 27—Stockholders of the Speedwell Motor Car Company, Dayton, O., met in that city last Tuesday and ratified the plan recently projected to authorize a bond issue of $150,000 for the extension of the business. This issue has not been subscribed, according to the company. It was also decided to increase the directorate of the corporation. President Pierce Schenck stated that Fred A. Funkhouser, president of the Winters National Bank of Dayton, will be one of the new directors. W. L. Caten was elected vice-president and general manager of the company at the Tuesday afternoon meeting. The Mead sleeve engine will be used in the cars of the concern in the future, and leading stockholders of the Mead Engine Company will take stock in the Speedwell Company and the plant will be enlarged.

Grabowsky Sold—Lion Sale Postponed

DETROIT, MICH., Dec. 31—*Special Telegram*—The referee in bankruptcy today accepted the offer of Samuel Winternitz and Company, of Chicago, for a part of the property of the Grabowsky Power Wagon Company. Winternitz and Company will sell the material and machinery and turn $55,000 over to the referee. The bid covers everything but the land, buildings, equipment, book accounts and bills receivable. The real estate will be sold by the referee at auction January 23 at the plant.

The sale of the Lion Motor Company property at Adrian, Mich., has been postponed by the referee for the second time. On the date first set for the sale the highest bid was $7,000 for property appraised at about $33,000. On December 24 another attempt was made to sell the property but on that occasion the highest bid was $12,250, this being from Samuel L. Winternitz of Chicago. This sale likely will be confirmed unless a bid of $12,750 is received before the date set for the sale.

A delegation of Adrian business men were in Detroit when the sale was postponed for the second time and members stated they believed they could procure a buyer who would pay $12,750.

Gear Company Changes Its Name

ALBANY, N. Y., Dec. 28—The New Process Gear Corporation has been incorporated in Albany with a capital stock of $1,000,000, all subscribed. The new company will, on January 1, take over the stock of the New Process Raw Hide Company.

Originally the manufacture of rawhide gears was the principal business of the company. Now it makes both metal and rawhide gears, the production of metal gears being many times greater than that of rawhide.

The New Process Company is now doubling its plant and capacity. A large extension to the factory in Plum street is nearing completion and will be wholly occupied when it is completed.

Freight Car Shortage Slightly Less

While demand for freight cars is still unprecedentedly severe, another reduction in the net shortage was reported by the American Railway Association for the fortnight ending December 14

Automobile Securities Quotations

AUTOMOBILE and accessory securities had a quiet week on the bourses. The general tone was firm but in the limited trading, due to the holidays, the market trend was somewhat irregular. Tire stocks were the strongest feature of the market with Goodyear and Firestone close to the record mark. Compared with the level of the last day of 1911, stocks show a material advance.

	1911		1912	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	180	200
Ajax-Grieb Rubber Co., pfd	..	..	96	100
Aluminum Castings Co., pfd	..	..	99	101
American Locomotive, com	36	37	41½	42½
American Locomotive, pfd	105	106	106	107
Chalmers Motor Company	..	..	130	145
Consolidated Rubber Tire Co., com	5	12	13	14
Consolidated Rubber Tire Co., pfd	5	20	50	60
Firestone Tire & Rubber Co., com	178	180	328	335
Firestone Tire & Rubber Co., pfd	108	110	105	107
Garford Company, preferred	..	..	100	102
General Motors Company, com	34	36	32	34
General Motors Company, pfd	77	78	76	78
B. F. Goodrich Company, com	..	..	64	65
B. F. Goodrich Company, pfd	..	..	103	105
Goodyear Tire & Rubber Co., com	330	335	440	450
Goodyear Tire & Rubber Co., pfd	104	106	104	105
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	10	20
International Motor Co., pfd	..	..	40	60
Lozier Motor Company	..	..	..	38
Miller Rubber Company	..	..	160	170
Packard Motor Company, pfd	105	107	104	106
Peerless Motor Company	..	..	120	125
Pope Manufacturing Co., com	38	40	35	36
Pope Manufacturing Co., pfd	68	70	79½	80½
Reo Motor Truck Company	8	10	9	10
Reo Motor Car Company	23	25	20	21
Studebaker Company, common	..	..	33½	35
Studebaker Company, preferred	..	..	92	94
Swinehart Tire Company	..	..	110	112
Rubber Goods Mfg. Company, pfd	100	105	105	108
U. S. Motor Company, com	..	..	..	10
U. S. Motor Company, 1st pfd	..	..	..	70
U. S. Motor Company, 2nd pfd	..	..	..	35
White Company, preferred	..	..	105	108
Willys-Overland Company, com	..	..	70½	71
Willys-Overland Company, pfd	..	..	98¾	99⅜

and unofficial information since that date indicates that still further reductions in the shortage have been made. At the time of the report there was a net shortage of 34,392.

Last year at this time there was a net surplus of freight cars of 76,814; thus the showing for this year is 111,000 less than last year at the corresponding time.

Heavy snows in several sections delayed freight operation to some extent, but not sufficiently to produce congestion. At latest reports the cars are moving rapidly, but in volume never before equalled in this country. The next fortnightly report, covering the situation up to December 28, will be issued early in January, and it is expected to show a reduction of the net shortage to below 20,000 cars.

Six Elected by M. & A. M.

At a meeting of the Motor and Accessory Manufacturers on December 26, the following concerns were elected to membership:

The Dayton Malleable Iron Company, Dayton, O.; Herschell, Spillman Company, North Tonawanda, N. Y.; North East Electric Company, Rochester, N. Y.; Penberthy Injector Company, Detroit, Mich.; The Portage Rubber Company, Barborton, O.; Tyer Rubber Company, Andover, Mass.

U. S. Motor Issues No Certificates

According to official announcement of the United States Motor Company, the receivers have decided not to take advantage of the authorization of court to actually issue the $1,500,000 of receivers' certificates, permission to do which was given by United States District Judge Hough under date of October 28. The receivers state that pending the judicial sale of the properties, scheduled for January 8, manufacturing schedules will be followed only as hitherto outlined; consisting largely of operations to maintain existing cars.

Market Changes for the Past Week

QUOTATIONS for materials during the past week varied but little from those of the preceding week. The holidays were responsible for a rather noticeable limitation of activity and prices remained at their old levels in almost every case. Steel, copper and lead suffered no change, but tin advanced slowly and steadily throughout the week. It closed 0.5 cent higher per pound than it had opened after Christmas.

Lubricants, oils and fuels remained likewise at their old prices. Cottonseed oil fluctuated a little, but the principal products, petroleum and gasoline, closed as they had opened and without any tendency toward a change of prices.

Japanese silk declined slightly, whereas the Italian product remained at its old price. Outside of the changes just enumerated none took place. The table of prices follows:

Material	Wed.	Thurs.	Fri.	Sat.	Mon.
Antimony, per lb.	.09	.09	.09	.09	.09
Beams & Channels, 100 lbs.	1.61	1.61	1.61	1.61	1.61
Bessemer Steel, Pittsburgh, ton	27.50	27.50	27.50	27.50	27.50
Copper, Elec., lb.	.17 9/20	.17 9/20	.17½	.17½	.17 9/20
Copper, Lake, lb.	.17½	.17⅝	.17⅝	.17⅝	.17⅝
Cottonseed Oil, Jan., bbl.	6.13	6.13	6.14	6.14	6.12
Cyanide Potash, lb.	.19	.19	.19	.19	.19
Fish Oil (Menhaden), Brown	.33	.33	.33	.33	.33
Gasoline, Auto, 200 gals. @	.21	.21	.21	.21	.21
Lard Oil, prime	.92	.92	.92	.92	.92
Lead, 100 lbs.	4.25	4.25	4.25	4.25	4.25
Linseed Oil, prime	.46	.46	.46	.46	.46
Open-Hearth Steel, per ton	28.00	28.00	28.00	28.00	28.00
Petroleum, bbl., Kansas crude	.83	.83	.83	.83	.83
Petroleum, bbl., Pa., crude	2.00	2.00	2.00	2.00	2.00
Rapeseed Oil, refined	.69	.69	.69	.69	.69
Silk, raw, Italy	....	4.35	....	....	4.35
Silk, raw, Japan	....	3.77½	....	....	3.72½
Sulphuric Acid, 60 Beaumé	.90	.90	.90	.90	.90
Tin, per 100 lbs.	50.20	50.25	50.375	50.45	50.75
Tire Scrap	.09¾	.09¾	.09⅞	.09⅞	.09⅞

Stoddard-Dayton to Fight for License

Receivers Decline Notice of Cancellation Served Upon the Company by the Owners of the Knight Patents

Testimony Taken in Huber Patent Case—Hardie Buys Interest in Miller Car Company

ANNOUNCEMENT was made last Thursday by receivers of United States Motor Company that notice of cancellation served upon the Dayton Motor Car Company with reference to the license of that company under the Knight sliding-sleeve engine patents had been declined on the part of that company.

Counsel representing the Dayton Motor Car Company have advised the company that in their opinion the contract between the Knight company and the Dayton Motor Car Company contains nothing upon which such cancellation order can be based, predicated upon any act so far performed by the Dayton Motor Car Company.

According to the receivers no move has yet been made to deliver a similar notice of cancellation to the Columbia Motor Car Company.

It was stated with color of authority that the chances favored an immediate withdrawal of the demand for cancellation of the Stoddard-Dayton license.

This is said to be due to the promising prospects of the United States Motor Company, the judicial sale of which is scheduled to take place January 8.

Up to date the creditors' committee reports that slightly in excess of 97 per cent. of all claims against the company have been filed and that before the date of sale practically the whole mass of claims will be represented by the committee.

The second call on the assessment directed to the stockholders was promptly paid by a sufficient number to constitute a majority of the outstanding issues, according to statements of the reorganization committee.

Testimony Taken in Huber Case

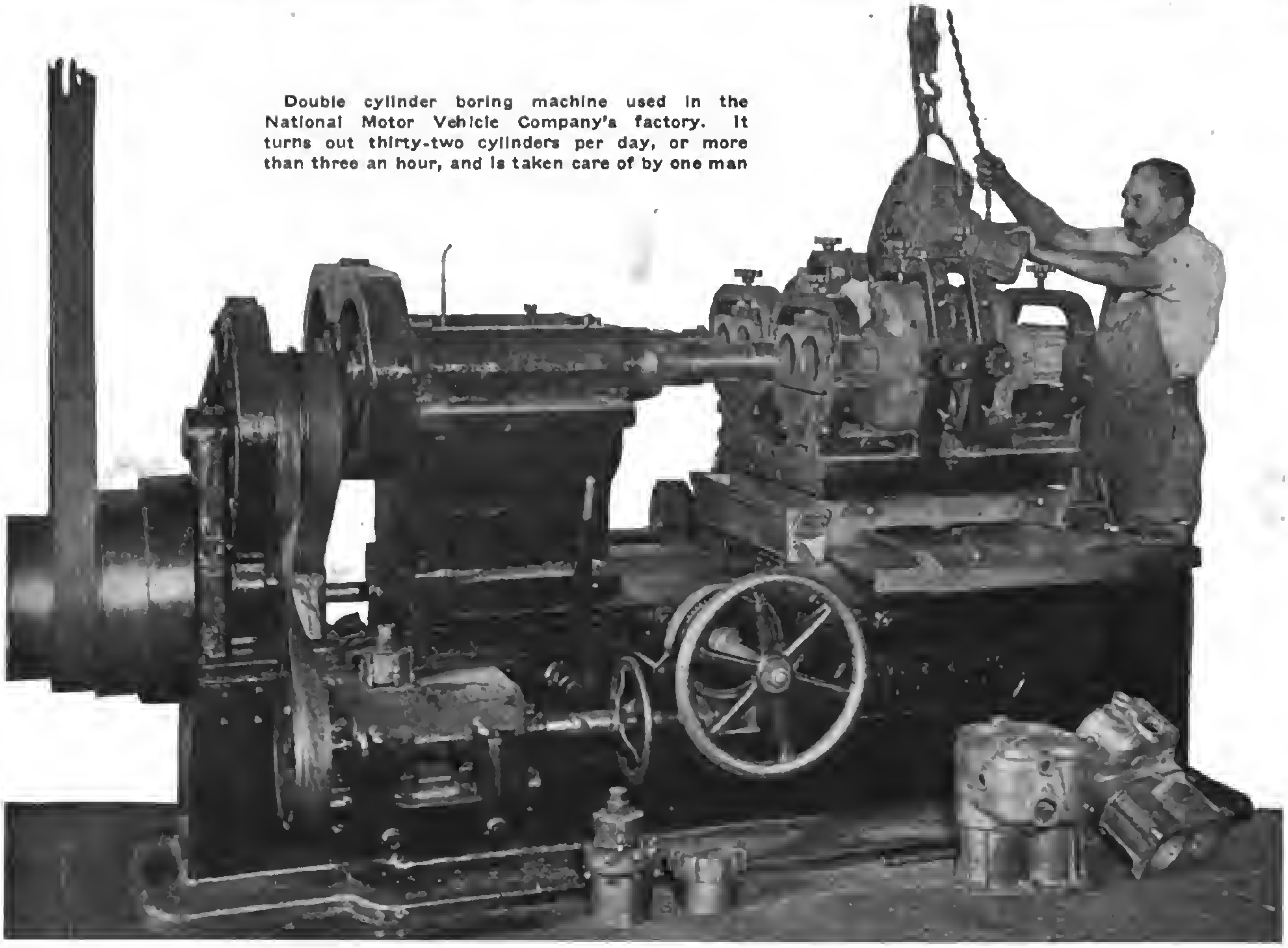
DETROIT, MICH., Dec. 30—In an effort to establish a *prima facie* case in the alleged patent infringement case of the North American Vehicle Company against the Detroit Taxicab & Transfer Company, in the federal court at Detroit, Attorney R. A. Parker, representing the complainants, took the deposition of Charles E. Wisner, mechanical designer and engineer, before E. P. Voorheis, United States Court Commissioner. The case involves the Emil Huber patent on three-point suspension of the motive mechanism to the main frame of an automobile and is being defended by the Kelly Motor Truck Company of Springfield, O., whose trucks the Detroit company is using. Engineer Wisner's testimony was to the effect that he considers the variation between the mechanism of certain portions of the truck and the Huber patent immaterial.

Hardie Takes Interest in Miller

DETROIT, MICH., Dec. 30—*Special Telegram*—James M. Hardie, who has been Chicago sales representative of the Miller Car Company of Detroit, has purchased stock in the company and has become secretary, treasurer and general manager. J. C. Hallock, whom he succeeds as secretary and treasurer, will confine more of his energies to the Detroit Excelsior Company, with which he is identified. According to Mr. Hardie the business of the Miller Company will be increased.

Factory Miscellany

Double cylinder boring machine used in the National Motor Vehicle Company's factory. It turns out thirty-two cylinders per day, or more than three an hour, and is taken care of by one man



CUTTING the time of a job in two without the use of extra men means the saving of money. The machine for boring cylinders shown in the above illustration does that very thing. It bores two cylinders at a time and requires the attention of one man. National cylinders are cast in pairs and are of the T-head type. The two cylinders in one block are too close together to work upon at the same time, therefore two blocks are placed in the machine and the outside cylinder in each block is bored. After this operation they are reversed by the aid of a chain fall and a device that looks like an ice tongs and the other two cylinders are bored. The T-head shape of the casting renders this possible on account of the symmetry. Sixteen pairs, or thirty-two cylinders are bored in one day of 10 hours, averaging 3.2 cylinders to the hour or about one cylinder every 19 minutes.

MOON Increased 65 Per Cent.—The Moon Motor Car Company, St. Louis, Mo., has increased its capacity about 65 per cent. in the last few months. This has been achieved by the addition of extra floor space in the building of an extra story and a building attached to the main building, all of which new space has been filled with machinery and is now in operation. The rear axle department recently added a number of new boring mills, and presses, one of 25-ton capacity. The testing department has been moved into a separate building, occupying much more floor space than formerly and now operated under its own power. The company is taking in new men daily and training them into the work.

Another Tractor Factory—The Canada Standard Automobile & Tractor Engine Company, Moose Jaw, Sask., is having plans prepared for a new factory.

Ravenna's Plant—The Ravenna Auto Truck Company, Ravenna, O., is erecting a plant 50 feet by 150 feet, for the manufacture of the Ravenna automobile truck.

Fedders Building—The Fedders Manufacturing Company, Buffalo, N. Y., automobile radiator maker, is building an addition to its plant at Tonawanda street and West avenue.

Chapin Autocycle Builds—The Chapin Autocycle Company, Brantford. Ont., recently incorporated with a capital of $200,000, will erect a factory, employing about 100 men.

Armitage Leather Company Builds—The Armitage Leather Company, Detroit, Mich., recently incorporated with a capital of $35,000, has established a plant at 87 West Congress street.

Louisville Concern Builds—Miller, White & Company, Louisville, Ky., recently incorporated with a capital of $5,000, has secured quarters at Third and Walnut streets, and is now buying machine tools.

Tractor Company Adding—The Killen-Walsh Manufacturing Company, Appleton, Wis., has leased the Double Power Wind Mill Company's plant at that city and is already engaged in the construction of additions.

New Bridgeport Factory—The Bridgeport Auto Company, Bridgeport, Conn., is starting work on its new factory, which is expected to be one of the largest automobile, motor boat and aeroplane factories in the world.

Miller Rubber Factory—Work will be started at once on erecting a four-story brick, steel and concrete factory building for the Miller Rubber Company, Akron, O., to cost $80,000.

Petrolea Planning Addition—The Petrolea Motor Car Company, Petrolea, Ont., plans an addition to its automobile factory in that city. A by-law will be submitted to the taxpayers to grant a $10,000 bonus for the extension.

Budd Building—The Budd Manufacturing Company, Philadelphia, Pa., is having plans prepared for a three-story factory building, 75 feet by 500 feet, to cost about $100,000. The company is manufacturing steel automobile bodies.

Anderson Gear Company Operating—The Anderson Rolled Gear Company, Cleveland, O., has taken over the new plant of the Cleveland Drop Forge Company, and is now operating a number of gear rolling machines on both spur and bevel gear work.

Prest-O-Lite Plant Explodes—The plant of the Prest-O-Lite Company, Indianapolis, Ind., exploded recently. The watchman was killed. The loss was $30,000. The explosion is believed to have come from the boiler, with the result that the plant ignited.

Plant Being Enlarged—The Craig-Center Auto Company, Pittsburgh, Pa., has secured additional vacant property on which it intends to erect additional buildings for show rooms and factory purposes. The new building will have a total floor space of 18,000 square feet.

Herring in New Quarters.—The Herring Motor Company, Des Moines, Ia., is moving into a four-story brick building. One entire floor of the building will be given over to the assembling plant where twenty Ford cars are assembled daily. Another floor will be used by the Herring Motor Supply Company.

Lee & Porter Building—The Lee & Porter Manufacturing Company, Buckhannan, Mich., makers of automobile axles, will at once proceed with the work of erecting a frame addition, with concrete foundations, to its plant, which will be 32 feet by 90 feet. About $8,000 worth of new machinery will be installed.

Club for Goodyear Employees—The Goodyear Tire & Rubber Company of Canada, Bowmanville, Ont., is taking care of its employees in a manner that tends to promote the best feeling between the company and the employee. It has purchased the Balmoral Hotel at Bowmanville and turned it into an up-to-date club for the benefit of the members of its staff.

Plans Another Addition—With two new buildings, aggregating 75,000 square feet of floor space, nearing completion, the Chalmers Motor Company, Detroit, Mich., now announces the erection of a third structure. This new building will be used for general manufacturing purposes and will have 24,000 square feet of floor space. It will be one story in height and 160 feet by 150 feet.

Alco Plant Splendidly Equipped—Among the noteworthy features of the American Locomotive Company's, Providence, R. I., plant is a heat-treating department, having twenty-one furnaces, all run by an automatic instrument, which prevents the metals from being burned. Then there is a chemical laboratory, also a physical laboratory to determine strains and shocks. Another feature of the plant's equipment is a 250,000-pound steam hammer, which cost $51,000 and is the largest in the country. It is used to drop forge the Alco axles and crankshafts. The plant includes twelve buildings on a ten-acre plot.

Factory of the Moon Motor Car Company, St. Louis, Mo.

The Automobile Calendar

Shows, Conventions, Etc.

Jan. 2-10..........New York City, Importers' Salon, Hotel Astor, Importers' Automobile Alliance.
Jan. 4-11..........Cleveland, O., Annual Automobile Show.
Jan. 4-11..........Montreal, Que., Montreal Motor Show, Drill Hall and 65th Regiment Armory.
Jan. 11-18.........Milwaukee, Wis., Annual Show, Auditorium, Milwaukee Automobile Dealers' Association.
Jan. 11-25.........New York City, Thirteenth Annual Show, Madison Square Garden and Grand Central Palace, Automobile Board of Trade.
Jan. 18-25.........Philadelphia, Pa., Annual Automobile Show.
Jan. 21-26.........Toledo, O., Annual Show, Exposition Building, Toledo Automobile Shows Company.
Jan. 25-Feb. 1.....Montreal, Que., Montreal Automobile and Truck Show, R. M. Jaffray, Manager.
Jan. 25-Feb. 1.....Providence, R. I., Annual Show, State Armory, Rhode Island Automobile Dealers' Association, Inc.
Jan. 27-Feb. 1.....Philadelphia, Pa., Truck Show.
Jan. 27-Feb. 1.....Buffalo, N. Y., Annual Automobile Show.
Jan. 27-Feb. 1.....Detroit, Mich., Annual Automobile Show.
Jan. 27-Feb. 1.....Rochester, N. Y., Annual Show, Exposition Park, Dealers' Association.
Jan. 27-Feb. 1.....Scranton, Pa., Annual Automobile Show, Hugh B. Andrews.
Jan. 27-Feb. 13....Troy, N. Y., Annual Show, State Armory, Troy Automobile Club.
Feb. 1-8...........Chicago, Ill., Annual Automobile Show, Coliseum and 7th Regiment Armory.
Feb. 3-8...........Washington, D. C., Annual Show.
Feb. 8-15..........Hartford, Conn., Annual Show, State Armory, Hartford Automobile Dealers' Association.
Feb. 10-15.........Chicago, Ill., Truck Show.
Feb. 10-15.........Minneapolis, Minn., Annual Automobile Show.
Feb. 10-15.........Ottawa, Ont., Ottawa Motor Show, Howick Hall, Louis Blumenstein.
Feb. 11-15.........Binghampton, N. Y., Annual Show, State Armory, Dealers' Association, R. W. Whipple.
Feb. 15-22.........Albany, N. Y., Annual Show, State Armory, Dealers' Association.
Feb. 15-22.........Newark, N. J., Annual Automobile Show, First Regiment Armory, New Jersey Automobile Exhibition Company.
Feb. 16-23.........Richmond, Va., Annual Show.
Feb. 17-22.........Kansas City, Kan., Annual Automobile Show.
Feb. 18-19.........Madison, Wis., Annual Show, City Market Building, Dealers' Association.
Feb. 18-21.........Grand Forks, N. D., Annual Show, Auditorium, Dealers' Association.
Feb. 18-22.........Baltimore, Md., Annual Show, B. A. D. A.
Feb. 19-22.........Bloomington, Ill., Annual Show, Coliseum, McLean County Automobile Club.
Feb. 19-22.........Geneva, N. Y., Automobile Show, Armory, Louis Blumenstein.
Feb. 19-23.........New Orleans, La., Annual Show.
Feb. 19-27.........Topeka, Kan., Annual Show.
Feb. 20-22.........Canadaigua, N. Y., Automobile Show, Louis Blumenstein.
Feb. 22-Mar. 1.....Brooklyn, N. Y., Annual Show, 23rd Regiment Armory.
Feb. 24-27.........Kansas City, Mo., Truck Show.
Feb. 24-Mar. 1.....St. Louis, Mo., Annual Show.
Feb. 24-Mar. 1.....Memphis, Tenn., Annual Show.
Feb. 24-Mar. 1.....Omaha, Neb., Annual Automobile Show.
Feb. 24-Mar. 1.....Paterson, N. J., Annual Show, Paterson Automobile Trade Association.
Feb. 24-Mar. 5.....Cincinnati, O., Annual Show, Music Hall, Cincinnati Automobile Dealers' Association.
Feb. 26-Mar. 1.....Fort Dodge, Ia., Annual Show.
Feb. 26-Mar. 1.....Glen Falls, N. Y., Automobile Show, Louis Blumenstein, Manager.
March 3-8..........Pittsburgh, Pa., Annual Automobile Show.
March 3-18.........Des Moines, Ia., Annual Show, Pleasure Car Section, Coliseum, Dealers' Association.
March 5-8..........Tiffin, O., Annual Show, Tiffin *Daily Advertiser*.
March 8-15.........Boston, Mass., Annual Automobile Show.
March 12-15........Ogdensburg, N. Y., Automobile Show, Louis Blumenstein, Manager.
March 18...........Syracuse, N. Y., Annual Show, Syracuse A. A.
March 19-26........Boston, Mass., Annual Truck Show.
March 20-24........New Orleans, La., Annual Show, N. O. A. D. A.
March 24-29........Indianapolis, Ind., Annual Automobile Show.
Jan. 6.............New York City, Meeting Motor Dealers' Contest Association.
Jan. 14............New York, Beefsteak Dinner, Big Village Motor Boosters.
Jan. 15............New York City, Banquet, Waldorf-Astoria, Motor and Accessory Manufacturers.
Jan. 16............New York City, Meeting, Hotel McAlpin, Society of Automobile Engineers.
Jan. 17............New York City, Banquet, Hotel McAlpin, Society of Automobile Engineers.

Race Meets, Runs, Hill Climbs, Etc.

May 30.............Indianapolis, Ind., 500-Mile Race, Speedway.

Foreign

Jan. 11-22.........Brussels, Belgium, Annual Belgian Automobile Show, Centenary Palace.
March ....France, Sealed Bonnet 3000-Mile Run.
March 31...........Montevidio, Uruguay, International Competition of Agricultural Motor Vehicles.
April ....Barcelona, Spain, International Exhibition.

One of the views along the Pacific Highway on the borderline between the States of Washington and Oregon

AMERICAN Cars in Majority—Practically all cars purchased in Bahia, Brazil, during 1912, were of American manufacture. Previously the sales had been confined to European cars. The change was due to the fact that two large hardware firms imported a number of American cars. That the Bahia public thought them superior to European cars was evidenced by the early sale of all cars on hand. Larger stocks of 1913 cars are being laid in.

Philadelphia Pullman Moves—The Pullman Automobile Company, Philadelphia, Pa., has moved to 1927 Market street.

Golde Top on Edwards—The Edwards car, manufactured by the Edwards Motor Car Company, New York City, is to be equipped with the Golde patent top.

Republic's St. Louis Branch—The Republic Rubber Company, Youngstown, O., will establish a branch at 2018 Locust street, St. Louis, Mo., with G. M. Hoffman as manager.

Chase Establishes Factory Branch—The Chase Motor Truck Company, Syracuse, N. Y., has established a factory branch in Philadelphia, Pa., with E. F. Howell as manager.

Building New Garage—The Garrison Garage Company, Baltimore, Md., has been formed and is building a handsome garage to accommodate the increased number of automobiles.

Baltimore Secures Show Building—Formal announcement is made that the Fifth Regiment Armory, Baltimore, Md., has been secured again for holding the automobile show from February 18 to February 22, inclusive.

Caten Vice-President—W. L. Caten has just assumed the office of vice-president and general manager of The Speedwell Motor Car Company, Dayton, O. This involves no change in any other officers of the company.

Stage Line in Wisconsin—The first stage line in Wisconsin since the days when horses were hitched to lumbering wagons, has been established between Kiel and Manitowoc, a 45-horsepower KisselKar forming the medium of transportation. The coach seats 32 persons and a driver, and has space for small luggage.

License Yellow and Black—The new automobile licenses for 1913, in Maryland, will be of yellow numbers on black background. These licenses are now being distributed at the office of Motor Vehicle Commissioner Roe.

Heinz Company Organized—The Heinz Motor Company, Baltimore, Md., has been organized and will be located at 533 North Howard street, where it will handle a full line of automobile tires and accessories, as well as automobiles.

Barger Rambler Representative—The Thomas B. Jeffery Company, Kenosha, Wis., makers of Rambler cars, has appointed W. H. Barger, Cleveland, O., as representative for the Cross Country model in that city and northeastern Ohio.

Barnes Promoted—W. R. Barnes has been promoted to district supervisor over the six factory branches of the Goodyear Company, located in Philadelphia, Pittsburgh, Scranton, Pa., Baltimore, Md., Washington, D. C., and Richmond, Va., with his headquarters in Philadelphia.

Colorado's Second Automobile Stage—The establishment of the second automobile stage in Pueblo County, Colorado, has just been reported. A high-powered automobile has taken the place of the old horse-drawn stage line between Pueblo and Beulah, a distance of 30 miles.

Biscuit Company Purchases Trucks—The Toledo Biscuit Company, Toledo, O., which has been experimenting with motor trucks for delivery purposes for some time, has decided to discard horses and has ordered a fleet of trucks from the Toledo Motor Truck Company.

Massachusetts State A. A. Banquet—The Massachusetts State A. A. has planned to have its annual banquet at the Hotel Somerset, Boston, Thursday evening, January 9, at which President Lewis R. Speare will preside and an address will be made by President Laurens Enos of the A. A. A.; George C. Diehl, chairman of the A. A. A. Good Roads Board; A. G. Batchelder, chairman of the A. A. A. executive committee; Colonel W. D. Sohier, chairman of the Massachusetts Highway Commission and President W. D. Parker of the Maine Automobile Association.

New Agencies Established During the Week

PLEASURE CARS

Place	Car	Agent
Beaver Dam, Wis	Enger	E. H. Pesbak
Berwyn, Neb	Enger	F. Miller
Boston, Mass	Studebaker	Donovan Motor Car Co.
Carroll, Ia	Cartercar	Carroll Cartercar Co.
Cedar Rapids, Ia	Enger	J. E. Elgin
Cleveland, O	Enger	L. M. Danner
Council Bluffs, Ia	Enger	J. G. McLesn
Craig, Ia	Moon	Craig Auto Co.
Cnlbertson, Neb	Hupmobile	August Sinner
Decatur, Ill	Moon	N. Main Street Garage
Eaton, O	Enger	J. A. Longnecker & Son
Geneva, Ind	Enger	A. P. Hardison
Goebner, Neb	Nyberg	Geo. Madison
Grinnell, Ia	Enger	Brownell & La Grsnge Co.
Hamilton, O	Moon	Orme Motor & Transfer Co.
Highland Park, Ill	Franklin	W. B. Ten Broeck
Kansas City, Kan	Enger	Security Gar. Repair & Sales Co.
Lincoln, Neb	Hupmobile	Goddard Auto Co.
Lockington, O	Enger	S. S. Gabriel
Logan, Ia	Abbott-Detroit	Kennedy Bros.
Maryville, Mo	Enger	W. W. Jones Co.
Maryville, Mo	Enger	G. B. Roseberry
Marcus, Ia	Moon	Johnson, Petty & Johnson
Massillon, O	Enger	A. H. Coleman
McCook, Neb	Hupmobile	McCook Mach. & Iron Wks.
Milledgeville, Ill	Enger	Miller Bros.
Montreal, Can	Enger	Poiriere, Rossette & Cie
New Haven, Conn	Moon	J. J. Laverty
North Englisb, Ia	Enger	W. C. Carson & Co.
Pawnee City, Neb	Studebaker	O. H. Sebenk
Red Oak, Ia	Cartercar	Whitaker Implement Co.
Rosenberg, Tex	Moon	Rosenberg Automobile Co.
Sharpsburg, Pa	Enger	Aupke Brotbers
Shelby, Neb	Enger	McBetb Brotbers
Sioux City, Ia	Moon	Bennett Auto & Supply Co.
Valentine, Neb	Hupmobile	Valentine Auto Co.
Wall Lake, Ia	Moon	Hopkins & Herrig
Waterloo, Ia	Franklin	Cramer & Bennett
Waukesbs, Wis	Enger	F. E. Shrader
Youngstown, O	Moon	Regal Sales Co.

COMMERCIAL VEHICLES

Place	Car	Agent
Boston, Mass	Stewart	H. Ross Maddocks
Cbicago, Ill	Stewart	Voltz Bros.
Hartford, Conn	Stewart	Capital City Auto Sales Co.
Montreal, Que	Stewart	Ralpb Careau
Pittsburg, Pa	Stewart	Alco-Pittsbnrgh Sales Co.
San Francisco, Cal	Stewart	S. G. Cbapman
St. Louis, Mc	Wilcox Trux	Wilcox Trux Sales Co.
Washington, D. C	Stewart	D. S. Hendrick

Move Salesrooms—Hess & Son will be located at 1031 Chestnut street, Philadelphia, Pa., after January 1.

Marble Purchases Company—W. H. Marble has purchased the personal property of the Leighton Auto Company, Brockton, Mass.

Gentry, Laplock Manager—H. C. Gentry has been appointed manager of the New York City branch of the Stein Laplock Tire Company.

Titus, Southern Alco Representative—F. J. Titus has been appointed southern representative of the American Locomotive Company, Providence, R. I.

Engler, Chief Engineer—W. B. Engler has been promoted to the post of chief engineer of the General Motors Truck Company, Pontiac, Mich. He will be in charge of the experimental and development work.

Cartercar's Atlanta Factory Branch—The Cartercar Company, Pontiac, Mich., has established an Atlanta, Ga., factory branch with W. C. Mahoney manager. The address of the new branch is 242 Peachtree street.

By Way of Correction—In the issue of THE AUTOMOBILE on December 19, 1912, a typographical error was made in describing the Marathon car. The Runner roadsters have three speeds forward, instead of two.

Moline Purchases Truck—Moline, Ill., is to purchase an additional fire truck, the city commission having decided to dispose of its remaining horse-drawn apparatus and increase the efficiency of the department with motor apparatus.

Pence Receives 150 Buicks—The Pence Automobile Company, Minneapolis, Minn., has received a train load of fifty freight cars of Buicks from the factory at Flint, Mich. The train left Flint December 24 and reached Minneapolis over the Milwaukee road December 27. The shipment was 150 automobiles.

United States Purchases Alcos—The United States Government has purchased from the American Locomotive Company, Providence, R. I., four trucks, two of which will be employed in army activities at the West Point post, and the others in salvage work in the fire department at Manila.

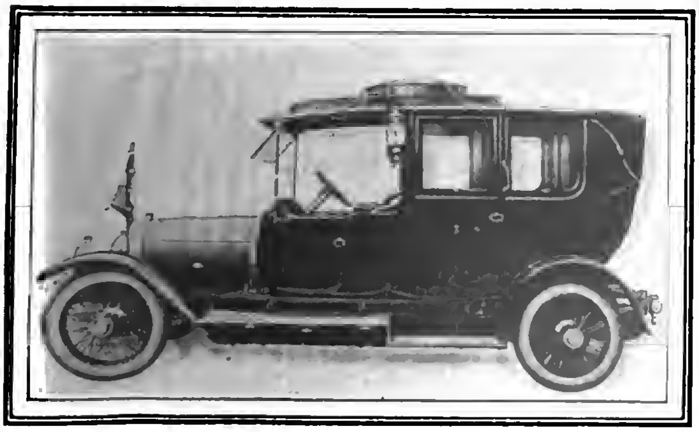
Want Ohio Assembly Aid—Extensive aid will be asked of the Ohio General Assembly this winter in the campaign of road building. The movement to have the General Assembly make direct levies for good roads has gained impetus since the defeat of the constitutional amendment to issue bonds.

Baltimore's Automobile Bank—The first automobile bank to be established in Baltimore, Md., went into service recently. This bank is used by the German-American Bank of Baltimore, and was put into service to enable the bank to accommodate its depositors in outlying sections of the city.

Milwaukee Company Bankrupt—The Bates-Odenbrett Automobile Company, Milwaukee, Wis., has been closed by involuntary bankruptcy proceedings. It is believed that a reorganization will be effected and the business, which apparently was one of the best in Milwaukee, continued.

Both Shaffers Add Agencies—R. M. Shaffer, of the Shaffer Manufacturing Company, Baltimore, Md., has become sales agent for the Pullman car, while Charles A. Shaffer, son of R. M. Shaffer, of the same company, has taken on the agency for the Selden car and will have offices and salesrooms with the company, which also handles the R. C. H. car here.

Want Ohio Assembly Aid—Extensive aid will be asked of the Ohio General Assembly this winter in the campaign of road building. The movement to have the General Assembly make direct levies for good roads has gained impetus since the defeat of the constitutional amendment to issue bonds. It is estimated that this would raise between $3,000,000 and $3,500,000 annually.



The Queen of the Netherlands' 30-horsepower Spyker automobile has been fitted with Rudge-Whitworth detachable wire wheels. The car, a torpedo-landaulet-limousine, carries a spare wheel on the right running board of the car and one on the roof of the body

The city of Baltimore now possesses an automobile bank, the Chalmers chassis and Zeil body here shown having been designed for the German-American Bank. The wooden body on the 30-horsepower chassis is finished as in steel and fully equipped for its purpose

Electric signs blazed at the Paris Salon and electroliers increased their magnificent impression

Marble Resigns—C. L. Marble, purchasing agent for the Abbott Motor Company, Detroit, Mich., has resigned.

Schott to Move—About January 1, S. W. Schott, Columbus, O., distributor for the Empire and Brush cars, will move his headquarters to 237 North Fourth street.

Frisco's Apparatus Complete.—San Francisco, Cal., has recently added a new high pressure Pope-Hartford hose wagon, which makes its fire fighting apparatus complete.

Coral for Surfacing Road—Coral is to be used in surfacing the new road which is to be built from New Orleans, La., to the Southern Yacht Club's properties on Lake Pontchartrain.

Washington Man Bankrupt—A voluntary petition in bankruptcy has been filed by Frederick K. Barbour, Washington, D. C., whose assets are listed at $4,438 and his liabilities at $9,021.

Erecting New Garage—The Yager Motor Car Company, Louisville, Ky., agent for the Hupmobile and Peerless cars, is erecting a new garage at Third avenue and the L. and N. railroad crossing.

Handles Walpole Tires—The Bracken Stanton Company, Columbus, Ohio, is the name of a new concern which has opened a tire business at Fourth and Gay streets and will handle the Walpole tires.

Tennant Resigns—C. A. Tennant, connected with the Sundry Department of the Franklin Automobile Company, Syracuse, N. Y., for the past five years, has resigned to accept a position with the Middlesex Bridge Company of New Brunswick, N. J.

Truck Proves Value—An automobile delivery truck furnished by the Post Office Department to the Selma, La., office has proven its worth. During the Christmas rush the use of the truck enabled the delivery of all mails on the usual schedules.

Adds Extra Garage—The T. C. Bradford Automobile Company, Wilmington, Del., has taken possession of the Postles garage, adjoining its garage, and is occupying both, additional room having been required since the Bradford Company inaugurated a taxicab service.

Wolverine Club to Move—The directors of the Wolverine Automobile Club have decided to move their headquarters not later than January 15. It is reported that the club will select the Tuller Hotel, where a dining room on the first floor will be converted into a clubroom 50 feet by 50 feet.

Shuman Cales Manager—C. S. Shuman, who has had charge of the Burn-Boston Battery Company's business in New York City, has ben made sales manager of the Automobile Supply & Manufacturing Company of Brooklyn, N. Y. This company makes the Newtone electric horn, also bulb horns.

Wilmington Company Adds—The Wilmington Automobile Company, Wilmington, Del., has opened an extension in the rear, with a frontage of about 100 feet. The rear section was a public stable until bought by the automobile company, which had it rebuilt. The main building and extension are of brick and concrete construction.

Studebaker to Move—The Studebaker Company, of Minneapolis, Minn., has made a lease for a three-story building, to be erected on a site 75 feet by 154 feet at Fourteenth street and Hennepin avenue in the heart of automobile row. Work will begin at once and the building will be ready by spring. The structure will cost about $75,000.

Des Moines Space Sold—All the space for the fourth annual Des Moines automobile show, to be held at the Coliseum March 3 to 14, has been sold and firms are still seeking admission. This in spite of the fact that the show has been lengthened to a two-weeks affair with pleasure cars only shown the first week. Arrangements are now being made for an overflow show.

Closes Garage—Following is the new policy of the Olds Motor Works to withdraw its wholesale branches in several cities and to handle the wholesale business through its factory at Lansing, Mich., the three-story garage at 728-730 South Fourth avenue, Louisville, Ky., the finest garage in Kentucky, has been sold. The consideration, it is understood, was close to $75,000.

Milwaukee's Two Cars—Milwaukee, Wis., has just placed in service two new motor police patrol and ambulance cars, built according to Milwaukee's specifications by the Kissel Motor Car Company, of Hartford, Wis. The cars cost $3,500 each and supplant three horse-drawn patrols now used by the

Automobile Incorporations

AUTOMOBILES AND PARTS

APPLETON, WIS.—Killen-Walsh Manufacturing Company; capital, $100,000; to manufacture an automobile tractor. Incorporators: W. H. Killen, W. L. Walsh, W. J. Walsh, William Strait.

BALTIMOAE, MD.—Maryland Motor Car Insurance Company; capital, $300,000; to insure automobiles. Incorporators: J. C. Fenhager, W. Whitridge, W. G. Bowdoin, J. P. Bonsal.

BOSTON, MASS.—R. B. Nettleton Company; capital, $1,000; to deal in automobiles. Incorporators: R. S. Barlow, S. G. Barker.

BOSTON, MASS.—Norwalk Motor Car Company; capital, $75,000; to deal in automobiles. Incorporators: C. C. Smith, J. W. Briggs, M. A. Beaudet.

CHICAGO, ILL.—Marmon Automobile Company; capital, $20,000; general automobile business. Incorporators: M. E. Horn, C. E. Worbstein, E. J. Ehlers.

CLEVELAND, O.—Praco Manufacturing Company; capital, $15,000; to manufacture automobile lamps. Incorporators: H. G. Smith, J. C. Hipp, T. J. Smith, Tony Laness, Dan Pfahl.

DETAOIT, MICH.—Detroit Armature & Motor Works; capital, $10,000; to manufacture automobile parts. Incorporators: W. J. Harting, J. S. Keightley, M. E. Reynolds.

JUNEAU, WIS.—Juno Motor Truck Company; capital, $125,000; to manufacture automobiles. Incorporators: L. C. Pautsch. H. A. Henning.

NEW YOAK CITY—Eureka Auto Dispatch; capital, $1,000; automobile express. Incorporators: R. C. Cuyler, J. C. Stewart, F. T. Lind.

MORAISTOWN, N. J.—Morristown Auto Company; capital, $25,000; general automobile business. Incorporators: J. J. Lyons, L. Van Gasbeek, A. Newkark.

NEW ORLEANS, LA.—J. A. Landry Motor Car Company; capital, $25,000; to deal in automobiles. Incorporators: J. A. Landry, J. B. Avegno, R. J. Monroes.

NEW YOAK CITY—Haverty's Taxicabs Incorporation; capital, $1,000; to carry on a taxicab trade. Incorporators: Charles O'Brien, Charles O'Brien, Jr., Margaretta V. Curran.

NEW YOAK CITY—Vaughn Car Company; capital, $1,000,000; to manufacture automobiles. Incorporators: R. C. Thompson, Julius Kahn, Paul Kammerer.

QUINCY, ILL.—Broadway Auto Sales Company; capital, $2,500; to deal in automobiles. Incorporators: Alex. Thompson, J. G. Stuart, J. G. Clough.

SAN ANTONIO, TEX.—Motor Car Supply Company; capital, $5,000; to deal in automobiles and accessories. Incorporators: C. P. Guthrie, H. B. Lyne, James Harrison, Will Harrison.

SOUTH BEND, IND.—Cadillac Motor Sales Company; capital, $10,000; to deal in automobiles. Incorporators: N. A. Otis, G. H. Grieger, E. W. Steinhart.

South, West and Bay View police stations. One horse patrol is abolished entirely.

Operated by Gasoline Motors—The Badger Electric Railway & Power Company, Jefferson, Wis., which is to build an interurban railway from Lake Geneva, Wis., to Watertown, Wis., via Jefferson, announces that it will operate its cars by gasoline motors instead of by electricity. It will be the first interurban or street railway line in Wisconsin to employ gasoline motors for this purpose.

Grossman Establishes English Branch—Upon his recent visit to London, Mr. Emil Grossman established an English company known as the Emil Grossman Company, under the management of Messrs. Krauss & Auerbach, at 144 Queen Victoria street, London, E. C. This branch will be the distributing depot and center of activity in Europe to support the invasion of Europe by the Red Head spark plug.

Smith-Hoppe Chalmers Agents—By taking on the Chalmers line, the Smith-Hoppe Auto Company, 215 Wisconsin street, now carries the two original lines of the Kopmeier Motor Car Company, of Milwaukee, Wis., the Detroit electric and Chalmers. The Kopmeier company now represents the Fiat and Flanders gas and electric cars, while Smith-Hoppe represents the R. C. H., Hupp-Yeats, Chalmers and Detroit.

Columbus Buys Automobile—The Columbus, O., postoffice has arranged for an automobile service for deliveries in the new parcel post system which becomes effective January 1. Postmaster Krumm has arranged for one automobile to take up the service at the beginning, but the number will be increased as occasion demands. It is believed a half dozen cars will be necessary to take care of the business within 6 months.

Spitzley and Bush Resign—B. C. Spitzley, general manager, and W. T. Bush, general sales manager, have resigned their connections with the Abbott Motor Company, Detroit, Mich., according to a report which has been confirmed. No statement has been given out by either of the officials and no inkling as to their plans for the future has been given to the public. Mr. Spitzler has just returned from a western trip for the company.

Concerning Franklin Conferences—A conference of the Franklin automobile dealers in the New England territory was held recently at the Franklin factory, Syracuse, N. Y., with Robert H. LaPorte, New England district sales manager, presiding. The Franklin dealers in the Pacific Coast territory will hold a conference at the Franklin factory on January 9, with John F. McLain, district sales manager of the coast territory, presiding.

Interior view of the Paris Salon at night, showing splendid scheme of illuminating the hall

Winter Sheboygan President—A. F. Winter has been elected president of the Sheboygan, Wis., Automobile Club, which recently was rejuvenated and now has a total of nearly 200 members. J. H. Optenberg was elected vice-president and Arthur F. Raab is the new secretary and treasurer. T. M. Bowler continues as counsel and will take an important part in the Wisconsin State A. A.'s work before the coming session of the Legislature.

Propose New Indianapolis Ordinance—The Hoosier Motor Club, Indianapolis, Ind., has asked the advisory commission to Mayor Shank, of that city, to indorse a proposed ordinance forbidding automobiles to go around street cars on the left-hand side. The club will submit such an ordinance to the city council at an early date and will use its influence to have it passed. The habit of going around street cars on the left side is regarded by the club as a dangerous one.

Indianapolis Has Successful Season—One of the best indications of the successful automobile business in Indianapolis, Ind., during 1912, was the large increase in the number of automobile licenses issued by the city, as compared with 1911. The number of licenses issued was 3466, as compared with 2600 in 1911. Licenses issued in 1912 were classified as follows: runabouts and roadsters, 1300; touring cars, 1802; light trucks, 172, and trucks of more than one thousand pounds, 192.

Galveston-Winnipeg Road—The final step was taken in logging the Meridian Winnipeg, Can., to Gulf automobile road, when J. C. Micholson, secretary of the Meridian Road Association arrived in Galveston, Tex., from Winnipeg, having covered a distance of 2,000 miles by automobile. There is a very important feature to this highway which should be borne in mind. Winnipeg, a city of 200,000 population, is so situated that Galveston, in point of actual distance, is the nearest deepwater port, with the exception of the Great Lakes outlets, which are closed to traffic several months out of the year on account of ice.

Automobile Incorporations

TORONTO, ONT.—McKinnon Motor Vebicle; capital, $100,000; to manufacture automobiles. Incorporators: T. S. Blues, G. B. Mansfield, D. J. McKinnon.

WORCESTER, MASS.—Maykel Automobile Company; capital, $12,500; to deal in automobiles. Incorporators: M. K. Maykel, M. L. Katz, A. Massad.

GARAGES AND ACCESSORIES

BIRMINGHAM, ALA.—Blacklock Tire & Rubber Company; capital, $3,000; to manufacture automobile tires. Incorporators: Kate Blacklock, Mary H. Bostick, H. Blacklock.

BRIDGEPORT, CONN.—Jones Pneumatic Tire Spring Companv; capital, $100,000; to manufacture automobile tires. Incorporators: Lyman D. Jones, E. E. Brandreau, Clarence R. Hall.

CHICAGO, ILL.—Aldine Auto Livery; capital, $2,500; automobile livery business. Incorporators: C. A. Dickinson, A. B. Lapbam, W. R. Scates.

DETROIT, MICH.—Armitage Leather Company; capital, $35,000; to manufacture leatber for automobile use. Incorporators: Edwin Armitage, W. S. Gurd, R. B. Gillespie.

JAMESTOWN, N. Y.—Eagle Garage Company; capital, $25,000; to engage in a garage business. Incorporators: S. B. Rubbins, Olive M. Spencer, George Rappole.

LOUISVILLE, KY.—Miller, Wbite & Company; capital, $5,000; to deal in automobiles. Incorporators: R. W. Miller, A. W. White, William Atix.

NEW YORK CITY—Favary Tire Company; capital, $300,000; to deal in tires and accessories. Incorporators: E. Favary, M. W. Brashears, C. S. Boyd.

NEW YORK CITY—Wholesale Automobile Tire Company; capital, $1,000; to deal in automobile tires. Incorporators: W. P. Cole, David Morris, Abraham Levy.

NEW YORK CITY—Macandaryba Tire Filler Company; capital, $25,000; to manufacture automobile tires. Incorporators: Moses Haas, Nathaniel Levy, G. A. Weingetz.

TOLEDO, O.—Rubber Nix Manufacturing Company; capital, $10,000; to mannfacture an insoluble compound containing no rubber invented by E. A. McLean. Incorporator: E. A. McLean.

WILLIAMSON, N. Y.—Williamson Garage Company; capital, $20,000; to carry on a general garage business. Incorporators: R. S. Carr, C. I. Dezutter, A. F. Raymor.

CHANGES OF CAPITAL AND NAME

COLUMBUS, O.—Peerless Motor Car Company; increase of capital from $3,000,000 to $10,000,000.

DETROIT, MICH.—Detroit Carriage Company; change of name to Detroit Body Company.

DETROIT, MICH.—Von Bloerck Motor Company; increase of capital from $10,000 to $100,000.

ANTI-Skidding Device—Comprising transverse members spanning the tire tread and being attached to their base so as to be capable of swiveling movement.

This patent refers to an anti-skidding device comprising anti-skid elements which are pivoted to the wheel and are provided with wear members, W, hinged at H. These wear members are so arranged that they overlap each other on the tire tread, as shown in Fig. 1. The anti-skid members are provided with resilient means, R, which yieldingly resist to the movement of the wear members W. This allows for a slight movement of the wear members on the tread surface, which is essential in preventing excessive wear of the latter.

No. 1,048,376—to Rudolph Thiesen and Campbell Thomas King, Jr., Atlanta, Ga. Granted December 24, 1912; filed December 23, 1911.

Baffle-Plate Muffler—In which liquid is used to guide the exhaust gases in their path.

Fig. 2 illustrates the subject matter of this patent, a muffler which has inlet and outlet ducts, the former, I, being connected to the exhaust pipe of the motor, and the latter, O1, to a body of liquid, whereby the gases escaping in this manner are silenced through their work of overcoming the resistance offered by a column of the liquid. A part of the muffler casing is formed as an expansion chamber, C, in which suitably constructed baffle plates, B and B1 are so arranged that the gases must pass through this chamber in a zigzag way, being afforded an opportunity for silent expansion while doing so. Means are provided for introducing a sheet or film of water across the path of the gas coming in through the inlet ducts, so as to cool the exhaust and somewhat reduce its volume.

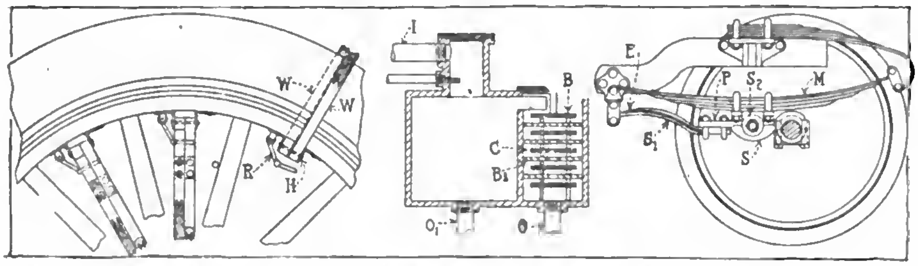


Fig. 1—Thiesen anti-skidding device. Fig. 2—Still muffler. Fig. 3—Neuberth spring suspension

No. 1,048,435—to Vernon B. Still, Patchogue, L. I., N. Y. Granted December 24, 1912; filed April 4, 1912.

Automobile Spring Suspension—Consisting of a small elliptical spring supplemental to the main spring in its action.

The spring described in this patent has the purpose of assisting the main elliptical suspension spring of the car in its work and also to serve as a rebound check, being adapted to compensate for excessive deformation of the main spring. It consists of a leaf spring, S1, attached to the end of a plate, P, which is formed by the free end of a saddle, S, the latter being secured to the axle of the car. The spring S1 projects beyond the plate P, and with the saddle S forms a lever having a gradual resiliency toward its outer end, E, which is secured to the body of the car. It may be noted in Fig. 3 that saddle S and spring S1 are of approximately the same length. A main spring, M, is secured at its ends to the car body and is supported at the center by a saddle, S2, which is arranged equidistantly between the axle and the supplemental leaf spring S1.

No. 1,048,336—to George E. Neuberth, Newark, N. J. Granted December 24, 1912; filed October 10, 1910.

Incandescent Headlight Lamp—Consisting of two filaments contained in the same bulb.

In Fig. 4 the headlight idea described in this patent is illustrated, the lamp consisting of a parabolic reflector and a bulb, B, mounted in its apex. In the bulb, which has two bases, B1 and B2, two filaments, F1 and F2, are contained, the former of which is located practically in the focal point of the parabolic reflector, while F2 is farther from the apex than this point. The rays of the filament F1 produce a beam of light parallel as it emanates from the reflector, while the shadow formed in this beam by the base B2 is dissolved by the intersecting rays of the filament F2, which is out of focus with respect to the parabolic reflector.

No. 1,048,017—to Theodore A. Willard, Cleveland, O. Granted December 24, 1912; filed February 9, 1910.

Tire-Patching Device—Consisting of bracing means for keeping a tire in place on a wheel-shaped carrier while it is being repaired.

This patent describes a tire-patching device, Fig. 5, comprising a flanged rim, R, on which a tire, T, is mounted, a flexible patching strap, P, extending across the tread portion of the tire. To one extremity of the strap a bar, B, is secured which rests on the outer extremity of the rim flange; a hook member, H, passes through the bar and engages one rim flange. The other end of the strap is secured at S to the rim.

No. 1,048,189—to Gustave J. Martel, Chicago, Ill. Granted December 24, 1912; filed July 21, 1911.

Internal-Combustion Engine—In which each working cylinder works in parallel with a pumping cylinder.

Fig. 6 shows the subject matter of this patent. The engine described in this patent consists in its simplest form of a working cylinder, C, and a pumping cylinder C1. A piston P is mounted in the working cylinder which compresses an explosive mixture at the end of each stroke, which mixture is exploded to impart reciprocating movement to the piston. The cylinder C has centrally disposed intake and outlet ports Q1. A pumping piston, P1, in the cylinder C1 is moved in the same sense and at the same speed as P. A carbureter is also mentioned in this patent, and a cylindrical casing, C2, is in place between it and the cylinder C1. A valve mechanism in this casing controls the admission of mixture to the two inlet ports located in the ends of the cylinder C1. Another casing between C1 and C regulates the passage of mixture from the former to the latter cylinder, the control mechanism consisting, in both cases, of a slightly tapered rotary valve having two oppositely disposed, superimposed ports making communication between proper passages in the casing to regulate admission and exhaust. This construction makes possible the working of the engine on the two-stroke cycle and without the use of poppet valves, insuring a plain and efficient combustion chamber.

No. 1,048,095—to Ralph Tagan, Atlanta, Ga. Granted December 24, 1912; filed July 24, 1911.

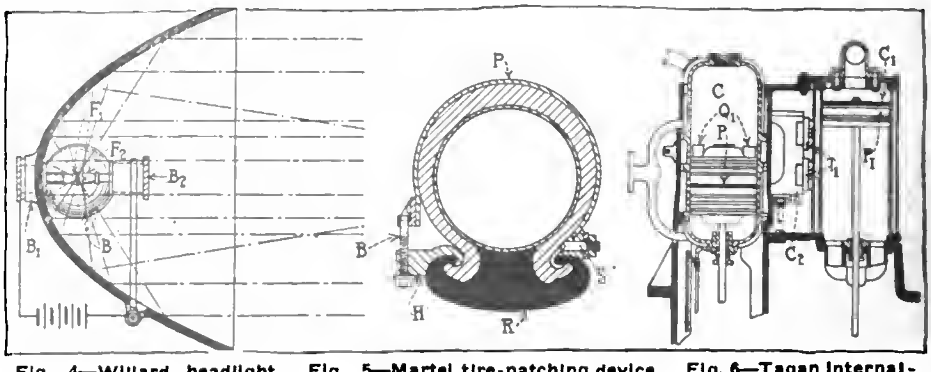


Fig. 4—Willard headlight. Fig. 5—Martel tire-patching device. Fig. 6—Tagan internal-combustion engine

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The AUTOMOBILE

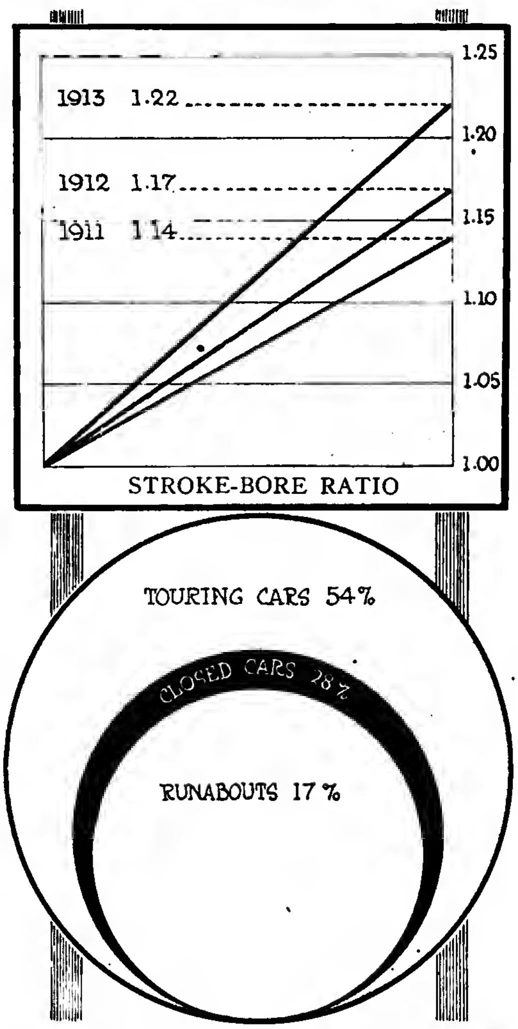
An Analysis of the 1913 Car

Survey of Entire American Automobile Industry Reveals Growth — Six-Cylinder Car Big Gainer—Horsepower Slightly Reduced and Stroke Lengthened—Engine Starters and Electric Lighting Are Features—Prices Are Higher

THE national automobile shows which open in Madison Square Garden and Grand Central Palace in this city on Saturday, January 11, will give the waiting public its first opportunity of viewing as a unit the 1913 models. In the Garden will be forty-three makes exhibited, in the Palace are forty-six, making a show total of eighty-nine. The buyer, in real earnest to survey the entire car field, can see ten other different makes along the Broadway salesrooms, thus having a field of 100 different makes to satiate his fastidious whims.

But though there is a round hundred laid at his feet, he then sees but a fraction of the enormous passenger car industry for there are sixty other makers of reputation who are neither at the shows nor represented along Broadway. Having the passenger vehicle shows held simultaneously in the two buildings for the first week and the commercial vehicle exhibits in the same arenas on the second week, with accessories present both weeks, affords a feast of showdom rarely if ever before afforded an American citizen.

Before in anywise endeavoring to analyze the broad field of automobile progress during the past year, look for a moment at what choice the purchaser has before him. The field is scarcely so broad as last year. At the start of 1912 there were 366 different chassis models to select from, and with the various bodies for each gave a possible field of 805 different body models. This year there are fewer chassis listed. To be exact, the number is 339, or a reduction of twenty-seven, due to the elimination of certain concerns by financial troubles followed by court action, and also to other concerns reducing the number of models they are marketing in order to cut down manufacturing cost and increase production. In the newcomer ranks are Edwards, Henderson and Touraine. Among those not now in existence, but familiar faces in the past are Elmore, Thomas,



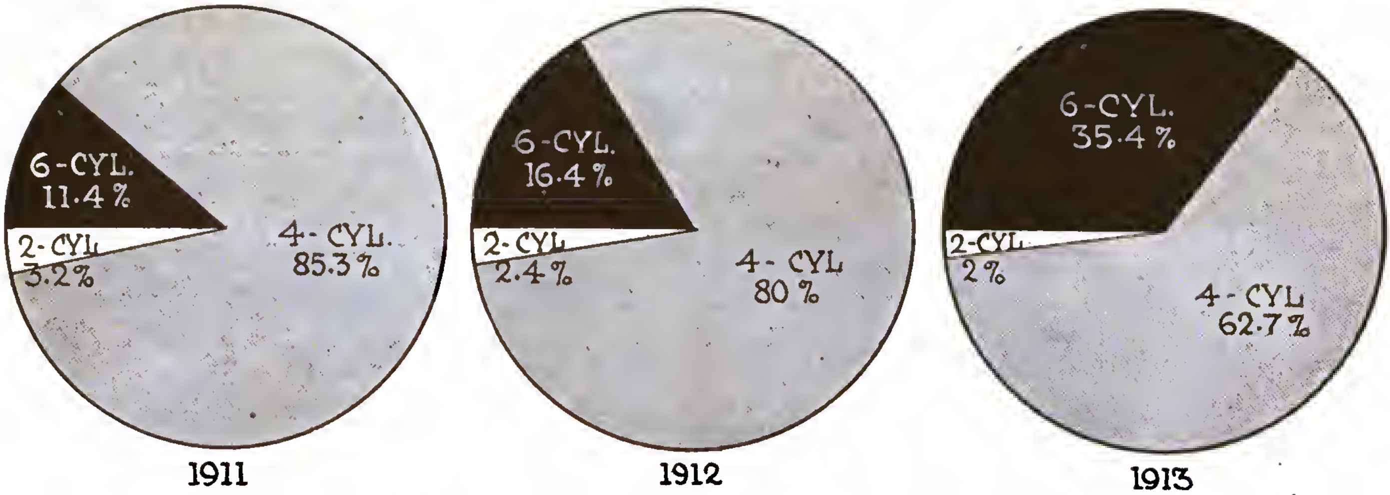
Average stroke-bore ratio increases—Popular favor still turns to the touring car, with closed cars second

Garden Cars

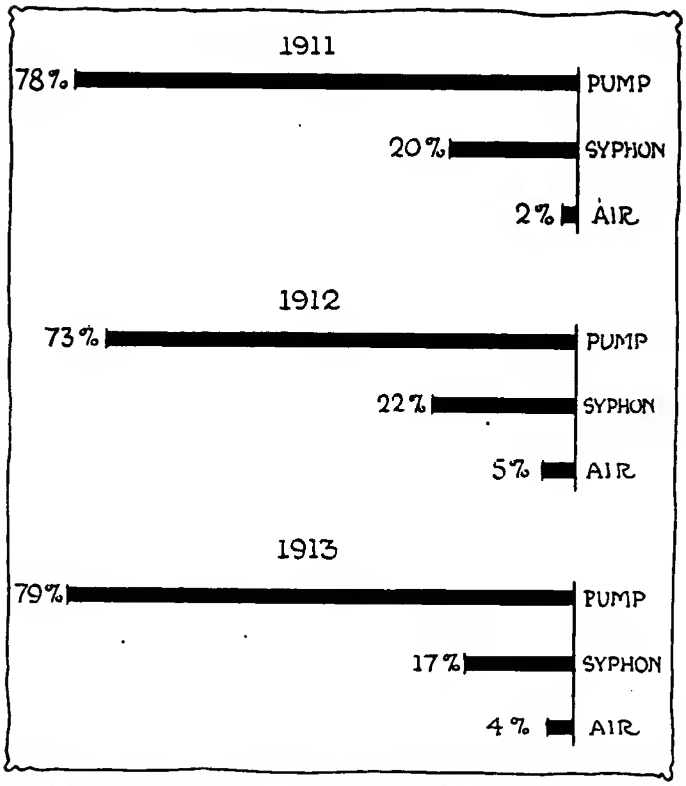
Alco	Jackson	Overland
Auburn	Knox	Packard
Buick	Locomobile	Peerless
Cadillac	Lozier	Pierce-Arrow
Cartercar	Matheson	Pope-Hartford
Chalmers	Maxwell	Premier
Columbia	Mercer	Pullman
Cunningham	Mitchell	Reo
Stoddard-Dayton	Moline	Selden
Flanders	Moon	S. G. V.
Franklin	National	Stearns
Garford	Marmon	Stevens-Duryea
Haynes	Oakland	White
Hudson	Oldsmobile	Winton

Palace Cars

Abbott-Detroit	Herreshoff	Pathfinder
American	Hupmobile	Norwalk
Bergdoll	Stutz	Only
Detroiter	Imperial	Paige
Buffalo	Inter-State	Paterson
Church-Field	Rambler	Case
Cole	Keeton	R.C.H.
Columbus	King	Regal
Cutting	Kisselkar	Republic
Davis	Kline	Speedwell
Edwards	Krit	Schacht
Empire	Lenox	Standard
Fiat	Marathon	Studebaker
Havers	Marion	Velie
Henderson	Metz	Westcott
	Michigan	



This chart tells the story of the growth of six-cylinder motors during 1911 and 1912 and the relative standing in 1913



Water pump circulation decreased slightly last year, but is now at its zenith

Marquette, Brush and a few others of less national reputation.

To the buyer who is interested in what he is going to get for the amount of money he has to spend, the question of price is paramount, and, in a nutshell, prices are higher than a year ago. Over half of the cars listed are higher priced than on January 1, 1912, due largely to more equipment in the way of engine starters, electric lights, tops, windshields, demountable rims, speedometers, anti-skid provisions, shock-absorbers and other equipment. The net result is more money's worth to the buyer, although his initial outlay is larger. The greater equipment is more noticeable among the cars listing at $2,500 and over, as generally those selling under this price were mostly sold with full equipment, the equipment being one of the inducements to the buyer.

The increase in price ranges from $50 to $500, but actual statistics, based on all of the listed models last year and those listed for this season, show the average price for 1912 at $2,508 and the average price for 1913 at $2,585, an increase of $77. This figure is based on the listed models and does not take the output into consideration. Were the average based on the actual cars sold it would be very much lower than this price mark.

But all have not raised the price. There are many examples of reduction, these ranging from $500 down. Where reductions are made they are largely attributed to reduced cost of production due to larger output, or to the reduction in the number of models, or to the redesigning of parts permitting of simpler manufacture and of using the parts in different models.

There are not a few cases where the prices of 1912 become the prices of 1913 and yet engine starters, electric lighting and more equipment are added. There are a few instances where the equipment has been added and the price cut from last year's figures.

Yet in spite of fewer models and higher prices, the buyer has a wide field to select from. If he desires a runabout there are 138 models listed to whet his appetite; if his tastes turn to five-passenger touring cars he has a selection field of 325; in the seven-passenger tourist field there are 100 models; the coupé division offers a latitude of 54; and in the limousines, landaulets and single-compartment vehicles there is a field of 174 to choose from. What more could be desired?

The following will be shown in their New York showrooms during the double exhibition: Apperson, Colby, Correja, Ford, G. J. G., Touraine, Palmer-Singer, Simplex, Staver and Warren.

Those that will not be seen in the show nor along Broadway include the following:

Ames, Amplex, Arbenz, Atlas, Austin, Burg, California, Cameron, Carhartt, Carroll, Chadwick, Cino, Coey, Corbitt, Crane, Crawford, Crow-Elkhart, Croxton, Day, Diamond T, Dispatch, Dorris, Duryea, Duquesne, Enger, Falcar, Great Eagle, Gleason, Glide, Great Southern, Great Western, Grout, Halladay, Holly, Indiana, Lambert, Lexington, Lion, Luverne, McFarlan, McIntyre, Mason, Motorette, Midland, Morse, Miller, Nyberg, Omaha, Pratt-Elkhart, Pilot, Pertex, Reeves, Richmond, Rayfield, Schlosser, Spaulding, Spoerer, Triumph and Zimmerman.

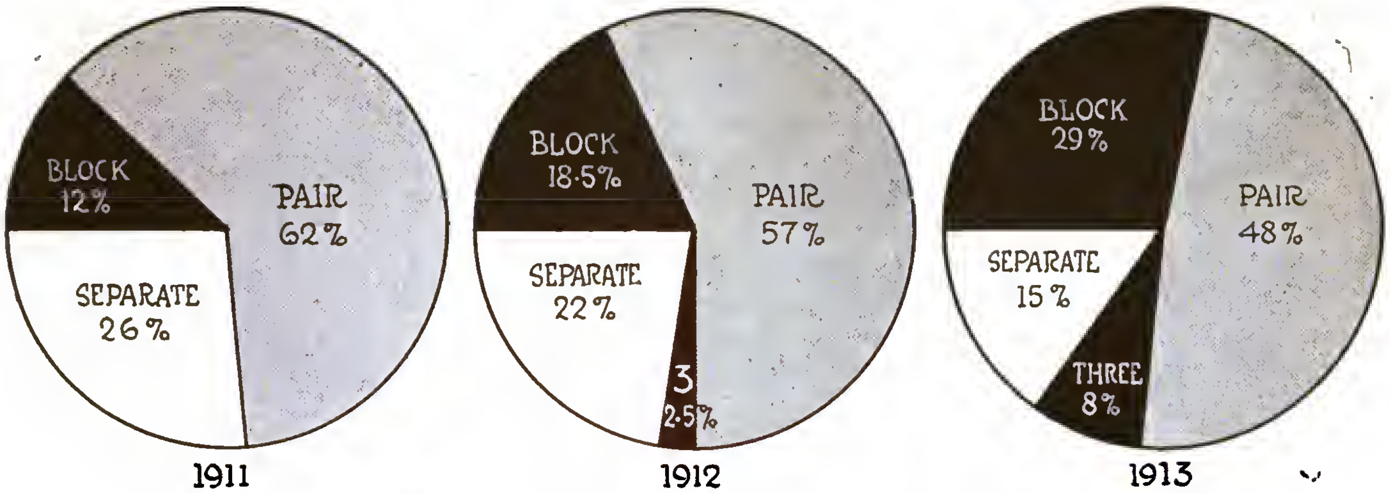
Coming to a consideration of the various chassis types for this year, and comparing them with previous years in order to note the direction of progress, many unmistakable currents of tendency are observed. Everybody is talking bore-stroke ratio, that is, the ratio of the piston stroke to the cylinder bore. In these days with a leaning towards long strokes this argument is perhaps more used by the salesman than any other. The bore-stroke ratio is 1.2 to 1, that is, on an average of all the American listed chassis the stroke exceeds the bore by 22 per cent. Last year the ratio was 1.16 to 1 and the year before 1.14 to 1.

Three Years of Stroke-Bore Ratio

1911, 1.14 to 1 1912, 1.16 to 1 1913, 1.22 to 1

These figures show an unmistakable movement, and while the stroke has been increasing, the bore has been diminishing. Figures covering these three years for motors with a stroke in excess of the bore, for motors with stroke equal to the bore, and for motors with a stroke less than the bore are:

	1911	1912	1913
Stroke greater than bore	219	306	314
Stroke equals bore	44	36	18
Stroke less than bore	17	24	7



The steady growth of block castings is one of the major characteristics of motor tendencies for the past two years

When reduced to percentage these figures show that in 1911 78.2 per cent. were of the longer-stroke type; in 1912 83.6 were of the longer-stroke type, and in 1913 93.1 are of the longer-stroke type. These figures are graphically charted on these pages.

Next of importance to stroke-bore ratio in motor design for this year is the strong leaning towards six-cylinder construction. There are not fewer than seventy-six concerns listing six-cylinder models, these companies having in all 120 different chassis models. Of this number there are thirty building nothing but sixes, some of them building one model, some two, and others three, four and five. Here are the names:

A. E. C.	2	Holly	1	Oldsmobile	2
Austin	3	Inter-State	1	Packard	5
Burg	2	Keeton	1	Palmer-Singer	2
Chadwick	2	Lexington	1	Pierce-Arrow	4
Chevrolet	1	Lozier	2	Premier	2
Coey	1	Luverne	1	Rayfield	1
Crane	1	Matheson	1	Speedwell	1
Flanders	2	McFarlan	3	Stevens-Duryea	2
Garford	2	McIntyre	2	Touraine	3
Havers	2	Norwalk	3	Winton	1

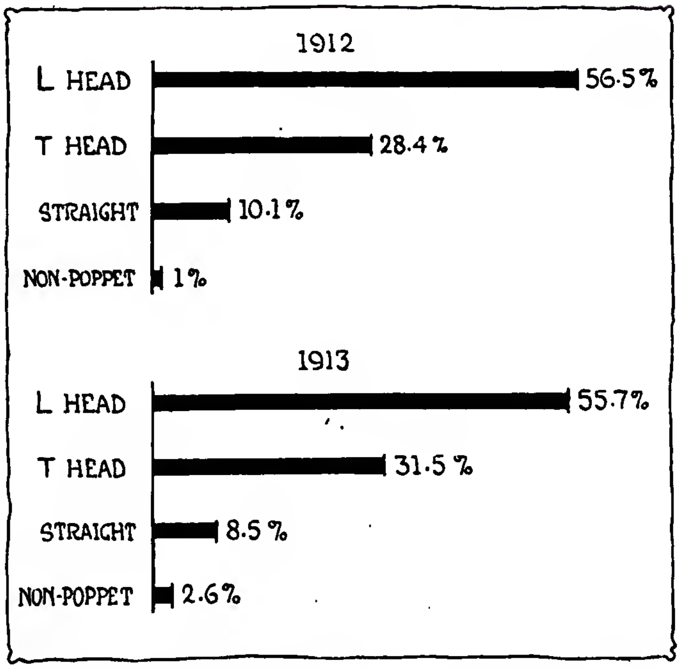
In this list are many new names which will be readily detected by those who are following the development of the art from year to year. Among these new six-cylinder faces are Stearns-Knight, Marmon, Stutz, Auburn, Moon, Norwalk, Touraine, Oakland, Speedwell, Studebaker, Staver, Warren, Westcott, Herreshoff, Hudson, Inter-State, Jackson, Cole, Colby, Chevrolet, McIntyre, Nyberg, Republic, Zimmerman, Croxton, Firestone-Columbus, Lenox, Lexington, Keeton, Holly, Duquesne, Crow-Elkhart, Correja, Crane, Burg, Alpena, Carroll, A. E. B., Luverne and Motza.

While these concerns have made their début into the field, the older concerns in the six-cylinder ranks have been adding to its numbers by introducing more models. For example, Packard, Locomobile, Lozier, Premier, Knox and others have added small sixes. There will be undoubtedly more of these additions announced before the show circuit is closed.

The growth of the six-cylinder field is largely an outcome of the public demand for sixes, which has been created by the able pioneering work done by a half dozen of our concerns which placed their entire confidence in six-cylinder types 3 and 4 years ago, and have been building them in many cases exclusively ever since. In this connection must be mentioned such concerns as Winton, Stevens-Duryea, Pierce-Arrow, Peerless, Franklin, Knox, etc.

The growth of the six-cylinder car during the last two seasons is well shown by the following figures, which show the number of two-cylinder, four-cylinder and six-cylinder chassis listed. Here they are, with percentages:

	1911	1912	1913
Six-cylinder chassis	32—11.4	60—16.4	120—35.4
Four-cylinder chassis	239—85.3	293—80	211—62.7
Two-cylinder chassis	9— 3.2	9— 2.4	7— 2



L-type cylinder casting is gradually losing ground and T-head type making slow gains

When viewed on a percentage basis, it will be seen how the six has gradually risen in regular steps from 11.4 per cent. in 1911 to 16.4 last year, and then with one broad leap to 35.4 this season. While this progress upward has been on hand, the percentage of four-cylinder models has gradually dropped in these three seasons, as the following figures show: 85.3 per cent., 80 per cent., 62 per cent.

The horsepower of the six-cylinder model in America averages higher than that for Europe, as might be expected, but there is a gradual reduction taking place from year to year, so that soon the American six-cylinder will be as low in horsepower as the foreign type, or nearly so. The poorer American roads and the heavier bodies call for additional horsepower, but with road improvements, increased motor efficiency and eliminating needless body weight, there is no reason why the next few years will not witness gradual steps downward in power.

Last year the average horsepower of the listed six-cylinder chassis was 45.77; this year it is 41.24, a reduction of 11 per cent. This is not all accounted for by longer stroke and reduced bore, because the piston displacement averages lower. Last year it was 474.4 cubic inches; this year it is 435.3. But yet with this reduction we are larger than the English six, which in

1912 averaged 34.7 horsepower and this year has risen to 36.8. In France, where the small motor is the giant of the day so far as activity is concerned, the average horsepower was 30.7 last year and it is cut to 26.6 this year.

In considering the style of casting used on four and six-cylinder motors, the T-head design is gaining. Last year its following numbered 28.4 per cent. of the total; this year it is 31.5, and during the same time L-head construction has fallen from 56.5 to 55.7. The valve-in-the-head type is diminishing. Last year thirty-seven models were listed; this year there are but twenty-nine. Last year saw four non-poppet models; this year there are nine, this increase being due to Stearns adding another Knight type, the Edwards company bringing out new Knight models. Speedwell adopting the Mead design, etc. The tabulation of cylinder types used and the percentage standing of each for this year and last is as follows:

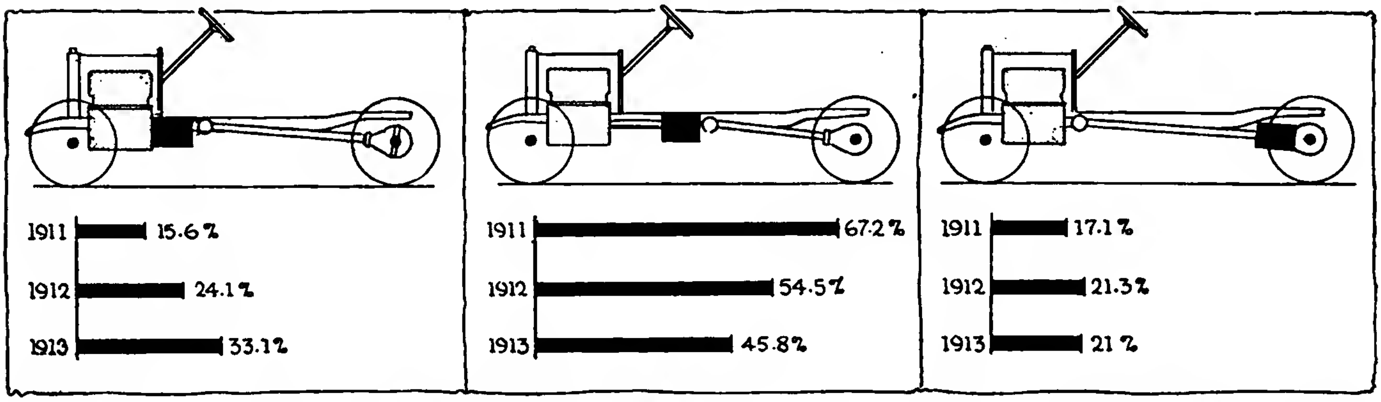
	1913 Per Cent.	1912 Per Cent.
T-head cylinder design	104—28.4	107—31.8
L-head cylinder design	207—56.5	189—55.7
Valve-in-head design	37—10.1	29— 8.5
Non-poppet design	4—1	9— 2.6

ferences in this respect. Fiat, for example, has a four-cylinder block with 557 cubic inches displacement, and a six with 556 cubic inches. These are the largest block types listed. The White six has 489.4 cubic inches displacement, the Staver six 452.4, the McFarlan the same, the Case measures 420.9. Others over the 400 mark are Only, 446.8; Pilot, 452.4; Cino, 452.4, and Westcott, 452.4.

The baby block is the new Studebaker, 154.8 cubic inches, with bore of 3.8 to 6.2 and stroke of 3.75 inches. Others in this low-capacity displacement class are Herreshoff, 161; Ford, 176; Krit, 176; Detroiter, 170; S. G. V., 193; R. C. H., 165.9; Paige, 170.7; Oakland, 192, and Metz, 176. The others range between the 200 and 400 marks.

Thermo-syphon cooling has dropped very considerably as compared with last year. In 1911 it was increasing, 1912 marked a gain and this year a slight drop. Here are the figures:

	1911	1912	1913
Water pump circulation	217—77.5	266—73	266—78.9
Thermo-syphon circulation	57—20.3	80—22	58—17.2
Air-cooling	6— 2.1	19— 5	13— 3.8



Mounting gearbox as unit with motor has gained 15 per cent. in last two years; mounting amidship has lost; and rear axle units remain stationary

Last year saw twelve different models of two-cycle engines listed, and for this year there are but five, due to the discontinuance of the Elmore and the Amplex being changed to four-cycle type.

With this trend in the matter of cylinder design there moves hand in hand the amazing landslide towards monobloc castings. This type of casting for four and six-cylinders has grown in leaps and bounds. There are sixteen concerns manufacturing six-cylinder block types of motors. They are: White, Fiat, Flanders, Garford, Studebaker, Warren, Inter-State, Herreshoff, Staver, McFarlan, McIntyre, Pilot, Keeton, Cino, Duquesne and N. E. C.

Statistics show that the block type of casting has grown from thirty-four in 1911 to sixty-seven in 1912 and to ninety-six this year. Here are the figures on the different methods of casting:

	1911	1912	1913
Cylinders cast in block	34	67	96
Cylinders cast in pairs	171	207	163
Cylinders cast in threes	...	9	27
Cylinders cast separately	72	82	51

When these figures are reduced to percentages, they show a steady reduction in the casting in pairs, the downward steps being 61.7 per cent., 56 per cent. and 48.3 per cent. There has been a steady reduction in casting separately as follows: 26 per cent., 22.4 per cent. and 15.1 per cent. The increase in block castings has been regular, namely, 12.2 per cent., 18.35 per cent. and 28.4 per cent. When block-motor castings were first introduced it was generally rumored that cylinder sizes would have to be kept especially low. Figures show, however, that there are wide dif-

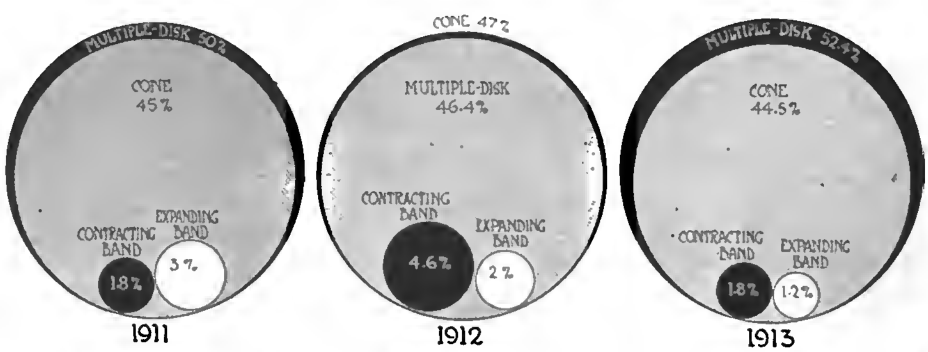
Dual ignition is still the popular hero, with a following of 234 models as compared with fifty-one using single ignition and fifty using double.

Much interest has been created of late in the method of mounting the gearbox so far as location is concerned. There are three divisions, those locating it as a unit with the motor, those mounting it as a separate unit, in the middle of the chassis, and those making it as a part of the rear axle. The rear-axle method is holding its own, mounting it as a unit with the motor is steadily increasing, and mounting it separately under the chassis is constantly falling off. The figures show:

	1911	1912	1913
Gearbox unit with motor	42—15.6	88—24.1	107—33.1
Gearbox separate amidships	181—67.2	199—54.5	148—45.8
Gearbox unit with rear axle	46—17.1	78—21.3	68—21

In these tables the actual number of models employing the different styles of gearset, as well as percentages of the total, are given. The trend is better shown by the per cent.

The four-speed gearbox is increasing in use; the three-speed



Multiple-disk clutches have gained in popularity and are now leading the pioneer cone type by a slight margin

set is holding its own; the two-speed set is decreasing; the friction set is decreasing. Statistics show as follows:

	1911	1912	1913
Four-speed gearset	50—17.8	66—18.2	76—22.4
Three-speed gearset	200—71.4	267—72.9	245—72.2
Two-speed gearset	18— 6.4	19— 5.1	9— 2.6
Friction transmission	12— 4.2	14— 3.8	9— 2.6

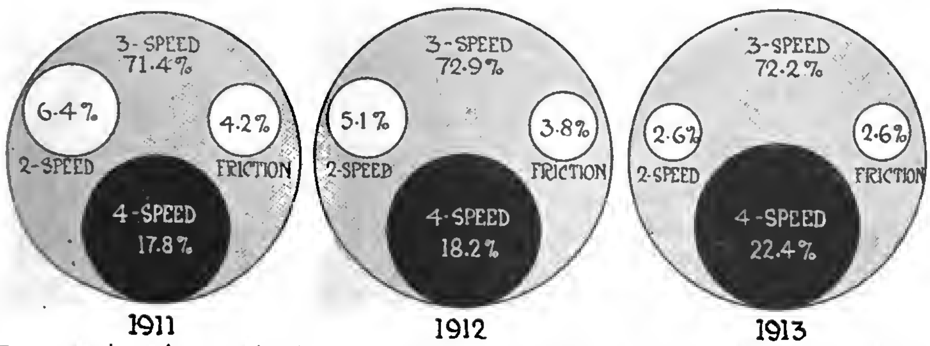
Space does not permit to go into detail in the question of clutches, which is a close contest between the multiple disk and the cone, with the disk a leader at 52 per cent. compared with 44 per cent. of the cone. Contracting band types and also expanding types have a following of less than 2 per cent. each.

It is all shaft drive when the question of final transmission is considered, so far as proportions are concerned, yet there are six companies listing worm reduction in the rear axle, three of which furnish it as an option. Those regularly listing worm drive are Edwards-Knight, Keeton and Holly. Firestone-Columbus, Pathfinder and Cino give it as an option.

The use of chain drive for camshafts, magneto shafts and pump shafts has grown. True, the growth has not been anything like what was anticipated, which, as one maker has put it, has been largely due to questions of manufacture. The American maker is favorable to fitting American-made chains for this work, and now that domestic products giving entire satisfaction are on the market it is certain that a rapid growth will be made. Thirteen companies fit silent chains, there being in all twenty-two models manufactured by these concerns. The companies and the number of models are:

Stearns, five; Velie, three; Kissel, four, and the following one each: Cadillac, Jackson, Oakland, Hupmobile, Edwards, Columbia, Stoddard-Dayton, Paige, Rayfield and Atlas.

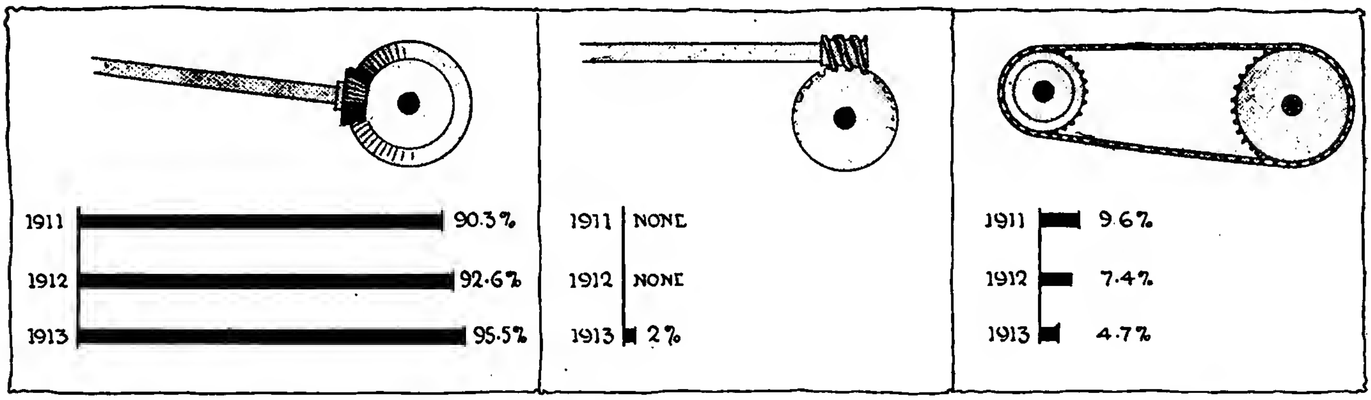
Fitting the steering column on the left side has made more than anticipated gains. At one time the feeling was that there would be a landslide towards this construction. The progress has been slower than looked for. Today eighty-five companies list left-hand control, 238 list right-hand control, twelve give an option, and four list center. It is easier to remember these in percentages: Right hand, 70; left hand, 25; optional, 3; center, 1.



Four-speed gearboxes make steady gains, while three-speed sets, which lead, remain stationary; friction sets decreasing

A wide change has come over the engine starter field within the last year in that the explosive gas type, which was a leader last season, is now in second place, and the premier position is held by the electric type, which controls 69 per cent. of the field. The explosive gas type is second with a following of 15 per cent., the air type is third with 11 per cent, and last comes the mechanical or spring type with 3 per cent following.

The advent of electric lights has greatly aided in the introduction of the electric starter, and from the avidity with which it has been taken it would seem that the public had been patiently waiting, and when the moment arrived received the electric type with open arms. The electric starter is present in a variety of forms, which for convenience may be designated single-unit systems and double-unit ones. There are types which act in unison with the electric lighting and also the ignition system, such an outfit really being a triple-service one. There are others in which one unit serves for starting and lighting; there are those where there is a single motor for starting; then, again, some systems are on the market in which two units are needed for starting, one a motor to crank the gasoline engine and the other a generator to charge the battery.



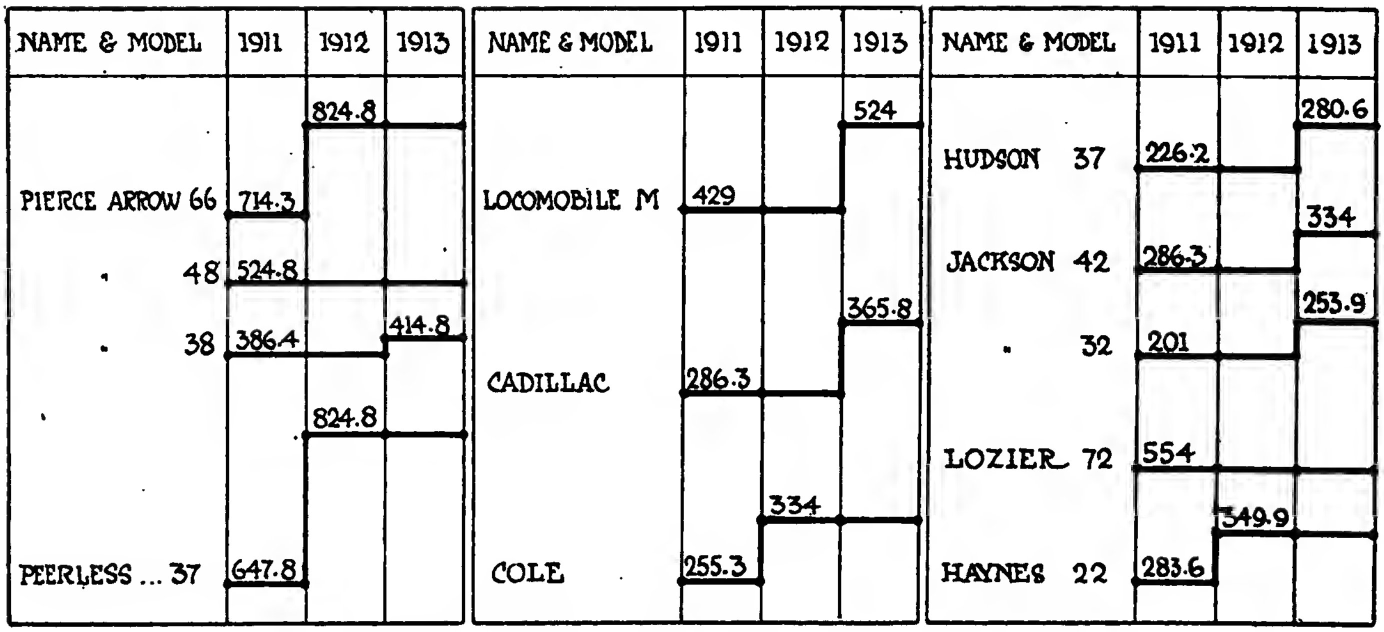
Bevel drive, which predominates the field, is gaining steadily; chain is losing slowly; worm makes its appearance

The flywheel type, that is the one in which the starting motor is incorporated in the flywheel, has made considerable progress. With this type as well as with others in which the motor or motor-generator are located alongside of the gasoline motor the one great aim is the reduction of weight and a keen business rivalry has developed on this line alone.

Many of the engine starters look the part of appurtenances, rather than forming an integral portion of the motor, a condition to be expected due to the rapid advent of the electric type, but which abuse, if it may be so termed, will be corrected before another year, so that the starting units will look as much a part of the gasoline motor as the carbureter or magneto.

Air starters have a good following. There has been a tendency, where they are used, to fit air pumps on the motor for generating the necessary air pressure, which has added to the expense to the extent of the pump, which is not mounted on the motor in every case, but often is grouped with the gearbox and driven from one of its shafts. Where air pumps are used they are more carefully made than last year.

The year has been an active one in the carbureter field, and while the vast majority of the carbureter business is carried on by car building companies, rather than by car building companies, it is nevertheless a fact that car makers are vitally interested in it. As the carbureter field is covered at some length in other pages of this issue, it is unnecessary to comment at length at this



Showing changes made in the piston displacement in some models in the last 2 years

time further than to state that the movement towards multiple-jet construction is gradually developing and there has been wide effort to add easy-starting devices whereby gasoline can be by-passed direct from the float chamber to the manifold above the throttle in order to get the necessary richness. Added to such arrangements are hot water or air jackets and hot-air horns connecting with the exhaust manifold. Those using auxiliary air valves have added improvements to secure more ready and accurate adjustment and more steady action.

The strong movement towards placing the steering wheel on the left side of the car, which was begun a year ago, has shown a marked increase and while right-side control still is a big leader, the left-hand argument has a 25 per cent. following, leaving right-hand with 70 and the remaining 5 per cent. divided between those giving an option and those placing it in the center. By count of 339 chassis listed in the tabulations in other pages of this issue, 238 fit the steering wheel on the right-hand side, eighty-five place it on the left side, twelve give an option and four mount it in the center.

The one-time argument that only low and medium-priced cars would have the wheel mounted on the left is quite exploded by the fact that some of the highest-priced makers have placed the wheel on the left side on new and smaller models that they have recently added to their lines. In this respect attention is directed to the new Packard six, White six and fours, Lozier, Marmon, Premier, National, etc. Among the concerns listing left-side steering are: Maxwell, Michigan, Midland, Mitchell, Moon, Metz, National, Nyberg, Packard, Paige, Peerless, Premier, R. C. H., Reo, Republic, Schacht, Spaulding, Speedwell, Staver, Stoddard, Velie, White, Ames, Atlas, Austin, Chevrolet, Correja, Croxton, Cunningham, Day, Detroiter, Duquesne, Edwards, Firestone-Columbus, Ford, Garford, Glide, Great Southern, Henderson, Herreshoff, Holly, Inter-State, Keeton, King, Krit, Lenox, Lexington, Lion, Lozier, Luverne and Marmon. Of these some list all with left-side wheel, others with one, some with two and some with three models.

There is little new in frame construction, the conventional dropped frame being in the ascendency. The double-drop has gained in following but not to the extent that might be anticipated. The underslinging of springs, that is, clipping them under the axle instead of above the axle, has worked against the double-dropped frame in that it allows of a considerable lower body support, without the added expense of the double-dropped side members. The three-quarter elliptic spring has gained during the year, in spite of the fact that some of its old followers in Europe have discarded it and returned to the semi-elliptic type in order to eliminate side sway of the body.

More concerns than ever before are equipping their cars with shock-absorbers as stock. This suggests the more abundant equipment that nearly all of the cars are being listed with for this season. Concerns that heretofore scoffed at selling with equipment have gone through the entire gamut in adding such necessaries as top, windshield, speedometer, demountable rims, self-starter, etc., and often without adding to the price and in one case the price has been reduced. The movement of the full-equipped car of a few years ago has had a strong influence on the buyer and has virtually forced the higher-priced maker to deliver his car ready for the roads and any kind of weather.

There is no doubt that the question of prices of the 1913 models will at first present to the average layman the idea that there has been an increase in prices generally, due to the higher list prices than were quoted on 1912 models. This is not the case, however. An arbitrary comparison of the list prices of 2 years is no criterion to go by. The question resolves itself down to this: What did the equipment of the car consist of last year as compared with this? The problem of equipment has been taken care of, by including the equipment at an inclusive price. One of the prime movers, in the price increase, is traced to the self-starter and lighting dynamo. In other cases, the model, although of approximately the same rated horsepower in both years, may have an entirely new rear axle and many other improvements such as increased wheelbase or larger tires. It will be found that after adding what it would actually cost to include the extras, and then place the total alongside the price of the 1913 model, that the 1913 model is really cheaper.

There are other cases where the prices have actually been reduced. Where this practice prevails, it will invariably be found that large quantity production is the direct cause. This is true of the three Ford types, where a drop of $90 has been made in the case of the touring car, $100 on the town car and $65 on the runabout. The Overland 71 is another example in which there is an actual drop of $25. But this does not represent by any means the actual saving to the buyer. The new model includes top, windshield, speedometer, acetylene gas tank, tire irons and crankless starter, besides an elongation of the wheelbase. The Cole model 50 was marketed last year without equipment at $1,885, and when the equipment that is included in this year's models was added, the price was increased to $2,060. The price of this year's model is $1,985 showing a *prima-facie* saving of $75. In addition to the equipment a stronger axle has been incorporated as well as a new radiator. The Delco lighting, starting and combined ignition system has also been added, which materially increases the price value of the car.

Due to an increased output, the Chalmers six-cylinder car has been reduced from $3,250 to $2,400 for the two, four and five-passenger cars and to $2,600 for the seven-seater. The other Chalmers model, while showing an actual increase in price from $1,900 to $1,950, has had a Gray & Davis lighting dynamo added, thereby virtually reducing the selling price.

Two further examples of actual price reduction are to be found in the Fiat and Packard models for next year. The Fiat company has made a clean-cut of $500 on the four-cylinder 35 and six-cylinder 50 models, besides including about $300 worth of equipment in the reduced price that was charged for extra last year. The reduction in price in this instance is due to the better and larger manufacturing facilities of the American factory. The Packard Company has reduced the price of the six-cylinder, 48-horsepower touring car from $5,000 to $4,850.

The accompanying table shows clearly that the majority of makers have a higher selling price this year than last. As has already been explained, this increase must not be regarded as such without further investigation into the cause. An excellent example of this is to be found in the 1913 Cadillac. Last year's model sold for $1,800 and the 1913 model is listed at $1,975, showing an increase of $175. Last year's model did not include a top, windshield or demountable rims which, when ordered extra as they usually are, would cost the purchaser $185, in itself alone more than the extra cost of the new 1913 model in which these extras are included. In addition the motor has been given 1.25 inches more bore, adding materially to the power, the wheelbase has been lengthened from 116 to 120 inches, the 4-inch tires have been increased to 4.5-inches, and a more expensive speedometer and a cocoanut mat have been added. It is only by analyzing the car in this manner that the buyer can form a correct idea and commensurate their values.

It would be manifestly unfair to compare the price of the last year's Hudson, for instance, with this year's model 37, the price of last year's being $1,600 against $1,870 this year. In the first place, the motor has been entirely changed, as well as several other structural features. Besides, a Delco starter and lighting outfit have been added including electric lights.

The tabulation given herewith has been compiled rather to show the tendency for next year than to attempt to set forth a complete list of the price changes that have been made. Consequently the figures cannot be taken as a means of striking a general average of increase in list price.

Quite a large number of the cars that list over $3,000 have remained at the same price, despite the fact that many have added equipment. Among those who have reduced their prices in this class may be mentioned the Haynes, Palmer-Singer and Premier. The Franklin prices have advanced $100, the extra price including an Entz self-starter and lighting system as well as a speedometer. The Kissel models have advanced $150, due to the addition of a self-starter and electric lighting system. The same remarks apply to the Matheson who have added a Westinghouse self-starter and electric lighting system, leaving the chassis materially the same as last year. The two larger models of the Pierce-Arrow have not been altered in price, while the smallest, namely, the six-cylinder 38 horsepower, has been increased by $300. This is due to the change in the size of the motor and the addition of an electric-lighting system and self-starter.

Both the White models that sell for more than $3,000, namely, the GE and GF, the latter being the six-cylinder, have not changed as far as price is concerned, but in addition to last year's equipment, an electric self-starter and lighting system have been incorporated besides the addition of a Klaxon horn.

In the $2,000-to-$3,000 class, the general advance seems to be between $100 to $200 to take care of the self-starters and electric lighting outfits that have been added. The National company has increased its list price on this account by $150. This also applies to the Haynes, Kissel, Marmon, Mercer. There are some, however, that have increased the price $250; but when the added equipment is taken into consideration, it is seen that there is no increase in price, without some compensating reason.

Table Showing Changes of Price on Some 1913 Models Giving the Amount of Increase or Decrease

CARS SELLING FOR $3000 AND UPWARDS

Make	Model	1912	1913	Increase or Decrease
Abbott-Detroit	Limousine	$3050	$3000	—$50
Alco	Touring	6000	6000	Same
American	Traveller	4250	4250	Same
Cadillac	Limousine	3250	3250	Same
Columbia	Touring	4500	4500	Same
Franklin D	Touring	3500	3600	+100
Franklin H	Touring	3750	3850	+100
Fiat	35	4500	4000	—500
Fiat	50 6-cylinder	5500	5000	—500
Haynes	Limousine	3800	3400	—400
Kissel	Touring	3000	3150	+150
Kline 6-60	Touring	3200	3500	+300
Locomobile	14 L	3500	3600	+100
Lozier 72	Touring	5000	5000	Same
Marmon 32	Limousine	4000	4000	Same
Marmon 32	Touring	3000	2750	—250
Matheson	Touring	4800	4800	Same
National	Touring	3250	3400	+150
Packard Six 48	Touring	5000	4850	—150
Palmer-Singer	Touring	3600	3200	—400
Peerless	All the same for both years			
Pierce-Arrow	6.38 Touring	4000	4300	+300
Pope-Hartford	33 Touring	3000	3250	+250
Premier	6.66	3750	4000	+250
S. G. V.	Limousine	3500	3500	Same
Simplex 127	Touring	5700	5700	Same
Stearns-Knight 4.40	Touring	3500	3750	+250
Stoddard-Dayton	Knight	5000	5000	Same
White GE	7-passenger	3500	3500	Same
Winton	Touring	3000	3000	Same

CARS COSTING FROM $2000 TO $3000

Make	Model	1912	1913	Increase or Decrease
Abbott-Detroit	Touring	$1800	$2000	+$200
American	Tourist	2250	2350	+100
Bergdoll	Touring	1900	2000	+100
Cadillac	Coupé	2250	2500	+250
Chalmers 5-seater	Six-Cylinder	3250	2400	—850
Chalmers 7-seater	Six-Cylinder	3250	2600	—650
Coey	Touring	1850	2000	+150
Cole, model 50	Touring	2060	1985	— 75
Franklin	M Touring	2800	2900	+100
Haynes 22	Touring	2100	2250	+150
Kissel 40	Touring	1850	2000	+150
Kissel 50	Touring	2350	2500	+150
Marmon	2-passenger	2750	2900	+150
Mercer	4-passenger	2750	2900	+150
National	5-passenger	3150	3300	+150
Pathfinder	Coupé	2250	2500	+250
Pratt	Touring	2100	2300	+200
Pullman 4.44	Touring	2150	2150	Same
Stoddard-Dayton	Touring	2800	2800	Same
Stutz	Roadster	2000	2000	Same
White	Touring	2250	2250	Same

CARS COSTING FROM $1250 TO $2000

Make	Model	1912	1913	Increase or Decrease
American	Scout	$1250	$1475	+$225
Ames	5-passenger	1600	1635	+ 35
Arbenz	Touring	1750	1875	+125
Bergdoll	Touring	1500	1600	+100
Buick 31	5-passenger	1250	1285	+ 35
Cadillac	Touring	1800	1975	+175
Carhartt	5-passenger	1350	1450	+100
Chalmers	40	1900	1950	+ 50
Franklin	Runabout	1650	1650	Same
Hudson	Touring	1600	1875	+275
Imperial 44	Touring	1750	1875	+125
King	Touring	1565	1500	+ 65
Jackson	Majestic	1650	1975	+325
Kissel	Roadster	1500	1700	+200
Marathon	Touring	1500	1350	—150
Marion	Touring	1285	1475	+190
Maxwell	Touring	1480	1675	+195
Mitchell 5.4	Touring	1350	1500	+150
Mitchell 5.6	Touring	1750	1850	+100
Moon	Touring	1600	1985	+385
Overland	71	1500	1475	— 25
Pathfinder	Touring	1750	1875	+125
Rambler	Cross Country	1650	1700	+ 50

CARS COSTING LESS THAN $1250

Make	Model	1912	1913	Increase or Decrease
Buick 24	Runabout	$900	$950	+$50
Buick 30	Roadster	1075	1125	+ 50
Ford	Touring	690	600	— 90
Ford	Town Car	900	800	—100
Ford	Runabout	590	525	— 65
Halladay	Touring	1100	1200	+100
Hupmobile	Runabout	750	750	Same
Krit	Touring	900	900	Same
Krit	Runabout	800	900	+100
Maxwell	Runabout	950	1110	+160
Maxwell	Touring	980	1145	+165
Metz	Runabout	495	495	Same
Overland 69	Touring	900	985	+ 85
R. C. H.	Runabout	750	900	+150
Reo the Fifth	5-passenger	1055	1095	+ 40

Stroke vs Bore

America - 1.22
France - - 1.65
Gt. Britain - 1.43

Installment I

¶ American motors show a tremendous majority of long stroke designs, 96.5 per cent. of all power plants being of this type. This article limits itself to a statistical review of this most important situation.

¶ In this installment American and French motors are dealt with, and a concluding installment to appear soon will contain a review of the British situation.

OUT of 280 American motors for this year, 272 have strokes which are longer than the bores; four are square, with bores and strokes the same; and four have shorter strokes than bores. The average stroke-bore ratio is .22:1, as compared with 1.16:1 last year and 1.14:1 in 1911. The long bore-stroke ratio for 1913 varies from 1.02 to 1.85, the various ratios being distributed as shown in the tabulation further down in this column. The latter indicates that 159.3 per cent., have a ratio between 1.10 and 1.30:1.

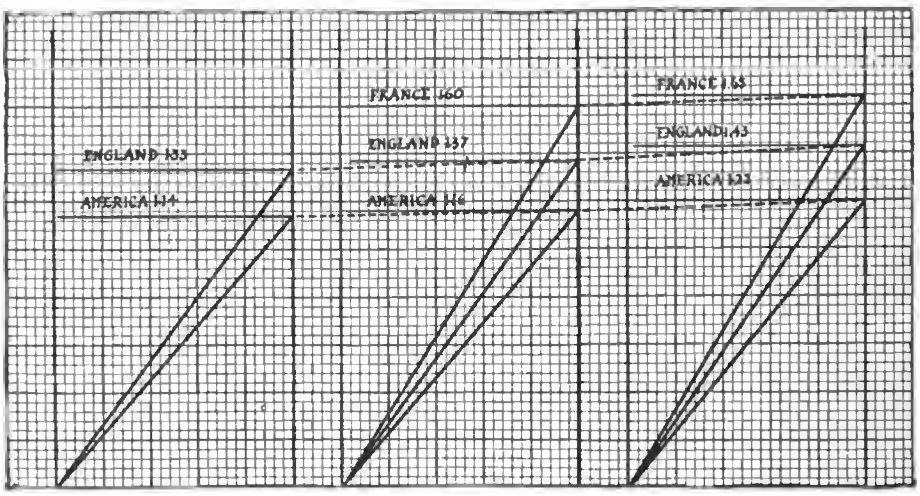
Stroke-bore ratios of American motors

From 1.00:1 to 1.10:1	31
From 1.11:1 to 1.20:1	84
From 1.21:1 to 1.30:1	82
From 1.31:1 to 1.40:1	36
From 1.41:1 to 1.50:1	23
From 1.51:1 to 1.60:1	6
From 1.61:1 to 1.85:1	3
Square Motors (1:1)	10
Short-stroke (1:>1)	5

Before considering American long-stroke motors individually it is proposed to draw a parallel between the long-stroke tendency as evidenced in this country and on the other side of the Atlantic. The triple chart shown on the bottom of this page illustrates the average stroke-bore ratios as they have obtained during the past 3 years in the manufacture of automobiles in the United States and Great Britain, that of France being given only for the past 2 years, but being sufficient to illustrate

French Six-Cylinder Motors

MOTOR	1912			1913		
	Bore	Stroke	Ratio	Bore	Stroke	Ratio
Aries	2.3	3.9	1.70	2.3	3.9	1.70
Aries	3.9	4.7	1.21	3.9	4.7	1.21
Bazelaire	2.9	4.3	1.48	2.9	4.7	1.62
Bollee, Leon	3.2	4.3	1.35	3.2	4.3	1.35
Brasier	3.5	5.5	1.57	3.5	5.5	1.57
Charron	3.1	4.7	1.52	3.1	4.7	1.52
Charron	3.7	5.1	1.38	3.7	5.1	1.38
Chenard & Walcker	3.1	5.9	1.91	3.1	5.9	1.91
Clement-Bayard	......	......	......	2.7	4.3	1.59
Clement-Bayard	3.1	4.7	1.52	3.1	4.7	1.52
Clement-Bayard	3.9	5.5	1.41	3.9	5.5	1.41
Delage	2.6	4.9	1.89	2.5	5.1	2.04
Delahaye	2.9	4.7	1.62	2.9	4.7	1.62
Delaunay-Belleville	2.8	4.7	1.68	2.8	4.7	1.68
Delaunay-Belleville	3.3	5.1	1.55	3.3	5.1	1.55
Delaunay-Belleville	3.9	5.5	1.41	3.9	5.5	1.41
Excelsior	3.3	5.1	1.55	3.3	5.1	1.55
F. L	3.1	3.9	1.26	3.1	3.9	1.26
Hotchkiss	3.7	5.1	1.38	3.7	5.1	1.38
Mors	......	......	......	3.3	5.9	1.79
La Buire	3.3	5.5	1.67	3.3	5.5	1.67
La Buire	3.5	5.5	1.57	3.5	5.5	1.57
Panhard-Levassor	3.9	5.5	1.41	3.9	5.5	1.41
Pilain	2.5	4.7	1.88	2.5	4.7	1.88
Renault	3.1	5.5	1.77	3.1	5.5	1.77
Renault	3.9	6.3	1.61	3.9	6.3	1.61
Roy	3.1	4.7	1.52	3.1	4.7	1.52
Schneider	2.9	4.7	1.62	2.9	5.1	1.76



Average stroke-bore ratios of American, English and French automobile motors, illustrating the increase of the ratio during the past 3 years and showing the remarkable start established by French engineers in their productions the trend in that country. These illustrations show that France is the leader of the long-stroke idea. While in 1912 the average stroke-bore ratio of French motors was 1.60:1, the ratio for 1913 is 1.65:1. The significance of this high figure is that while French engineers were among the first to realize the advantages of a long-stroke motor they have had no reason to change their opinion during the past 2 years; but, rather, the experiences obtained with early long-stroke motors have been of such a nature to induce them to further increase the ratio of the cylinder dimensions. If France was the pioneer in this movement, England was the first follower, perhaps due to the proximity of the two countries. England in 1911 produced motors with an average stroke-bore ratio of 1.33:1, in 1912 the ratio advanced to 1.37:1 and in 1913 to 1.43:1, perhaps on account of greater conservatism of the English engineers as compared with their French colleagues. The dotted lines on the chart illustrate the rate at which the stroke-bore ratio has been growing during the past years and if any conclusion may be drawn from this information, the tendency has rather gained and may be expected to gain still during the next few years.

To illustrate in detail the trend in American design THE AUTOMOBILE has compiled the accompanying tabulation giving bore, stroke and ratios for the past 3 years, but including only such motors as are still on the market. While this tabulation is not claimed to be absolutely complete, it is so within a very narrow margin, so that the averages from it are practically exact.

The greatest increase in stroke-bore ratio during 1912 was made by the Oakland 35 and the Westcott 50, both cars having a ratio exceeding their last year's by 43 per cent. The Oakland car, which had a square motor in 1912, has now a long-stroke type with a ratio of 1.43:1, and the Westcott had 1.05:1 stroke-bore ratio for 1912 and uses a ratio of 1.5:1 for this year. The leadership of these two makes in long-stroke progress illustrates in the best manner possible the alertness of manufacturers of medium-priced American cars. Directly after Oakland and Westcott comes the Mitchell 7-6 with a bore-stroke ratio of 1.65 which had a ratio of 1.11:1 in 1912. Next is the Auburn 33, formerly a square motor, but now having a stroke-bore ratio of 1.40:1. The Mitchell 5-4 is next with a ratio increase of 31 per cent., the 1913 ratio being 1.54:1 as against 1.18:1 in the 2 preceding years. The Staver 35, which had a ratio of 1.11:1 in 1912, is now 1.50:1, an increase of 35 per cent. Two cars show a ratio increase of exactly 30 per cent. These are the Moon 39, which had a ratio of 1.11:1 last year and

American Motor Dimensions and Ratios for Past 3 Years

MOTOR	1911			1912			1913		
	Bore	Stroke	Ratio	Bore	Stroke	Ratio	Bore	Stroke	Ratio
Abbott-Detroit D	4.00	4.50	1.12	4.13	4.25	1.03	4.13	5.25	1.27
Abbott-Detroit E	4.00	4.25	1.06	4.50	5.50	1.22	4.50	5.50	1.22
Adams-Farwell 9	....	....	....	5.50	5.00	.91	5.50	5.00	.91
A.E.C. 6-45	....	....	....	....	....	....	3.75	5.50	1.47
A.E.C. 6-60	....	....	....	....	....	....	4.25	5.00	1.18
Alco 7-16	....	....	....	....	....	....	3.94	4.25	1.08
Alco 11-60	4.75	5.50	1.16	4.75	5.50	1.16	4.75	5.50	1.16
Alpena N-50	4.00	4.50	1.12	4.13	5.25	1.27	3.75	5.25	1.40
American Scout 22A	....	....	....	3.75	4.50	1.20	3.75	5.00	1.33
American Tour. 34A	....	....	....	4.50	5.00	1.11	4.50	5.00	1.11
American Traveler 54A	5.38	5.50	1.02	5.38	5.50	1.02	5.38	5.50	1.02
Ames 44, 45	....	....	....	4.13	5.25	1.27	4.13	5.25	1.27
Apperson 4-45	4.50	5.00	1.11	4.50	5.00	1.11	4.50	5.00	1.11
Apperson 4-55	4.75	5.00	1.05	4.75	5.00	1.05	4.75	5.00	1.05
Arbenz F, G, H	4.13	5.25	1.27	4.13	5.25	1.27	4.13	5.50	1.33
Atlas 12	....	....	....	4.50	4.50	1.00	4.50	5.50	1.22
Auburn 33L	4.00	4.00	1.00	4.00	4.00	1.00	3.75	5.25	1.40
Auburn 37L	3.25	5.00	1.54	4.13	5.25	1.27	4.25	4.75	1.12
Auburn 40L	4.50	5.00	1.11	4.50	5.00	1.11	4.50	5.00	1.11
Auburn 6-50	....	....	....	4.13	5.25	1.27	4.13	5.25	1.27
Austin 55	....	....	....	4.38	5.25	1.20	4.00	5.00	1.25
Austin 66, 67	....	....	....	4.50	7.00	1.56	4.50	7.00	1.56
Bergdoll 30	4.00	4.50	1.12	4.00	4.50	1.12	4.00	4.50	1.12
Bergdoll 40	....	....	....	4.00	5.94	1.49	4.00	5.94	1.49
Buick 25, 24	3.75	3.75	1.00	3.75	3.75	1.00	3.75	3.75	1.00
Buick 31, 30	4.00	4.00	1.00	4.00	4.00	1.00	4.00	4.00	1.00
Buick 40	4.50	5.00	1.11	4.50	5.00	1.11	4.25	4.50	1.06
Burg S	....	....	....	....	....	....	3.75	5.25	1.40
Burg R	....	....	....	....	....	....	4.13	5.25	1.27
Cadillac 1913	4.50	4.50	1.00	4.50	4.50	1.00	4.50	5.75	1.27
Cameron 29A	3.88	3.75	.97	3.88	3.75	.97	3.88	3.75	.97
Carhartt K	4.06	4.50	1.11	4.06	4.50	1.11	4.06	4.50	1.11
Carhartt B	4.00	4.00	1.00	4.88	5.50	1.13	4.50	5.50	1.11
Carroll 6C	....	....	....	....	....	....	4.13	5.25	1.27
Carroll 4E	....	....	....	....	....	....	4.50	5.50	1.22
Carroll 4D	....	....	....	....	....	....	5.00	5.00	1.00
Cartercar 5	....	....	....	4.13	4.75	1.15	4.13	4.75	1.15
Case N	4.25	5.00	1.17	4.25	5.00	1.17	4.13	5.25	1.27
Case O	....	....	....	4.50	5.25	1.17	4.50	5.25	1.17
Chadwick 19	5.00	6.00	1.20	5.00	6.00	1.20	5.00	6.00	1.20
Chalmers 17	5.00	4.75	.95	4.25	5.25	1.23	4.25	5.25	1.23
Chevrolet C	....	....	....	....	....	....	3.55	5.00	1.41
Cino 440	4.38	5.00	1.14	4.38	5.00	1.14	4.50	5.00	1.11
Cino 660	....	....	....	4.00	5.00	1.25	4.00	6.00	1.50
Cino 950	....	....	....	....	....	....	4.50	6.00	1.33
Coey	....	....	....	4.00	5.00	1.25	4.00	5.00	1.25
Colby C	4.13	5.25	1.27	4.13	5.25	1.27	4.13	5.25	1.27
Colby E	4.25	5.25	1.23	4.25	5.25	1.23	4.50	5.50	1.22
Cole 40	....	....	....	....	....	....	4.13	4.75	1.15
Cole 50	4.25	4.50	1.06	4.50	5.25	1.17	4.50	5.25	1.17
Columbia	....	....	....	4.88	5.13	1.05	4.88	5.13	1.05
Corbitt D, E, F	....	....	....	....	....	....	4.00	4.50	1.12
Correja T & D	4.25	5.00	1.18	4.25	5.00	1.18	4.25	5.00	1.18
Correja C & J	....	....	....	....	....	....	3.50	5.00	1.43
Correja R & S	....	....	....	....	....	....	4.00	6.00	1.50
Crane 3	....	....	....	....	....	....	4.38	6.25	1.46
Crawford 13-30	4.25	4.50	1.06	4.13	4.75	1.15	4.13	5.25	1.27
Crawford 13-40	4.50	4.50	1.00	4.50	4.50	1.00	4.50	5.50	1.22
Crow-Elkhart C1	....	....	....	3.75	4.50	1.20	3.75	4.50	1.20
Crow-Elkhart C2, 3, 4, DT	....	....	....	4.00	4.50	1.12	4.00	4.50	1.12
Crow-Elkhart C5	....	....	....	4.13	4.75	1.15	4.13	5.00	1.21
Crow-Elkhart C6A	....	....	....	4.38	5.00	1.14	4.13	5.25	1.27
Crow-Elkhart C7, 8, 9	....	....	....	4.50	5.00	1.11	4.50	5.00	1.11
Crow-Elkhart C6B	....	....	....	....	....	....	3.75	5.00	1.33
Croxton A	....	....	....	....	....	....	4.13	5.50	1.33
Croxton B6	....	....	....	....	....	....	4.25	5.50	1.29
Cunningham M	4.75	5.75	1.21	4.75	5.75	1.21	4.75	5.75	1.21
Cutting 40	3.75	5.00	1.33	4.00	5.00	1.25	4.00	5.00	1.25
Davis 40	....	....	....	....	....	....	4.13	5.25	1.27
Davis 50	....	....	....	....	....	....	4.50	5.50	1.22
Day Utility D	....	....	....	4.00	4.50	1.12	4.00	4.50	1.12
Detroiter A	....	....	....	....	....	....	3.38	4.75	1.41
Diamond TP	....	....	....	....	....	....	5.00	5.50	1.10
Dispatch G2	....	....	....	3.50	5.00	1.43	3.50	5.00	1.43
Dorris H	4.38	5.00	1.14	4.38	5.00	1.14	4.38	5.00	1.14
Duquesne 50	....	....	....	....	....	....	4.75	5.50	1.16
Duquesne Six	....	....	....	....	....	....	3.75	5.50	1.47
Duryea	....	....	....	3.75	3.75	1.00	3.75	3.75	1.00
Edwards 25	....	....	....	....	....	....	4.00	5.50	1.37
Empire	3.50	4.00	1.15	3.50	4.00	1.15	3.50	4.50	1.28
Enger F, J, E	....	....	....	....	....	....	4.50	5.25	1.17
Falcar 40	....	....	....	....	....	....	4.13	5.25	1.27
Fiat 54	....	....	....	4.40	6.00	1.36	4.40	6.00	1.36
Fiat 55	....	....	....	....	....	....	5.13	6.75	1.32
Fiat 56	....	....	....	....	....	....	4.40	6.00	1.36
Firestone-C. 88E	4.25	4.50	1.06	4.13	5.25	1.27	4.13	5.25	1.27
Firestone 6C0	4.50	5.50	1.22	4.50	5.50	1.22	4.50	5.50	1.22
Flanders 40	3.63	3.75	1.03	3.63	3.75	1.03	3.63	4.50	1.24
Flanders 50	....	....	....	....	....	....	4.00	4.75	1.19
Ford T	3.75	4.00	1.07	3.75	4.00	1.07	3.75	4.00	1.07
Franklin G	4.00	4.00	1.00	4.00	4.00	1.00	4.00	4.00	1.00
Franklin M	....	....	....	3.63	4.00	1.10	3.63	4.00	1.10
Garford G15	....	....	....	4.25	5.25	1.23	3.75	6.00	1.60
Garford 14	4.25	5.25	1.24	4.25	5.25	1.24	4.25	5.25	1.24
G.J.G. Jr.	....	....	....	3.75	4.50	1.20	3.75	4.50	1.20
G.J.G. Sr.	4.75	5.00	1.05	4.75	5.00	1.05	4.75	5.00	1.05
Gleason R	....	....	....	....	....	....	4.75	4.00	.84
Glide 36-42	....	....	....	....	....	....	4.13	5.25	.127
Glide 45	4.75	5.00	1.05	4.75	5.00	1.05	4.75	5.00	1.05

Cylinder Sizes and Ratios of Bores and Strokes of American Four and Six-Cylinder Automobile Motors for 1911, 1912 and 1913

MOTOR	1911			1912			1913		
	Bore	Stroke	Ratio	Bore	Stroke	Ratio	Bore	Stroke	Ratio
Great Eagle C	....	....	....	4.13	5.25	1.27	4.13	5.25	1.11
Great Eagle B	....	....	....	....	....	....	4.75	5.00	1.05
Great Southern 30	....	....	....	4.00	4.50	1.12	4.00	4.50	1.12
Great Southern 51	....	....	....	5.13	6.00	1.17	5.19	6.00	1.15
Great Western	4.25	5.00	1.18	4.25	5.00	1.18	4.25	5.50	1.29
Grout 35	4.50	5.00	1.11	4.50	5.00	1.11	4.50	5.50	1.22
Grout 45	4.75	5.00	1.05	4.75	5.00	1.05	4.75	5.00	1.05
Halladay 32	4.00	4.00	1.00	3.75	5.25	1.40	3.75	5.25	1.40
Halladay 40	4.50	5.00	1.11	4.50	5.00	1.11	4.50	5.00	1.11
Havers 44	....	....	....	3.75	5.00	1.33	3.75	5.00	1.33
Havers 55	....	....	....	....	....	....	4.00	5.00	1.25
Haynes 22	4.50	5.50	1.22	4.50	5.50	1.22	4.50	5.50	1.22
Henderson	....	....	....	....	....	....	4.13	5.25	1.27
Herreshoff 4-30, 6-36	3.38	3.75	1.12	3.38	3.75	1.12	3.38	4.50	1.33
Holly A	....	....	....	....	....	....	4.00	5.00	1.25
Hudson 37	4.00	4.50	1.12	4.00	4.50	1.12	4.13	5.25	1.27
Hudson 54	....	....	....	....	....	....	4.13	5.50	1.27
Hupmobile C, E	3.25	3.38	1.04	3.25	3.38	1.04	3.25	3.38	1.04
Hupmobile H	....	....	....	3.25	5.50	1.05	3.25	5.50	1.05
Imperial 34	4.19	5.25	1.27	4.19	5.25	1.27	4.50	5.25	1.17
Imperial 44	4.38	4.50	1.03	4.50	5.25	1.17	4.75	5.25	1.10
Interstate 45	4.50	5.00	1.11	4.50	5.00	1.11	4.00	5.00	1.25
Jackson Olympic	4.50	4.50	1.00	4.50	4.50	1.00	4.13	4.75	1.15
Jackson Majestic	4.75	4.75	1.00	4.75	4.75	1.00	4.50	5.25	1.17
Keeton 48	....	....	....	....	....	....	3.75	5.50	1.47
King	3.81	5.13	1.34	3.81	5.13	1.34	3.81	5.13	1.34
King	....	....	....	....	....	....	4.00	5.50	1.37
Kisselkar 30	4.25	4.25	1.00	4.25	4.25	1.00	4.25	4.25	1.00
Kisselkar 40	4.50	4.75	1.05	4.50	4.75	1.05	4.50	5.25	1.17
Kisselkar 50	4.88	5.00	1.03	4.88	5.00	1.03	4.88	5.00	1.03
Kisselkar 60	4.88	4.75	.98	4.50	4.75	1.05	4.50	5.25	1.17
Klinekar 30	4.00	4.50	1.12	4.00	4.63	1.15	4.00	4.63	1.15
Klinekar 40	4.25	5.25	1.23	4.25	5.50	1.29	4.25	5.50	1.29
Klinekar 50	4.10	5.00	1.22	4.10	5.00	1.22	4.10	5.00	1.22
Knox 46	5.00	4.25	.95	5.00	4.25	.95	4.38	5.50	1.20
Knox 44	....	....	....	5.00	5.50	1.10	5.00	5.50	1.10
Krit K	3.38	4.00	1.06	3.38	4.00	1.06	3.70	4.00	1.08
Lambert 40	4.13	5.50	1.33	4.13	5.50	1.33	3.25	5.25	1.62
Lambert 99	4.50	5.00	1.11	4.50	5.00	1.11	4.25	5.25	1.23
Lenox Four	4.25	5.50	1.29	4.25	5.50	1.29	4.25	5.50	1.29
Lenox Six	....	....	....	....	....	....	4.00	5.00	1.25
Lexington 13	4.75	5.00	1.05	4.38	5.50	1.33	4.13	5.25	1.27
Lion 30	4.50	5.00	1.11	4.50	5.00	1.11	3.50	5.00	1.43
Little Four A	....	....	....	....	....	....	3.50	3.38	.97
Locomobile L	4.50	4.50	1.00	4.50	4.50	1.00	4.50	4.50	1.00
Locomobile R	....	....	....	....	....	....	4.25	5.00	1.18
Locomobile M	....	....	....	....	....	....	4.50	5.50	1.22
Lozier 72	4.63	5.50	1.19	4.63	5.50	1.19	4.63	5.50	1.19
Lozier 77	....	....	....	....	....	....	3.63	5.50	1.51
Luverne 760	....	....	....	4.75	5.00	1.05	4.25	5.25	1.23
Marathon Run	3.25	3.50	1.08	3.25	3.50	1.08	3.50	4.50	1.28
Marathon Win	4.25	4.50	1.06	4.25	4.50	1.06	4.25	4.50	1.06
Marathon Champ	....	....	....	4.50	5.13	1.14	4.50	5.13	1.14
Marion 36A, 37A	....	....	....	4.00	5.00	1.25	4.00	5.00	1.25
Marion 48A	4.25	4.50	1.06	4.13	5.50	1.33	4.13	5.50	1.33
Marmon 32	4.50	5.00	1.11	4.50	5.00	1.11	4.50	5.00	1.11
Marmon Six	....	....	....	....	....	....	4.50	6.00	1.33
Mason A, B, C	4.50	5.00	1.11	4.50	5.00	1.11	5.00	5.00	1.00
Mason K	....	....	....	....	....	....	4.00	4.50	1.12
Matheson C	....	....	....	4.50	5.00	1.11	4.50	5.00	1.11
Maxwell 4	4.50	4.00	.89	4.50	4.00	.89	3.75	4.00	1.07
Maxwell 8	4.25	4.25	1.00	4.25	4.25	1.00	4.00	4.63	1.16
Maxwell 10	....	....	....	4.25	5.25	1.23	4.25	5.25	1.23
McFarlan S	4.00	5.00	1.25	4.00	5.00	1.25	4.00	5.00	1.25
McFarlan M	3.63	4.00	1.10	4.25	5.00	1.18	4.25	5.00	1.18
McFarlan T	....	....	....	....	....	....	4.00	6.00	1.05
McIntyre G	....	....	....	4.00	5.00	1.25	3.50	4.50	1.27
Mercer J & K	4.38	5.00	1.14	4.38	5.00	1.14	4.38	5.00	1.14
Mercer G & H	4.25	4.50	1.06	4.50	5.00	1.11	4.50	5.00	1.11
Metz 22	....	....	....	3.75	4.00	1.07	3.75	4.00	1.07
Michigan L & O	....	....	....	....	....	....	4.06	4.50	1.11
Michigan R & S	....	....	....	....	....	....	4.25	5.25	1.23
Midland T4	4.50	5.00	1.11	4.50	5.00	1.11	4.50	5.00	1.11
Midland T6	4.75	5.50	1.16	4.36	5.00	1.14	4.00	5.00	1.25
Miller 40	....	....	....	....	....	....	4.13	5.15	1.24
Mitchell 5-4	4.25	5.00	1.18	4.25	5.00	1.18	4.25	7.00	1.54
Mitchell 5-6	3.75	5.50	1.46	3.75	5.50	1.46	3.75	6.00	1.60
Mitchell 7-6	4.50	5.00	1.11	4.50	5.00	1.11	4.25	7.00	1.65
Moline M40	4.00	6.00	1.50	4.00	6.00	1.50	4.13	6.00	1.45
Moon 39	4.50	5.00	1.11	4.50	5.00	1.11	4.00	5.75	1.44
Moon 48	4.75	5.00	1.05	4.75	5.00	1.05	4.50	5.00	1.11
Moon 65	....	....	....	....	....	....	4.00	5.75	1.44
Morse	4.63	5.00	1.08	4.63	5.00	1.08	4.63	5.00	1.08
Motorette L, M & R	....	....	....	3.25	3.75	1.16	3.75	3.75	1.00
Moyer D & F	....	....	....	....	....	....	4.00	5.00	1.25
Moyer B & E	....	....	....	....	....	....	4.50	5.00	1.11
National Series V	....	....	....	4.88	6.00	1.23	4.88	6.00	1.23
Norwalk A	....	....	....	....	....	....	4.00	5.00	1.25
Norwalk B	....	....	....	....	....	....	4.50	5.50	1.22
Nyberg 437	....	....	....	....	....	....	3.75	5.25	1.40
Nyberg 440	....	....	....	....	....	....	4.25	5.25	1.23
Nyberg 64SR	....	....	....	....	....	....	4.25	5.00	1.17

the year before and which now is 1.44:1. The other motor is the Garford G 15; last year its stroke was only 23 per cent. longer than the bore, but for 1913 the ratio has been increased to 1.60, which gives the motor one of the highest ratios used in American practice today. An increase of 28 per cent. has taken place in the case of the Knox 46, which has been changed from a short-stroke to a long-stroke design during the year 1912. Instead of .95:1 the motor is now 1.20:1. A stroke-bore ratio increase of 27 per cent. is the record of the Cadillac, which was a square motor, but which now has a ratio of 1.27:1. The Speedwell car has undergone the same change.

An examination of the tabulation brings out many other increases ranging from 25 per cent. down to 10 and less. Among the motors included in this group are the White GEB and White GF, the Maxwell 4, Crawford, Crow-Elkhart, Flanders 40, Atlas 12, Lambert 40, and many others.

On the other hand a few companies have reduced the stroke-bore ratios of their product, and the most notable instance in this group is the Oldsmobile, which has now a ratio of 1.15:1 as compared with last year's of 1.50:1. The decrease in this case is equivalent to 23 per cent. The Motorette is now a square design, while last year it had a ratio of 1.16:1. The Auburn 37 has continued its development toward a low stroke-bore ratio by using the proportion 1.12:1 this year, after the 1912 ratio of 1.27:1, which in turn was considerably below that of the preceding year, namely, 1.54:1. Mason, Krit and Imperial are other examples of the same practice.

Coming to the stroke-bore ratios themselves, the highest value in this respect is that by the Only car, which continues its ratio of 1.85:1 from last year. The second greatest ratio is that of the Mitchell 7-6, namely, 1.65:1. The Lambert cars with a ratio of 1.62:1 is next, being followed by the Mitchell 5-6 and the Garford G15, both of which have strokes 60 per cent. greater than their respective bores.

The stroke-bore ratio which ranks next after these is 1.56:1, in the Austin 66 and 67. Then follow several motors with the ratio of 1.54:1, as the R. C. H. and the Mitchell 5-4. Five makes of cars use motors with a stroke-bore ratio of 1.50:1; these are the Cino 560, the Correja R and S, Pilot 60, Staver 65 and Westcott 50. The motors with ratios between 1.40 and 1.50:1 number about a score, while the majority of cars use ratios from 1.10 to 1.33:1.

The tabulations of French bores, strokes and ratios appearing on pages 72 and 76 afford an opportunity to compare the continental practice to that current in America. Out of 229 motors listed in this tabulation all but forty have stroke-bore ratios of more than 1.30:1 and of these forty twenty-seven ratios are higher than 1.20:1 Not a single short-stroke motor appears in the table, the minimum ratio being 1.07:1, this being the Germain motor. A Sizaire-Naudin motor with a ratio of 2.48:1 represents the most advanced step of the French designer in the direction of the long stroke. Next to it ranks the Gobron motor, which has a ratio of 2.19:1, the La Buire with a ratio of 2.18:1 and the Rossel, 2.12:1. There are fully thirteen motors with a ratio of 2.04:1, bringing the number of power plants in which the stroke is more than twice the bore beyond a score. Remembering that the American Only car with a ratio of 1.85 stands practically in a class by itself and that the next ratio is 1.65:1, it appears that the French school of automobile engineering, which has this year produced dozens of motors with ratios higher than 1.65:1, is far ahead of American practice in this point of design. The reason is probably that the advantages of long-stroke motors were reasoned out theoretically some time before practice verified the assumptions of their designers, and the French being so much greater theorists than Americans, gained an appreciable advantage over the latter, due to their energetic start in this contest of designs. The practical effect of this development is that the French average ratio of 1.65:1 is 35 per cent. higher than the American average of 1.22:1 and on a level with the ratio 1.65, which in a way may be considered as the American high-water mark in stroke-bore ratios.

Of the 229 French motors here tabulated, 201 are four-cylinder types and twenty-eight six-cylinder designs. The average stroke-bore ratio of the four-cylinder motors is 1.64:1 and that of the six-cylinder power plants 1.80, which is responsible for the general average being slightly higher than that of the four-cylinder motors.

The list of English cars for 1913 is much smaller in number than either that of American or French products, but nevertheless the progressive spirit of British designers has created in 1913 product with an average ratio, as mentioned above, of 1.43:1. In an early issue of THE AUTOMOBILE a list of English motors giving their bores, strokes and ratios will be published.

One of the chief differences between French and British designers is the favoring attitude of the latter toward six-cylinder designs. In France, twenty-eight out of 201 motors are six-cylinder types, or 12.2 per cent., as compared with 18.6 per cent. of the 113 English motors. The list of English motors not being published this week, only specific instances will be cited at present.

Cylinder Sizes and Ratios of Bores and Strokes of American Four and Six-Cylinder Automobile Motors for 1911, 1912, 1913

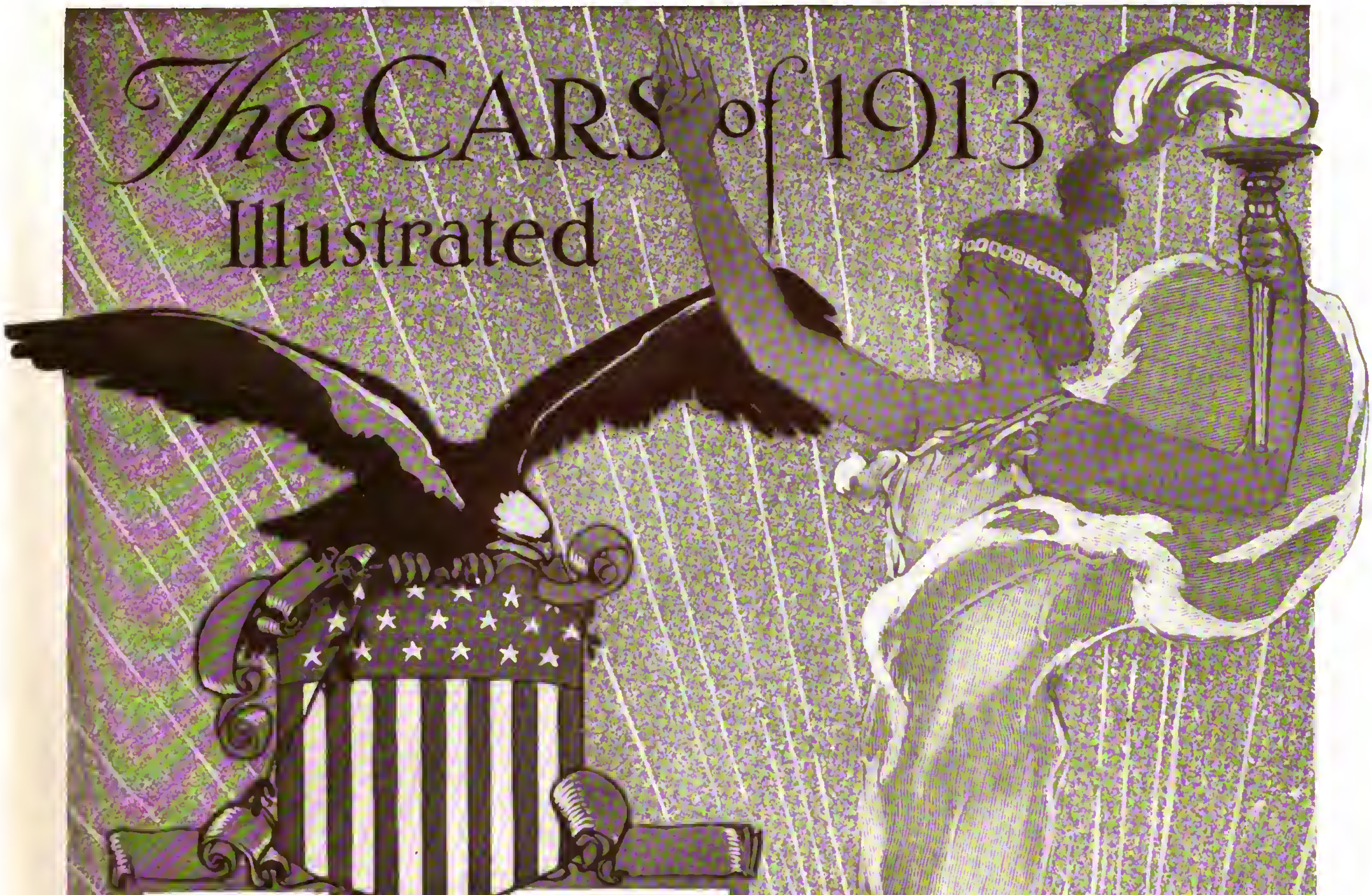
MOTOR	1911			1912			1913		
	Bore	Stroke	Ratio	Bore	Stroke	Ratio	Bore	Stroke	Ratio
Oakland 35	4.00	4.00	1.00	4.00	4.00	1.00	3.50	5.00	1.43
Oakland 42, 6-60	4.50	5.00	1.11	4.50	5.25	1.16	4.13	4.75	1.15
Oldsmobile 53	....	....	....	4.00	6.00	1.50	4.13	4.75	1.15
Omaha 30	....	....	....	....	....	....	4.06	4.50	1.11
Only A	5.13	10.00	1.95	4.25	7.88	1.85	4.25	7.88	1.85
Overland 69	4.00	4.50	1.12	4.00	4.50	1.12	4.00	4.50	1.12
Overland 71	4.25	4.50	1.06	4.38	4.50	1.03	4.38	4.50	1.03
Pacific Special A & B	....	....	....	....	....	....	4.50	5.00	1.11
Packard 38	4.06	5.13	1.26	4.06	5.13	1.26	4.00	5.50	1.37
Packard 48	....	....	....	4.50	5.50	1.22	4.50	5.50	1.22
Paige 25	3.75	4.00	1.07	3.75	4.00	1.07	3.75	4.00	1.07
Paige 36	....	....	....	....	....	....	4.00	5.00	1.25
Palmer-Singer Brighton	4.00	4.75	1.18	4.00	5.00	1.25	4.00	5.00	1.25
Palmer-Singer LXIV	4.88	5.50	1.13	4.88	5.50	1.13	4.88	5.50	1.13
Paterson 43	4.00	4.00	1.00	4.00	4.00	1.00	4.13	4.75	1.15
Paterson 47	3.63	3.63	1.01	4.50	5.25	1.17	4.50	5.25	1.17
Pathfinder	4.13	5.25	1.27	4.13	5.25	1.27	4.13	5.25	1.27
Peerless 29	4.00	4.63	1.16	4.00	4.63	1.16	4.00	4.63	1.16
Peerless 35	....	....	....	4.00	5.50	1.37	4.00	5.50	1.37
Peerless 36	....	....	....	4.50	6.00	1.33	4.50	6.00	1.33
Peerless 37	....	....	....	5.00	7.00	1.40	5.00	7.00	1.40
Perfex 2	....	....	....	....	....	....	3.75	4.50	1.20
Pierce-A, 38C	4.00	5.13	1.28	4.00	5.13	1.28	4.00	5.50	1.37
Pierce-A, 48D	....	....	....	4.50	5.50	1.22	4.50	5.50	1.22
Pierce-A, 66A	5.00	7.00	1.40	5.00	7.00	1.40	5.00	7.00	1.40
Pilot 50	4.50	5.00	1.11	4.50	5.00	1.11	4.50	6.00	1.33
Pilot 60	....	....	....	....	....	....	4.00	6.00	1.50
Pope-Hartford 33	4.75	5.50	1.16	4.75	5.50	1.16	4.75	5.50	1.16
Pope-Hartford 29	....	....	....	4.19	5.38	1.28	4.32	5.38	1.24
Pope-Hartford 31	....	....	....	....	....	....	4.32	5.13	1.19
Pratt 30	....	....	....	....	....	....	4.00	4.50	1.12
Pratt 40	4.50	4.75	1.05	4.50	4.75	1.05	4.50	4.75	1.05
Pratt 50	....	....	....	....	....	....	4.50	5.75	1.28
Premier 6-40	4.50	5.25	1.17	4.50	5.25	1.17	4.00	5.00	1.25
Premier 6-60	4.50	5.25	1.17	4.50	5.25	1.17	4.50	5.25	1.17
Pullman 36	4.06	5.00	1.23	4.06	5.00	1.23	4.06	5.00	1.23
Pullman 44, 66	....	....	....	4.50	5.50	1.22	4.50	5.50	1.22
Rambler Cr. C.	....	....	....	4.50	4.50	1.00	4.50	4.50	1.00
Rayfield C.	3.56	5.00	1.40	3.56	5.00	1.40	3.50	5.50	1.47
R-C-H	....	....	....	3.25	5.00	1.54	3.25	5.00	1.54
Reeves Sexto Auto	....	....	....	....	....	....	4.75	5.50	1.16
Regal T & N	....	....	....	4.13	4.00	.97	3.75	4.50	1.20
Regal H	4.25	4.50	1.06	4.25	4.50	1.06	4.25	4.50	1.06
Regal C	4.00	4.50	1.12	4.00	4.50	1.12	4.00	5.00	1.25
Reo V	4.00	4.50	1.12	4.00	4.50	1.12	4.00	4.50	1.12
Republic E, D	4.25	5.00	1.18	4.25	5.00	1.18	4.25	5.00	1.18
Richmond O	....	....	....	4.00	4.50	1.12	4.00	4.50	1.12
Richmond P	4.50	5.00	1.11	4.50	5.00	1.11	4.50	5.00	1.11
Schacht NS, KO	4.00	4.25	1.06	4.32	5.00	1.16	4.25	5.50	1.29
Schlosser	....	....	....	5.00	6.00	1.20	5.00	6.00	1.20
Selden 48	....	....	....	4.75	5.00	1.05	4.75	5.00	1.05
S.G.V.A	3.75	4.38	1.17	3.75	4.38	1.17	3.75	4.38	1.17
S.G.V.D	4.00	5.25	1.31	4.00	5.25	1.31	4.00	5.25	1.31
Simplex 127	4.88	6.50	1.33	4.88	6.50	1.33	4.88	6.50	1.33
Simplex 129	....	....	....	5.75	5.75	1.00	5.75	5.75	1.00
Spaulding G	....	....	....	4.13	5.25	1.27	4.25	5.50	1.29
Speedwell G	4.00	4.50	1.12	5.00	5.00	1.00	4.13	5.25	1.27
Spoerer 40-C	....	....	....	4.88	5.50	1.18	4.88	5.50	1.18
Spoerer 25-A	....	....	....	4.13	5.50	1.33	4.13	5.50	1.33
Staver 45	4.50	5.00	1.11	4.50	5.00	1.11	4.50	5.00	1.11
Staver 55	4.50	5.00	1.11	4.50	5.00	1.11	4.50	6.00	1.33
Staver 65	....	....	....	4.50	5.00	1.11	4.00	6.00	1.50
Stearns-Knight 4	4.25	5.50	1.29	4.25	5.50	1.29	4.25	5.50	1.29
Stearns-Knight 6	....	....	....	....	....	....	4.25	5.75	1.35
Stevens Duryea C	....	....	....	4.25	4.75	1.12	4.32	5.50	1.27
Stoddard-Dayton 30	4.00	4.50	1.12	4.00	4.50	1.12	4.00	4.50	1.12
Stoddard-Dayton 38	4.25	5.13	1.21	4.25	5.13	1.21	4.25	5.13	1.21
Stoddard-Dayton 48	4.75	5.00	1.05	4.75	5.00	1.05	4.75	5.00	1.05
Stoddard-Dayton Knight	4.50	5.50	1.22	4.50	5.50	1.22	4.50	5.50	1.22
Studebaker 20	3.75	3.63	.97	3.63	3.75	1.03	3.63	3.75	1.03
Studebaker 25, Six	....	....	....	....	....	....	3.50	5.00	1.43
Studebaker 30	4.00	5.50	1.37	4.00	4.50	1.12	4.00	4.50	1.12
Studebaker 35	....	....	....	....	....	....	4.13	5.00	1.21
Stutz Four	....	....	....	4.75	5.50	1.16	4.75	5.50	1.16
Stutz Six	....	....	....	....	....	....	4.25	5.00	1.18
Touraine 7, 6	....	....	....	....	....	....	4.00	5.25	1.31
Triumph A, B	....	....	....	....	....	....	4.75	5.50	1.16
Velie 32	....	....	....	....	....	....	.75	5.50	1.47
Velie 40	....	....	....	4.50	5.25	1.17	4.50	5.25	1.17
Warren Wolverine	4.00	4.50	1.12	4.13	4.50	1.09	4.13	4.50	1.09
Warren Resolute	....	....	....	4.25	4.75	1.12	4.00	5.00	1.25
Warren Pilgrim	....	....	....	....	....	....	4.25	4.75	1.10
Westcott 40	....	....	....	4.50	5.00	1.11	4.50	5.00	1.11
Westcott 50	4.75	5.00	1.05	4.75	5.00	1.05	4.00	6.00	1.50
White GRE	....	....	....	3.75	5.13	1.37	3.75	5.13	1.37
White GEB, GF	....	....	....	4.75	5.13	1.08	4.25	5.75	1.35
Winton 17D	4.50	5.00	1.11	4.50	5.00	1.11	4.50	5.00	1.11
Zimmerman Z6	....	....	....	....	....	....	3.75	5.00	1.33
Zimmerman Z40	....	....	....	4.32	5.00	1.16	4.32	5.00	1.16
		1.14			1.17			1.22	

Cylinder Bores, Strokes and Ratios of French Four - Cylinder Motors

MOTOR	1912 Bore	1912 Stroke	1912 Ratio	1913 Bore	1913 Stroke	1913 Ratio
Alcyon	2.9	4.7	1.62	2.9	5.1	1.76
Alcyon	3.1	5.1	1.65	3.1	5.1	1.65
Aries	2.3	3.9	1.70	2.3	3.9	1.70
Aries	2.5	3.9	1.56	2.5	3.9	1.56
Aries	2.9	5.5	1.90	2.9	5.5	1.90
Aries	3.3	5.1	1.55	3.3	5.1	1.55
Aries	4.1	6.2	1.51	4.1	6.2	1.51
Barre	2.5	4.3	1.72	2.5	4.3	1.72
Barre	2.9	5.1	1.76	2.9	5.1	1.76
Bazelaire	2.95	3.9	1.32	2.95	3.9	1.32
Bazelaire	2.99	4.7	1.57	2.99	4.7	1.57
Bazelaire	3.3	5.1	1.55	3.3	5.1	1.55
Berliet	2.7	3.9	1.44	2.7	3.9	1.44
Berliet	3.1	4.7	1.52	3.1	4.7	1.52
Berliet				3.3	5.5	1.67
Berliet	3.9	5.5	1.41	3.9	5.5	1.41
Berliet	4.7	5.5	1.17	4.7	5.5	1.17
Bollee, Leon	3.2	4.3	1.34	3.2	4.3	1.34
Bozier	2.5	5.1	2.04	2.5	5.1	2.04
Bozier	2.9	4.7	1.62	2.9	5.1	1.76
Bozier	2.9	5.9	2.04	2.9	5.9	2.04
Brasier	2.6	4.3	1.65	2.6	4.3	1.65
Brasier	2.7	4.7	1.74	2.7	4.7	1.74
Brasier	3.3	5.5	1.67	3.3	5.5	1.67
Brasier	3.9	5.9	1.51	3.9	5.9	1.51
Buchet	2.9	4.7	1.62	2.9	4.7	1.62
Charron	2.5	4.7	1.88	2.5	4.7	1.88
Charron	3.1	4.7	1.52	3.1	4.7	1.52
Charron	3.7	5.1	1.38	3.7	5.1	1.38
Charron	4.3	5.9	1.37	4.3	5.9	1.37
Chenard & Walcker	2.5	4.7	1.88	2.7	5.1	1.89
Chenard & Walcker	2.9	4.7	1.62	2.9	5.1	1.76
Chenard & Walcker	3.1	5.9	1.58	3.1	5.9	1.58
C. I. D.	2.9	4.7	1.62	2.9	4.7	1.62
C. L. C.	3.1	5.5	1.78	2.5	5.1	2.04
Clement-Bayard	2.3	4.7	2.04	2.3	4.7	2.04
Clement-Bayard				2.5	4.7	1.88
Clement-Bayard	2.7	4.3	1.59	2.9	4.3	1.48
Clement-Bayard	3.1	4.7	1.52	3.1	5.1	1.65
Clement-Bayard				3.3	5.5	1.67
Clement-Bayard				3.3	5.1	1.55
Clement-Bayard				3.9	5.5	1.41
Corre La Licorne	2.7	4.7	1.74	2.9	4.7	1.62
Corre La Licorne	2.5	5.1	2.04	2.5	5.1	2.04
Corre La Licorne	2.9	5.9	2.03	2.9	5.9	2.03
Corre La Licorne	3.9	5.5	1.41	3.9	5.5	1.41
Cote	2.9	4.1	1.42	2.9	4.7	1.62
Cote	3.1	4.1	1.32	3.1	4.7	1.52
Cote	3.5	4.7	1.34	3.5	4.7	1.34
Cote	3.9	4.7	1.21	3.9	4.7	1.21
Cottin & Desgouttes	3.1	6.2	2.00	3.1	6.2	2.00
Cottin & Desgouttes	3.9	5.5	1.41	3.9	6.2	1.59
Cottin & Desgouttes	4.7	6.2	1.32	4.7	6.2	1.32
Cottin & Desgouttes	5.1	7.8	1.72	5.1	7.8	1.72
Crespelle	2.5	5.1	2.04	2.5	5.1	2.04
Crespelle	2.9	4.7	1.62	2.9	4.7	1.62
Crespelle	2.9	5.9	2.04	2.9	5.9	2.04
Darracq	2.9	4.7	1.62	2.9	4.7	1.62
Darracq	3.9	5.5	1.41	3.9	5.5	1.41
Darracq				3.3	5.1	1.55
Delage	2.5	4.3	1.72	2.5	4.3	1.72
Delage	2.9	4.7	1.62	2.9	5.1	1.76
Delahaye	2.44	3.9	1.60	2.44	3.9	1.60
Delahaye	2.9	4.3	1.48	2.9	4.3	1.48
Delahaye	3.3	5.1	1.55	3.3	5.1	1.55
Delahaye	3.7	5.1	1.38	3.7	5.1	1.38
Delaunay-Belleville	3.3	5.1	1.55	3.3	5.1	1.55
Delaunay-Belleville	3.9	5.5	1.41	3.9	5.5	1.41
De Dion-Bouton	2.5	4.7	1.88	2.5	4.7	1.88
De Dion-Bouton	2.7	5.1	1.89	2.9	5.1	1.76
De Dion-Bouton	3.1	5.5	1.78	3.1	5.5	1.78
De Dion-Bouton	3.9	5.5	1.41	3.9	5.5	1.41
D. P. F.	2.5	4.7	1.88	2.5	4.7	1.88
D. P. F.	2.7	5.1	1.89	2.7	5.1	1.89
D. P. F.	3.1	5.9	1.90	3.1	5.9	1.90
Excelsior	3.3	5.1	1.55	3.3	5.1	1.55
F. L.	3.1	3.9	1.26	3.1	3.9	1.26
F. N.	2.9	3.5	1.21	2.7	5.1	1.89
F. N.	3.1	4.7	1.52	3.3	4.7	1.42
Germain	3.38	4.3	1.27	3.38	4.3	1.27
Germain	3.6	4.3	1.19	3.6	4.3	1.19
Germain	3.1	5.1	1.65	3.1	5.1	1.65
Germain	4.0	4.3	1.07	4.0	4.3	1.07
Germain	4.7	5.1	1.09	4.7	5.1	1.09
Gobron	2.7	5.9	2.19	2.7	5.9	2.19
Gobron				3.1	6.2	2.00
Gobron	3.5	7.0	2.00	3.5	7.0	2.00
Gobron	4.3	9.8	2.28	4.3	9.8	2.28
Gregoire				3.9	6.7	1.72
Gregoire				2.5	5.1	2.04
Gregoire	3.1	4.3	1.39	3.1	4.3	1.39
Gregoire				3.1	5.1	1.65
Gregoire	3.1	6.2	2.00	3.1	6.2	2.00
Hotchkiss	3.1	4.7	1.52	3.1	4.7	1.52
Hotchkiss	3.7	5.1	1.38	3.7	5.1	1.38
Hotchkiss	4.3	5.9	1.37	4.3	5.9	1.37
Hurtu	2.7	3.9	1.45	2.7	4.3	1.59
Hurtu	3.1	4.3	1.39	2.9	4.7	1.62
La Buire				2.5	5.1	2.04
La Buire	2.7	5.9	2.18	2.7	5.9	2.18
La Buire	3.1	6.2	2.00	3.1	6.2	2.00
La Buire	3.3	5.5	1.67	3.3	5.5	1.67
La Buire	3.5	6.2	1.77	3.5	6.2	1.77
Lorraine-Dietrich	2.7	4.7	1.74	2.7	4.7	1.74
Lorraine-Dietrich	3.5	5.1	1.46	3.5	5.1	1.46
Lorraine-Dietrich	4.9	6.2	1.27	4.9	6.7	1.37

MOTOR	1912 Bore	1912 Stroke	1912 Ratio	1913 Bore	1913 Stroke	1913 Ratio
Martini	3.1	4.7	1.52	3.1	4.7	1.52
Martini	3.5	5.5	1.57	3.5	5.5	1.57
Martini				3.5	5.5	1.57
Mors	2.9	4.7	1.62	2.9	4.7	1.62
Mors	3.1	4.7	1.52	3.3	5.9	1.79
Mors				2.9	4.7	1.62
Mors				3.5	5.1	1.46
Mors				3.9	5.5	1.41
Mors				4.8	5.9	1.23
Motobloc	2.5	4.7	1.88	2.5	4.7	1.88
Motobloc	3.1	4.7	1.52	3.1	4.7	1.52
Motobloc	3.1	5.8	1.87	3.1	5.8	1.87
Motobloc	3.5	5.1	2.04	3.5	5.1	2.04
Motobloc	3.5	6.2	1.77	3.5	6.2	1.77
N. A. G.				2.9	3.3	1.14
N. A. G.				2.9	4.6	1.59
N. A. G.				3.2	4.7	1.47
N. A. G.				3.5	5.1	1.46
N. A. G.				4.9	9.9	2.02
N. A. G.				5.1	6.2	1.22
Nagent	2.7	4.6	1.70	2.9	4.6	1.59
Nagent	3.5	4.7	1.34	3.2	4.7	1.47
Nagent	3.5	5.1	1.46	3.5	5.1	1.46
Nagent	4.17	5.1	1.22	4.5	4.9	1.09
Nagent	4.1	6.2	1.51	5.1	6.2	1.21
Panhard-Levassor				2.7	5.5	2.04
Panhard-Levassor	3.1	4.7	1.52	3.1	4.7	1.52
Panhard-Levassor				3.1	5.1	1.65
Panhard-Levassor	3.9	5.1	1.31	3.9	5.5	1.41
Peugeot				2.1	3.5	1.67
Peugeot	2.7	5.1	1.89	2.6	5.1	1.96
Peugeot	3.1	5.1	1.65	3.1	5.1	1.65
Peugeot				3.1	5.5	1.78
Peugeot	3.5	5.9	1.69	3.5	5.9	1.69
Peugeot				3.7	6.2	1.67
Peugeot	3.6	5.9	1.61	3.6	5.9	1.61
Peugeot	3.9	6.2	1.59	3.9	6.2	1.59
Peugeot				4.7	7.8	1.66
Piccard-Pictet	3.1	4.7	1.52	3.1	4.7	1.52
Piccard-Pictet				3.1	5.5	1.78
Piccard-Pictet	3.5	5.1	1.46	3.5	5.9	1.69
Piccard-Pictet				3.5	6.7	1.92
Piccard-Pictet	3.9	5.5	1.41	3.9	5.9	1.51
Pilain	2.5	4.7	1.88	2.5	4.7	1.88
Pilain				2.1	4.3	2.05
Pilain	2.9	4.3	1.48	2.9	4.3	1.48
Pilain	3.5	4.7	1.34	3.5	4.7	1.34
Pilain				3.3	7.2	2.18
Pilain	3.9	4.7	1.21	3.9	5.5	1.41
Pilain	4.8	5.5	1.15	4.8	5.5	1.15
Pipe	2.9	4.3	1.48	2.9	4.3	1.48
Pipe	3.1	5.9	1.90	3.1	5.9	1.90
Pipe	3.9	7.0	1.80	3.9	7.0	1.80
Pipe	5.5	7.0	1.27	5.5	7.0	1.27
Renault	3.1	4.7	1.52	3.1	4.7	1.52
Renault	3.5	5.5	1.57	3.5	5.5	1.57
Renault	3.9	6.3	1.62	3.9	6.3	1.62
Renault	5.1	6.3	1.24	5.1	6.3	1.24
Rolland-Pilain	2.7	4.3	1.59			
Rolland-Pilain	3.1	4.3	1.39			
Rolland-Pilain	3.1	5.5	1.77			
Rolland-Pilain	3.3	5.5	1.67			
Rolland-Pilain	4.1	5.9	1.44			
Rolland-Pilain	4.3	6.4	1.49			
Rolland-Pilain	5.1	6.4	1.26			
Rolland-Pilain	5.1	10.6	2.08			
Rossel	2.5	5.3	2.12	2.5	5.3	2.12
Rossel	2.9	5.9	2.04	2.9	5.9	2.04
Rossel	3.5	4.3	1.23	3.5	4.3	1.23
Rossel	3.1	4.3	1.39	3.1	4.3	1.39
Roy	3.1	4.7	1.52	3.1	5.1	1.65
Roy	3.5	5.5	1.57	3.5	5.5	1.57
Schneider	2.7	4.7	1.74	2.7	4.7	1.74
Schneider				2.9	5.1	1.76
Schneider	3.1	5.1	1.65	3.1	5.5	1.78
Schneider	3.7	5.1	1.38	3.1	5.9	1.90
Schneider	4.1	5.9	1.44	4.3	6.3	1.47
Sizaire-Naudin	2.7	6.7	2.48	2.7	6.7	2.48
Sizaire-Naudin				2.5	4.3	1.72
Sizaire-Naudin				2.9	4.7	1.62
S. P. A.	2.7	4.7	1.74	2.7	4.7	1.74
S. P. A.	3.1	4.7	1.52	3.1	4.7	1.52
S. P. A.	3.9	5.5	1.41	3.9	5.5	1.41
S. P. A.	5.1	5.7	1.12	4.3	7.8	1.82
Stimula	2.7	4.3	1.59	2.9	4.7	1.62
Stimula	3.4	4.3	1.27	3.4	4.3	1.27
Stimula	3.1	4.3	1.39	3.1	4.3	1.39
Turcat-Mery	3.1	5.1	1.65	3.1	5.1	1.65
Turcat-Mery	3.5	5.1	1.46	3.5	5.1	1.46
Turcat-Mery	3.9	5.1	1.31	3.9	5.1	1.31
Turcat-Mery				4.3	6.3	1.47
Unic				2.5	4.3	1.72
Unic	2.9	4.7	1.62	2.9	4.7	1.62
Unic	3.5	4.7	1.34	3.5	5.1	1.46
Vermorel				2.6	4.7	1.81
Vermorel	2.9	4.7	1.62	2.9	4.7	1.62
Vermorel	3.5	5.1	1.46	3.5	5.1	1.46
Vinot	2.7	4.3	1.59	2.7	4.3	1.59
Vinot	3.1	4.3	1.39	3.1	5.1	1.65
Vinot	4.0	5.1	1.28	3.97	5.1	1.28
Vivinus	3.1	4.7	1.52	3.1	4.7	1.52
Vivinus	3.5	5.1	1.46	3.5	5.1	1.46
Zebre	1.96	3.9	1.99	1.96	3.9	1.99
Zebre	3.6	4.7	1.28	3.6	4.7	1.28
Zedel	2.8	4.7	1.68	2.8	4.7	1.68
Zedel	3.5	5.5	1.57	3.5	5.5	1.57

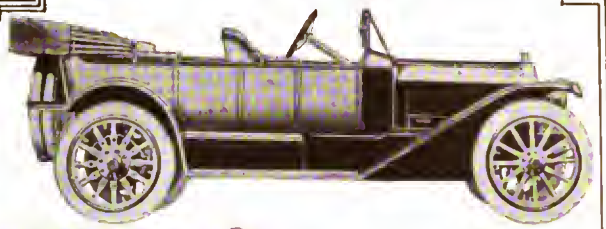
The CARS of 1913 Illustrated



CARS for 1913 are illustrative of a number of tendencies which have been growing for several years and have become sufficiently crystallized in this year's products to make them very noticeable. The first thing that strikes the casual observer of the cars as a whole is the increased beauty of line combined with utility of design which is exhibited. Long, flowing lines, easy curves, and smooth, clean-cut appearance are the rule this year instead of the exception among the open bodies, while in the closed cars two opposing tendencies which have been gaining for years have resulted in two distinct types of design, diametrically opposite in intent. One of these is the colonial style, which this year has been carried to a point almost of exaggeration, while the other is the stream-line effect, with its sweeping curves and subdued corners.

¶ Electric lighting and electric starting are the feature of the year in all classes of cars. Except in the very cheapest, electricity is relied upon to furnish not only the power for lighting the car but at the same time is utilized to take the place of the laborious hand cranking. This is only the latest evidence of the effort toward ease of operation and riding which is the aim of the engineers. The effort has resulted also in longer and more flexible springs, longer wheelbase and deeper upholstering.

STAVER 55 $2250

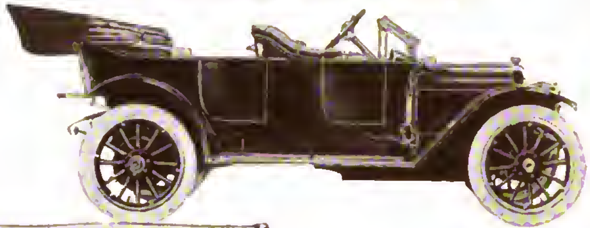


HAVERS 55 $2250

POPE 31 $2250

KISSELKAR 4-40 $2250

CASE N $2500



PULLMAN 4-44 $2250

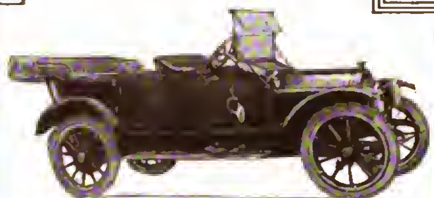
Five-Seated Touring Cars

THE losses in numbers are not evenly distributed. They are more pronounced in the high and low-priced classes and a distinct gain is shown in the division listing at $1,250-$2,000.

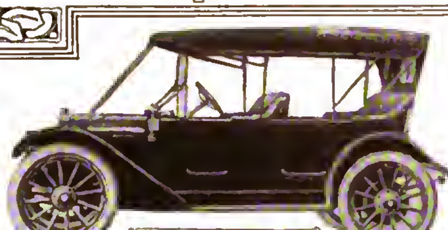
In the $1,000 division thirty-one models are made. This compares with fifty-two in 1912.

In the $1,500 class there has been a striking increase in touring car manufacture.

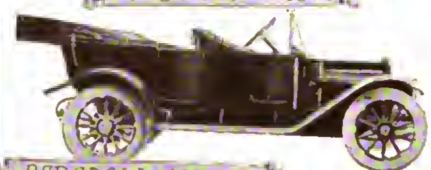
In 1913 there are 232 models, embracing 134 touring cars.



HUDSON 37 $1875



ARBENZ $1875



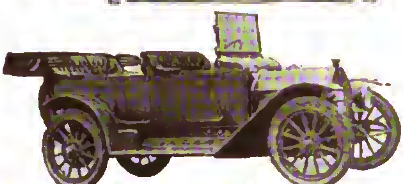
BERGDOLL 40 $2000

CRAWFORD 40 $2100

MOLINE M 40 $1950

WESTCOTT 30 $2475

PATHFINDER SERIES 13 $1875



LENOX 40 $2000

NYBERG 6-60 $2000

PALMER-SINGER SIX $2000

Staver 55. $2,250. 32.4 H.P., 120 W.B., 36 x 4 tires.
Pope 31. $2,250. 30.1 H.P., 118½ W.B., 36 x 4½.
Case N. $2,500. 27.25 H.P., 115 W.B., 34 x 4 tires.
Havers 55. $2,250. 38.4 H.P., 128 W.B., 36 x 4 tires.
Kisselkar 4-40. $2,250. 32.4 H.P., 121 W.B., 35 x 4½ and 35 x 4 tires.
Pullman 4-44. $2,250. 32.4 H.P., 122 W.B., 36 x 4 tires.
Hudson 37. $1,875. 27.25 H.P., 118 W.B., 36 x 4 tires.
Arbenz. $1,875. 27.3 H.P., 120 W.B., 36 x 4 tires.
Bergdoll 40, $2,000. 25.5 H.P., 121 W.B., 36 x 4 tires.
Crawford 40. $2,100. 32.4 H.P., 125 W.B., 36 x 4 tires.
Moline M-40. $1,950. 27.25 H.P., 124 W.B., 36 x 4 tires.
Westcott 30, $2,475. 38.4 H.P., 127 W.B., 37 x 4½ tires.
Pathfinder 13. $1,875. 27.25 H.P., 120 W.B., 36 x 4 tires.
Lenox 40, $2,000. 28.9 H.P., 118 W.B., 36 x 4 tires.
Nyberg 6-60, $2,000. 43.8 H.P., 128 W.B., 36 x 4 tires.
Palmer-Singer, $2,000. 38.4 H.P., 127 W.B., 36 x 4 tires.

Tourists of Medium Price

IN the $2,500 class there are 234 models and 143 touring cars against 288 models and 176 touring cars last year.

In the $4,000 class there are 322 models and 137 touring cars against 408 models and 173 touring cars in 1912.

Prices are steady to strong throughout the industry for the reason pointed out.

The tables show that the division listing between $1,250 and $2,000 has increased in number of manufacturers, number of models, and, of course, in volume of production.

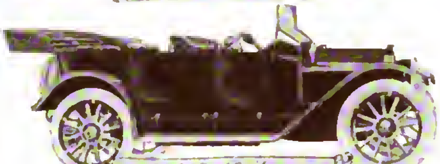
Jackson Majestic, $1,850. 32.4 H.P., 124 W.B., 36 x 4 tires.
Schacht N. S., $1,775. 28.9 H.P., 120 W.B., 36 x 4 tires.
Rambler, $1,700. 32.4 H.P., 120 W.B., 36 x 4 tires.
Enger P. $1,750. 32.4 H.P., 120 W.B., 36 x 4 tires.
Marion 48A. $1,850. 27.25 H.P., 120 W.B., 36 x 4 tires.
Herreshoff 6. $1,700. 27.25 H.P., 124 W.B., 34 x 4 tires.
Richmond P., $1,750. 32.4 H.P., 120 W.B., 36 x 4 tires.
Stoddard-Dayton 30. $1,450. 25 H.P., 112 W.B., 34 x 4 tires.
Abbott-Detroit D. $1,750. 27.3 H.P., 116 W.B., 34 x 4 tires.
Cartercar 5A. $1.700. 27.25 H.P., 116 W.B., 36 x 4 tires.
Pratt 50. $1,850. 32.4 H.P., 120 W.B., 36 x 4 tires.
Imperial 34. $1,650. 32.4 H.P., 118 W.B., 36 x 4 tires.
Ames 40. $1,635. 27.3 H.P., 118 W.B., 36 x 4 tires.
Glide 36-42, $1,600. 27.25 H.P. 118 W.B., 34 x 4 tires.
Michigan 40R. $1,585. 28.9 H.P., 118 W.B., 35 x 4½ tires.
Great Western. $1.585. 28.9 H.P., 118 W.B., 26 x 4 tires


JACKSON MAJESTIC $1850


SCHACHT N S $1775


RAMBLER $1700


ENGER P. $1750


MARION 48 A $1850


HERRESHOFF SIX $1700

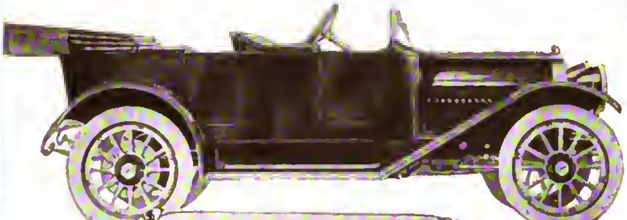

RICHMOND P $1750


STODDARD-DAYTON 30 $1450

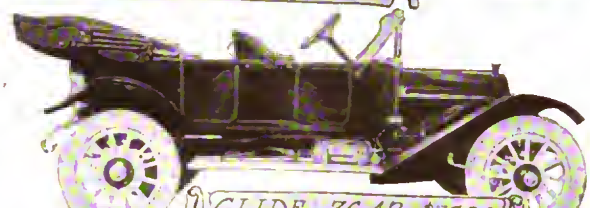

ABBOTT-DETROIT-D $1750


CARTERCAR 5A $1700


PRATT 50

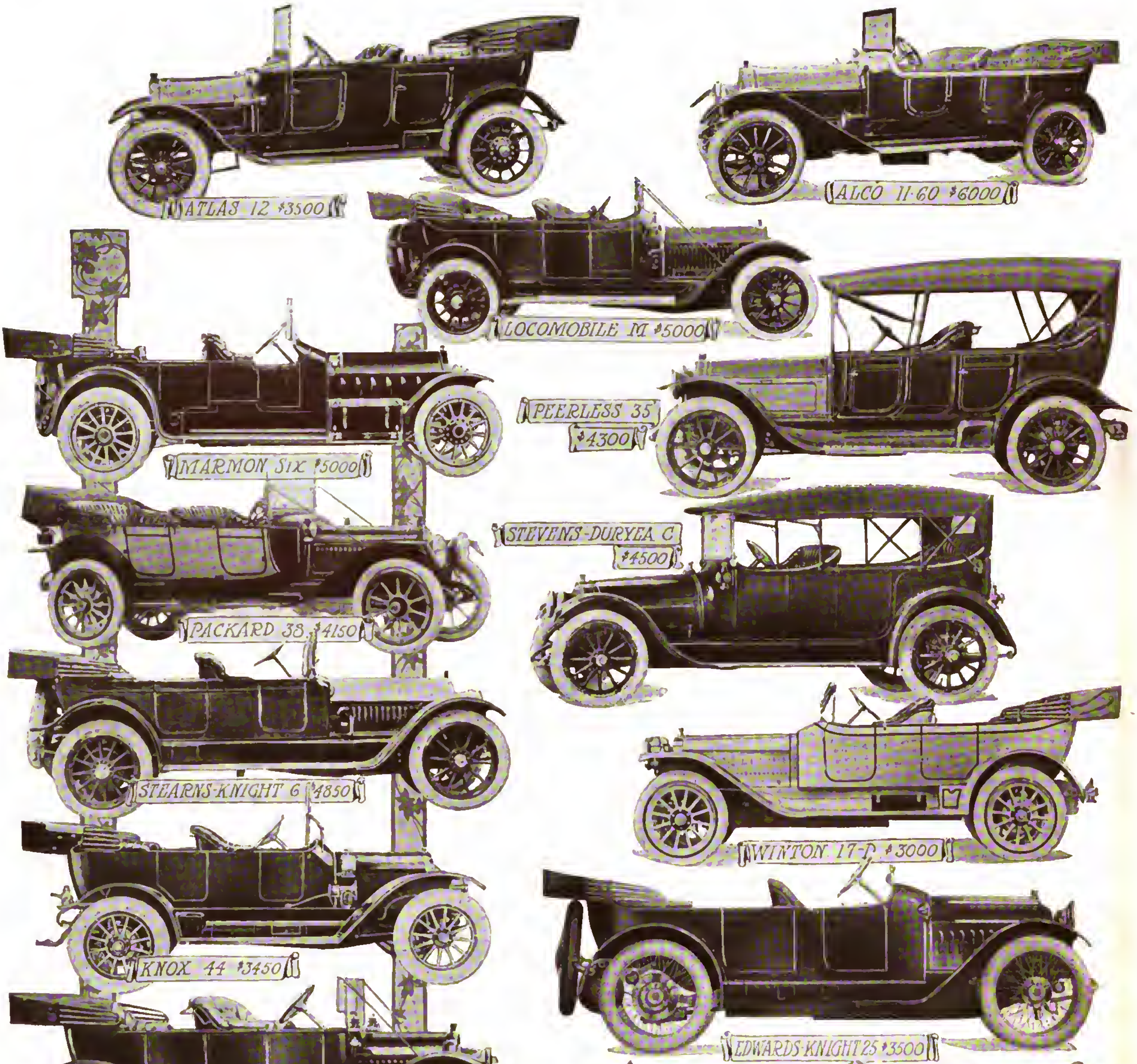

IMPERIAL 34 $1650

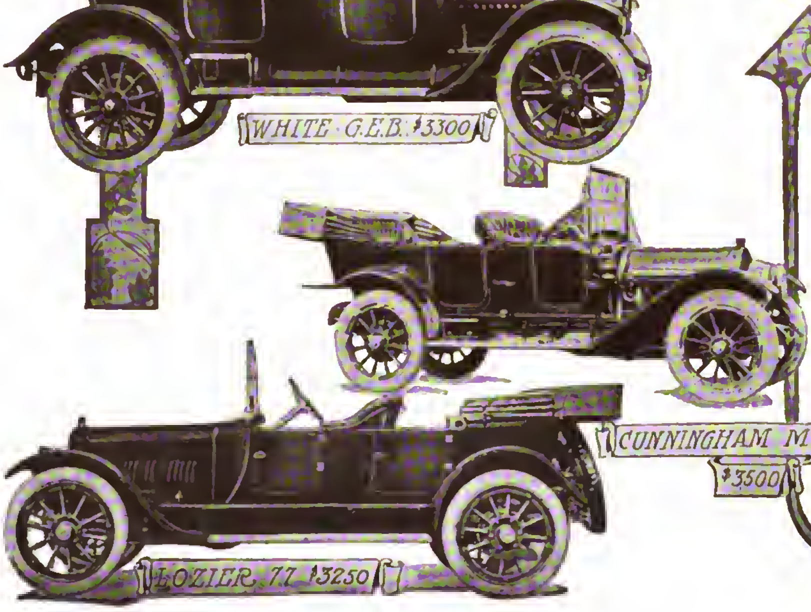

AMES 40 $1635


GLIDE 36-42 $1600


MICHIGAN 40 $1585

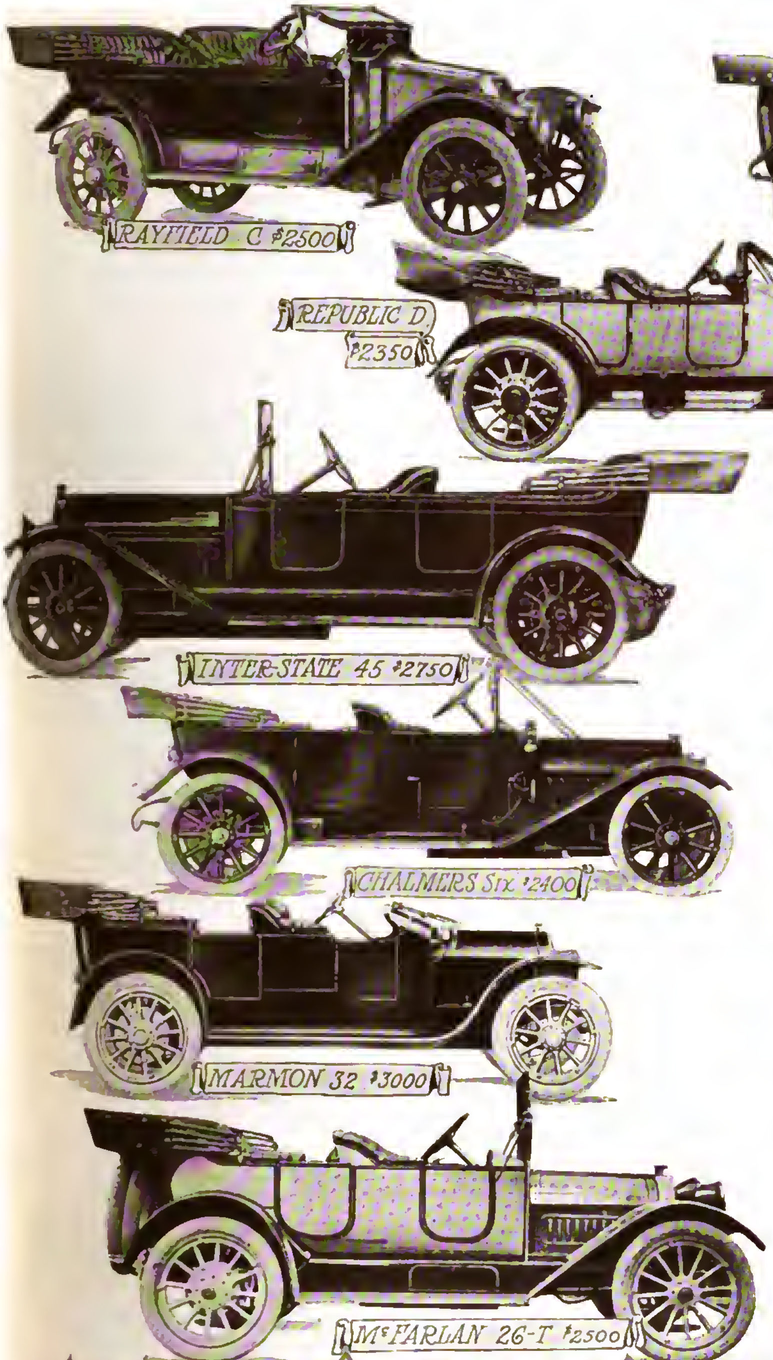

GREAT WESTERN $1585

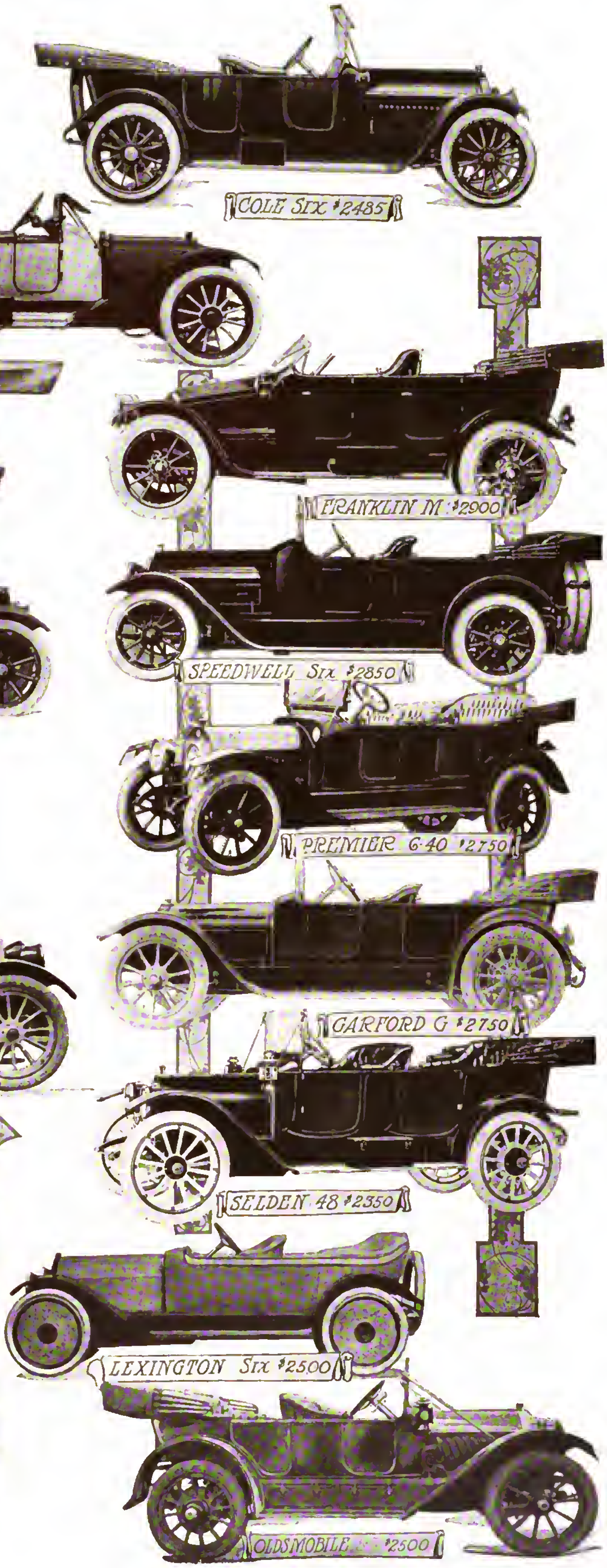




Five-Passenger Touring Cars at $3000 to $6000

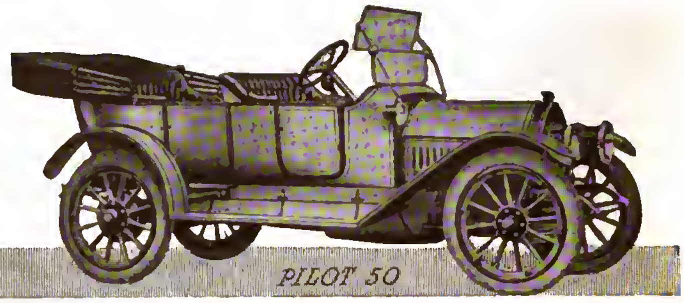
Atlas 12, $3,500. 32.4 H.P., 130 W.B., 37 by 5 tires.
Alco 11-60, $6,000. 54.1 H.P., 133½ W.B., 36 by 4½ and 37 x 5 tires.
Locomobile M, $5,000. 48.6 H.P., 136 W.B., 36 x 4½ and 37 x 5 tires.
Marmon Six, $5,000. 48.6 H.P., 145 W.B., 36 x 4½ and 37 x 5 tires.
Peerless 35, $4,300. 38.4 H.P., 125 W.B., 36 x 4½ tires.
Packard 38, $4,150. 38.4 H.P., 134 W.B., 36 x 4½ and 37 x 5 tires.
Stevens-Duryea C, $4,500. 46.1 H.P., 131 W.B., 37 x 4½ tires.
Stearns-Knight Six, $4,850. 43.8 H.P., 134 W.B., 37 x 5 tires.
Winton 17D, $3,000. 48-6 H.P., 130 W.B., 36 x 4½ tires.
Knox 44, $3,450. 40 H.P., 122 W.B., 36 x 4½ tires.
Edwards-Knight 25, $3,500. 25.6 H.P., 120 W.B., 36 x 4½ tires.
White GEB, $3,300. 28.9 H.P., 120 W.B., 36 x 4½ tires.
Cunningham M, $3,500. 36.1 H.P., 124 W.B., 36 x 4½ tires.
Lozier 77, $3,250. 31.6 H. P., 127½ W.B., 36 x 4½ tires.

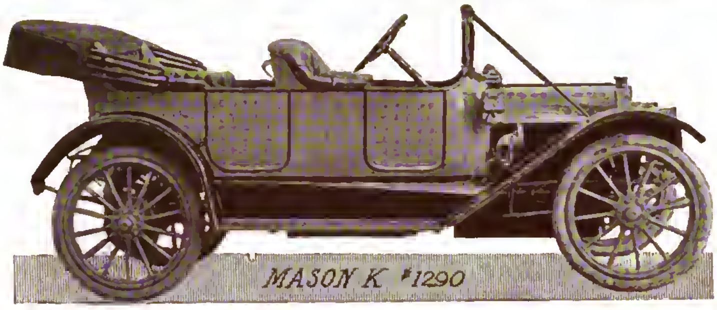


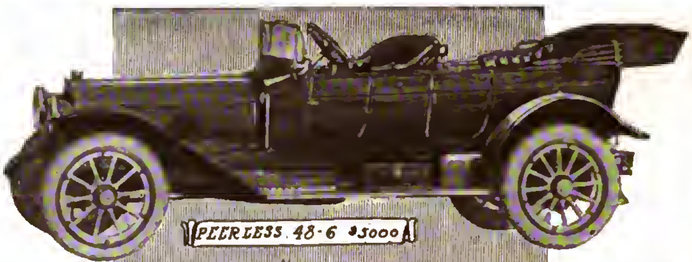


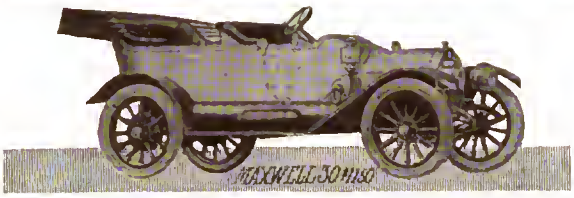
Open Cars for Five Passengers at $2400 to $3000

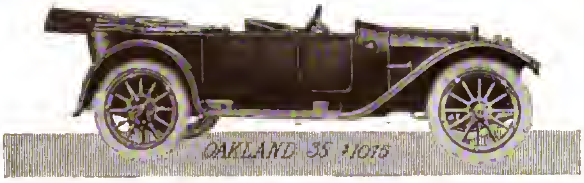
Rayfield C, $2,500. 29.4 H.P., 117 W.B., 34 x 4 tires.
Cole 60, $2,485. 40.9 H.P., 132 W.B., 37 x 4½ tires.
Republic D. $2,350. 28.9 H.P., 120 W.B., 36 x 4 tires.
Inter-State 45, $2,750. 38.4 H.P., 132 WB., 36 x 4½ tires.
Franklin M. $2,900. 31.6 H.P., 116 W.B., 34 x 4½ tires.
Chalmers 18, $2,400. 43.8 H.P., 130 W.B., 36 x 4½ tires.
Speedwell Six, G. $2,850. 40.9 H.P., 134 W.B., 36 x 4½ tires.
Marmon 32, $3,000. 32.4 H.P., 120 W.B., 35 x 4½ tires.
Premier 6-40, $2,750. 38.4 H.P., 132 W.B., 36 x 4½ tires.
McFarlan T, $2,500. 38.4 H.P., 124 W.B., 37 x 4½ tires.
Garford G, $2,750. 33.75 H.P., 128 W.B., 36 x 4½ tires.
Selden 48, $2,350. 36.1 H.P., 125 W.B., 36 x 4 tires.
Lexington 13-6, $2,500. 40.9 H.P., 129 W.B., 36 by 4½ tires.
Oldsmobile, $2,500.

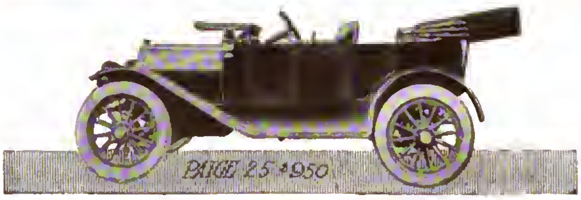


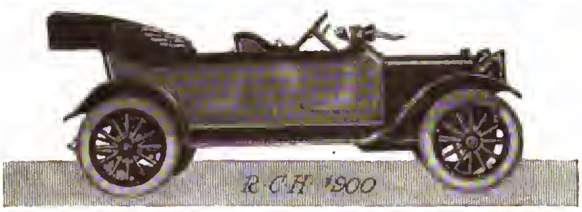


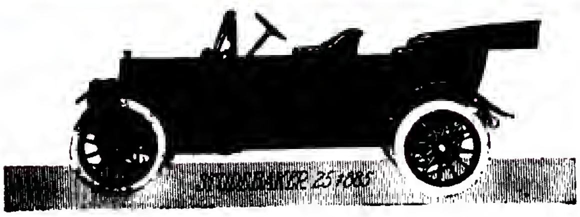








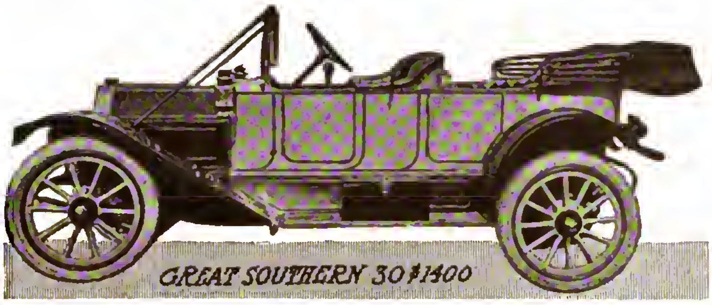


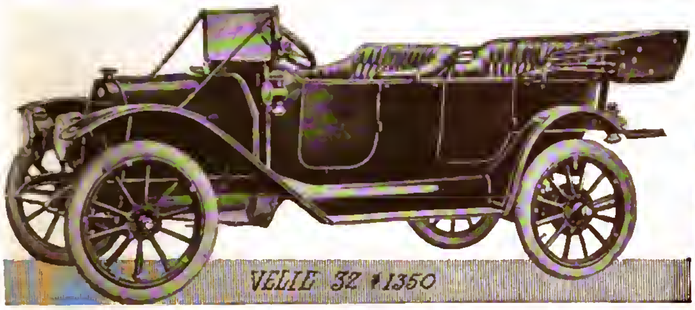


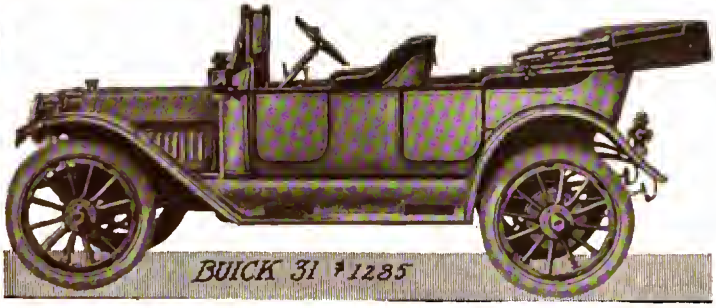
Six Seaters and Low Priced Touring Cars

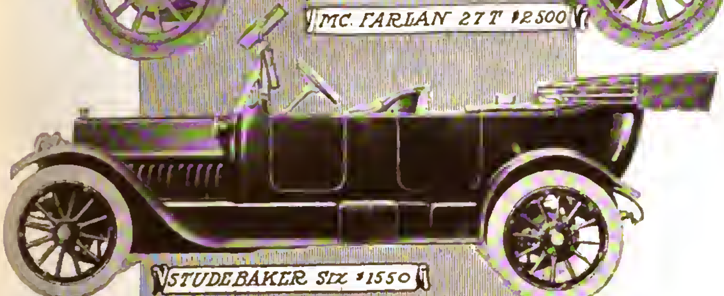
STRAIGHT, clean side lines, rounded lower rear sections of the body with more grace in the outward sweep of the rear seat, all of which are designed to prevent dust annoyance and to minimize wind-resistance, are the actual practical advances and betterments of the season.

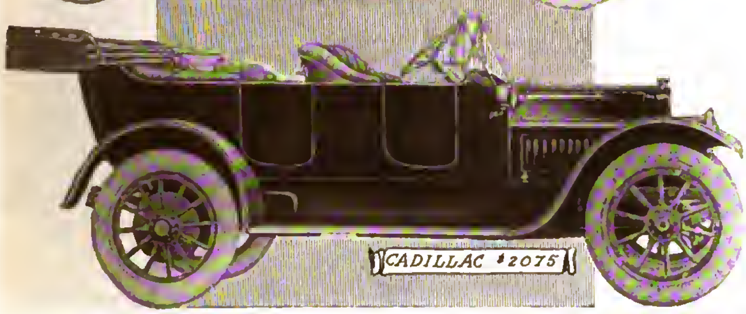
Henderson 47, six passengers, $1,485. 27.25 H.P., 116 W.B., 34 x 4 tires.
Pilot 50, $2.250. 32.4 H.P., 126 W.B., 36 x 4 tires.
Mason K, $1,290. 25.6 H.P., 116 W.B., 36 x 3½ tires.
Marathon Winner, $1,375. 28.9 H.P., 116 W.B., 34 x 4 tires.
Regal C, $1,250. 25.6 H.P., 116 W.B., 34 x 4 tires.
Peerless, six passengers, $5,000. 48.6 H.P., 137 W.B., 36 x 4½ and 37 x 5 tires.
Maxwell 50, $1,150. 25.6 H.P., 106 W.B., 32 x 3½ tires.
Oakland 35, $1,075. 19.6 H.P., 112 W.B., 32 x 3½ tires.
Paige 25, $950. 22.5 H.P., 110 W.B., 32 x 3½ tires.
R.C.H., $900. 16.9 H.P., 110 W.B., 32 x 3½ tires.
Studebaker 25, $885. 19.6 H.P., 101 W.B., 30 x 3½ tires.
Knox 46, six passengers, $4,350. 45.96 H.P., 134 W.B., 38 x 5 tires.
Schacht, N. S., six passengers, $2,500. 28.9 H.P., 120 W.B., 36 x 4 tires.

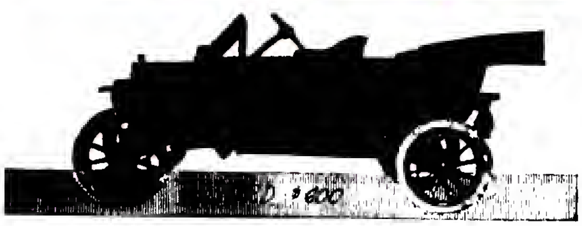








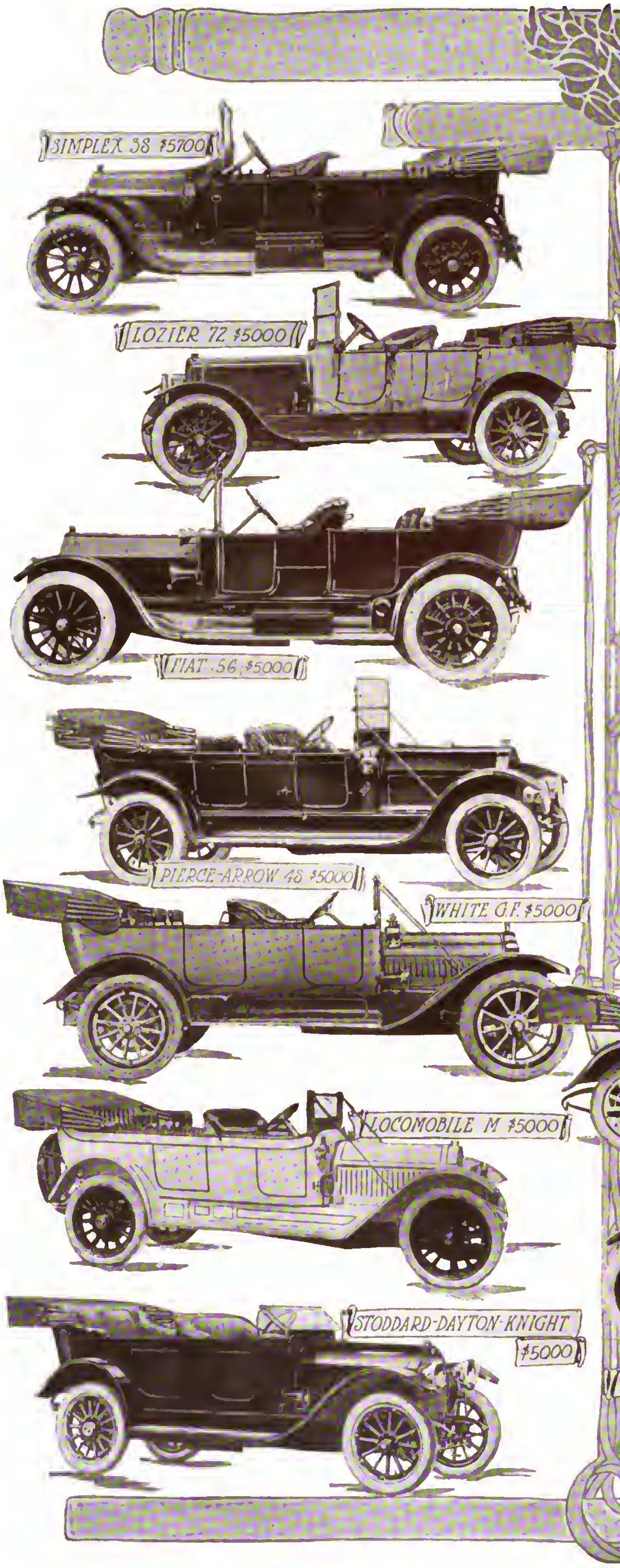


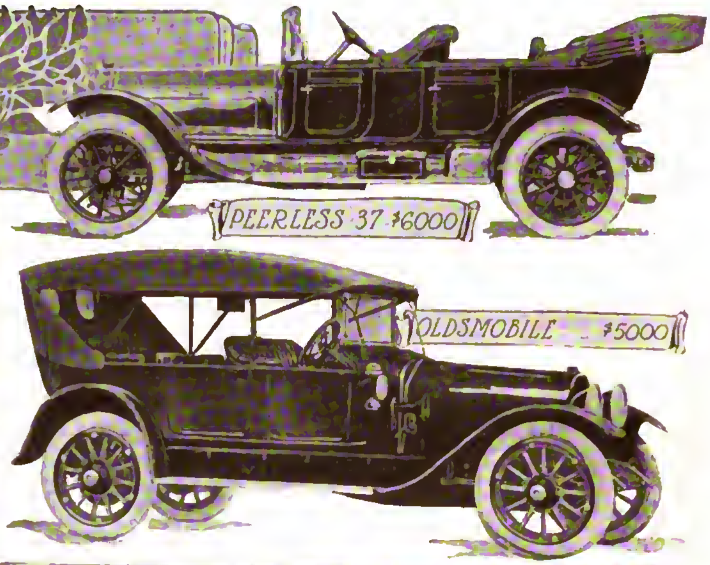


Five and Six Passenger Cars of Low Price

IMPROVEMENTS in touring bodies are generally developments of ideas thoroughly outlined in 1912. The most striking thing about the current touring car is its cleanness of outline. Throughout the offerings of 1913 the running boards are free from incumbrance.

Cutting B-40, $1,475. 25.6 H.P., 120 W.B., 36 x 4 tires.
Great Southern 30, $1,400. 25.6 H.P., 118 W.B., 34 x 4 tires.
Velie 32, $1,350. 22.5 H.P., 110 W.B., 34 x 3½ tires.
Buick 31, $1,285. 25.6 H.P., 108 W.B., 34 x 4 tires.
McFarland 27T, $2,500. 38.4 H.P., 124 W.B., 37 x 4½ tires.
Lambert 99, $1,250. 28.9 H.P., 117 W.B., 34 x 3½ tires.
Studebaker Six, six passengers, $2,550. 29.4 H.P., 121 W.B., 34 x 4 tires.
Reo 5, $1,095. 25.6 H.P., 112 W.B., 34 x 4 tires.
Cadillac, six passengers, $2,075. 32.4 H.P., 120 W.B., 36 x 4½ tires.
Overland, $985. 25.6 H.P., 110 W.B., 32 x 3½ tires.
Empire, $950. 19.6 H.P., 104 W.B., 32 x 3½ tires.
Detroiter, $900. 18.25 H.P., 104 W.B., 32 x 3½ tires.
Ford, $525. 22.5 H.P., 100 W.B., 30 x 3 tires.

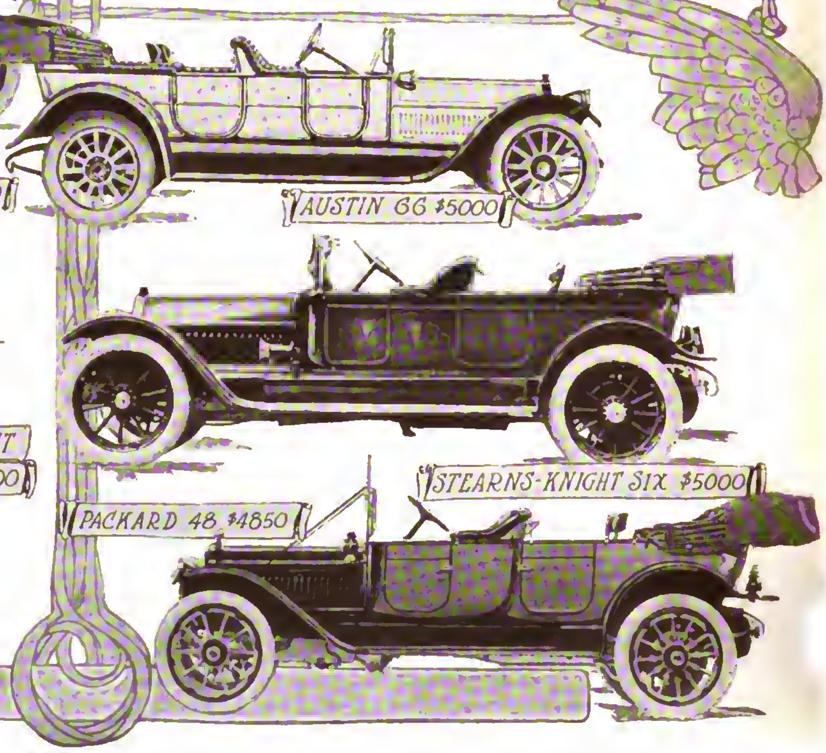


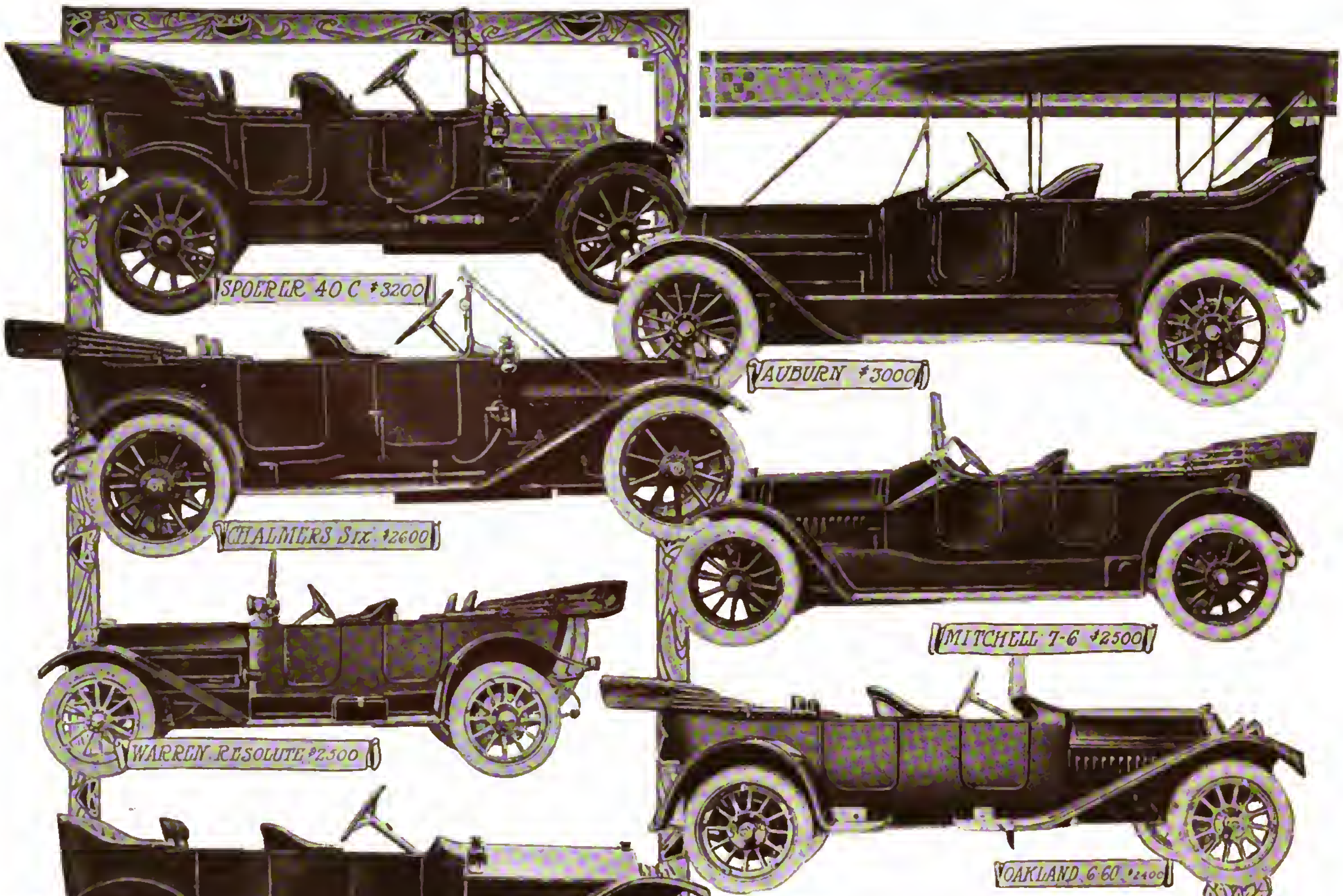


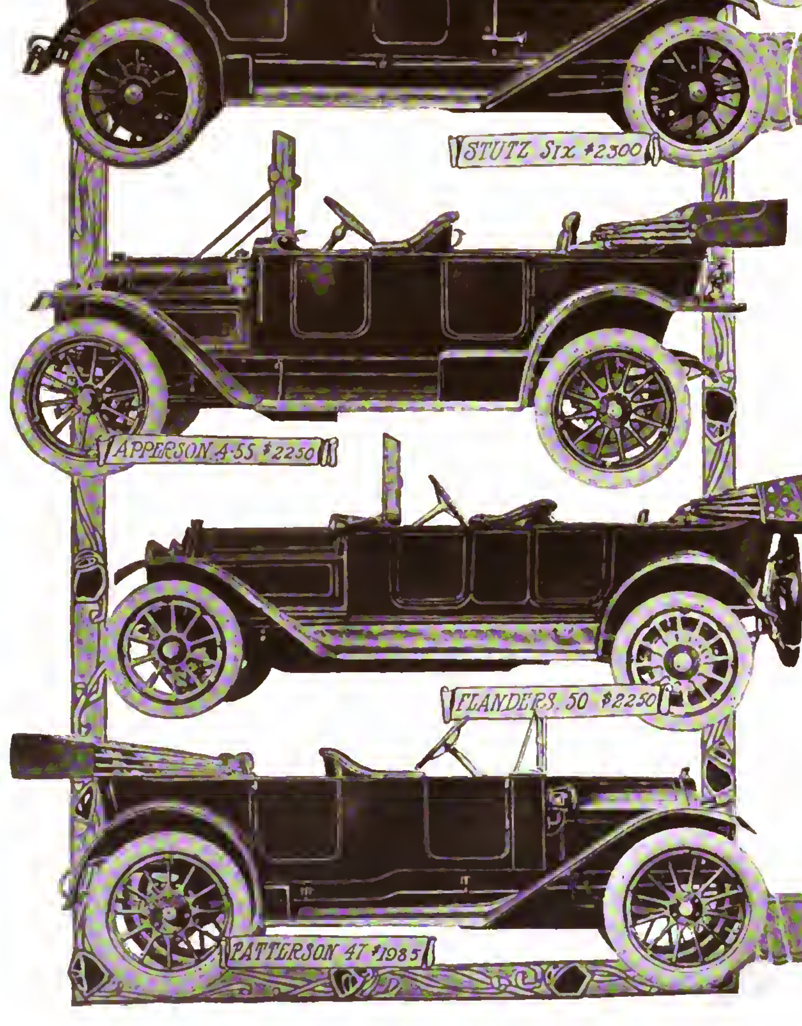
Seven-Passenger Touring Cars at $5000 to $6000

A VIEW of the seven-passenger touring car offerings of the year will explain some vital truths about the industry itself. There are ninety-one current models, against ninety last year. On the face of the tables it would seem as if only a slight increase had been scored for the seven-passenger car, while the truth is that the increase has been very large. In 1912 almost every manufacturer of large cars put out a foredoor model and a model without foredoors and the total appeared in the summaries. As an example, the Simplex put out five models of seven-passenger touring cars in 1912 and in 1913 the number listed is two.

Peerless, $6,000. 60 H.P., 140 W.B., 38 x 5½ tires.
Oldsmobile, $5,000. 40.9 H.P., 13 W.B., 36 x 4½ tires.
Simplex, $5,700. 38 H.P., 137 W.B., 35 x 5 tires.
Lozier 72, $5,000. 51.6 H.P., 131 W.B., 36 x 4½ and 27 x 5 tires.
Fiat 56, $5,000. 46.65 H.P., 135 W.B., 36 x 4½ and 37 x 5 tires.
Pierce-Arrow 48D, $5,000. 48.6 H.P., 134½ W.B., 37 x 5 tires.
White G. F., $5,000. 43.8 H.P., 132 W.B., 37 x 5 tires.
Austin 66, $5,000.
Locomobile M, $5,000. 48.6 H.P., 136 W.B., 36 x 4½ and 37 x 5 tires.
Stoddard-Dayton-Knight, $5,000. 48.6 H.P., 133 W.B., 30 x 5 tires.
Stearns-Knight Six, $5,000. 43.8 H.P., 140 W.B., 37 x 5 tires.
Packard 48, $4,850. 48.6 H.P., 139 W.B., 30 x 4½ and 37 x 5 tires.



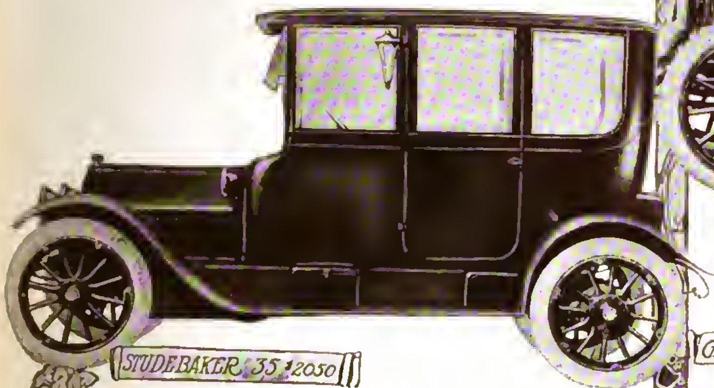


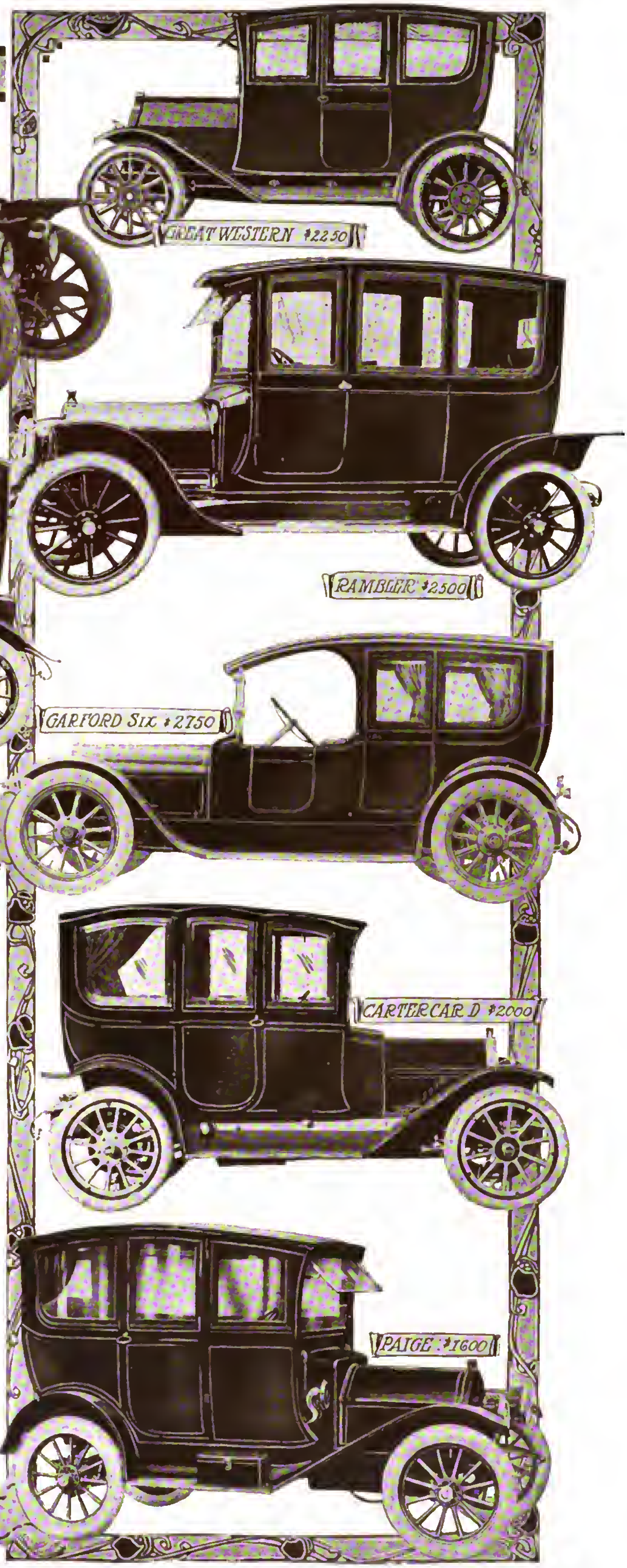


Low Priced Touring Cars

EVEN with full consideration of the multiplicity of models put out last year on account of duplications due to the introduction of foredoors, a view of the $2,500 class shows the immense advance that has been made. There are thirty-one models in the 1913 collection against twenty-five in 1912. The accessions to the class number the A. E. C., Alpena, Auburn, Burg, Carroll, Chevrolet, Croxton, Duquesne, Garford, Great Western, Holly, Hudson, Keeton, Moyer, Norwalk, Nyberg, Pilot, Pope-Hartford, Premier, Schacht, Studebaker, Touraine and Warren. Several of these companies are just entering business.

Spoerer, 40C, $3,200. 38 H.P., 120 W.B., 37 x 4½ tires.
Auburn 6-50, $3,000. 40.9 H.P., 135 W.B., 37 x 4½ tires.
Chalmers Six, $2,600. 43.8 H.P., 130 W.B., 36 x 4½ tires.
Mitchell 7-6, $2,500. 43.8 H.P., 144 W.B., 36 x 4½ tires.
Warren Resolute, five passengers, $2,500. 38.4 H.P., 130 W.B., 36 x 4½ tires.
Oakland 6-60, five passengers, $2,400. 40.9 H.P., 130 W.B., 34 x 4½ tires.
Stutz 6, six passengers, $2,300. 43.8 H.P., 130 W.B., 34 x 4½ tires.
Apperson 4-55, seven passengers, $2,250. 36.1 H.P., 122 W.B., 36 x 4½ tires.
Flanders 50, seven passengers, $2,250. 38.4 H.P., 130 W.B., 36 x 4½ tires.
Patterson 47, $1,985. 32.4 H.P., 122 W.B., 36 x 4 tires.

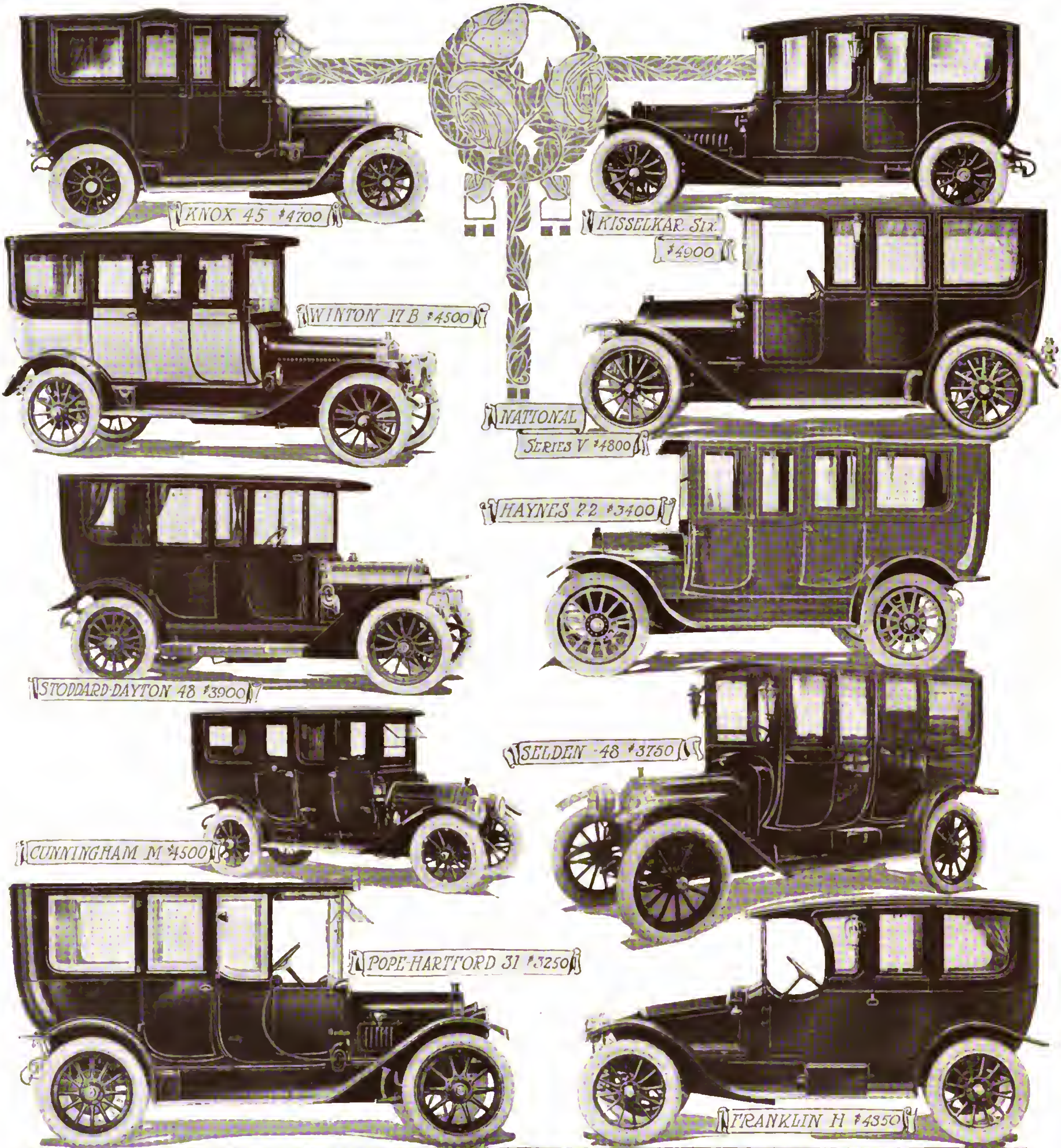




New Compartment Bodies

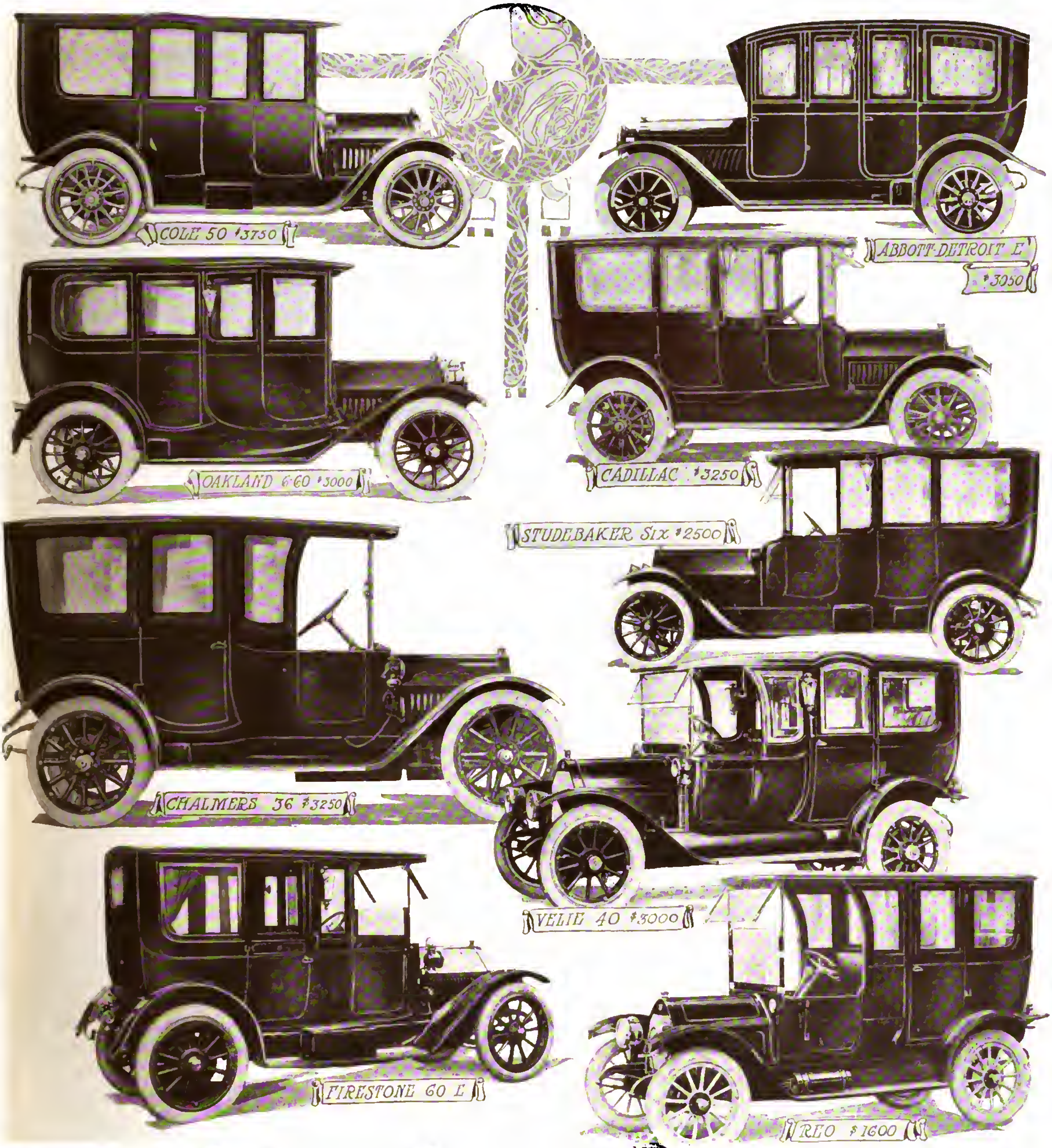
SINGLE-compartment cars constitute one of the main variations from the formal types of inclosed bodies. These cars are so arranged that the driver is not separated from the other passengers. On some there is but a single door at one side, whereas others have a door on each side in staggered relation to each other. The driver's seat is generally an arm-chair type, and that of the passenger at his side usually a revolving or folding-chair type. The cars differ little in other respects from the established types. The idea involved in this style of body is to reduce the distinction between driver and passengers to such an extent that the owner of the car may figure as driver if it should be desirable for him to do so or the chauffeur may be used as in other inclosed types by simply raising a glass partition. In the high-priced class the equipment is fuller than ever before. Electric cigar lighters, special fittings for flower vases and other refinements have become very frequent.

S.G.V., seven-passenger landaulet, $4,000, 25.6 H.P., 118 W.B., 35 x 4½ tires.
Great Western, Sedan, four passengers, $2,250, 28.9 H.P., 118 W.B., 36 x 4 tires.
Studebaker 35, five-passenger sedan, $2,050, 27.25 H.P., 115½ W.B., 34 x 4 tires.
Rambler, five-passenger limousine, $2,500, 32.4 H.P., 120 W.B., 37 x 4½ tires.
Garford G, four-passenger compartment, $2,750, 33.75 H.P., 128 W.B., 36 x 4½ tires.
Cartercar D, five-passenger sedan, $2,000, 27.25 H.P., 116 W.B., 36 x 4 tires.
Paige, five-passenger compartment, $1,600, 25.6 H.P., 116 W.B., 34 x 4 tires.



Enclosed Cars Seating Five or More Passengers

Knox 45, seven passenger, price $4,700. 40 H.P., 126 W.B., 37 x 5 tires.
Kisselkar 60, seven passenger, $4,900. 48.6 H.P., 140 W.B., 37 x 5 tires.
Winton 17D, seven passenger, $4,500. 48.6 H.P., 130 W.B., 36 x 4½ tires.
National V, seven passenger, $4,800. 38 H.P., 128 W.B., 36 x 5 tires.
Stoddard-Dayton 48, seven passenger, $3,900. 36.1 H.P., 122½ W.B., 36 x 4½ tires.
Haynes 22, seven passenger, $3,400. 32.4 H.P., 120 W.B., 36 x 4½ tires.
Cunningham M, seven passenger, $4,500. 36.1 H.P., 124 W.B., 36 x 4½ tires.
Selden 48, seven passenger, $3,750. 36.1 H.P., 125 W.B., 37 x 4½ tires.
Pope-Hartford 31, five passenger, $3,250. 30.25 H.P., 118½ W.B., 36 x 4½ tires.
Franklin H, seven passenger, $4,850. 38.4 H.P., 126 W.B., 37 x 5 tires.



Lower Priced Limousines, Landaulets and Berlines

Cole 50, seven passenger, $3,750. 40.9 H.P., 132 W.B., 37 x 4¼ tires.

Abbott-Detroit E, seven passenger, $3050. 32.4 H.P., 121 W.B., 36 by 4¼ tires.

Oakland 6-60, seven passenger, $3,000. 40.9 H.P., 130 W.B., 34 x 4¼ tires.

Cadillac, seven passenger, $3,250. 32.4 H.P., 120 W.B., 36 x 4½ tires

Studebaker, seven passenger, $2,500. 20.4 H.P., 121 W.B., 34 x 4 tires.

Chalmers 17, seven passenger, $3,250. 28.9 H.P., 118 W.B., 37 x 4½ tires.

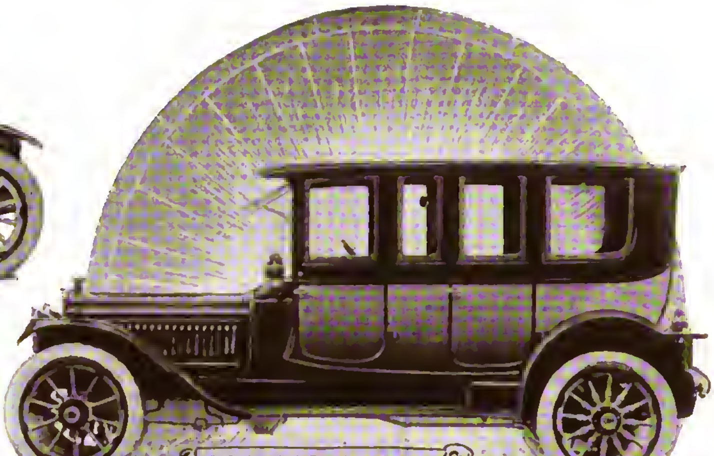
Velie 40, five passenger, $3,000. 32.4 H.P., 118 W.B., 36 x 4 tires.

Firestone-Columbus, 60-E, seven passenger, 32.4 H.P., 122 W.B., 32 x 4 and 36 x 4 tires.

Reo 5, seven passenger, $1,600. 25.6 H. P., 112 W.B., 34 x 4 tires.

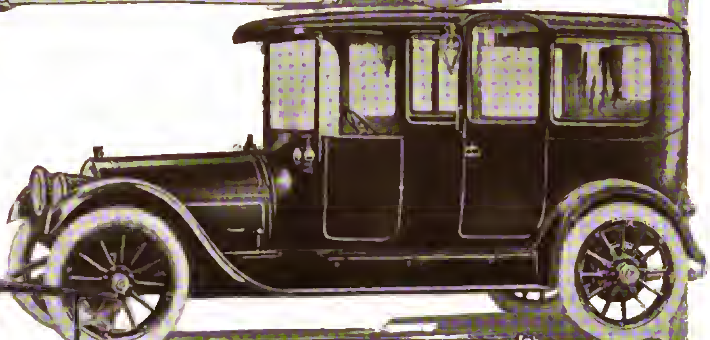
SIMPLEX 38 $6500

LOCOMOBILE R $5350

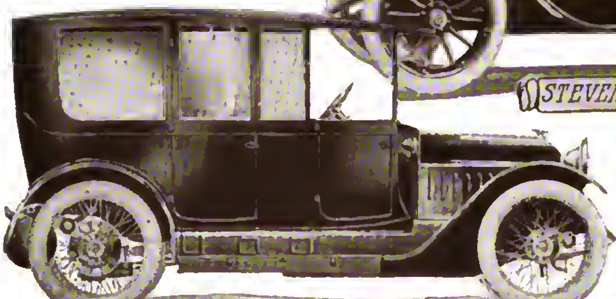


PACKARD 48 $5200

STEARNS-KNIGHT 4 $5000



STEVENS-DURYEA C $5500



EDWARDS-KNIGHT 25 $4600

WHITE SIX G.F. $6300

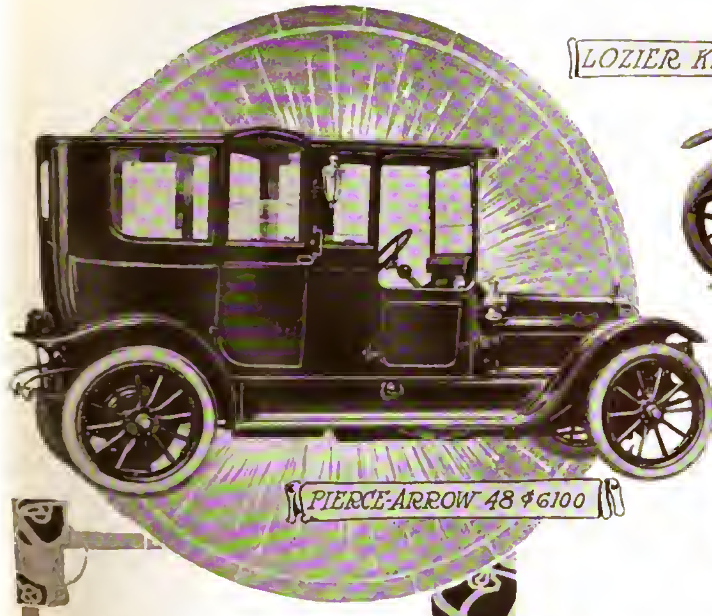
Enclosed Cars of Larger Capacity

THE entire field of the closed car has been subjected to the same changes and improvements that have been noted with regard to other current automobiles.

Much has been said in favor of the curved roof, bending down in front and having a tendency to limit the perpendicular range of vision. This idea has been adopted in modified form and has been incorporated pretty generally throughout the industry in conjunction with larger side windows. Extreme types embodying the idea of colonial coach-building are to be seen, but the straight-topped car, with enough flare and curved outlines in the lower portion of the body to get away from the freight car appearance of earlier years, is still a popular standard type.

There is a marked tendency to shorten the projecting roof over the driver's seat in broughams and towncars, but in the limousine and landaulet models the projection is carried out beyond the windshield. Electric lamps built into the bodies the surface being flush with the lines of the car are widely used.

Simplex 38, seven passengers, $6,500. 38 H.P., 137 W.B., 35 x 5 tires.
Packard 48, seven passengers, $5,200. 48.6 H.P., 139 W.B., 36 x 4½ and 37 x 5 tires.
Locomobile R, seven passengers, $5,350. 43.8 H.P., 128 W.B., 36 x 4½ tires.
Stearns-Knight 4, five passengers, $5,000. 28.9 H.P., 121 W.B., 36 x 4½ tires.
Stevens-Duryea C, seven passengers, $5,500. 46.1 H.P., 131 W.B., 37 x 4½ and 37 x 5 tires.
Edwards-Knight 25, seven passengers, $4,600. 25.6 H.P., 120 W.B., 36 x 4½ tires.
White GF, seven passengers, $6,300. 43.8 H.P., 132 W.B., 37 x 5 tires.



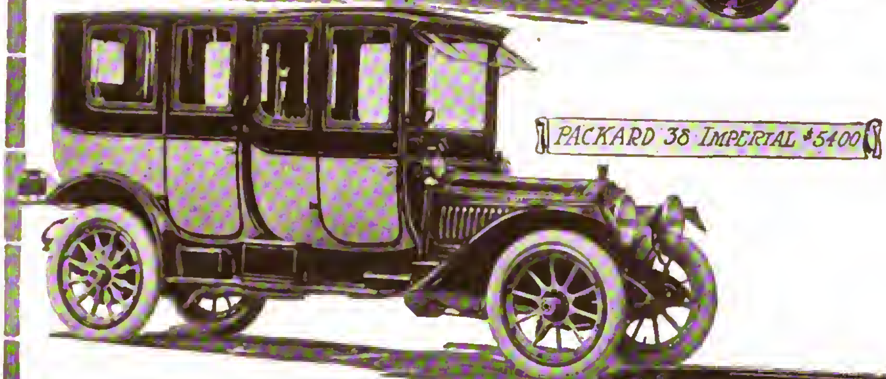
Limousines and Landaulets

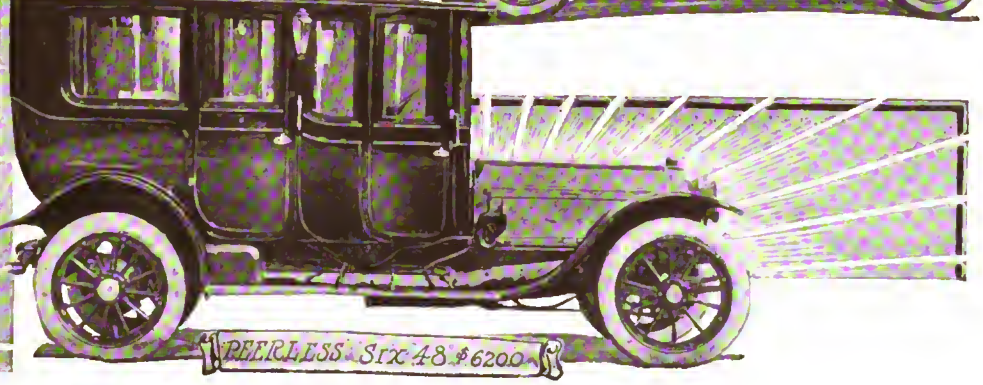
IN the closed-car types, having passenger capacity of from five to ten persons many models have been eliminated in the class selling for over $3,000. Statistics show that the market affords a choice of only 154 models, while last year there were thirty more. Four more models have been added to the $2,000-$3,000 class, making a total of fourteen, and the net loss in the high-priced line is thirty-five. The addition of the single offering in the $1,250-$2,000 class makes the total count 154 for 1913 against 184 for 1912.

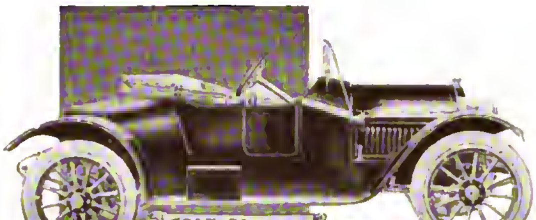
The sedan, an enlargement of the coupé idea but seating five or six passengers, is the distinctive feature of the year. Limousines, landaulets, berlines, broughams and towncars are included in the classification generally and are continued in somewhat reduced numbers by all the manufacturers in active manufacturing who made them last year.

Passenger compartments are larger, lower and better balanced than heretofore. The softening of angles is a well-nigh universal tendency. One concern puts out two limousine models with a carrying capacity of ten persons each.

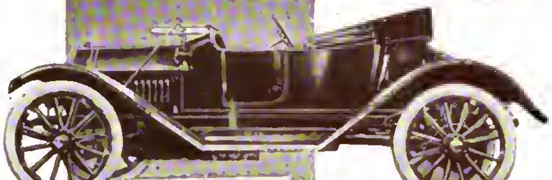
Pierce-Arrow 48D, seven passengers, $6,100. 48.6 H.P., 134½ W.B., 37 x 5 tires.
Lozier Knickerbocker, seven passengers, $6,500. 51.6 H.P., 131 W.B., 36 x 4½ and 37 x 5 tires.
Stevens-Duryea C, seven passengers, $5,750. 46.1 H.P., 138 W.B., 37 x 4½ and 37 x 5 tires.
Simplex 137, seven passengers, $6,500. 38 H.P., 137 W.B., 35 x 5 tires.
Packard 38, seven passengers, $5,400. 38.4 H.P., 134 W.B., 36 x 4½ and 37 x 5 tires.
Columbia Knight 88, seven passengers, $5,800. 38 H.P., 129 W.B., 36 x 4½ tires.
Peerless 36, seven passenger, $6,200. 48.6 H.P., 137 W.B., 36 x 4½ and 37 x 5 tires.

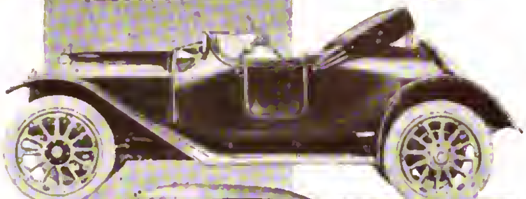


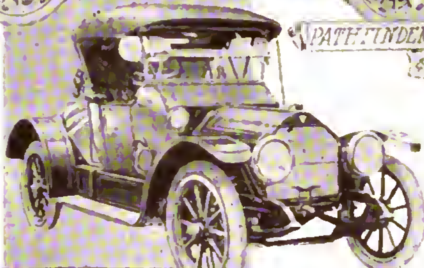



COLE 50 $1985

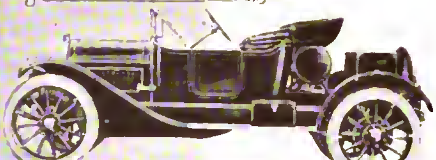

CADILLAC $1975

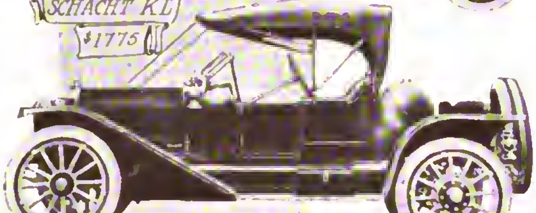

MOLINE M $1950

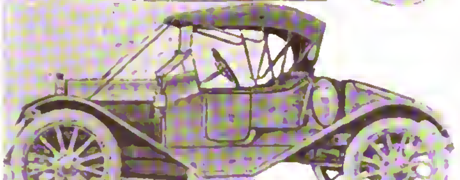

PATHFINDER 13 $1875


HUDSON 37 $1875


MITCHELL 2-6 $1850


SCHACHT KL $1775


HAVERS 44 $1850


ARBENZ H $1825

Runabouts Listed at $1500 to $2000

As indicated so strongly last year, the tendency toward storing the spare tires at the rear, either upon the flat or sloping deck or in holders at the extreme end, has been developed and adopted by almost every maker.

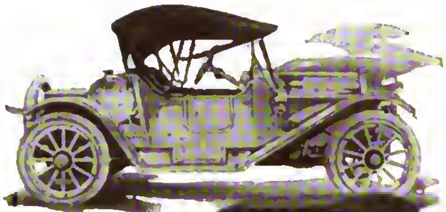
In appearance the 1913 runabout is more graceful. Its running boards are clear from one end of the division to the other. Tool boxes are built flush with the sides; tire-carriers have been eliminated from the boards; gas tanks are no longer omnipresent, quite the contrary in fact, although some are still to be seen.

In facilities for distance work the runabout is far in advance of other years. In almost all of the models, except a few of the smallest variety, special facilities have been supplied for touring. Comfortable seating is one of the elements; larger gasoline storage is another; adequate baggage capacity is still another essential that has been worked out in the current line. The seating and gasoline tanks are details but the baggage carrying is an improvement. In a considerable majority of the cars listed at and above $1,250, provision is made for carrying baggage on the rear deck. This idea is worked out in a variety of ways but the favorite seems to be the compartment, which may be utilized for tire carrying or for the accommodation of a small trunk or suit cases.

The idea of touring in a high-powered runabout is one that is growing steadily.

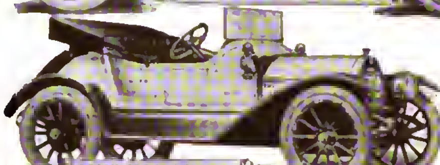
Mechanically the changes of 1913 are of small importance although rather large in number. The general adoption of electric lighting and the large installation of electric starting devices have resulted in the elimination of battery boxes on the running board and led to their suspension on the frame beneath the body. This has caused a number of rearrangements in the mechanical parts of the automobile. The same may be said for the adoption of central control with its tendency to shorten the leftward reach of the levers.

Cole 50, two passengers, $1,985. 32.4 H.P., 122 WB., 36 x 4 tires.
Cadillac, two passengers, $1,975. 32.4 H.P., 120 WB., 36 x 4½ tires.
Moline M, two passengers, $1,950. 27.25 H.P., 115 WB., 34 x 4 tires.
Pathfinder 13, two passengers, $1,875. 27.25 H.P., 120 WB., 36 x 4 tires.
Hudson 37, two passengers, $1,875. 27.25 H.P., 118 WB., 36 x 4 tires.
Mitchell 2-6, two passengers, $1,850. 33 H.P., 132 WB., 36 x 4 tires.
Schacht KL, two passengers, $1,775. 28.9 H.P., 120 WB., 36 x 4 tires.
Havers 44, two passengers, $1,850. 33.75 H.P., 122 WB., 36 x 4 tires.
Arbenz H, two passengers, $1,825. 27.3 H.P., 120 WB., 36 by 4 tires.
Crawford 30, two passengers, $1,750. 27.25 H.P., 115 WB., 34 x 4 tires.
Abbott-Detroit D, two passengers, $1,700. 27.3 H.P., 116 WB., 34 x 4 tires.
Marathon Champion, two passengers, $1,675. 32.4 H.P., 123 WB., 36 x 4 tires.
Maxwell 40, two passengers, $1,675. 28.9 H.P., 115 WB., 36 x 4 tires.
Rambler, two passengers, $1,650. 32.4 H.P., 120 WB., 36 x 4 tires.
Cartercar 5B, two passengers, price $1,600. 27.25 H.P., 116 WB., 36 x 4 tires.
Apperson 4-45, two passengers, $1,600. 32.4 H.P., 114 WB., 34 x 4 tires.
Oakland 42, three passengers, $1,600. 27.25 H.P., 116 WB., 34 x 4 tires.
Ames 44, two passengers, $1,595. 27.3 H.P., 118 WB., 36 x 4 tires.
Great Western, two passengers, $1,585. 28.9 H.P., 118 WB., 36 x 4 tires.

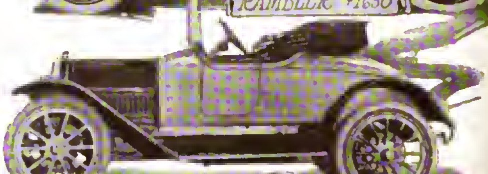

CRAWFORD 30 $1750


ABBOTT-DETROIT D $1700


MARATHON CHAMPION $1675


MAXWELL 40 $1675

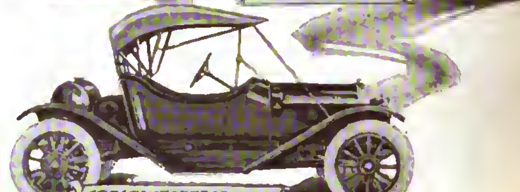

RAMBLER $1650


CARTERCAR 5B $1600

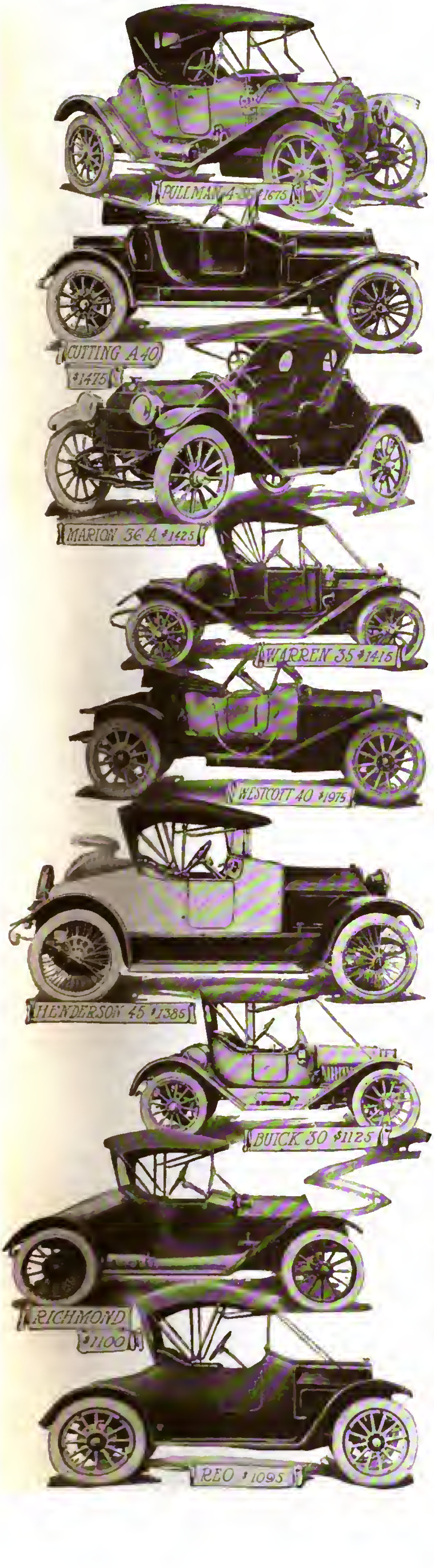

APPERSON 4-45 $1600


OAKLAND 42 $1600


AMES 44 $1595


GREAT WESTERN $1585

Low Priced Roadsters and Runabouts



DESPITE the fact that wheelbases in the high-priced class are generally longer than last year, the tendency noted hitherto to bring back the motor and place the radiator nearly on a line with the front axle has made little progress.

In average price there has been an advance. While the list price of most of the models is little higher than last year the marked decrease in the number of cheaper cars, the transfer of a few makers of their runabout models from lower to higher-priced classes and the steady price trend noted in the high-priced class, account for the difference.

More equipment is furnished all around than last year and as a general proposition it may be said that the buyer receives more for the same money than he did last year and that in such a view of the industry, prices have actually declined.

In the line of three-passenger, open-bodied cars, 1913 and 1912 stand on the same basis so far as the number of models presented are concerned. There are twenty-three in the 1913 offering and the same number were presented last year. The standard companies in the high-priced class are continuing their models of this type, except that the new cars contain the various detail developments noted elsewhere in the industry as typical of 1913.

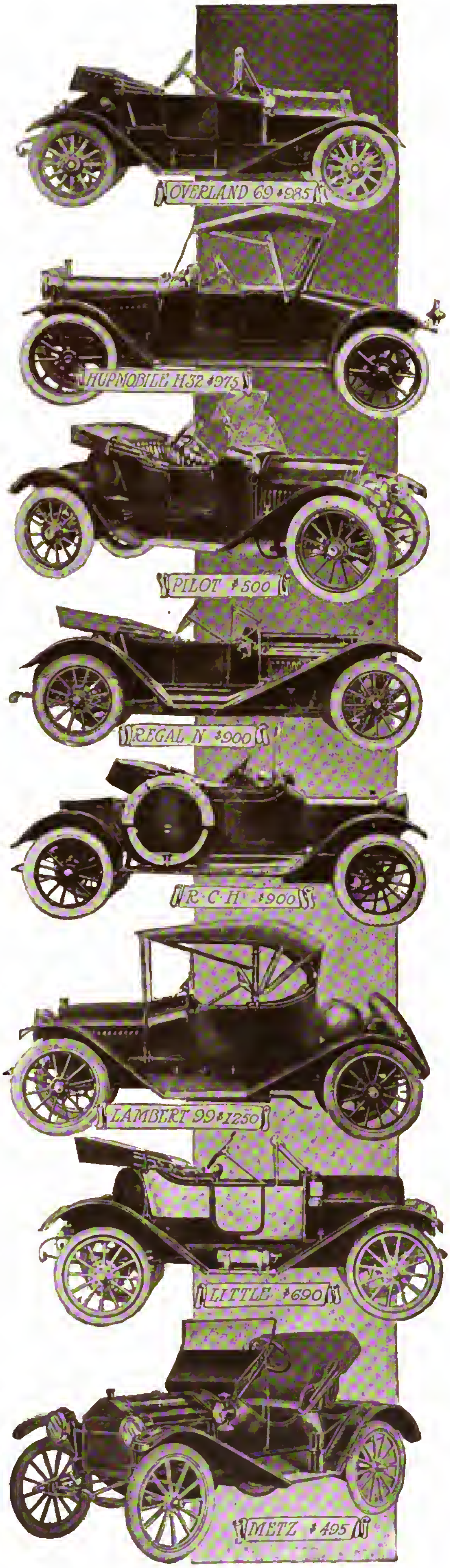
In the medium classes much the same condition obtains, but in the low priced class there have been numerous changes. Four companies that included a three-passenger model in 1912 are not presenting one this year, while four new companies have taken their place in the ranks of this class.

The withdrawals and additions in the higher classes about counterbalance.

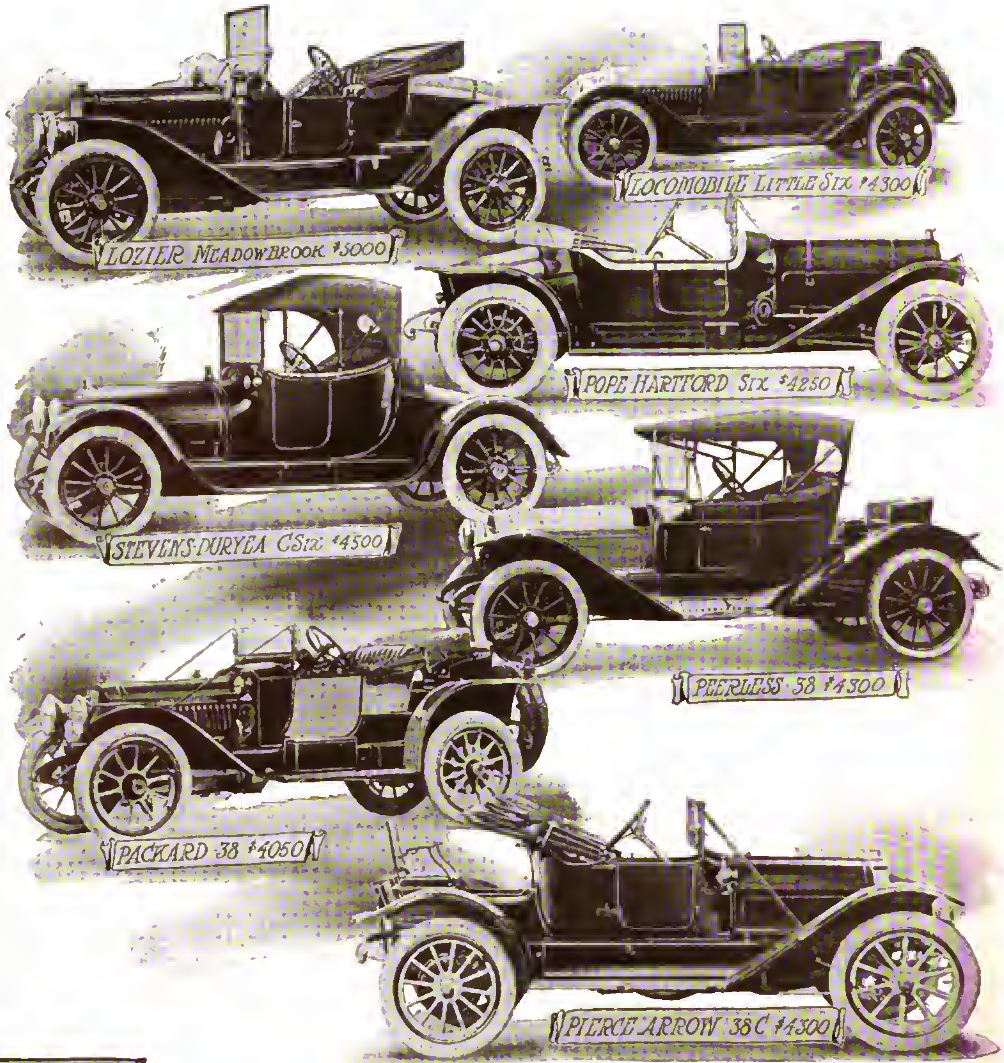
The three-passenger idea is worked out in several ways. These include the addition of a rumble seat, side seat and the widening of the body to accommodate three sitting abreast.

To a greater extent than applies to any other class of automobile building, the three-passenger type appeals to newcomers, but continued patronage is shown distinctly by the fact that the standard companies retain these models practically unchanged from year to year.

Pullman, two passengers, $1,675. 26.4 H.P., 118 W.B., 34 x 4 tires.
Cutting A-40, two passengers, $1,475. 25.6 H.P., 120 W.B., 36 x 4 tires.
Marion 36-A, two passengers, $1,425. 25.6 H.P., 112 W.B., 34 x 4 tires.
Warren 35, two passengers, $1,415. 27.25 H.P., 110 W.B., 36 x 4 tires.
Westcott 40, two passengers, $1,975. 32.4 H.P., 120 W.B., 36 x 4 tires.
Henderson 45, two passengers, $1,385. 27.25 H.P., 116 W.B., 34 x 4 tires.
Buick 30, two passengers, $1,125. 25.6 H.P., 108 W.B., 34 x 4 tires.
Richmond O, two passengers, $1,100. 25.6 H.P., 112 W.B., 34 x 3½ tires.
Reo 5, two passengers, $1,095. 25.6 H.P., 112 W.B., 34 x 4 tires.
Overland 69, two passengers, $985. 25.6 H.P., 110 W.B., 32 x 3½ tires.
Hupmobile H32, two passengers, $975. 16.9 H.P., 106 W.B., 32 x 3½ tires.
Pilot, two passengers, $500.
Regal N, two passengers, $900. 22.5 H.P., 108 W.B., 32 x 3½ tires.
R.C.H., two passengers, $900. 16.9 H.P., 110 W.B., 32 x 3½ tires.
Lambert 99, two passengers, $1,250. 28.9 H.P., 117 W.B., 34 x 3½ tires.
Little, two passengers, $690. 19.6 H.P., 90 W.B., 30 x 3½ tires.
Metz, two passengers, $495. 22.5 H.P., 90 W.B., 30 x 3 tires.



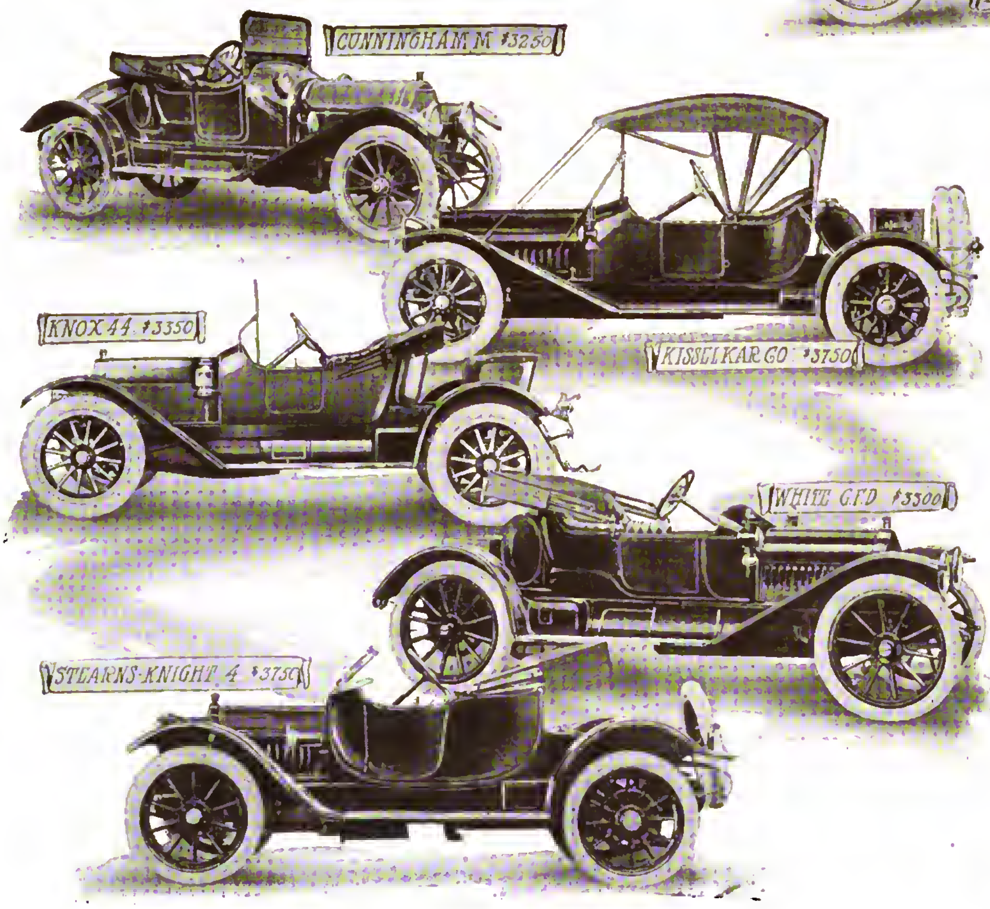
Two Passenger Cars - $3000 and over -



MUSHROOM companies that at an earlier period of the industry sprang up in a night, almost invariably put out two or more runabouts and when the financial blight overtook them for any one of a dozen excellent reasons, the subsequent tabulations of the industry showed the absence of their models. In the 1912 season twenty-six companies retired, accounting for a gross loss of seventy-eight models in the runabout class. At the same time thirteen new makers entered the lists with twenty-three models. On the face of the reports this shows a net loss of fifty-five models but the difference is made up by the weeding and adjustment of the list.

Almost all of the losses in the runabout class were scored in the highest and lowest price divisions. In the low class the losses were caused largely by retirements from business; in the upper class by the elimination of models. In the two middle classes, namely: from $1,251 to $2,000 and from $2,001 to $3,000 the net loss was only eight models. This indicates on even broader lines the tendency toward centralization.

The differences between the runabout of 1913 and its predecessors are mostly developments of innovations introduced in 1912 and earlier in the industry. Inside control is all but universal, although there is still a wide difference in design as to the location of the control levers. A central position for the levers has advanced in favor and is to be seen in a very large percentage of the cars offered. Many models are made with



control at the right side and in a few cases the control is at the left side of the car. Left side drive has been adopted quite generally.

Electric lights are practically universal. Some sort of an engine starter has been installed in nearly all the medium and high-priced cars. The starters are generally electric but there are also gas and pneumatic types.

The cowl is deeper in most models and the streamline effect, so much sought after in body design, is emphasized by the improvement of the cowl this year. Two practical purposes are served, in the first place it protects the instruments on the dash and second, it affords opportunity to install forward gasoline storage which has been accepted by a number of manufacturers.

Cunningham M, three passengers, $3,250. 36.1 H.P., 124 W.B., 36 x 4½ tires.
Kisselkar 60, two passengers, $3,750. 48.6 H.P., 140 W.B., 37 x 5 tires.
Knox 44, four passengers, $3,350. 50 H.P. 122 W.B., 36 x 4½ tires.
White G.F.D., two passengers, $3,300. 28.9 H.P., 120 W.B., 36 x 4½ tires.
Stearns-Knight 4, three passengers, $3,750. 28.9 H.P., 116 W.B., 36 x 4½ tires.
Lozier Meadowbrook, two passengers, $5,000. 51.6 H.P., 131 W.B., 36 x 4½ and 37 x 5 tires.
Locomobile R, two passengers, $4,300. 43.8 H.P., 128 W.B., 36 x 4½ tires.
Stevens-Duryea C, two passengers, $4,500. 46.1 H.P., 131 W.B., 37 x 4½ tires.
Pope-Hartford 29, two passengers, $4,250. 46.1 H.P., 133 W.B., 37 x 5 tires.
Peerless 38, three passengers, $4,300. 38.4 H.P., 125 W.B., 36 x 4½ tires.
Packard 38, three passengers, $4,050. 38.4 H.P., 115½ W.B., 36 x 4½ and 37 x 5 tires.
Pierce-Arrow 38C, three passengers, $4,300. 38.4 H.P., 132 W.B., 36 x 4½ tires.

Runabouts and Roadsters - from $2000 to $3000 -

ROADSTERS or runabouts with seating capacity for two passengers are not presented in such large numbers this year as they were in 1912. The current offerings of the American automobile industry consist of 224 models while last year 276 were on the market.

The reasons for this decline in the roadster type are mainly, the universal tendency toward centralizing manufacturing and selling effort upon a single chassis size, and the retirement from the field of a number of makers whose product consisted largely of two-passenger open-bodied cars.

Dividing the industry into four groups or sections marked out by the selling prices of the runabouts, it will be found that in the class listing at $1,250 and under there are only thirty-three models presented, against sixty-three last year.

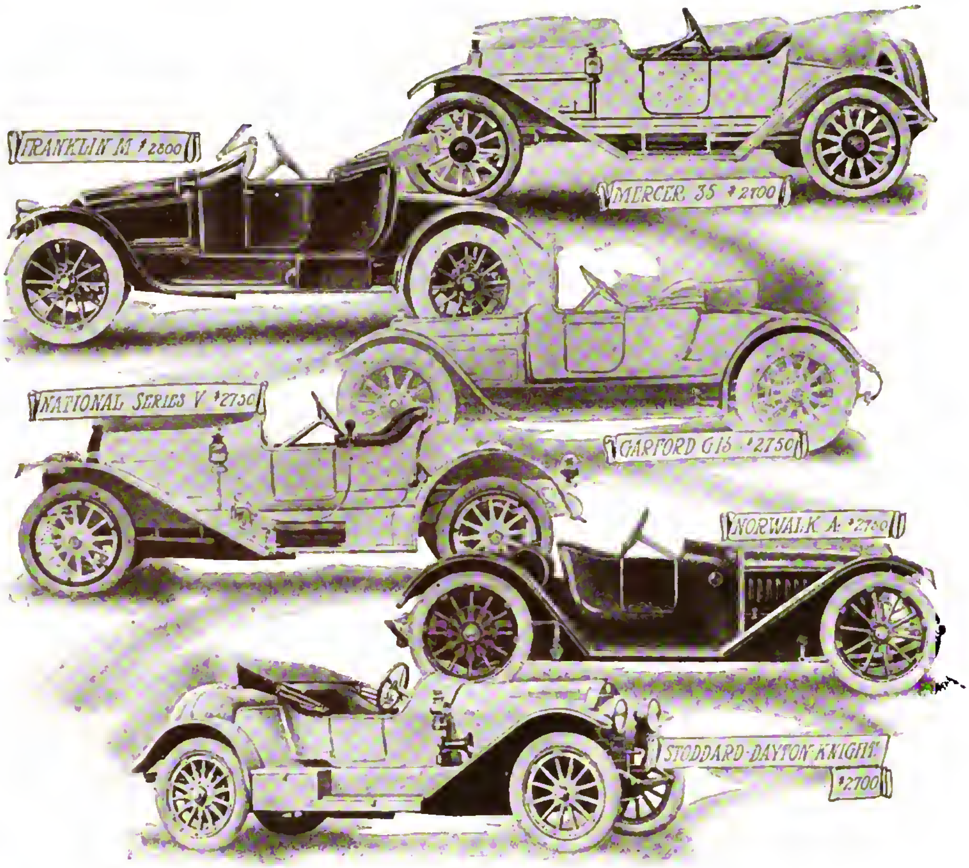
In the class selling from $1,251 to $2,000, there is a net gain of one model, the tables showing seventy-four for 1913 and seventy-three for 1912.

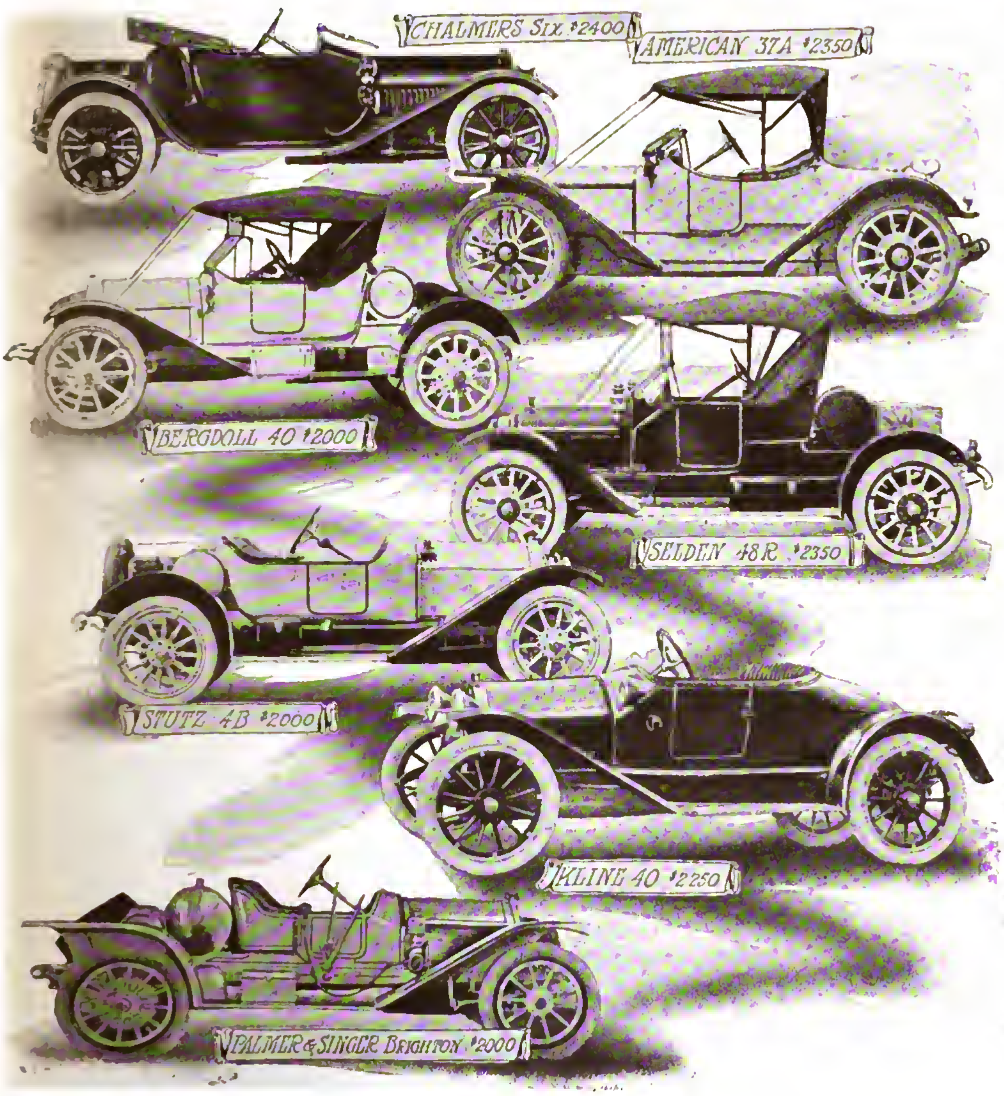
In the $2,001-$3,000 class there are eighty-seven this year and there were ninety-six last year.

Above $3,000 there are thirty models of roadsters listed for 1913 while in 1912 the number was forty-four.

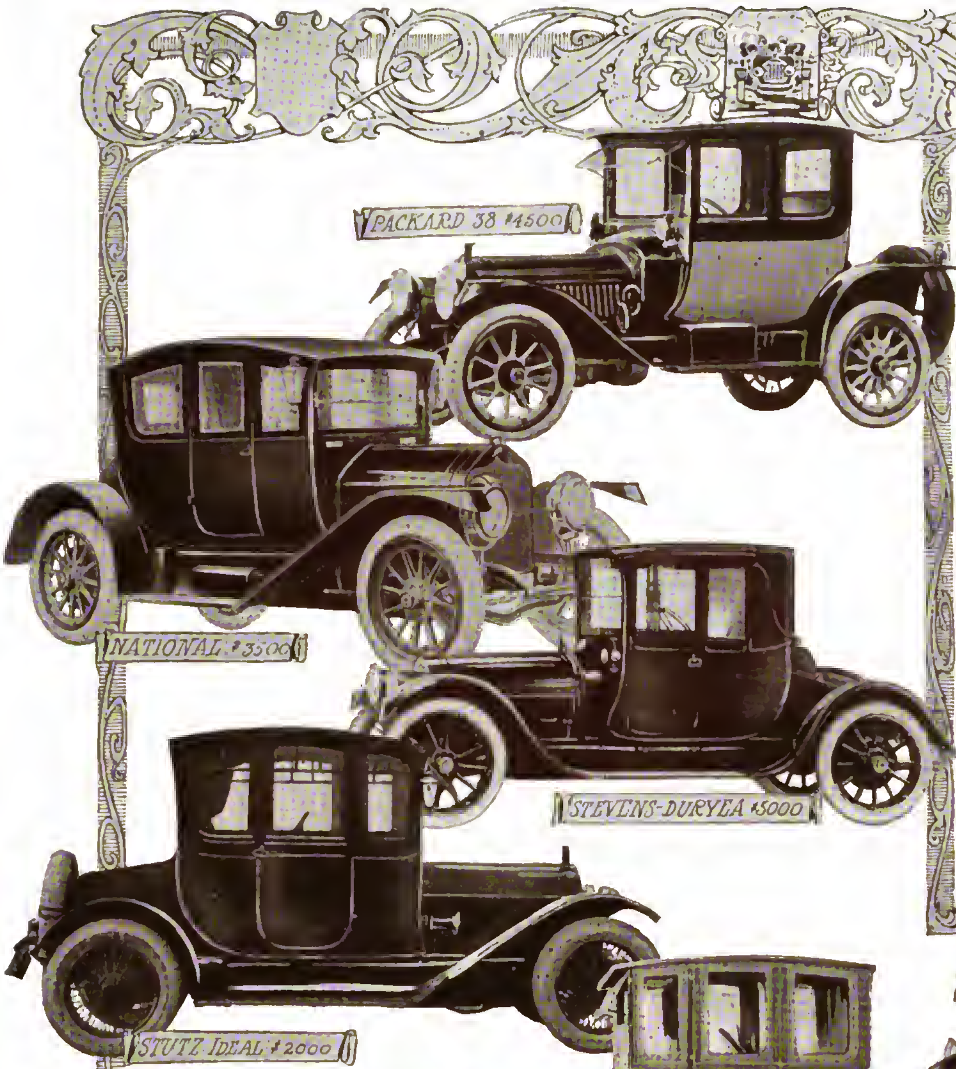
In the process of centralization the manufacturers have eliminated more than a score of models and the remainder are accounted for by retirement of former makers from the field. All told the net reduction amounts to fifty-two models as compared with last year, or a little less than 19 per cent.

The reduction in the number of models does not mean that this type of automobile has been discredited or has lost any popularity. It means only that where a company listed several runabouts last year, the same company is making only one or two types and centering its attention upon them. In a few instances well established companies have discontinued two-passenger open-bodied cars, but it will be found that in almost every instance of that kind the runabout business of the company was of small proportions and the scattering of forces required by a multiplicity of models was too high a price to pay for whatever advantage there may be in putting out a full line including all body types. The fact that quite a material number of those companies that dropped out during 1912, manufactured runabouts, is no reflection against the type.





Chalmers 18, two passengers, $2,400. 48.8 H.P., 180 WB., 86 x 4½ tires.
American 87A. two passengers, $2,350. 82.4 H.P., 118 WB., 87 x 4 tires.
Bergdoll 40, two passengers, $2,000. 25.6 H.P., 121 WB., 86 x 4 tires.
Selden 48R. two passengers, $2,850. 36.1 H.P., 125 WB., 86 x 4 tires.
Stuts 4B, two passengers. $2,000. 86.1 H.P., 120 WB., 34 x 4½ tires.
Kline 40, two-passengers. $2,250. 28.9 H.P., 118 WB., 86 by 4 tires.
Palmer & Singer, Brighton. two passengers, $2,000. 88.4 H.P., 127 WB., 86 x 4 tires.
Mercer 85. two passengers. $2,700. 30.63 H.P., 108 WB., 82 x 4 tires.
Franklin M. two passengers, $2,800. 31.6 H.P., 116 WB., 84 x 4 tires.
Garford G15. two passengers. $2,750. 33.75 H.P., 128 WB., 86 x 4½ tires.
National V. two passengers, $2,750. 38 H.P., 120 WB., 88 x 4½ tires.
Norwalk A. two passengers, $2,750. 38.4 H.P., 126 WB., 38 x 4½ tires.
Stoddard-Dayton Knight, two passengers, $2,700. 36.1 H.P., 122½ WB., 86 x 4½ tires.

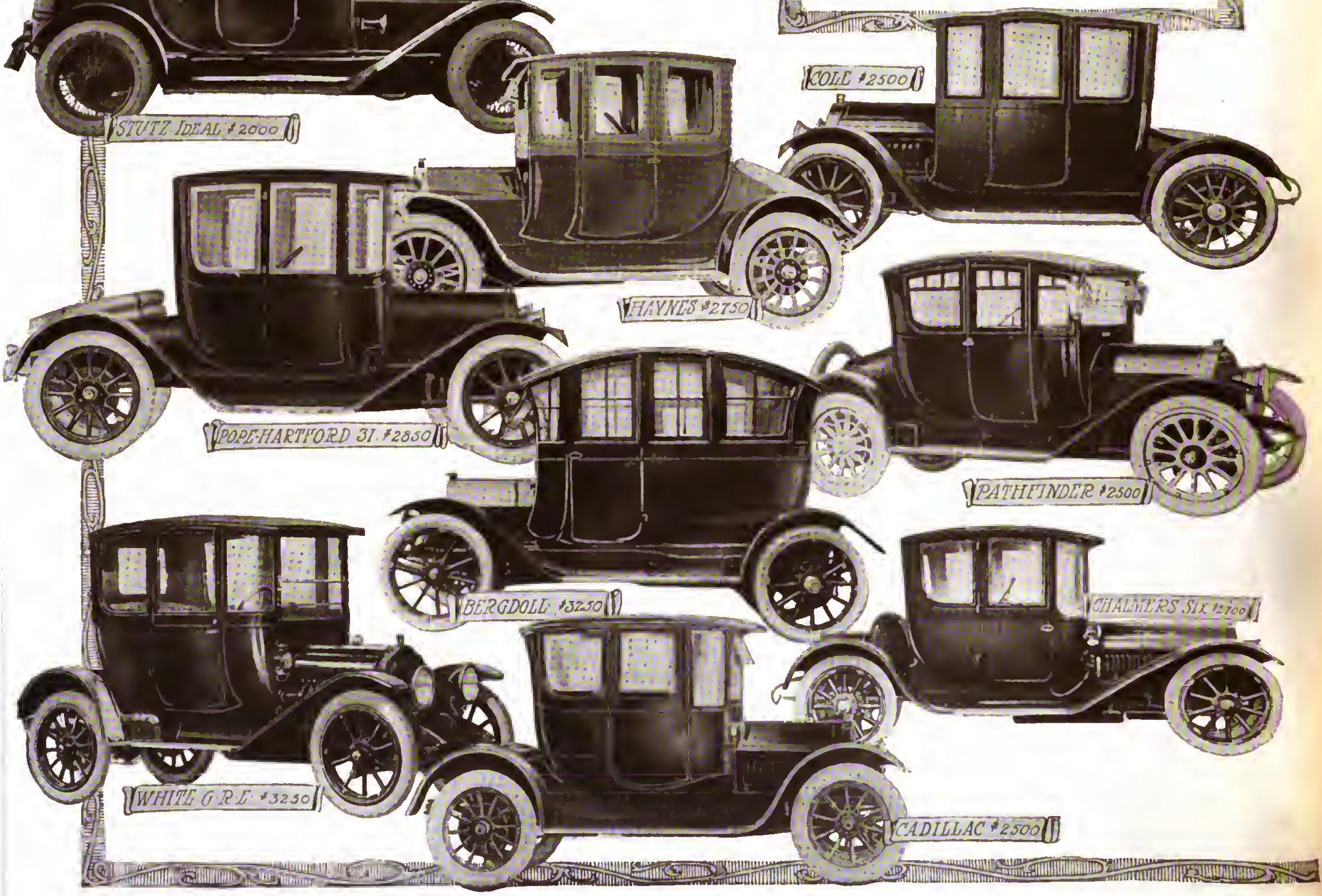


Coupes of Higher Price

IN the coupé types one of the popular trends of the season is encountered. The coupé will be one of the most important cars of 1913, as foreshadowed by the interest taken in it by the manufacturer.

For 1913 the industry presents fifty-two models and the $2,000-$3,000 class only shows a loss in the number of models.

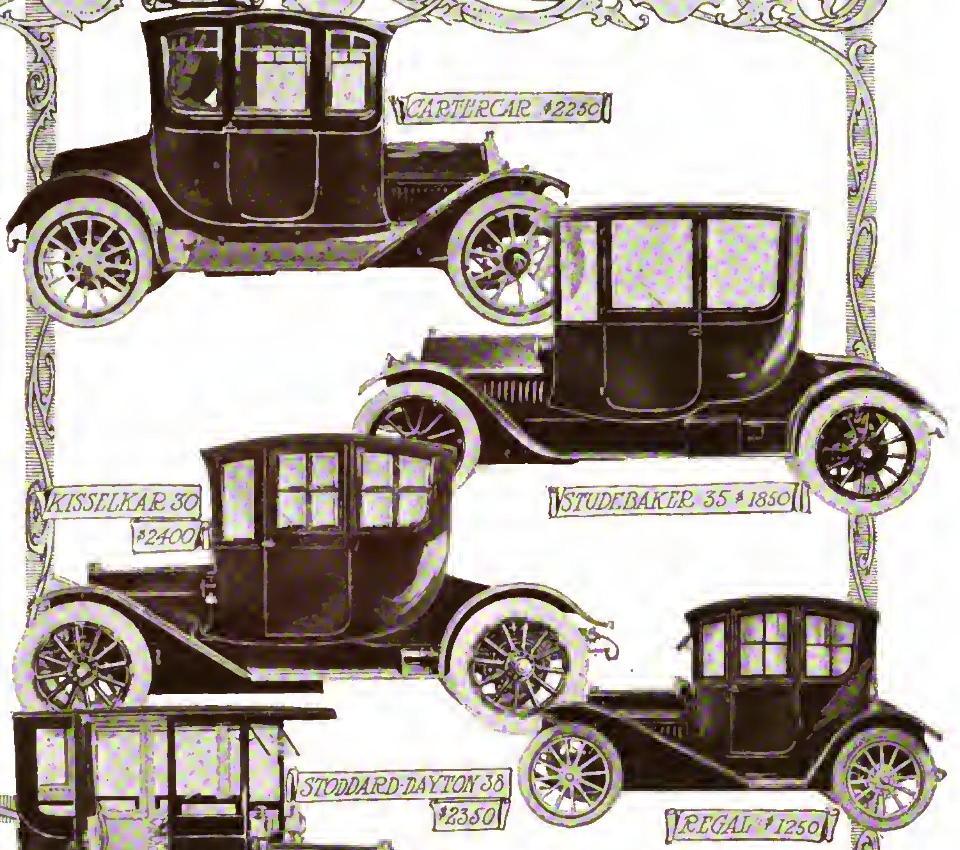
Packard 38, $4,500. 38.4 H.P., 115½ W.B., 36 x 4½ and 37 x 5 tires.
National V, $3,500. 38 H.P., 128 W.B., 36 x 4½ tires.
Stevens-Duryea, $5,000. 46.1 H.P., 131 W.B., 37 x 4½ and 37 x 5 tires.
Stutz, $2,000. 36.1 H.P., 120 W.B., 34 x 4½ tires.
Cole, $2,500. 32.4 H.P., 122 W.B., 36 x 4 tires.
Haynes, $2,750. 32.4 H.P., 120 W.B., 36 x 4½ tires.
Pope-Hartford 31, $2,850. 30.1 H.P., 118½ W.B., 36 x 4½ tires.
Pathfinder 13, $2,500. 27.25 H.P., 120 W.B., 36 x 4 tires.
Bergdoll 40, $3,250. 25.6 H.P., 121 W.B., 36 x 4 tires.
White GRE, $3,250. 22.5 H.P., 110 W.B., 34 x 4 tires.
Cadillac, $2,500. 32.4 H.P., 120 W.B., 36 x 4½ tires.
Chalmers 18, $2,700. 43.8 H.P., 130 W.B., 36 x 4½ tires.

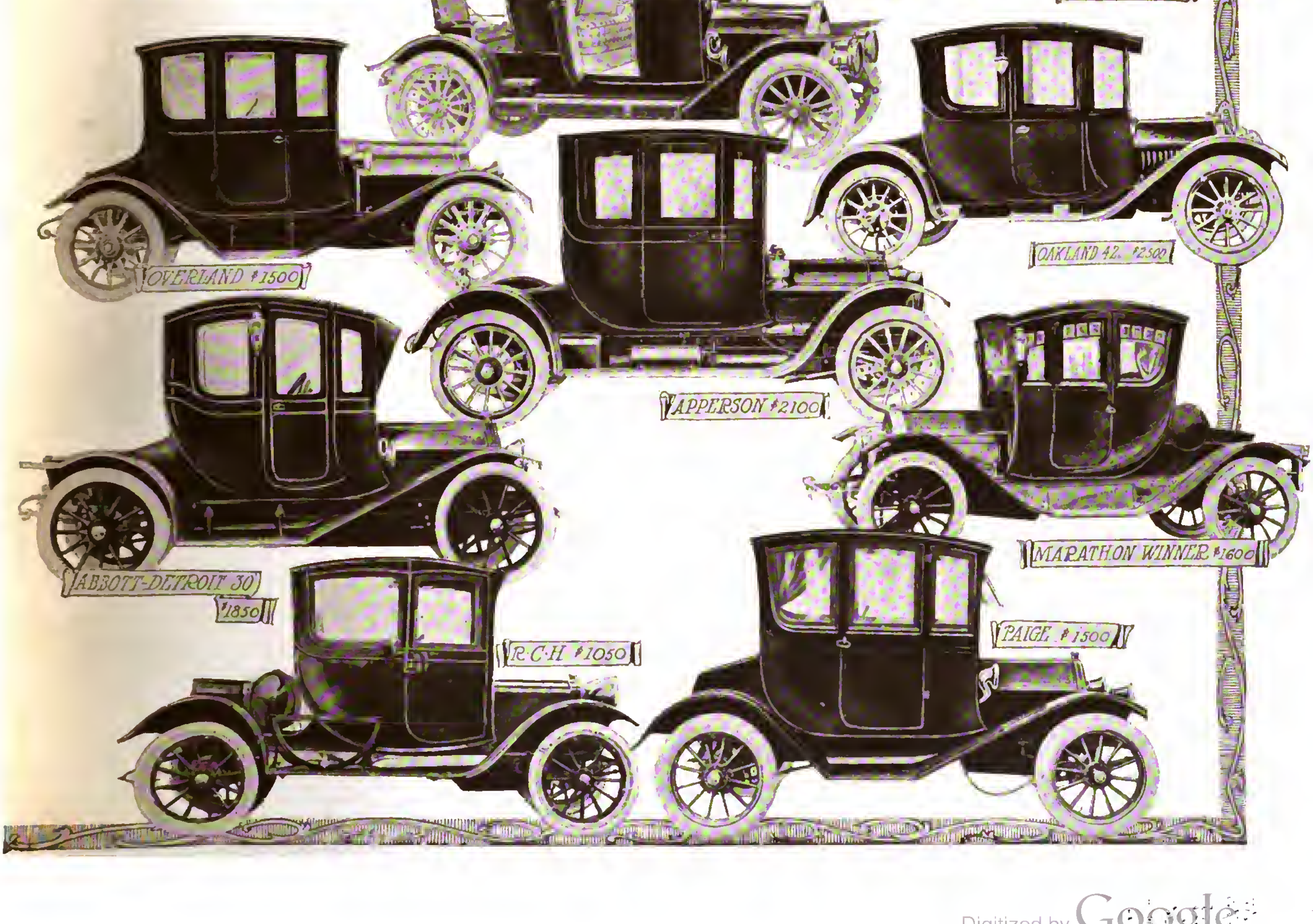


Medium Priced Coupes

IN the high-priced class the increase is remarkable, as in 1912 there were only four models of coupés offered, while this season the list contains nineteen models. In the $2,500 class the loss is more apparent than real, for included in its list are five sedan models, which are simple enlargements of the coupé types carried in 1912. In the $1,500 class a large increase is shown.

Cartercar 5, $2,250. 27.25 H.P., 116 W.B., 36 x 4 tires.
Studebaker 35, $1,850. 27.25 H.P., 115½ W.B., 34 x 4 tires.
Kisselkar, $2,400. 32.4 H.P., 121 W.B., 35 x 4½ and 35 x 4 tires.
Regal, $1,250. 22.5 H.P., 100 W.B., 32 x 3½ tires.
Stoddard-Dayton 38, $2,350. 28.9 H.P., 114 W.B., 35 x 4½ tires.
Overland 69, $1,500. 25.6 H.P., 110 W.B., 32 x 3½ tires.
Oakland 42, $2,500. 27.25 H.P., 116 W.B., 34 x 4 tires.
Apperson 4-45, $2,100. 32.4 H.P., 114 W.B., 34 x 4 tires.
Abbott-Detroit, $1,850. 27.3 H.P., 116 W.B., 34 x 4 tires.
Marathon Winner, $1,600. 28.9 H.P., 116 W.B., 34 x 4 tires.
R.C.H., $1,050. 16.9 H.P., 110 W.B., 32 x 3½ tires.
Paige, $1,500. 22.5 H.P., 110 W.B., 33 x 4 tires.





The Check Book and the Cars

Full Pocket-Book Class

Costing Over $3000

PROSPECTIVE purchasers of 1913 cars of high-class manufacture will be confronted with the products of no less than forty-eight factories, ranging in price between $3,000 and $7,250. These cars represent the cream of American automobile engineering, body building and equipment. Fully 360 models are offered to the public and almost one-fourth of these are limousine equipped, indicating the rapidly increasing degree in which this splendid type of body attracts automobilists and showing that comfort is among the chief requirements of an expensive car. Besides eighty-seven limousines there are fifty-eight seven-passenger touring cars, forty-one five-passenger touring cars, thirty-six roadsters and thirty-one landaulets; while the remainder of the body styles is made up by three- and four-passenger touring cars, broughams, phaetons, coupés, runabouts and a variety of so-called fancy styles.

Next to comfort, power is a leading consideration in selecting a quality automobile. The cars shown this year vary in horsepower from 60.50 to 25.60, these sizes referring to the five-cylinder Adams-Farwell and the new Edwards-Knight, respectively. The average horsepower of the high-priced 1913 car is 39.49.

(*Continued on page* 102.)

Automobiles Costing Over $3000

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheelbase	Tires Front	Tires Rear
Abbott-Detroit, E.	Limousine..	$3050	7	32.40	121	36x4½	36x4½
Adams-Farwell, 9.	Road.......	3000	5	60.50	120	36x4½	36x4½
Adams-Farwell, 9.	Tour.......	3500	7	60.50	120	36x4½	36x4½
A.E.C., 6-60......	Road.......	3000	2	48.60	138	37x5	37x5
A.E.C., 6-60......	Tour.......	3000	7	48.60	138	37x5	37x5
Alco, 7-16........	Land.......	6750	6	24.90	104	32x4	32x4
Alco, 11-60......	Tour.......	6000	7	54.10	133½	36x4½	37x5
Alco, 11-60......	Tour.......	6000	5	54.10	133½	36x4½	37x5
Alco, 11-60......	Limousine..	6750	5	54.10	133½	36x4½	37x5
Alco, 11-60......	Berl........	7250	7	54.10	133½	36x4½	37x5
Amer. Trav., 54A..	Tour.......	4250	4	46.00	124	40x4	41x4½
Amer. Trav., 65A..	Tour.......	4500	6	46.00	140	41x4½	41x4½
Atlas, 12.........	Tour.......	3500	5	32.40	130	37x5	37x5
Atlas, 12	Tour.......	3700	7	32.40	130	37x5	37x5
Auburn, 6-60.....	Tour.......	3000	7	40.90	135	37x4½	37x4½
Bergdoll, 40......	Limousine..	3250	7	25.60	121	36x4	36x4
Bergdoll, 40......	Coupe......	3250	4	25.60	121	36x4	36x4
Cadillac, 1913....	Limousine..	3250	7	32.40	120	36x4½	36x4½
Carroll, 4D.......	Road.......	3000	2	40.00	128	36x4½	36x4½
Carroll, 4D.......	Road.......	3000	3	40.00	128	36x4½	36x4½
Carroll, 4D.......	Tour.......	3250	4	40.00	128	36x4½	36x4½
Carroll, 4D.......	Tour.......	3250	5	40.00	128	36x4½	36x4½
Carroll, 4D.......	Tour.......	3300	6	40.00	128	36x4½	36x4½
Carroll, 4D.......	Tour.......	3300	7	40.00	128	36x4½	36x4½
Carroll, 6C.......	Road.......	3250	2	40.90	128	36x4½	36x4½
Carroll, 6C.......	Road.......	3250	3	40.90	128	36x4½	36x4½
Carroll, 6C.......	Tour.......	3500	4	40.90	128	36x4½	36x4½
Carroll, 6C.......	Tour.......	3500	5	40.90	128	36x4½	36x4½
Carroll, 6C.......	Tour.......	3500	6	40.90	128	36–4½	36x4½
Carroll, 6C.......	Tour.......	3500	7	40.90	128	36x4½	36x4½
Chadwick, 19....	Tour.......	5500	7	60.00	133	36x4½	37x5
Chadwick, 19....	Tour.......	5500	5	60.00	133	36x4½	37x5
Chadwick, 19....	Limousine..	6500	7	60.00	133	36x4½	37x5
Chadwick, 19....	Road.......	5500	2	60.00	112	36x4½	36x4½
Chadwick, 19....	Road.......	5500	3	60.00	112	36x4½	36x4½
Chalmers, 17.....	Limousine..	3250	7	28.90	118	37x4½	37x4½
Chalmers, 18.....	Limousine..	3700	7	43.80	130	37x5	37x5
Cole, 50..........	Limousine..	3250	4	32.40	122	36x4	36x4
Cole, 50..........	Coupe......	3000	4	40.90	132	37x4½	37x4½
Cole, 50..........	Limousine..	3750	7	40.90	132	37x4½	37x4½
Columbia, 88.....	Road.......	$4500	2	38.00	129	36x4½	36x4½
Columbia, 88.....	Tour.......	4500	4	38.00	129	36x4½	36x4½
Columbia, 88.....	Tour.......	4500	7	38.00	129	36x4½	36x4½
Columbia, 88.....	Limousine..	5800	7	38.00	129	36x4½	36x4½
Columbia, 88.....	Land.......	5800	7	38.00	129	36x4½	36x4½
Columbia, 88.....	Tour.......	4500	6	38.00	129	36x4½	36x4½
Columbia, 85-2...	Road.......	3300	2	38.00	120	36x4½	36x4½
Columbia, 85-2...	Road.......	3300	4	38.00	120	36x4½	36x4½
Columbia, 85-2...	Tour.......	3400	6	38.00	120	36x4½	36x4½
Columbia, 85-2...	Tour.......	3500	7	38.00	120	36x4½	36x4½
Columbia, 85-2...	Limousine..	4800	7	38.00	120	36x4½	36x4½
Croxton, B-6.....	Tour.......	3000	6	28.90	138	36x4½	36x4½
Cunningham, M..	Tour.......	3500	7	36.10	124	36x4½	36x4½
Cunningham, M..	Phaeton....	3500	5	36.10	124	36x4½	36x4½
Cunningham, M..	Limousine..	4500	7	36.10	124	36x4½	36x4½
Cunningbam, M..	Land.......	4500	7	36.10	124	36x4½	36x4½
Cunningham, M..	Road.......	3250	3	36.10	124	36x4½	36x4½
Diamond, T......	Opt........	3500	....	40.00	126	36x4½	36x4½
Duquesne, 50....	Tour.......	3000	5	33.75	133	36x4½	36x4½
Duquesne, 50....	Road.......	3000	3	33.75	133	36x4½	36x4½
Duquesne, 50....	Tour.......	3000	4	33.75	133	36x4½	36x4½
Duquesne, 50....	Road.......	3000	2	33.75	133	36x4½	36x4½
Edwards, 25.....	Tour.......	3500	5	25.60	120	36x4½	36x4½
Edwards, 25.....	Tour.......	3500	4	25.60	120	36x4½	36x4½
Edwards, 25.....	Road.......	3500	2	25.60	120	36x4½	36x4½
Edwards, 25.....	Limousine..	4600	7	25.60	120	36x4½	36x4½
Edwards, 25.....	Land.......	4700	7	25.60	120	36x4½	36x4½
Fiat, 54..........	Phateon....	4000	5	31.10	123	36x4½	36x4½
Fiat, 54..........	Tour.......	4000	7	31.10	123	36x4½	36x4½
Fiat, 54..........	Run........	4000	4	31.10	123	36x4½	36x4½
Fiat, 54..........	Limousine..	5000	7	31.10	123	36x4½	36x4½
Fiat, 54..........	Land.......	5100	7	31.10	123	36x4½	36x4½
Fiat, 56..........	Phaeton....	5000	5	46.65	135	36x4½	37x5
Fiat, 56..........	Tour.......	5000	7	46.65	135	36x4½	37x5
Fiat, 56..........	Run........	5000	4	46.65	135	36x4½	37x5
Fiat, 56..........	Limousine..	6000	7	46.65	135	36x4½	37x5
Fiat, 56..........	Land.......	6100	7	46.65	135	36x4½	36x5
Fiat, 55..........	Phaeton....	4500	5	42.00	128	36x4½	37x5
Fiat, 55..........	Tour.......	4500	7	42.00	128	36x4½	37x5
Fiat, 55..........	Road.......	4500	4	42.00	128	36x4½	37x5
Fiat, 55..........	Limousine..	5500	7	42.00	128	36x4½	37x5
Fiat, 55..........	Land.......	5600	7	42.00	128	36x4½	37x5
Firestone-Col. 90E	Tour.......	....	5	40.90	130	36x4½	36x4½
Firestone-Col. 90E	Tour.......	....	7	40.90	130	36x4½	36x44
Firest.-Col., 86-E..	Road.......	....	5	27.25	116	34x4	34x4½
Firest.-Col., 86-E..	Tour.......	....	3	27.25	116	34x4	34x

Automobiles Costing Over $3000

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheelbase	Tires	
						Front	Rear
Firest.-Col., 60-E	Tour	....	5	32.40	122	36x4	36x4
Firest.-Col., 60-E	Tour	....	7	32.40	122	36x4	36x4
Firest.-Col., 60-E	Limousine	....	7	32.40	122	32x4	36x4
Franklin, D	Tour	$3600	5	38.40	123	36x4½	37x5
Franklin, H	Tour	3850	7	38.40	126	37x5	37x5
Franklin, H	Limousine	4850	7	38.40	126	37x5	37x5
Garford, G-14	Run	4500	2	43.80	139	37x5	37x5
Garford, G-14	Tour	4500	5 & 7	43.80	139	37x5	37x5
Garford, G-14	Limousine	5650	7	43.80	139	37x5	37x5
Garford, G-14	Land	5750	7	43.80	139	37x5	37x5
Great Eagle, B	Tour	3500	7	36.10	135	36x4½	36x4½
Great Eagle, B	Limousine	4000	7	36.10	135	36x4½	36x4½
Great Eagle, B	Limousine	4750	10	36.10	135	36x4½	36x4½
Great Eagle, B	Land	3500	7	36.10	135	36x4½	36x4½
Great Eagle, C	Tour	4000	7	40.90	142	37x5	37x5
Great Eagle, C	Limousine	4500	7	40.90	142	37x5	37x5
Great Eagle, C	Limousine	5250	10	40.90	142	37x5	37x5
Great Eagle, C	Land	4000	7	40.90	142	37x5	37x5
Haynes, 22	Limousine	3400	7	32.40	120	36x4½	36x4½
Haynes, 22	Berl	3500	7	32.40	120	36x4½	36x4½
Hudson, 37	Limousine	3250	7	27.25	118	36x4	36x4
Hudson, 54	Limousine	3750	7	40.90	127	36x4½	36x4½
Kissel, 60	Tour	3150	6	48.60	140	37x5	37x5
Kissel, 60	Tour	3150	7	48.60	140	37x5	37x5
Klinekar, 4-40	Limousine	3750	7	28.90	118	36x4	36x4
Klinekar, 6-50	Limousine	4350	7	40.70	126	36x4½	36x4½
Klinekar, 6-50	Coupe	3150	3	40.70	126	36x4½	36x4½
Klinekar, 6-60	Tour	3500	6	43.80	132	37x5	37x5
Klinekar, 6-60	Tour	3500	7	43.80	132	37x5	37x5
Klinekar, 6-60	Phaeton	3500	4	43.80	132	37x5	37x5
Klinekar, 6-60	Run	3250	2	43.80	132	37x5	37x5
Klinekar, 6-60	Coupe	3750	3	43.80	132	37x5	37x5
Klinekar, 6-60	Limousine	5000	7	43.80	132	37x5	37x5
Klinekar, 6-60	Meteor	3200	2	43.80	132	37x5	37x5
Knox, 44	Run	3350	2	40.00	122	36x4½	36x4½
Knox, 44	Tour	3400	4	40.00	122	36x4½	36x4½
Knox, 44	Run	3350	4	40.00	122	36x4½	36x4½
Knox, 44	Tour	3450	5	40.00	122	36x4½	36x4½
Knox, 44	Tour	3500	7	40.00	122	36x4½	36x4½
Knox, 45	Tour	3700	6	40.00	126	37x5	37x5
Knox, 45	Tour	3800	7	40.00	126	37x5	37x5
Knox, 46	Limousine	4700	7	40.00	126	37x5	37x5
Knox, 45	Land	4750	7	40.00	126	37x5	37x5
Knox, 46	Tour	4350	7	45.96	134	38x5	38x5
Knox, 46	Tour	4350	6	45.96	134	38x5	38x5
Knox, 46	Run	4350	2	45.96	134	38x5	38x5
Knox, 46	Limousine	5350	7	45.96	134	38x5	38x5
Knox, 46	Land	5400	7	45.96	134	38x5	38x5
Knox, 46	Run	4350	4	45.96	134	38x5	38x5
Knox, 66	Tour	5000	7	60.00	134	38x5½	38x5½
Knox, 66	Tour	5000	6	60.00	134	38x5½	38x5½
Knox, 66	Run	4800	2	60.00	134	38x5½	38x5½
Knox, 66	Run	4800	4	60.00	134	38x5½	38x5½
Knox, 66	Limousine	6400	7	60.00	134	38x5½	38x5½
Knox, 66	Land	6400	7	60.00	134	38x5½	38x5½
Locomobile, L	Tour	3600	5	32.40	120	34x4½	34x4½
Locomobile, L	Tour	3600	4	32.40	120	34x4½	34x4½
Locomobile, L	Roadster	3600	2	32.40	120	34x4½	34x4½
Locomobile, R	Tour	4300	5	43.80	128	36x4½	36x4½
Locomobile, R	Tour	4300	4	43.80	128	36x4½	36x4½
Locomobile, R	Road	4300	2	43.80	128	36x4½	36x4½
Locomobile, R	Limousine	5350	7	43.80	128	36x4½	36x4½
Locomobile, R	Berline	5500	7	43.80	128	36x4½	36x4½
Locomobile, R	Land	5650	7	43.80	128	36x4½	36x4½
Locomobile, M	Tour	5000	7	48.60	136	36x4½	37x5
Locomobile, M	Tour	5000	5	48.60	136	36x4½	37x5
Locomobile, M	Road	5000	2	48.60	136	36x4½	37x5
Locomobile, M	Limousine	6000	7	48.60	136	36x4½	37x5
Locomobile, M	Land	6100	7	48.60	136	36x4½	37x5
Lozier, 77	Tour	3250	5	31.60	127½	36x4½	36x4½
Lozier, 77	Coupe	3850	3	31.60	127½	36x4½	36x4½
Lozier, 77	Road	3250	3	31.60	127½	36x4½	36x4½
Lozier, 77	Limousine	4450	6	31.60	127½	36x4½	36x4½
Lozier, 77	Limousine	4450	5	31.60	127½	36x4½	36x4½
Lozier, 72	Tour	5000	7	51.60	131	36x4½	37x5
Lozier, 72	Limousine	6500	7	51.60	131	36x4½	37x5
Lozier, 72	Tour	5000	5	51.60	131	36x4½	37x5
Lozier, 72	Land	6500	7	51.60	131	36x4½	37x5
Lozier, 72	Road	5000	2	51.60	131	36x4½	37x5
Marmon, 32	Tour	3000	5	32.40	120	35x4½	35x4½
Marmon, 32	Tour	3125	7	32.40	120	35x4½	35x4½
Marmon, 32	Tour	3000	4	32.40	120	35x4½	35x4½
Marmon, 32	Limousine	4000	7	32.40	120	35x4½	35x4½
Marmon, 32	Land	4100	7	32.40	120	35x4½	35x4½
Marmon, 32	Coupe	3700	4	32.40	120	35x4½	35x4½
Marmon, Six	Tour	5000	7	48.60	145	36x4½	37x5
Marmon, Six	Tour	5000	5	48.60	145	36x4½	37x5
Marmon, Six	Tour	5000	4	48.60	145	36x4½	37x5
Marmon, Six	Road	5000	2	48.60	145	36x4½	37x5
Marmon, Six	Limousine	6250	7	48.60	145	36x4½	37x5
Marmon, Six	Ber	6450	7	48.60	145	36x4½	37x5
Marmon, Six	Land	6350	7	48.60	145	36x4½	37x5
Matheson, C	Tour	$4800	7	48.60	135	37x5	37x5
Matheson, C	Tour	4800	5	48.60	135	37x5	37x5
McFarlan, S	Coupe	3100	2	38.40	124	37x4½	37x4½
McFarlan, S	Coupe	3300	4	38.40	124	37x4½	37x4½
McFarlan, T	Coupe	3300	2	38.40	124	37x4½	37x4½
McFarlan, T	Coupe	3300	4	38.40	124	37x4½	37x4½
McFarlan, T	Limousine	3700	7	38.40	124	37x4½	37x4½
McFarlan, M	Limousine	4050	7	38.40	124	37x4½	37x4½
Midland, T-4	Sedan	3250	5	32.40	121	34x4	34x4
Morse, 34	Tour	4200	5	34.25	127	36x4½	36x4½
Morse, 34	Road	4200	2	34.25	127	36x4½	36x4½
Morse, 34	Limousine	5400	5	34.25	127	36x4½	36x4½
Morse, 34	Tour	4200	4	34.25	127	36x4½	36x4½
National, V	Tour	3300	5	38.00	128	36x4½	36x4½
National, V	Tour	3300	4	38.00	128	36x4½	36x4½
National, V	Tour	3400	7	38.00	128	36x5	36x5
National, V	Limousine	4800	7	38.00	128	36x5	36x5
National, V	Road	3150	2	38.00	120	34x4½	34x4½
Norwalk, A	Tour	3000	4	38.40	136	40x4½	40x4½
Norwalk, A	Tour	3100	6	38.40	136	40x4½	40x4½
Norwalk, B	Tour	3850	4	43.80	144	41x5	41x5
Norwalk, B	Tour	3750	6	43.80	144	41x5	41x5
Oldsmobile, 53	Road	3200	2	40.90	135	36x4½	36x4½
Oldsmobile, 53	Tour	3350	4	40.90	135	36x4½	36x4½
Oldsmobile, 53	Tour	4800	5	40.90	135	36x4½	36x4½
Oldsmobile, 53	Tour	5000	7	40.90	135	36x4½	36x4½
Oldsmobile, 53	Limousine	6500	7	40.90	135	36x4½	36x4½
Packard, 38	Run	4050	3	38.40	115½	36x4½	37x5
Packard, 38	Coupe	4500	3	38.40	115½	36x4½	37x5
Packard, 38	Coupe	4900	5	38.40	115½	36x4½	37x5
Packard, 38	Tour	4150	5	38.40	134	36x4½	37x5
Packard, 38	Limousine	5200	7	38.40	134	36x4½	37x5
Packard, 38	Land	5300	7	38.40	134	36x4½	37x5
Packard, 38	Limousine	5400	7	38.40	134	36x4½	37x5
Packard, 38	Phaeton	4150	5	38.40	138	36x4½	37x5
Packard, 38	Phaeton	4150	4	38.40	138	36x4½	37x5
Packard, 38	Broug	5200	5	38.40	138	36x4½	37x5
Packard, 48	Run	4650	3	48.60	121½	36x4½	37x5
Packard, 48	Coupe	5100	3	48.60	121½	36x4½	37x5
Packard, 48	Tour	4850	7	48.60	139	36x4½	37x5
Packard, 48	Limousine	5850	7	48.60	139	36x4½	37x5
Packard, 48	Land	5950	7	48.60	139	36x4½	37x5
Packard, 48	Limousine	6050	7	48.60	139	36x4½	37x5
Packard, 48	Phaeton	4750	5	48.60	139	36x4½	37x5
Packard, 48	Broug	5800	5	48.60	139	36x4½	37x5
Palmer-Sing., 64	Tour	3200	7	57.00	138	36x4	36x5
Palmer-Sing., 64	Tour	3000	5	57.00	138	36x4	36x5
Palmer-Sing., 64	Road	3000	2	57.00	138	36x4	36x5
Peerless, 29	Limousine	4200	6	25.00	113	34x4½	34x4½
Peerless, 29	Land	4300	6	25.60	113	34x4½	34x4½
Peerless, 35	Tour	4300	5	38.40	125	36x4½	36x4½
Peerless, 36	Tour	4300	4	38.40	125	36x4½	36x4½
Peerless, 36	Road	4300	3	38.40	125	36x4½	36x4½
Peerless, 35	Limousine	5300	7	38.40	125	36x4½	36x4½
Peerless, 36	Land	5400	7	38.40	125	36x4½	36x4½
Peerless, 35	Limousine	5500	7	38.40	125	36x4½	36x4½
Peerless, 36	Coupe	5000	3	38.40	125	36x4½	36x4½
Peerless, 36	Tour	5000	7	48.60	137	36x4½	37x5
Peerless, 36	Tour	5000	6	48.60	137	36x4½	37x5
Peerless, 36	Limousine	6000	7	48.60	137	36x4½	37x5
Peerless, 36	Land	6100	7	48.60	137	36x4½	37x5
Peerless, 36	Limousine	6200	7	48.60	137	36x4½	37x5
Peerless, 37	Tour	6000	7	60.00	140	38x5½	38x5½
Peerless, 37	Tour	6000	6	60.00	140	38x5½	38x5½
Peerless, 37	Limousine	7000	7	60.00	140	38x5½	38x5½
Peerless, 37	Land	7100	7	60.00	140	38x5½	38x5½
Peerless, 37	Limousine	7200	7	60.00	140	38x5½	38x5½
Pierce, 38C	Run	4300	3	38.40	132	36x4½	36x4½
Pierce, 38C	Tour	4300	4	38.40	132	36x4½	36x4½
Pierce, 38C	Tour	4300	5	38.40	132	36x4½	36x4½
Pierce, 38C	Broug	5200	7	38.40	132	36x4½	36x4½
Pierce, 38C	Land	5200	7	38.40	132	36x4½	36x4½
Pierce, 48D	Tour	5000	7	48.60	134½	37x5	37x5
Pierce, 48D	Tour	6100	7	48.60	134½	37x5	37x5
Pierce, 48D	Limousine	6100	7	48.60	134½	37x5	37x5
Pierce, 48B	Run	4850	3	48.60	142	37x5	37x5
Pierce, 48B	Tour	4850	5	48.60	142	37x5	37x5
Pierce, 48B	Tour	5000	7	48.60	142	37x5	37x5
Pierce, 48B	Limousine	6100	7	48.60	142	37x5	37x5
Pierce, 48B	Land	6100	7	48.60	142	37x5	37x5
Pierce, 66A	Tour	5850	5	60.00	147½	37x5	38x5½
Pierce, 66A	Tour	6000	7	60.00	147½	37x5	38x5½
Pierce, 66A	Limousine	7100	7	60.00	147½	37x5	38x5½
Pierce, 66A	Land	7100	7	60.00	147½	37x5	38x5½
Pope-Hart., 31	Limousine	3250	5	30.25	118½	36x4½	36x4½
Pope-Hart., 33	Tour	3250	5	36.10	124	36x4½	36x4½
Pope-Hart., 33	Tour	3500	7	36.10	124	36x4½	36x4½
Pope-Hart., 33	Phaeton	3250	5	36.10	124	36x4½	36x4½
Pope-Hart., 33	Road	3250	2	36.10	124	36x4½	36x4½
Pope-Hart., 33	Limousine	4300	7	36.10	124	36x4½	36x4½
Pope-Hart., 33	Land	4300	7	36.10	124	36x4½	36x4½

Automobiles Costing Over $3000

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheel-base	TIRES Front	TIRES Rear
Pope-Hart., 38	Berl	$4550	7	36.10	124	36x4½	36x4½
Pope-Hart., 29	Tour	4250	7	46.10	133	37x5	37x5
Pope-Hart., 29	Phaeton	4250	5	46.10	133	37x5	37x5
Pope-Hart., 29	Road	4250	2	46.10	133	37x5	37x5
Pope-Hart., 29	Limousine	5300	7	46.10	133	37x5	37x5
Pope-Hart., 29	Land	5300	7	46.10	133	37x5	37x5
Pope-Hart., 29	Berl	5550	7	46.10	133	37x5	37x5
Premier 6-40	Limousine	4250	7	38.40	132	36x4½	36x4½
Premier 6-40	Coupe	3750	3	38.40	132	36x4½	36x4½
Premier, 6-60	Limousine	6000	7	48.60	137	37x5	37x5
Premier, 6-60	Limousine	5500	7	48.60	137	37x5	37x5
Premier, 6-60	Tour	4000	7	48.60	137	37x5	37x5
Premier 6-60	Tour	4000	5	48.60	137	37x5	37x5
Premier, 6-60	Coupe	5000	3	48.60	137	37x5	37x5
Premier, 6-60	Road	4000	2	48.60	137	37x5	37x5
Reeves, Sexto	Tour	4500	7	36.10	158	34x4½	34x4½
Republic, E	Tour	3150	7	43.80	132	36x4½	36x4½
Schlosser	Optional	......	......	40.00	124	36x4½	36x4½
Selden, 48	Limousine	3750	7	36.10	125	37x4½	37x4½
S.G.V., A	Land	3500	7	22.50	116	34x4	34x4
S.G.V., A	Land	3500	5	22.50	116	34x4	34x4
S.G.V., A	Limousine	3500	5	22.50	116	34x4	34x4
S.G.V., A	Limousine	3500	7	22.50	116	34x4	34x4
S.G.V., D	Run	3000	2	25.60	118	35x4½	35x4½
S.G.V., D	Tour	3250	5	25.60	118	35x4½	35x4½
S.G.V., D	Tour	3250	4	25.60	118	35x4½	35x4½
S.G.V., D	Land	4000	5	25.60	118	35x4½	35x4½
S.G.V., D	Land	4000	7	25.60	118	35x4½	35x4½
S.G.V., D	Limousine	4000	5	25.60	118	35x4½	35x4½
S.G.V., D	Limousine	4000	7	25.60	118	35x4½	35x4½
Simplex, 127	Tour	5600	5	38.00	127	35x5	35x5
Simplex, 127	Tour	5500	4	38.00	127	35x5	35x5
Simplex, 137	Tour	5700	7	38.00	137	35x5	35x5
Simplex, 137	Limousine	6400	5	38.00	137	35x5	35x5
Simplex, 137	Limousine	6400	4	38.00	137	35x5	35x5
Simplex, 137	Land	6400	4	38.00	137	35x5	35x5
Simplex, 127	Land	6400	5	38.00	137	35x5	35x5
Simplex, 137	Limousine	6500	7	38.00	137	35x5	35x5
Simplex, 137	Land	6500	7	38.00	137	35x5	35x5
Simplex, 137	Broug	6500	4	38.00	137	35x5	35x5
Simplex, 129	Tour	6100	5	53.00	129	36x4	36x5
Simplex, 129	Tour	6000	4	53.00	129	36x4	36x5
Simplex, 139	Tour	6200	7	53.00	139	36x5	36x5
Spoerer, 40G	Tour	3000	5	38.00	120	37x4½	37x4½
Spoerer, 40G	Tour	3200	7	38.00	120	37x4½	37x4½
Spoerer, 40G	Run	3000	2	38.00	120	37x4½	37x4½

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheel-base	TIRES Front	TIRES Rear
Stearns, Kn., 4	Road	$3750	3	28.90	116	36x4½	36x4½
Stearns, Kn., 4	Tour	3750	4	28.90	121	36x4½	36x4½
Stearns, Kn., 4	Tour	3750	5	28.90	121	36x4½	36x4½
Stearns, Kn., 4	Limousine	5000	5	28.90	121	36x4½	36x4½
Stearns, Kn., 4	Land	5100	5	28.90	121	36x4½	36x4½
Stearns, Kn., 4	Tour	3900	7	28.90	127	36x4½	36x4½
Stearns, Kn., 4	Limousine	5000	5	28.90	127	36x4½	36x4½
Stearns, Kn., 4	Land	5100	5	28.90	127	36x4½	36x4½
Stearns, Kn., 6	Road	4850	3	43.80	134	37x5	37x5
Stearns, Kn., 6	Tour	4850	4	43.80	134	37x5	37x5
Stearns, Kn., 6	Tour	4850	5	43.80	134	37x5	37x5
Stearns, Kn., 6	Limousine	6100	5	43.80	134	37x5	37x5
Stearns, Kn., 6	Land	6200	5	43.80	134	37x5	37x5
Stearns, Kn., 6	Tour	5000	7	43.80	140	37x5	37x5
Stearns, Kn., 6	Limousine	6100	5	43.80	140	37x5	37x5
Stearns, Kn., 6	Land	6200	5	43.80	140	37x5	37x5
Slevens-Dur., C	Tour	4500	5	46.10	131	37x4½	37x4½
Slevens-Dur., C	Road	4500	2	46.10	131	37x4½	37x4½
Stevens-Dur., C	Phaeton	5000	5	46.10	131	37x4½	37x4½
Slevens-Dur., C	Berl	5550	5	46.10	131	37x4½	37x5
Slevens-Dur., C	Coupe	5000	2	46.10	131	37x4½	37x5
Slevens-Dur., C	Limousine	5500	7	46.10	131	37x4½	37x5
Slevens-Dur., C	Berl	5700	7	46.10	131	37x4½	37x5
Slevens-Dur., C	Tour	4750	7	46.10	138	37x4½	37x5
Slevens-Dur., C	Phaeton	5250	7	46.10	138	37x4½	37x5
Slevens-Dur., C	Limousine	5750	7	46.10	138	37x4½	37x5
Slevens-Dur., C	Berl	5950	7	46.10	138	37x4½	37x5
Stoddard-Day., 48	Limousine	3900	7	36.10	122½	36x4½	36x4½
Sloddard-Day., 13	Tour	5000	7	48.60	133	36x5	36x5
Stoddard-Day., 13	Limousine	6250	7	48.60	133	36x5	36x5
Sloddard-Day., 13	Road	4900	2	48.60	133	36x5	36x5
Winlon, 17D	Tour	3000	5	48.60	130	36x4½	36x4½
Winton, 17D	Tour	3000	4	48.60	130	36x4½	36x4½
Winlon, 17D	Tour	3250	6	48.60	130	36x4½	36x4½
Winlon, 17D	Tour	3250	7	48.60	130	36x4½	36x4½
Winlon, 17D	Limousine	4250	7	48.60	130	36x4½	36x4½
Winlon, 17D	Limousine	4500	7	48.60	130	36x4½	36x4½
Winton, 17D	Land	4500	7	48.60	130	36x4½	36x4½
Velie, 40	Limousine	3000	5	32.40	118	36x4	36x4
White, GRE	Coupe	3250	3	22.50	110	34x4	34x4
White, GEB	Tour	3300	5	28.90	120	36x4½	36x4½
White, GEB	Tour	3500	7	28.90	120	36x4½	36x4½
White, GEB	Road	3300	2	28.90	120	36x4½	36x4½
White, GEB	Coupe	4100	3	28.90	120	36x4½	36x4½
White, GEB	Limousine	5000	7	28.90	120	36x4½	36x4½
White, GF	Tour	5000	7	43.80	132	37x5	37x5
White, GF	Tour	5000	5	43.80	132	37x5	37x5
White, GF	Road	4800	2	43.80	132	37x5	37x5
White, GF	Limousine	6300	7	43.80	132	37x5	37x5

(*Continued from page* 100.)

Motors for the year 1913 include ninety-one power plants, eighty-six of which are of the long-stroke type; in other words, the makers of 95 per cent. of the high-priced automobiles have become convinced of the often-elaborated advantages of long-stroke designs. Only one car in this class has a short-stroke motor, and four square motors are in use. Among the long-stroke designs, the Lozier 77 motor ranks foremost, with a stroke-bore ratio of 1.51, being followed by the Bergdoll 40, 1.48:1, and Peerless 37 and Pierce 6-66, both with a ratio of 1.4:1. The smallest ratio is that of the Adams-Farwell cylinders, namely .91:1. The practical progress made by the Knight motor, so far as the number of manufacturers is concerned, is rather modest; in addition to Stearns, Atlas, Columbia and Stoddard-Dayton, one company, the Edwards, has taken up the manufacture of the sleeve-valve motor, so that now nine models of cars equipped with the silent Knight power plant are on the market. The six-cylinder power plant constructions have gained in numbers and now compose forty-seven of the motors on hand, or 52.5 per cent., while there are forty-three four-cylinder designs and one five-cylinder, rotary motor.

Another respect in which automobile luxury has been augmented is the wide use of electric lighting-generator outfits in this class of cars. This type of outfit has made most remarkable strides since last year and is today almost universal in the $4,000 class of automobiles. Together with several battery lighting outfits it has entirely supplanted the acetylene tank and headlights in this department of the show. A most scrutinizing inspection has revealed the fact that of the fifty-eight makes included in this class, fifty-three, or 91 per cent., are fitted with electric lighting generators of perhaps a dozen makes. Five makes of automobiles are equipped with storage batteries to be charged at the garage for lighting purposes.

The Pierce-Arrow 66-A is the leader in wheelbase length, with 147.5 inches, being followed by the Marmon Six with 145 inches and the Norwalk with 144 inches. There are a number of 140-inch cars and a host of such having wheelbase lengths from 130 to 130 inches. The shortest wheelbase is that of the Alco 7-16 landaulet, namely, 104 inches. As heretofore, the standard tread has been preserved at 56 inches in the majority of cases, with exceptions or options at 60 inches.

As regards tire sizes, the American, formerly the leader in large wheels, has been superseded by the Norwalk, a newcomer, with 41 by 5-inch tires. The most common tire size in this department is still 36 by 3.5 inches, but a number of 37 and 38-inch tires have been introduced this year.

One of the questions which have been in the foreground during 1912 is that of the position of the steering wheel. A vigorous campaign in favor of the left-hand steer has been conducted during the past twelvemonth, and as a result, fourteen companies out of fifty-eight, or 24 per cent., have introduced the left-hand control on their automobiles.

A comparison between the cars listed in the $4,000 class and those enumerated in it a year ago shows many changes. There are thirteen companies listed in this department for the first time, some of whom appear for the first time.

Automobiles Costing $1250 and Under

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheelbase	Tires Front	Tires Rear
Auburn 33L	Road	$1150	2	22.50	112	34x3½	34x3½
Auburn, 33L	Tour	1150	5	22.50	112	34x3½	34x3½
Buick, 24	Road	950	2	22.50	105	32x3½	32x3½
Buick, 25	Tour	1050	5	22.50	105	32x3½	32x3½
Buick, 30	Road	1125	2	25.60	108	34x4	34x4
Cameron, 28	Tour	800	4	24.00	104	32x3	32x3
Cameron, 29A	Tour	950	5	24.00	110	32x3½	32x3½
Cameron, 30	Flyer	1200	2	36.07	114	34x3½	34x3½
Crow-Elkhart, C-1	Road	.....	2	22.50	112	32x3½	32x3½
Crow-Elkhart, C-2	Tour	.....	5	25.60	114	34x3½	34x3½
Detroiter, A-3	Road	900	2	18.25	104	32x3½	32x3½
Detroiter, A-4	Road	900	2	18.25	104	32x3½	32x3½
Detroiter, A	Tour	850	5	18.25	104	32x3½	32x3½
Detroiter, A-1	Tour	900	5	18.25	104	32x3½	32x3½
Detroiter, A-2	Tour	900	5	18.25	104	32x3½	32x3½
Duryea, F.P.	Run	625	2	.....	80	30x3	36x3
Duryea, F.P.	Buggy	487	2	.....	80	1½	1½
Duryea, F.P.	Surrey	537	4	.....	90	1½	1½
Duryea, F.P.	Vict	625	2	.....	100	1½	1½
Empire, 25	Tour	950	5	19.60	104	32x3½	32x3½
Ford, T	Tour	600	5	22.50	100	30x3	30x3½
Ford, T	Run	525	2	22.50	100	30x3	30x3½
Ford, T	Town Car	800	6	22.50	100	30x3	30x3½
Gleason, R	Run	850	2	18.00	96	36x2	36x2
Gleason, R	Run	875	3	18.00	96	36x2	36x2
Gleason, R	Tour	1000	5	18.00	96	36x2	36x2
Halladay, 32	Road	1200	2	22.50	112	33x4	33x4
Halladay, 32	Tour	1200	5	22.50	112	33x4	33x4
Hupmobile, C	Run	750	2	16.90	86	30x3	30x3
Hupmobile, E	Road	850	2	16.90	110	30x3	30x3
Hupmobile, H	Road	975	2	16.90	106	32x3½	32x3½
Hupmobile, H	Tour	975	4	16.90	106	32x3½	32x3½
Hupmobile, C	Coupe	1100	3	16.90	86	30x3	30x3
Hupmobile, E	Coupe	1150	3	16.90	110	30x3	31x3½
King	Road	1190	2	22.50	110	32x3½	32x3½
Krit, K	Road	900	2	22.50	106	32x3½	32x3½
Krit, K	Tour	900	5	22.50	106	32x3½	32x3½
Lambert, 40	Tour	1130	5	16.90	112	32x3½	32x3½
Little Four	Run	690	2	19.60	90	30x3½	30x3½
Lion, 30	Road	890	2	19.60	110	32x3½	32x3½
Marathon, Run'r.	Road	875	2	19.60	104	32x3½	32x3½
Marathon, Run'r.	Tour	950	5	19.60	104	32x3½	32x3½
Marathon, Run'r.	Coupe	1050	2	19.60	104	32x3½	32x3½
Mason, A	Tour	.....	4	20.00	96	32x3½	32x3½
Mason, C	Tour	.....	5	20.00	96	32x3½	32x3½
Maxwell, 4	Road	785	2	22.50	93	30x3½	30x3½
Maxwell, 8	Road	1110	2	25.60	106	32x3½	32x3½
Maxwell, 8	Tour	1145	5	25.60	106	32x3½	32x3½
Metz	Run	495	2	22.50	90	30x3	30x3
Motorette, M1	Run	350	2	11.25	74	28x2½	28x3
Motorette, R1	Run	350	3	11.25	74	28x2½	28x3
Oakland, 35	Road	1000	3	19.60	112	32x3½	32x3½
Oakland, 35	Tour	1075	5	19.60	112	32x3½	32x3½
Only, A	Run	1000	2	28.90	112	32x3½	32x3½
Overland, 69	Road	985	2	25.60	110	32x3½	32x3½
Overland, 69	Tour	985	5	25.60	110	32x3½	32x3½
Overland, 60	Tour	1010	4	25.60	110	32x3½	32x3½
Paige, 25	Road	950	2	22.50	110	32x3½	32x3½
Paige, 25	Tour	950	5	22.50	110	32x3½	32x3½
Perfex, 2	Road	1050	2	22.50	106	32x3½	32x3½
R.C.H.	Road	900	2	16.90	110	32x3½	32x3½
R.C.H.	Tour	900	5	16.90	110	32x3½	32x3½
Regal, N	Road	900	2	22.50	108	32x3½	32x3½
Regal, T	Tour	950	4	22.50	108	32x3½	32x3½
Reo, The Fifth	Road	1095	2	25.60	112	34x4	34x4
Reo, The Fifth	Tour	1095	5	25.60	112	34x4	34x4
Richmond, O	Road	1100	2	25.60	112	34x3½	34x3½
Richmond, O	Tour	1200	5	25.60	112	34x3½	34x3½
Studebaker, 20	Road	750	2	20.30	102	30x3	30x3½
Studebaker, 20	Suburban	800	4	20.50	102	30x3	30x3
Studebaker, 20	Coupe	1050	2	20.50	102	30x3	30x3
Studebaker, 20	Tour	800	4	20.50	102	32x3	32x3
Studebaker, 25	Road	875	2	19.60	101	30x3½	30x3½
Studebaker, 25	Tour	885	5	19.60	101	30x3½	30x3½
Studebaker, 30	Road	1100	2	25.60	112	32x3½	32x3½
Studebaker, 30	Demi-Ton	1100	4	25.60	112	32x3½	32x3½
Studebaker, 30	Tour	1100	5	25.60	112	32x3½	32x3½

CHEAP CARS, that is, cars selling at $1,250 and less, are the products of thirty-one makers. Seven of these are new in their class, they being the Detroiter, Mason, Perfex, Gleason, King, Lambert and McIntyre. The companies who have ceased to manufacture low-priced cars are twenty-seven, and among them are the makers of Brush, DeTamble, Jonz, Cutting, Jackson, Mitchell, Schacht, Cartercar, Herreshoff and Elmore.

The average power plant is a four-cylinder, water-cooled motor, with a stroke-bore ratio of 1.21:1, while last year's ratio was 1.15:1. The practice of casting enbloc prevails as it did last year, and if anything has gained followers. The average horsepower is 21.51 as against 21.18 last year, but the actual rating of the motors varies from 11.25 (Motorette) to 28.90 (Only). The thirty-six power plants used by the thirty-one makers in this class include thirty-two four-cylinder motors, three two-cylinder and one six-cylinder power plant, the Cameron 30. Out of all these motors only four have bores and strokes of equal length and two the stroke shorter than the bore. Poppet-valve motors are used without exception.

The wheelbase has been slightly lengthened for 1913, giving an average of 104.2, while last year this dimension was 104 inches. The Motorette has the minimum wheelbase, 74 inches, while the maximum of 114 inches is that of the Cameron Flyer. Tires vary in size from 28 by 2.5 inches for the front and 28 by 3 inches for the rear (Motorette) to 34 by 4-inch all-around equipment as used by Buick and Reo cars.

Nine companies out of thirty-one, or 29 per cent., use the left-hand control at least on part of their models. This speaks volumes for the alertness of the manufacturers of small cars who are quick to see advantages of construction and to utilize them in order to increase the comfort of their customers. The public has shown great favor toward the left-hand control, and considering that Ford, R-C-H, Reo the Fifth and Maxwell are equipped with this type of control, it may safely be said that a very considerable portion of the total 1913 output of automobile factories will be equipped with the left-hand steer.

More conservatism, however, is displayed in respect of the lighting equipment, which has also been a pertinent problem during the past two years. In the small-car class acetylene lighting has remained prevalent, and only Auburn, Oakland and Halladay use electric lighting generators, while nine companies include storage batteries in their equipment. In other words, 61 per cent. of small-car makers use acetylene headlights.

There are seventy-seven different models in the $1,000-car class, which belong to twelve types, according to the bodies used on them. The majority of these are roadsters and five-passenger touring cars, numbering twenty-six and twenty-four respectively, or 33.8 and 31.2 per cent., respectively. Furthermore, ten runabouts, and six four-passenger touring cars, as well as four coupés, are offered in this class, while there is one car equipped with each of the following body types: towncar, demi-tonneau, suburban, victoria, surrey, buggy, flyer. Thus, out of seventy-seven models only five are fitted with closed bodies, so that 93.5 per cent. of the low-priced cars are open to the air; this condition is characteristic of low-priced cars today, as is brought out strikingly by a comparison with the figures given in con-condition is characteristic of low-priced cars today.

Automobiles Costing from $1251 to $1999

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheel-base	Tires Front	Tires Rear
Abbott-Detroit, E.	Demi-Ton...	$1975	4	32.40	121	36x4½	36x4½
Abbott-Detroit, D.	Road.......	1700	2	27.30	116	34x4	34x4
Alpena, P-40.....	Road.......	1750	2	22.50	135	36x4	36x4
Alpena, P-40.....	Tour.......	1800	4	22.50	135	36x4	36x4
Alpena, P-40.....	Tour.......	1800	5	22.50	135	36x4	36x4
Alpena, P-40.....	Tour.......	1890	6	22.50	135	36x4	36x4
Alpena, P-40.....	Tour.......	1890	7	22.50	135	36x4	36x4
Amer., Scout, 22A	Road.......	1475	2	22.50	105	36x3½	36x3½
Ames, 44........	Road.......	1595	2	27.30	118	36x4	36x4
Ames, 45........	Tour.......	1635	5	27.30	118	36x4	36x4
Apperson, 4-45...	Road.......	1600	2	32.40	114	34x4	34x4
Apperson, 4-45...	Tour.......	1600	5	32.40	114	34x4	34x4
Arbenz, F........	Tour.......	1875	5	27.30	120	36x4	36x4
Arbenz, G........	Torpedo....	1875	4	27.30	120	36x4	36x4
Arbenz, H........	Road.......	1825	2	27.30	120	36x4	36x4
Auburn, 37L.....	Tour.......	1400	5	28.90	115	35x4	35x4
Auburn, 40L.....	Road.......	1650	2	32.40	122	36x4	36x4
Auburn, 40L.....	Tour.......	1650	5	32.40	122	36x4	36x4
Bergdoll, C-30....	Road.......	1600	2	25.60	115	34x4	34x4
Bergdoll, C-30....	Tour.......	1600	5	25.60	115	34x4	34x4
Bergdoll, C-30....	Fore Door...	1600	4	25.60	115	34x4	34x4
Bergdoll, C-30....	Torpedo....	1600	4	25.60	115	34x4	34x4
Bergdoll, D-40....	Road.......	1800	2	25.60	115	34x4	34x4
Bergdoll, D-40....	Torpedo....	1800	4	25.60	115	34x4	34x4
Bergdoll, D-40....	Tour.......	1800	5	25.60	115	34x4	34x4
Buick, 31.........	Fore Door...	1285	5	25.60	108	34x4	34x4
Buick, 40.........	Tour.......	1650	5	28.90	115	36x4	36x4
Burg, S..........	Run........	1975	3	33.75	134	36x4	36x4
Burg, R..........	Tour.......	1975	5	40.90	134	36x4	36x4
Cadillac, 1913....	Road.......	1975	2	32.40	120	36x4½	36x4½
Cadillac, 1913....	Torpedo....	1975	4	32.40	120	36x4½	36x4½
Cadillac, 1913....	Phaeton....	1975	4	32.40	120	36x4½	36x4½
Cadillac, 1913....	Tour.......	1975	5	32.40	120	36x4½	36x4½
Cameron, 32.....	Tour.......	1450	5	36.07	120	34x3½	34x3½
Carhartt, K......	Run........	1450	3	26.40	109	34x4	34x4
Carhartt, K......	Tour.......	1450	5	26.40	109	34x4	34x4
Carhartt, B......	Run........	1850	3	32.40	119	34x4	34x4
Carhartt, B......	Tour.......	1850	5	32.40	119	34x4	34x4
Cartercar, 5......	Road.......	1600	2	27.25	116	36x4	36x4
Cartercar, 5......	Tour.......	1700	5	27.25	116	36x4	36x4
Cartercar, 5......	Coupe......	$1900	3	27.25	116	36x4	36x4
Case, N..........	Road.......	1350	2	27.25	115	34x4	34x4
Case, N..........	Tour.......	1500	5	27.25	115	34x4	34x4
Case, O..........	Road.......	1985	2	32.40	125	37x4½	37x4½
Colby, C.........	Road.......	1850	2	27.25	118	34x4½	34x4½
Colby, C.........	Tour.......	1850	5	27.25	118	34x4½	34x4½
Cutting, A-40.....	Road.......	1475	2	25.60	120	36x4	36x4
Cutting, B-40.....	Tour.......	1475	5	25.60	120	36x4	36x4
Crawford, 13-30..	Road.......	1750	2	27.25	115	34x4	34x4
Crawford, 13-30..	Tour.......	1750	5	27.25	115	34x4	34x4
Crow-Elkhart, C-3	Road.......		2	25.60	114	34x3½	34x3½
Crow-Elkhart, C-4	Tour.......		5	25,60	114	34x3½	34x3½
Crow-Elkhart, C-5	Tour.......		5	27.25	122	35x4	35x4
Correja, T & D...	Run........	1650	2	28.90	125	36x4	36x4
Correja, T & D...	Tour.......	1650	4	28.90	125	36x4	36x4
Correja, T & D...	Tour.......	1650	5	28.90	125	36x4	36x4
Correja, A........	Run........	1450	2	28.90	105	34x3½	34x3½
Correja, C........	Road.......	1450	2	28.90	105	34x3½	34x3½
Correja, B........	Coupe......	1850	2	28.90	105	34x3½	34x3½
Correja, S & R...	Run........	1950	2	28.90	120	36x4	36x4
Correja, G........	Run........	1850	2	19.60	125	34x4	34x4
Correja, J........	Tour.......	1850	5	19.60	125	34x4	34x4
Corbitt, D........	Run........	1800	2	25.60	120	34x4	34x4
Corbitt, E........	Tour.......	1875	4	25.60	120	34x4	34x4
Corbitt, F........	Tour.......	1875	5	25.60	120	34x4	34x4
Cino, 440-A......	Tour.......	1600	5	32.60	120	34x4	34x4
Cino, 440-R......	Road.......	1600	2	32.60	120	34x4	34x4
Cino, 450........	Tour.......	1850	5	32.60	120	34x4	34x4
Cole, 40.........	Run........	1685	2	27.25	116	36x4	36x4
Cole, 40.........	Tour.......	1685	5	27.25	116	36x4	36x4
Cole, 50.........	Run........	1985	2	32.40	122	36x4	36x4
Cole, 50.........	Tour.......	1985	5	32.40	122	36x4	36x4
Davis, 40C.......	Run........	1850	2	27.25	118	36x4	36x4
Davis, 40E.......	Tour.......	1850	4	27.25	118	36x4	36x4
Davis, 40D.......	Tour.......	1850	5	27.25	118	36x4	36x4
Davis, 50A.......	Tour.......	1950	2	32.40	118	36x4	36x4
Davis, 50B.......	Run........	1950	2	32.40	118	36x4	36x4
Day Utility, D....	Tour.......	1500	5	25.60	115	34x4	34x4
Enger, F.........	Tour.......	1475	5	32.40	120	34x4	34x4
Enger, J.........	Tour.......	1475	4	32.40	120	34x4	34x4

IN REVIEWING the $1,500 car several striking points come up. For one thing, this group contains almost exclusively cars having decidedly long-stroke motors, with an average bore slightly less than what it was last year. Consequently the average horsepower rating according to the S. A. E. formula is less than what it was a year ago; while as a matter of fact an actual power increase has been realized in the cases of most cars. The wheelbases have been lengthened, and many firms have introduced electric lighting, left-hand control, self-starters and other appliances which tend to increase comfort.

To be exact, the average motor in this class has the following characteristics: Bore, 4.13 inches, stroke, 5 inches, ratio, 1.21:1. The cylinders are cast in pairs and water-cooled. The average horsepower is 28.81, while in 1912 it was 30.01, when the stroke-bore ratio was 1.14:1. The actual maximum and minimum of horsepower on this class are 36.10 (Imperial 44) and 16.90 (R-C-H). As a matter of fact, there are 110 power plants used by the seventy-nine companies making cars which range in this class, and 106 out of these 110 have a stroke-bore ratio greater than 1.1, while the other four motors are square, so-called. Ninety-nine engines are of the four-cylinder type and eleven are six-cylinder designs.

The increased length of the chassis is evidenced by the average wheelbase being 118.4, or 2.4 inches in excess of what it was last year. The longest wheelbase in this class is that of the Burg, namely, 134 inches, while Franklin and Regal with 100 inches each are tied for minimum wheelbase. Tire sizes range from 32 by 3.5 inches to 36 by 4.5 inches.

Each of the seventy-nine makers manufactures, as an average, three models, a total of 213 different models, as follows:

Five-p. touring............	100	100	Fore-door body................	3
Roadster	57	57	Six-p. touring..................	2
Runabout	22		Phaeton	2
Coupé	12		Speedster	2
Four-p. touring...........	11		Semi-racer	2
Seven-p. touring..........	6		Two-p. touring.................	1
Torpedo	7		Demi-tonneau	1
Toy tonneau...............	4		Semi-touring	1

The prevalence of five-passenger touring cars which compose 43 per cent. of the models offered at this time is remarkable and indicates that a very large portion of touring cars are recruited from this class of automobiles. In fact, the touring cars of the $1,500 class compose 28.5 per cent. of all the touring models announced for 1913. Only 5.4 per cent. of the cars in this class, namely, the coupés, are closed designs. Eighty-four models, or 36.2 per cent., of the 232 models, are two-passenger designs.

Nineteen out of the seventy-nine companies have equipped their products, or at least part of them, with left-hand control. This means 24 per cent., and together with two companies making the left steer optional, 26 per cent. of the $1,500-car manufacturers. A similarly progressive position has been taken by the makers of this class of cars in equipping 80 per cent. of their output with electric lights, 52 per cent. of the makers using generators and 28 per cent. batteries only.

While twenty-three manufacturers who were represented in this class last year have disappeared from the class list, twenty-five new ones have come up instead. Actually new among these are the manufacturers of the following cars: Henderson, Mason, Nyberg, Omaha and Pacific Special.

Automobiles Costing from $1251 to $1999

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheel-base	TIRES Front	TIRES Rear
Enger, E	Road	$1475	2	32.40	120	34x4	34x4
Enger, P	Tour	1750	5	32.40	120	36x4	36x4
Falcar, 35	Run	1850	2	27.25	116	34x4	34x4
Falcar, 35	Road	1850	3	27.25	116	34x4	34x4
Falcar, 35	Toy Ton	1850	4	27.25	116	34x4	34x4
Falcar, 35	Tour	1850	7	27.25	116	34x4	34x4
Flanders, 40	Tour	1550	5	31.60	118	34x4	34x4
Franklin, G	Run	1650	2	25.60	100	32x3½	32x3½
Glide, 36	Speed	1690	2	27.25	118	34x4	34x4
Glide, 36	Tour	1690	5	27.25	118	34x4	34x4
Great Southern, 30	Road	1400	2	25.60	113	34x4	34x4
Great Southern, 30	Tour	1400	5	25.60	113	34x4	34x4
Great West., 1913	Road	1585	2	28.90	118	36x4	36x4
Great West., 1913	Tour	1585	4	28.90	118	36x4	36x4
Great West., 1913	Tour	1585	5	28.90	118	36x4	36x4
Halladay, 40	Road	1800	2	32.40	118	36x4	36x4
Halladay, 40	Toy Ton	1800	4	32.40	118	36x4	36x4
Halladay, 40	Tour	1800	5	32.40	118	36x4	36x4
Havers, 44	Road	1850	2	33.75	122	36x4	36x4
Havers, 44	Tour	1850	4	33.75	122	36x4	36x4
Havers, 44	Tour	1850	5	33.75	122	36x4	36x4
Henderson, 44	Road	1385	2	27.25	116	34x4	34x4
Henderson, 46	Tour	1485	5	27.25	116	34x4	34x4
Herreshoff, 30	Run	1250	2	18.25	100	34x4	34x4
Herreshoff, 30	Tour	1350	5	18.25	110	34x4	34x4
Herreshoff, 36	Run	1700	2	27.25	124	34x4	34x4
Herreshoff, 36	Tour	1700	5	27.25	124	34x4	34x4
Hudson, 37	Road	1875	2	27.25	118	36x4	36x4
Hudson, 37	Torpedo	1875	5	27.25	118	36x4	36x4
Hudson, 37	Tour	1875	5	27.25	118	36x4	36x4
Imperial, 34	Tour	1650	5	32.40	118	34x4	34x4
Imperial, 44	Tour	1875	5	36.10	122	36x4	36x4
Jackson, Olympic	Tour	1500	5	27.25	115	34x4	34x4
Jackson, Majestic	Tour	1850	5	32.40	124	36x4	36x4
King, 1913	Tour	1500	5	25.60	115	34x4	34x4
Kissel, 30	Semi-Rac	1700	2	28.90	116	34x4	34x4
Kissel, 30	Semi-Tour	1700	5	28.90	116	34x4	34x4
Klinekar, 4-30	Run	1850	2	25.60	115	34x4	34x4
Klinekar, 4-30	Toy Ton	1850	4	25.60	115	34x4	34x4
Klinekar, 4-30	Tour	1850	5	25.60	115	34x4	34x4
Lambert, 99	Tour	1250	5	28.90	117	34x3½	34x3½
Marathon, Win'r.	Road	1275	2	28.90	116	34x4	34x4
Marathon, Win'r.	Tour	1350	5	28.90	116	34x4	34x4
Marathon, Win'r.	Coupe	1600	2	28.90	116	34x4	34x4
Marathon, Cham.	Road	1675	2	32.40	123	36x4	36x4
Marathon, Cham.	Tour	1750	5	32.40	123	36x4	36x4
Marathon, Cham.	Tour	1800	7	32.40	123	36x4	36x4
Marion, 37A	Tour	1475	5	25.60	112	34x4	34x4
Marion, 36A	Road	1425	2	25.60	112	34x4	34x4
Marion, 48A	Tour	1850	5	27.25	120	36x4	36x4
Mason, K	Run	1290	2	25.60	116	36x3½	36x3½
Mason, K	Tour	1290	5	25.60	116	36x3½	36x3½
Maxwell, 10	Road	1675	2	28.90	115	36x4	36x4
Maxwell, 10	Tour	1675	5	28.90	115	36x4	36x4
McIntyre, G-13	Run	1485	2	29.40	116	34x4	34x4
McIntyre, G-13	Tour	1485	5	29.40	116	34x4	34x4
Michigan, R	Tour	1585	5	28.90	118	35x4½	35x4½
Michigan, S	Road	1585	2	28.90	118	35x4½	35x4½
Michigan, L	Tour	1400	5	26.40	114	34x4	34x4
Michigan, O	Road	1400	2	26.40	114	34x4	34x4
Midland, T-4	Road	1685	2	32.40	121	34x4	34x4
Midland, T-4	Speed	1685	5	32.40	121	34x4	34x4
Midland, T-4	Tour	1685	5	32.40	121	34x4	34x4
Miller, 40	Tour	1450	5	27.25	116	34x4	34x4
Mitchell, 5-4	Run	1500	2	28.90	120	36x4	36x4
Mitchell, 5-4	Tour	1500	5	28.90	120	36x4	36x4
Mitchell, 5-6	Run	1850	2	33.75	132	36x4	36x4
Mitchell, 5-6	Tour	1850	5	33.75	132	36x4	36x4
Moline, M-40	Road	1950	2	27.25	124	36x4	36x4
Moline, M-40	Tour	1950	5	27.25	124	36x4	36x4
Moon, 39	Road	1650	2	25.60	116	34x4	34x4
Moon, 39	Torpedo	1650	4	25.60	116	34x4	34x4
Moon, 39	Tour	1650	5	25.60	116	34x4	34x4
Moon, 48	Road	1985	2	32.40	121	36x4	36x4
Moon, 48	Torpedo	1985	4	32.40	121	36x4	36x4
Moon, 48	Tour	1985	5	32.40	121	36x4	36x4

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheel-base	TIRES Front	TIRES Rear
Nyberg, 4-37	Road	$1285	2	22.50	118	34x4	34x4
Nyberg, 4-37	Tour	1295	5	22.50	118	34x4	34x4
Nyberg, 4-40	Road	1400	2	28.90	128	36x4	36x4
Nyberg, 4-40	Tour	1450	5	28.90	128	36x4	36x4
Nyberg, 6-45	Road	1950	2	33.75	126	36x4	36x4
Oakland, 42	Road	1600	3	27.25	116	34x4	34x4
Oakland, 42	Toy Ton	1600	4	27.25	116	34x4	34x4
Oakland, 42	Tour	1600	5	27.25	116	34x4	34x4
Omaha, 42	Road	1385	2	26.40	116	36x4	36x4
Omaha, 42	Tour	1385	5	26.40	116	36x4	36x4
Only, A	Tour	1250	5	28.90	112	32x3½	32x3½
Overland, 69	Coupe	1500	3	25.60	110	32x3½	32x3½
Overland, 71	Road	1475	2	30.63	114	34x4	34x4
Overland, 71	Tour	1475	4	30.63	114	34x4	34x4
Overland, 71	Tour	1475	5	30.63	114	34x4	34x4
Pacific Spec., A	Tour	1950	5	32.40	121	34x4	34x4
Pacific Spec., B	Road	1950	2	32.40	121	34x4	34x4
Paige, 25	Coupe	1500	3	22.50	110	33x4	33x4
Paige, 25	Coupe	1600	5	22.50	110	33x4	33x4
Paige, 36	Tour	1275	5	25.60	116	34x4	34x4
Paige, 36	Road	1275	2	25.60	116	34x4	34x4
Paige, 36	Coupe	......	3	25.60	116	34x4	34x4
Paige, 36	Coupe	......	5	25.60	116	34x4	34x4
Paterson, 43	Tour	1685	5	27.25	116	34x4	34x4
Paterson, 47	Tour	1985	7	32.40	122	36x4	36x4
Pathfinder, 13	Tour	1875	5	27.25	120	36x4	36x4
Pathfinder, 13	Phaeton	1875	4	27.25	120	36x4	36x4
Pathfinder, 13	Road	1875	2	27.25	120	36x4	36x4
Pilot, 50	Tour	2250	5	32.40	126	36x4	36x4
Pratt, 30	Road	1400	2	25.60	114	32x3½	32x3½
Pratt, 30	Tour	1400	5	25.60	114	32x3½	32x3½
Pratt, 40	Road	1850	2	32.40	120	36x4	36x4
Pratt, 40	Tour	1850	5	32.40	120	36x4	36x4
Pratt, 40	Tour	1950	7	32.40	120	36x4	36x4
Pullman, 4-36	Tour	1675	5	26.40	118	34x4	34x4
Pullman, 4-36	Tour	1850	5	26.40	118	34x4	34x4
Rambler, Cross-C.	Tour	1700	5	32.40	120	36x4	36x4
Rambler, Cross-C.	Tour	1700	4	32.40	120	36x4	36x4
Rambler, Cross-C.	Road	1650	2	32.40	120	36x4	36x4
Rambler, Cross-C.	Tour	1900	7	32.40	120	37x4½	37x4½
R.C.H.	Coupe	1300	2	16.90	110	32x3½	32x3½
Regal	Coupe	1250	3	22.50	100	32x3½	32x3½
Regal, H	Tour	1400	5	28.90	118	34x4	34x4
Regal, C	Tour	1250	5	25.60	116	34x4	34x4
Reo, The Fifth	Limousine	1600	7	25.60	112	34x4	34x4
Richmond, P	Tour	1750	5	32.40	120	36x4	36x4
Schacht, NS	Tour	1775	5	28.90	120	36x4	36x4
Schacht, KL	Road	1775	2	28.90	120	36x4	36x4
Spaulding, G	Tour	1650	5	28.90	120	36x4	36x4
Spaulding, G	Road	1600	2	28.90	120	36x4	36x4
Spoerer, 25-A	Run	1900	2	27.25	120	35x4	35x4
Staver, 45	Run	1750	2	32.40	113	34x4	34x4
Staver, 45	Road	1750	2	32.40	113	34x4	34x4
Staver, 45	Tour	1750	5	32.40	113	34x4	34x4
Staver, 45	Semi-racer	1750	2	32.40	116	34x4	34x4
Staver, 45	Fore-door	1750	2	32.40	116	34x4	34x4
Staver, 45	Tour	1750	5	32.40	116	34x4	34x4
Stoddard-Day., 30	Road	1350	2	25.00	112	34x4	34x4
Stoddard-Day., 30	Tour	1450	5	25.00	112	34x4	34x4
Stoddard-Day., 38	Road	1750	2	28.90	114	35x4½	35x4½
Stoddard-Day., 38	Tour	1850	5	28.90	114	35x4½	35x4½
Studebaker, 30	Coupe	1475	5	25.60	112	32x3½	32x3½
Studebaker, 35	Coupe	1850	5	27.25	115½	34x4	34x4
Studebaker, 35	Tour	1290	6	27.25	115½	34x4	34x4
Studebaker, Six	Road	1550	2	29.40	121	34x4	34x4
Studebaker, Six	Tour	1550	6	29.40	121	34x4	34x4
Velie, Dispatch	Road	1450	2	22.50	113	34x4	34x4
Velie, Dispatch	Tour	1500	5	22.50	113	34x4	34x4
Velie, 32	Tour	1350	5	22.50	113	34x3½	34x3½
Warren, 30	Road	1250	2	27.25	110	34x4	34x4
Warren, 30	Tour	1250	5	27.25	110	34x4	34x4
Warren, 40	Tour	1415	5	27.25	110	34x4	34x4
Westcott, 40	Tour	1975	5	32.40	120	36x4	36x4
Westcott, 40	Torpedo	1975	4	32.40	120	36x4	36x4
Westcott, 40	Road	1975	2	32.40	120	36x4	36x4
Zimmerman, Z-40	Tour	1600	5	30.75	116	35x4	35x4
Zimmerman, Z-46	Tour	1950	5	33.75	128	36x4	36x4

Automobiles Costing from $2000 to $2999

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheelbase	TIRES Front	TIRES Rear
Abbott-Detroit, E.	Tour	$2000	7	32.40	121	36x4½	36x4½
Abbott-Detroit, E.	Road	2150	2	32.40	121	36x4½	36x4½
A.E.C., 6-45	Tour	2500	5	33.75	130	36x4½	36x4½
A.E.C., 6-45	Road	2500	2	33.75	130	36x4½	36x4½
Alpena, N-6-50	Road	2200	2	33.75	135	36x4	36x4
Alpena, N-6-50	Tour	2250	4	33.75	135	36x4	36x4
Alpena, N-6-50	Tour	2250	5	33.75	135	36x4	36x4
Alpena, N-6-50	Tour	2390	6	33.75	135	36x4	36x4
Alpena, N-6-50	Tour	2390	7	33.75	135	36x4	36x4
Amer. Tour, 34A	Tour	2350	4	32.40	118	37x4	37x4
American, 32A	Road	2350	2	32.40	118	37x4	37x4
Apperson, 4-45	Coupe	2100	4	32.40	114	34x4	34x4
Apperson, 4-55	Tour	2000	5	36.10	118	36x4	36x4
Apperson, 4-55	Tour	2250	7	36.10	122	36x4½	36x4½
Auburn, 40L	Town Car	2500	5	32.40	122	36x4	36x4
Auburn, 6-45	Tour	2000	5	33.75	130	36x4	36x4
Auburn, 6-45	Road	2000	2	33.75	130	36x4	36x4
Auburn, 6-45	Coupe	2600	5	33.75	130	36x4	36x4
Bergdoll, C-30	Limousine	2400	7	25.60	115	34x4	34x4
Bergdoll, 40	Tour	2000	5	25.60	121	36x4	36x4
Bergdoll, 40	Tour	2100	7	25.60	121	36x4	36x4
Bergdoll, 40	Torpedo	2000	4	25.60	121	36x4	36x4
Bergdoll, 40	Road	2000	2	25.60	121	36x4	36x4
Bergdoll, D-40	Limousine	2600	7	25.60	115	34x4	34x4
Burg, R	Tour	2450	5	27.25	134	36x4½	36x4½
Cadillac, 1913	Tour	2075	6	32.40	120	36x4½	36x4½
Cadillac, 1913	Coupe	2500	4	32.40	120	36x4½	36x4½
Carroll, 4E	Road	2250	2	32.40	118	36x4	36x4
Carroll, 4E	Road	2250	3	32.40	118	36x4	36x4
Carroll, 4E	Tour	2400	4	32.40	118	36x4	36x4
Carroll, 4E	Tour	2400	5	32.40	118	36x4	36x4
Carroll, 4E	Tour	2400	6	32.40	118	36x4	36x4
Cartercar, 5	Sedan	2000	5	27.25	116	36x4	36x4
Case, O	Tour	2050	5	32.40	125	37x4½	37x4½
Chalmers, 17	Tour	2150	7	28.90	118	36x4½	36x4½
Chalmers, 17	Coupe	2250	4	28.90	118	36x4½	36x4½
Chalmers, 18	Tour	2400	5	43.80	130	36x4½	36x4½
Chalmers, 18	Tour	2600	7	43.80	130	36x4½	36x4½
Chalmers, 18	Torpedo	2900	4	43.80	130	36x4½	36x4½
Chalmers, 18	Road	2400	2	43.80	130	36x4½	36x4½
Chalmers, 18	Coupe	2700	4	43.80	130	36x4½	36x4½
Chevrolet, C	Tour	$2100	6	31.95	120	35x4½	35x4½
Cino, 660	Tour	2700	7	38.25	132	36x4½	36x4½
Cino, 660	Road	2700	2	38.25	132	36x4½	36x4½
Coey, A	Tour	2000	4	38.40	128	36x4	36x4
Coey, B	Road	2000	2	38.40	128	36x4	36x4
Colby, E	Tour	2150	7	25.60	128	36x4½	36x4½
Colby, 6C	Tour	2500	7	40.90	138	37x5	37x5
Cole, 50	Coupe	2500	4	32.40	122	36x4	36x4
Cole, 60	Tour	2485	6	40.90	132	37x4½	37x4½
Correja, T & D	Limousine	2300	4	28.90	125	36x4	36x4
Correja, T & D	Limousine	2300	6	28.90	125	36x4	36x4
Correja, S & R	Tour	2150	4	43.80	125	36x4	36x4
Correja, S & R	Tour	2150	5	43.80	125	36x4	36x4
Correja, S & R	Tour	2350	7	43.80	125	36x4	36x4
Correja, S & R	Limousine	2750	4	43.80	125	36x4	36x4
Correja, S & R	Limousine	2950	7	43.80	125	36x4	36x4
Correja, R	Run	2250	2	38.40	125	34x4	34x4
Correja, S	Tour	2250	5	38.40	125	34x4	34x4
Crawford, 13-40	Road	2050	2	32.40	125	36x4	36x4
Crawford, 13-40	Tour	2100	5	32.40	125	36x4	36x4
Crow-Elkhart, C-7	Road		2	32.40	122	36x4	36x4
Crow-Elkhart, C-8	Tour		5	32.40	122	36x4	36x4
Crow-Elkhart, C-9	Tour		7	32.40	122	36x4	36x4
Crow-Elk., C-8B	Tour		5	33.75	122	35x4½	35x4
Crow-Elk., C-6A	Tour		7	40.90	137	37x4½	37x4½
Croxton, A-4	Tour	2500	4	27.25	121	36x4	36x4
Croxton, D-4	Road	2250	2	27.25	121	36x4	36x4
Croxton, 10	Taxi	2250		27.25	121	36x4	36x4
Dorris, H	Tour	2500	5	30.63	121	36x4	36x4
Dorris, H	Tour	2550	7	30.63	121	36x4	36x4
Dorris, H	Tour	2500	4	30.63	121	36x4	36x4
Dorris, H	Tour	2550	6	30.60	121	36x4	36x4
Duquesne, 50	Tour	2500	5	36.10	124	36x4½	36x4½
Duquesne, 50	Road	2500	2	36.10	124	36x4½	36x4½
Flanders, 50	Tour	2200	4	38.40	130	36x4½	36x4½
Flanders, 50	Tour	2250	7	38.40	130	36x4½	36x4½
Franklin, G	Tour	2000	5	25.60	103	32x4	32x4
Franklin, M	Tour	2900	5	31.60	116	34x4½	34x4½
Franklin, M	Run	2800	2	31.60	116	34x4	34x4
Franklin, M	Phaeton	2900	5	31.60	116	34x4½	34x4½
Garford, G-15	Road	2750	2	33.75	128	36x4½	36x4½
Garford, G-15	Tour	2750	5	33.75	128	36x4½	36x4½

THE CLASS of medium-priced cars averaging at $2,500 comprises 219 models manufactured by seventy-nine makers and equipped with 100 different power plants. As in the case of the $1,500 cars, the average S. A. E. horsepower is smaller than in 1912, the reason being the same in both classes of cars.

Only two square motors are found in this class, ninety-eight being long-stroke designs; the average S. A. E. horsepower is 34.3, compared with 35.45 in 1912. The average stroke-bore ratio has been increased 7 per cent., being now 1.209:1, while in 1912 it was 1.13:1. All the motors in this class are poppet-valve designs of the water-cooled type, and four and six-cylinder power plants are almost evenly divided, the former numbering fifty-three and the latter forty-seven. The actual horsepower varies from 22.5 (White GRE) to 48.6 (Pullman 6-66).

The wheelbase has also been lengthened 5.7 inches, being now 125.7 inches. The maximum and minimum wheelbases, however, as actually used in the cars, range over a space of 40 inches; the Franklin G having 103 inches and the Mitchell 7-6 144 inches. The tire sizes, too, cover a wide range. Mercer and Franklin G cars, fitted with 32 by 4-inch tires all around, represent the minimum dimensions in this respect; the new Norwalk car leads by its 38.5 by 4.5-inch wheels.

Twenty-one makers have made the left-hand steer stock equipment and three have made it optional, so that twenty-four manufacturers, or 30.6 per cent. of the whole, offer left-hand control to their customers. This is the largest percentage among the makers of any class. The reason is that the man who buys a car for from $2,000 to $3,000 demands comfort.

As in the $1,500 car class, which also includes seventy-nine makers, the automobiles in this class are rapidly being equipped with electric lighting outfits. As in the $1,500 car class, sixty-three makers out of the seventy-nine use electric lights, but on the $2,500 cars the generator equipment is much more frequent than on the cheaper cars, being used on fifty-seven cars, so that only six makes are fitted with batteries. As for self-starters, visitors of the shows will see for themselves how common this equipment has become for the new year.

Among the various bodies shown, the five-passenger touring cars and roadster designs are about equal in number, the first being represented by fifty-four and the latter by forty-nine makes. There are thirty-three seven-passenger touring cars and thirty-two four-passenger touring cars, and the next place is taken by seventeen coupés. Besides eleven six-passenger touring cars, there are a few limousines, runabouts, landaulets, town cars, sedans, torpedoes, speedsters, phaetons, etc.

While in this class there are eleven new names, including A. E. C., Burg, Carroll, Holly, Moyer, Norwalk and Nyberg, as well as new products of the makers of Hudson, Garford, Flanders and Duquesne, forty makers who formerly made cars selling at from $1,750 to $3,000 have discontinued these cars or have gone out of business altogether. The former include National, Overland, Stevens-Duryea, Studebaker, Halladay, Everitt, Autocar, Amplex, Cutting, Marathon and Warren, etc. Among the companies who have dropped the making of automobiles are the former manufacturers of Corbin, Johnson, Jonz, Otto, and Standard.

Automobiles Costing from $2000 to $2999

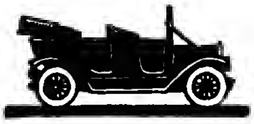
Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheel-base	Tires Front	Tires Rear
Glide, 46	Road	$2000	2	36.10	120	36x4½	36x4½
Glide, 45	Tour	2000	4	36.10	120	36x4½	36x4½
Glide, 45	Tour	2150	5	36.10	120	36x4½	36x4½
Glide, 45	Tour	2250	7	36.10	120	36x4½	36x4½
Great South., 61	Tour	2100	6	43.90	128	36x4	36x4½
Great West., 1913	Sedan	2250	4	28.90	118	36x4	36x4
Grout, 35	Tour	2000	5	32.40	116	34x4	35x4½
Grout, 35	Road	2000	5	32.40	116	34x4	35x4½
Grout, 45	Tour	2850	7	36.10	123	36x4	37x4½
Grout, 45	Tour	2750	4	36.10	123	36x4	37x4½
Havers, 55	Road	2250	2	38.40	128	36x4	36x4
Havers, 55	Tour	2250	5	38.40	128	36x4	36x4
Haynes, 22	Tour	2250	5	32.40	120	36x4½	36x4½
Haynes, 22	Tour	2250	4	32.40	120	36x4½	36x4½
Haynes, 22	Road	2250	2	32.40	120	36x4½	36x4½
Haynes, 22	Coupe	2750	3	32.40	120	36x4½	36x4½
Holly, A	Tour	2500	5	38.40	130	36x4½	36x4½
Holly, A	Tour	2500	7	38.40	130	36x4½	36x4½
Hudson, 37	Coupe	2350	3	27.25	118	36x4	36x4
Hudson, 54	Tour	2450	5	40.90	127	36x4½	36x4½
Hudson, 64	Tour	2450	5	40.90	127	36x4½	36x4½
Hudson, 54	Road	2450	2	40.90	127	36x4½	36x4½
Hudson, 54	Tour	2600	7	40.90	127	36x4½	36x4½
Hudson, 54	Coupe	2950	3	40.90	127	36x4½	36x4½
Inter-State	Tour	2750	5	38.40	132	36x4½	36x4½
Jackson, Sultanic	Tour	2500	5	40.90	138	36x4½	36x4½
Jackson, Sultanic	Tour	2650	7	40.90	138	36x4½	36x4½
Keeton, M'hrook	Road	2500	2	33.75	131	36x4	37x4½
Keeton, Riverside	Tour	2500	5	33.75	131	36x4	37x4½
Keeton, Tuxedo	Coupe	2850	2	33.75	131	36x4	37x4½
Kissel, 40	Tour	2000	5	32.40	121	35x4½	35x4
Kissel, 50	Tour	2500	6	38.00	132	36x4½	36x4½
Klinekar, 4-40	Tour	2250	5	28.90	118	36x4	36x4
Klinekar, 4-40	Tour	2250	4	28.90	118	36x4	36x4
Klinekar, 4-40	Run	2250	2	28.90	118	36x4	36x4
Klinekar, 4-40	Coupe	2750	3	28.90	118	36x4	36x4
Klinekar, 6-50	Tour	2850	5	26.80	126	36x4½	36x4½
Klinekar, 6-50	Tour	2850	4	26.80	126	36x4½	36x4½
Klinekar, 6-50	Run	2650	2	26.80	126	36x4½	36x4½
Klinekar, 6-50	Road	2800	2	26.80	126	36x4½	36x4½
Lenox, 40	Tour	2000	5	28.90	118	34x4	34x4
Lenox, 40	Speedster	2100	2	28.90	118	34x4	34x4
Lenox, 40	Road	2000	2	28.90	118	34x4	34x4
Lenox, 40	Road	2000	3	28.90	118	34x4	34x4
Lenox, 40	Road	2000	4	28.90	118	34x4	34x4
Lenox, 40	Tour	2000	4	28.90	118	34x4	34x4
Lenox, Six	Tour	2750	6	38.40	130	35x4½	35x4½
Lenox, Six	Limousine	......	6	38.40	130	35x4½	35x4½
Lexington, 13-6	Tour	......	5	40.90	129	36x4½	36x4½
Luverne, 76	Tour	2850	7	43.80	130	37x5	37x5
Marmon, 32	Road	2900	2	32.40	120	35x4½	35x4½
Marmon, 32	Speedster	2850	2	32.40	120	35x4½	35x4½
McFarlan, S	Road	2300	2	38.40	124	37x4½	37x4½
McFarlan, S	Tour	2300	5	38.40	124	37x4½	37x4½
McFarlan, S	Tour	2300	4	38.40	124	37x4½	37x4½
McFarlan, T	Road	2500	2	28.40	124	37x4½	37x4½
McFarlan, T	Tour	2500	5	38.40	124	37x4½	37x4½
McFarlan, T	Tour	2500	4	38.40	124	37x4½	37x4½
McFarlan, T	Tour	2550	6	38.40	124	37x4½	37x4½
McFarlan, M	Road	2750	2	43.80	128	37x4½	37x4½
McFarlan, M	Tour	2750	4	43.80	128	37x4½	37x4½
McFarlan, M	Tour	2750	5	43.80	128	37x4½	37x4½
McFarlan, M	Tour	2750	7	43.80	128	37x4½	37x4½
Mercer, J	Race	2600	2	30.63	108	32x4	34x4
Mercer, K	Run	2700	2	30.63	108	32x4	32x4
Mercer, G	Tour	2900	4	32.40	118	34x4	34x4
Mercer, H	Tour	2900	5	32.40	118	34x4	34x4
Midland, T-4	Coupe	2350	3	32.40	121	34x4	34x4
Midland, T-6	Road	2385	2	38.40	134	36x4½	36x4½
Midland, T-6	Tour	2450	7	38.40	134	36x4½	36x4½
Mitchell, 7-6	Tour	2500	7	43.80	144	36x4½	36x4½
Moon, 65	Tour	2500	5	38.40	132	36x4½	36x4½
Moon, 65	Tour	2500	4	38.40	132	36x4½	36x4½
Moon, 65	Road	2500	2	38.40	132	36x4½	36x4½
Moyer, D	Tour	......	5	38.40	122	35x4½	35x4½
Moyer, F	Phaeton	......	7	38.40	122	35x4½	35x4½
Norwalk, A	Tour	2750	5	38.40	127	38x4½	38x4½
Norwalk, A	Road	2750	2	38.40	127	38x4½	38x4½
Nyberg, 6-45	Tour	2000	5	33.75	126	36x4	36x4

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheel-base	Tires Front	Tires Rear
Nyberg, 6-46	Tour	$2000	....	33.75	136	36x4	36x4
Nyberg, 6-45	Tour	2100	7	33.75	136	36x4	36x4
Nyberg, 6-60	Road	2200	2	43.80	128	36x4	36x4
Nyberg, 6-60	Tour	2200	5	43.80	128	36x4	36x4
Nyberg, 6-60	Tour	2200	......	43.80	138	36x4	36x4
Nyberg, 6-60	Tour	2300	7	43.80	138	36x4	36x4
Oakland, 42	Coupe	2500	4	27.25	116	34x4	34x4
Oakland, 6-60	Tour	2400	7	40.90	130	34x4½	34x4½
Oakland, 6-60	Tour	2400	5	40.90	130	34x4½	34x4½
Oakland, 6-60	Tour	2400	4	40.90	130	34x4½	34x4½
Oakland, 6-60	Speed	2400	2	40.90	130	34x4½	34x4½
Palmer-Sing., Six	Tour	2000	5	38.40	127	36x4	36x4
Palmer-Sing., Six	Road	2000	2	38.40	127	36x4	36x4
Pathfinder, 13	Coupe	2500	3	27.25	120	36x4	36x4
Pathfinder, 13	Cruiser	2000	2	27.25	120	36x4	36x4
Pilot, 60	Tour	2250	5	32.40	126	36x4	36x4
Pilot, 60	Tour	2500	5	38.40	132	......	......
Pope-Hart., 31	Tour	2250	5	30.10	118½	36x4½	36x4½
Pope-Hart., 31	Phaeton	2250	4	30.10	118½	36x4½	36x4½
Pope-Hart., 31	Road	2250	2	30.10	118½	36x4½	36x4½
Pope-Hart., 31	Coupe	2850	3	30.10	118½	36x4½	36x4½
Pratt, 60	Tour	2150	4	32.40	122	36x4	36x4
Pratt, 50	Tour	2150	5	32.40	122	36x4	36x4
Pratt, 50	Tour	2300	7	32.40	122	36x4	36x4
Premier, 6-40	Tour	2735	5	38.40	132	36x4½	36x4½
Premier, 6-40	Road	2600	2	38.40	132	36x4½	36x4½
Pullman, 4-44	Tour	2150	5	32.40	122	36x4	36x4
Pullman, 6-66	Tour	2750	7	48.60	138	36x4	36x4
Rambler, Cross-C	Coupe	2500	4	32.40	120	37x4½	37x4½
Rambler, Cross-C	Limousine	2850	5	32.40	120	37x4½	37x4½
Rayfield, C	Tour	2500	5	29.40	117	34x4	34x4
Rayfield, C	Road	2500	2	29.40	117	34x4	34x4
Republic, D	Tour	2350	5	28.90	120	36x4	36x4
Republic, D	Tour	2350	4	28.90	120	36x4	36x4
Republic, D	Road	2350	2	28.90	120	36x4	36x4
Republic, E	Tour	2950	5	43.80	132	36x4½	36x4½
Schacht, NS	Tour	2500	6	28.90	120	36x4	36x4
Selden, 48	Tour	2500	7	36.10	125	37x4½	37x4½
Selden, 48	Tour	2350	5	36.10	125	36x4	36x4
Selden, 48	Tour	2350	4	36.10	125	36x4	36x4
Selden, 48	Road	2350	2	36.10	125	36x4	36x4
S.G.V., A	Run	2500	2	22.50	116	34x4	34x4
S.G.V., A	Tour	2500	5	22.50	116	34x4	34x4
Speedwell, G	Tour	2850	4	40.90	134	36x4½	36x4½
Speedwell, G	Tour	2850	5	40.90	134	36x4½	36x4½
Speedwell, G	Tour	2950	7	40.90	134	36x4½	36x4½
Spoerer, 25-A	Tour	2000	5	27.25	120	35x4	35x4
Staver, 66	Tour	2250	5	32.40	120	36x4	36x4
Staver, 66	Tour	2400	4	32.40	124	36x4	36x4
Staver, 66	Tour	2750	5	38.40	138	37x4½	37x4½
Staver, 66	Tour	2750	7	38.40	138	37x4½	37x4½
Stoddard-Day., 38	Land	2750	......	28.90	114	35x4½	35x4½
Stoddard-Day., 38	Coupe	2350	......	28.90	114	35x4½	35x4½
Stoddard-Day., 48	Road	2700	......	36.10	122½	36x4½	36x4½
Stoddard-Day., 48	Tour	2800	......	36.10	122½	36x4½	36x4½
Studebaker, 35	Sedan	2050	5	27.25	115½	34x4	34x4
Studebaker, Six	Limousine	2500	7	20.40	121	34x4	34x4
Stutz, 4 Bearcat	Road	2000	2	36.10	120	34x4½	34x4½
Stutz, 4 Tour	Tour	2000	4	36.10	124	34x4½	34x4½
Stutz, 4 Tour	Tour	2050	6	36.10	124	34x4½	34x4½
Stutz, 6 Bearcat	Road	2250	2	43.80	124	34x4½	34x4½
Stutz, 6 Tour	Tour	2300	6	43.80	130	34x4½	34x4½
Touraine, 7	Race	2750	2	38.40	114	36x4	36x4
Touraine, 7	Tour	2950	7	38.40	133	36x4	36x4
Touraine, 6	Run	2750	2	38.40	124	36x4	36x4
Touraine, 6	Phaeton	2750	5	38.40	124	36x4	36x4
Touraine, 6	Tour	2750	4	38.40	124	36x4	36x4
Triumph, A	Run	2250	2	36.10	114	36x4	36x4
Triumph, A	Road	2250	3	36.10	114	36x4	36x4
Triumph, B	Tour	2500	5	36.10	114	36x4	36x4
Velie, 40	Tour	2000	5	32.40	118	36x4	36x4
Velie, 40	Tour	2000	4	32.40	118	36x4	36x4
Warren, 60	Resolute	2500	5	38.40	130	36x4½	36x4½
Westcott, 50	Tour	2475	5	38.40	127	37x4½	37x4½
Westcott, 50	Tour	2525	7	38.40	127	36x4½	37x4½
White, GPE	Tour	2500	5	22.50	110	34x4	34x4
White, GRE	Road	2500	2	22.50	110	34x4	34x4

Brain Products

Being a Company-by-Company Story of All 1913 Cars, Listing Their Changes, Lines of Development and the General Tendencies in Chassis and Bodies

By J. Edward Schipper



Practice

¶ In the following pages The Automobile presents its descriptive and illustrative review of the majority of the automobiles listed for the 1913 market. For general conveniences these summaries of changes in design, for such they really are, are in alphabetical order with a few exceptions.

¶ These summaries tell the progress story as exemplified in the 1913 products. Every detail change is not enumerated, but the leading trends are indicated.

¶ There is scarcely a concern that was building in 1912 that has not listed some changes for this year. In spite of the many announcements against annual models it is a fact that such concerns have incorporated changes by way of lighting or starting systems, and in nearly every case there has been an effort to have these changes settled and incorporated in the old models before the commencement of the show circuit.

¶ An exemplary trend in new models with not a few concerns is the aim at standardization of parts for two or more models, so that the same cylinder castings can be used for four or six-cylinder models; besides, the factory operations on corresponding parts in different models are simplified, all with the one aim of decreasing the cost of production.

¶ There has been an avalanche toward starting and lighting systems using electricity, and the installation of such outfits has necessitated not a few motor changes in flywheels, manifolds, camshaft and pumpshaft drives and disposition of timing and motor gears.

¶ Throughout the entire gamut of manufacture there is a pronounced tendency toward reduction in the number of chassis models. With a few there has been a wholesale cutting from four or five models last year to a single one for this season; but again there are a few companies that list more models than last season, due primarily to the introduction of new models without the immediate discontinuance of some of the old ones. The reduction in number of models has made itself conspicuous with several makers of very large outputs, these finding it imperative to reduce the number of models in order to get the output.

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Abbott—Adds New Model

There are two Abbotts on the market for 1913. These are the 44-50, which is practically unchanged from last year, and the 34-40, which is a new model. The new model is of somewhat different design from that incorporated in the line for 1912. In the first place, the valve-in-the-head motor has been replaced by an L-head monobloc. Besides this the adoption of the underslung spring construction on all models along with an electric starting device, are added features. The starting system is entirely independent of the electric light generator and magneto. It is designed especially for the Abbott cars and is driven by a current taken from a storage battery which is mounted under the car body near the rear of the frame. This battery has a capacity of 180 ampere-hours. It is charged by the lighting generator. Underslinging the springs all around on all models has made no difference in the appearance of the cars.

Alco—Adopts Disk Clutch

A new dry-plate clutch has been installed in the 1913 Alco. It is of multiple-disk design, the driving disks being faced with high-friction material which bears against driven disks of saw-steel. The new clutch as compared with the one formerly used has seven driving disks against twenty-four; eight driven disks of steel against twenty-five of bronze. The driving pins and lugs are the same in both types of clutches, but when the spring thrust is engaged in the new type the pressure is only 344 pounds against 395 for the old; released, the new 420 against 485. Pressure required on the pedal to release the new clutch is 36 pounds, while under the old system it required 75 pounds. The area of the clutch brake is 8.85 inches against 3 inches before. Aside from that single change in the mechanism, the difference between the current Alcos and those of 1912 consist of body developments and added comforts and luxuries. The curved roof of some of the inclosed bodies, an electric searchlight on the windshield for night touring, artistic doors, slightly wider and trimmer than last year's model even, deeper upholstery, electric light under the door on the curb side of the body to show the running board when the door is opened, a disappearing window at the back of the front seat in the closed cars, a tell-tale gasoline gauge and a few other details are noted.

Alpena—Adds a Six

A single six-cylinder model will be produced by the Alpena Motor Car Company for 1913. The motor is the Rutenber six-cylinder type, with cylinders 3.75 by 5.25, cast in pairs. The valves are located on the left side, their springs and tappets inclosed by cover plates. The motor is suspended on three points. The clutch is of the faced multiple-disk-in-oil type, the facing being Raybestos. The three-speed selective gearset is located amidships, and drives the floating rear axle through a Spicer shaft. A 135-inch wheelbase and 36 by 4-inch tires are used, the tires being mounted on Baker demountable rims. One spare is furnished. The car is electrically lighted and started by a dynamo and storage battery which also furnish current for ignition. This is the second season that this has been done. Right-hand drive and center control are featured, with nickel trimming throughout. Full equipment is furnished.

American—Better Equipped

Three models of American are known as the Traveler, Tourist and Scout. The use of the underslung construction is to be continued this season. The Traveler chassis comes in two sizes, one with 140-inch wheelbase, the other with 124 inches; 41 by 4.5-inch tires front and rear on demountable rims are used in this model. This is one of the largest wheels on the American market for this season. Small refinements in this model are noticed which may be mentioned, these are, the inclosing of the space between the body and the running boards, housing the forward shackle of the rear springs and more complete equipment. The latter includes specially constructed adjustable mohair top, top booth and curtains, a combination lighting dynamo and electric starter supplying current for all five lights, Warner combination clock and speedometer. The Tourist model continues the same as last year except that the body has been widened 2 inches, pockets have been placed in the tonneau doors, a glove box placed between the two front seats, and electric light installed on the left fender and a license bracket on the right. The former ratchet spark and throttle control has been replaced by one of the friction type. The little Scout is the newest model. and has the fewest changes, these taking the shape of better equipment.

Ames—Uses Bloc Motor

Two models are being put out for the 1913 season by the Ames Motor Car Company. One is a touring model known as the 45 and the other a roadster known as model 44. Both these are mounted on the same chassis. The Continental four-cylinder en bloc motor is incorporated in this design. It has a bore of 4.125 inches and a stroke of 5.25 inches. The cooling circulation is maintained by centrifugal pump. One of the features of the new model is the Gray and Davis electric lighting and starting outfit used in connection with Willard storage battery. The clutch and gearset are a unit with the motor, the casing being integral with the rear end of the crankcase. For 1913 the new Schebler model O carbureter has been adopted. The clutch is of the multiple disk type with alternate disks lined with Raybestos. Control levers are attached directly to the gearset housing giving center control. The drive is by a shaft carrying two Spicer universal joints, one at either end. The pressed steel torque arm is distinct and separate from the drive. The rear axle is floating and the differential is carried on annular ball bearings. A slight improvement has been made in the gasoline tank, which although still located beneath the front seat may be filled without removing the seat cushions, the filler pipe coming up through the glove box in the partition between the two front seats. The bodies on both models are all steel. One of the features of the body is a flush handrail or moulding running all the way round the car.. This moulding instead of being fastened to the body with screws is attached underneath the outside covering, thereby securing a perfectly smooth top surface.

Apperson—Abandons Yearly Models

One more firm, that of Apperson Brothers, has abandoned the yearly model idea, producing on the series plan, making improvements as designed without reference to the time of the year. The 1913 series is almost identical with that of 1912. Full equipment is included in the standard price, with the optional features of electric starter and electric lights. The line includes all five of last year's models, three of which are of 45 horsepower and two of which have a 55-horsepower motor. Both motors are of the four-cylinder type with valves on opposite sides and have hollow crankshaft oiling system.

Auburn—Adds a Six

Five models constitute the Auburn line for 1913. Two of these are continuations of last season's models. Two sizes are offered, one the 6-50, a continuation, and the other the 6-45, a new model. Last year's 40-N is this year's 40 L, while the 35 L and the 30 L have been supplanted by the 33-L and the 37 L. No change has been made in the 6-50 except the addition of the Ward-Leonard lighting system as regular equipment. The new six employs a long-stroke motor, 3.75 by 5.5, with valves on the left side. The clutch is of the leather-faced cone type, and the gearset of the three-speed selective variety. A floating rear axle is used, and 36 by 4-inch tires. The wheelbase is 130 inches. The wheelbase on the 40 L is 122 inches, 2 inches longer than on last year's car. The tires this year are 36 by 4

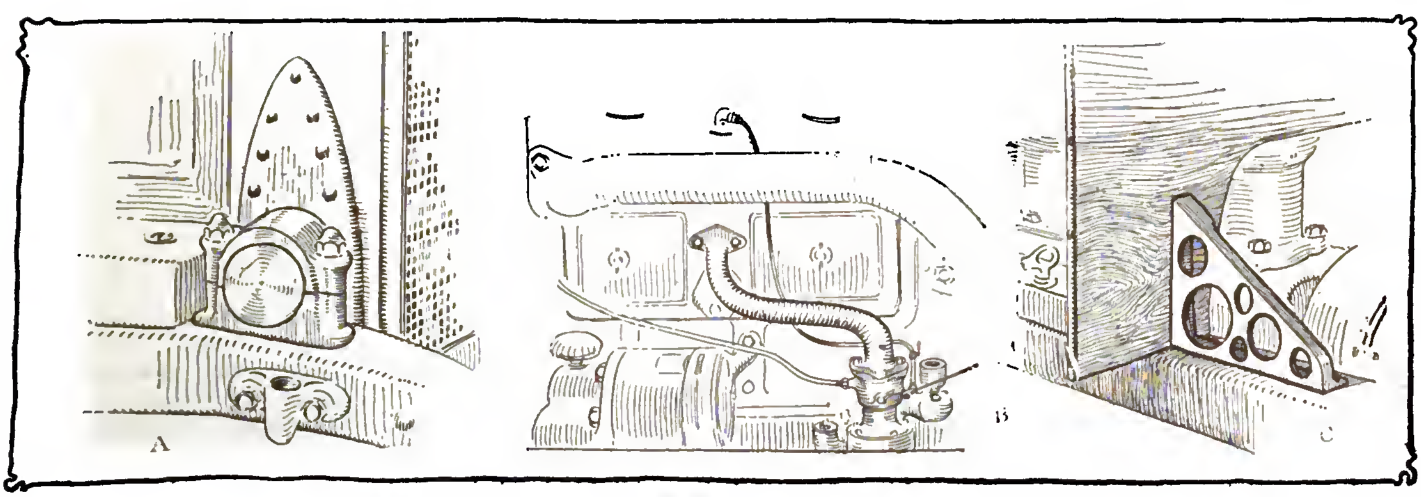


Fig. 1—A, Alco radiator suspension; B, Abbott intake manifold; C, Alco dash bracket

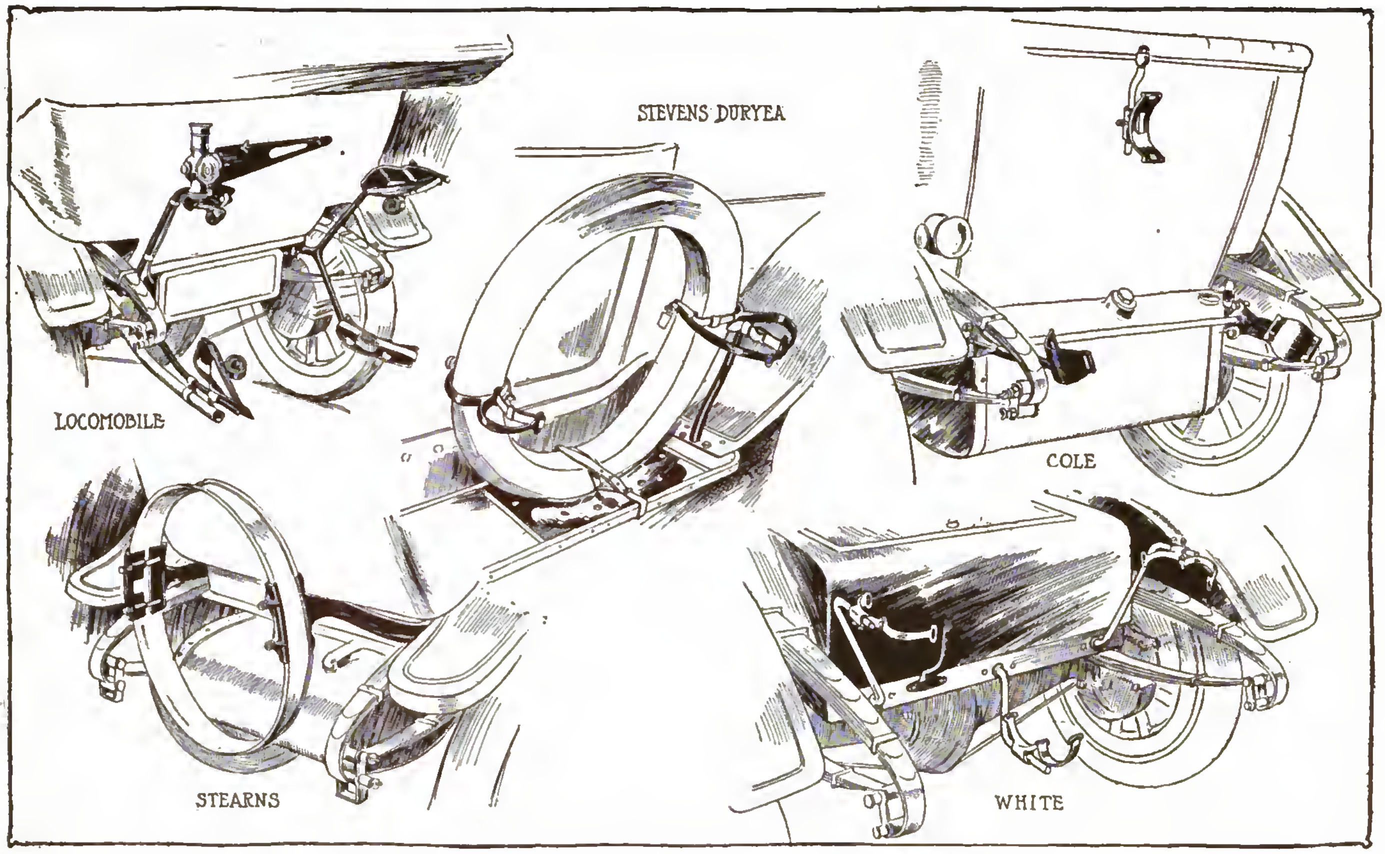


Fig. 2—Rear tire carriers are becoming more popular than ever before

against 37 by 4 in 1912. Model 33 L uses the new Rutenber 3.75 by 5.5 four-cylinder block motor with valves on the left side. A leather-faced cone clutch and three-speed selective gearset are used, the rear axle being of the floating type, on Hyatt roller bearings. The wheels are 34 by 3 1-2 inches all around with a 112-inch wheelbase. Model 37L has a motor 4 1-4 by 4 3-4, of the mono-block type, with valves on the left side. A multiple-disk-in-oil clutch and three-speed selective gearset are included in the unit power plant, and the floating axle is equipped with ball bearings throughout. The wheelbase of this model is 115 inches, and the tires are 35 by 4. The Remy magneto, Schebler carbureter, Rutenber motor and Ward-Leonard electric lighting system are used on all models.

Amplex—Four-Cycle Six

A completely reorganized line has been put on the market for 1913 by the Amplex company. The two-cycle type formerly made under the name of Amplex has been discontinued as a stock production. The new chassis is a six-cylinder with the cylinders cast in pairs. It has a bore of 4.125 inches and a stroke of 5.25 inches. Among the important features on this chassis are the use of the Northeast lighting and starting system and rear axle gearset. It is stated that the Amplex company will shortly bring out a Knight motor.

Austin—Has Two-speed Axle

No marked changes other than the new two-speed Austin axle will be noticed in this concern's line which consists of three models of sixes. This year they are known as the models 77, 66 and 55, they are all supplied with electric starting and light plants, and they appear in their distinctive finish of ivory white and tan. Two-speed axle, which is a decided innovation, has incorporated in its gear a two-speed system. These are a medium direct-drive of 3.5 to 1 and a high direct drive of 2 to 1. This combined with the three-speed gearset gives six speeds forward and two reverse. It is claimed by the makers that a great saving in fuel consumption is retained through the medium of the two-speed action, 50 per cent. more mileage being obtained per gallon of gasoline as compared with medium direct drive. Another point claimed for the two-speed axle is its aid to silent operation, the high-gear ratio eliminating noises caused by low-geared motors on level road.

Bergdoll—Greater Wheelbase

Bergdoll cars for the new season, the 40 Fairmount models in particular, have been greatly refined in appearance and enlarged by the use of a longer frame, the wheelbase, formerly 115 inches being in the new models 121 inches in length. The most notable change, however, is in the adoption of U. S. L. electric starting and lighting system. Motors are of the four-cylinder block type, with cylinders 4 by 5.9375 and 4 by 4 respectively. Equipment is complete on each model, in top, windshield, demountable rims, etc.

Buick—Has Five Models

The 1913 Buick cars are in five models, known as the 24, 25, 30, 31 and 40. Models 24 and 25 are hung on the same chassis, 24 being a roadster and the 25 a touring car. The four-cylinder motor is of the valve-in-the-head type with semi-steel cylinders cast in pairs giving a three-bearing crankshaft. Cooling circulation is maintained by gear-driven centrifugal pump bolted to the crankcase and through brass water manifolds and a vertical-tube radiator. The clutch is an aluminum cone, faced with leather, and transmits the power to a three-speed selected gearset running on annular ball bearings. The steering gear is the semi-irreversible split nut-and-worm type. Models 30 and 31 have the same chassis; in this case the 30 is a runabout and 31 a touring car. The motor in this case is a unit with the clutch and gearset. It has four cylinders of the valve-in-the-head type, and a bore-stroke ratio of 1. The cylinders are of semi-steel analysis and the crankshaft is carried on three bronze-backed babbit-lined bearings. The clutch is an aluminum cone faced with leather with spring beneath to prevent harsh action. A three-speed sliding gearset is used and is carried on annular ball bearings. Model 40 Buick has a block motor without valve cages, the valves being carried in the head. Three-bearing crankshaft is also used in this motor. In general design this model is similar to the other Buicks, having the leather-faced cone clutch, three-speed gearset, direct drive to bevel gear in the differential, semi-irreversible split nut and worm steering gear, and right drive and control.

Cadillac—One Chassis, Seven Bodies

One Cadillac chassis upon which seven styles of body may be mounted is on the market for 1913 and, although to external appearance the motor presents the general Cadillac features of design, a number of mechanical changes having been made. The stroke has been increased from 4.5 to 5.75 inches, while the bore remains at 4.5 inches. The horsepower has been increased from 18 to 25 per cent. owing to this change, althongh according to the S. A. E. rating it still remains at 32.4. The makers claim the motor develops from 40 to 50 horsepower on the block. As would be expected from an increase in the cylinder dimensions a number of increases in other dimensions throughout the motor may be expected. This is so. The principal points of increase has been in the camshaft, which has now a diameter of 1.1875 inches in place of .75 inch. It is mounted on three bearings now instead of on five, the greater diameter giving the greatest stiffness and thereby allowing of a larger stand between bearings. Otber points of increase are the crankshaft wristpin and connecting-rod bearings. Silent chain replaces the spur gears in driving the camshaft. Lubrication remains the same, the splash system being used. Separate copper waterjackets are used on the cylinders, while the radiator consists of 147 seamless copper tubes which pass vertically through 135 horizontal copper plates. The Delco electrical system is used. Improvements have been made in the latter, however, in the shape of minor refinements, such as concealed wiring, fuses and a Yale lock on the ignition switch. The wheelbase has been increased to 120 inches in place of 116 inches. A cowl is used on all the new open bodies in place of the dash, and all the open bodies are made of sheet steel; closed bodies are aluminum.

Cartercar—Bigger Motor

Model 5 Cartercar has been put on the market for 1913. Four different types of body are mounted on this chassis and all have a new electric starting and lighting system, and the following improvements: The motor has been made higher and narrower and now has a bore of 4.125 inches and a stroke of 4.75 inches. The valve action is on the left side and three-point suspension is used as before. The gasoline tank is in a new position. This year finds it placed beneath the cowl of the dash rendering it possible to lower the body on the frame and to raise the carbureter much higher. The tank is filled from in front of the windshield and is fitted with a gauge which is visible from the driver's seat. Lubrication system has been modified, the oil reservoir being enlarged, and a better shape given the crankcase. A new type of plunger pump is used to circulate the oil. The friction on the drive members of the friction gear can be altered by removing the front footboard, loosening a nut and screwing down a bolt. A one-piece windshield has been placed on the touring and roadster cars. Top straps are fastened to the dash and not to the frame at the lamp brackets as heretofore. Seat springs are built higher in front than in rear to prevent passengers from being thrown forward. Springs are of the double-deck type. Full equipment is fitted on all cars.

Case—Adds New Four

Two models of Case will be on the market for 1913, the model 30, which is entirely new, and the model 40, which was on the market last year, but which has been improved in many respects. The model 30 has a four-cylinder 4.125 by 5.25-inch motor, Westinghouse electric lighter and starter, Remy magneto, Rayfield carbureter, floating rear axle, demountable rims, fore-door ventilators, and a 115-inch wheelbase. The running boards on this

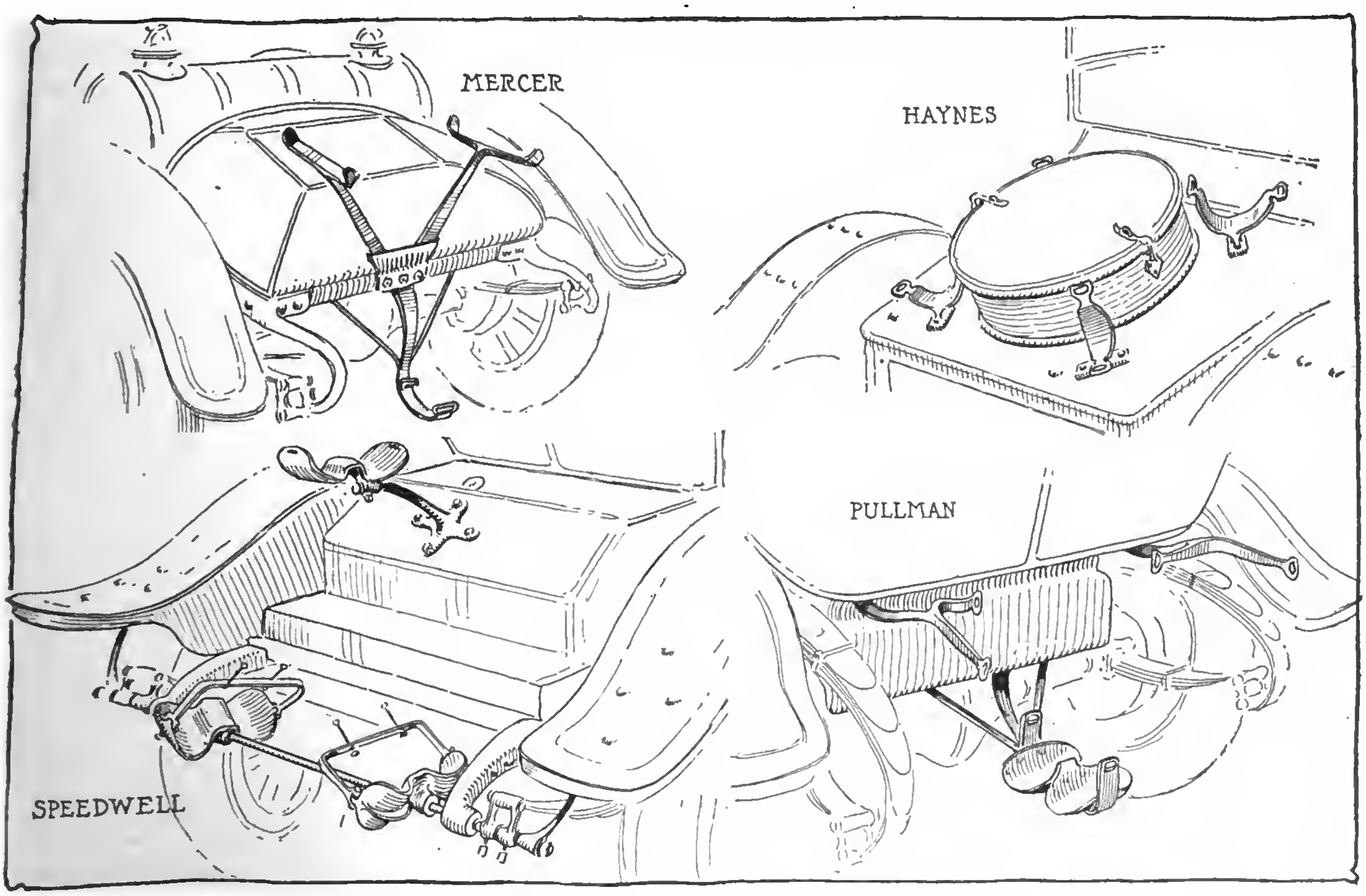


Fig. 3—Great attention being given to making rear tire carriers rigid

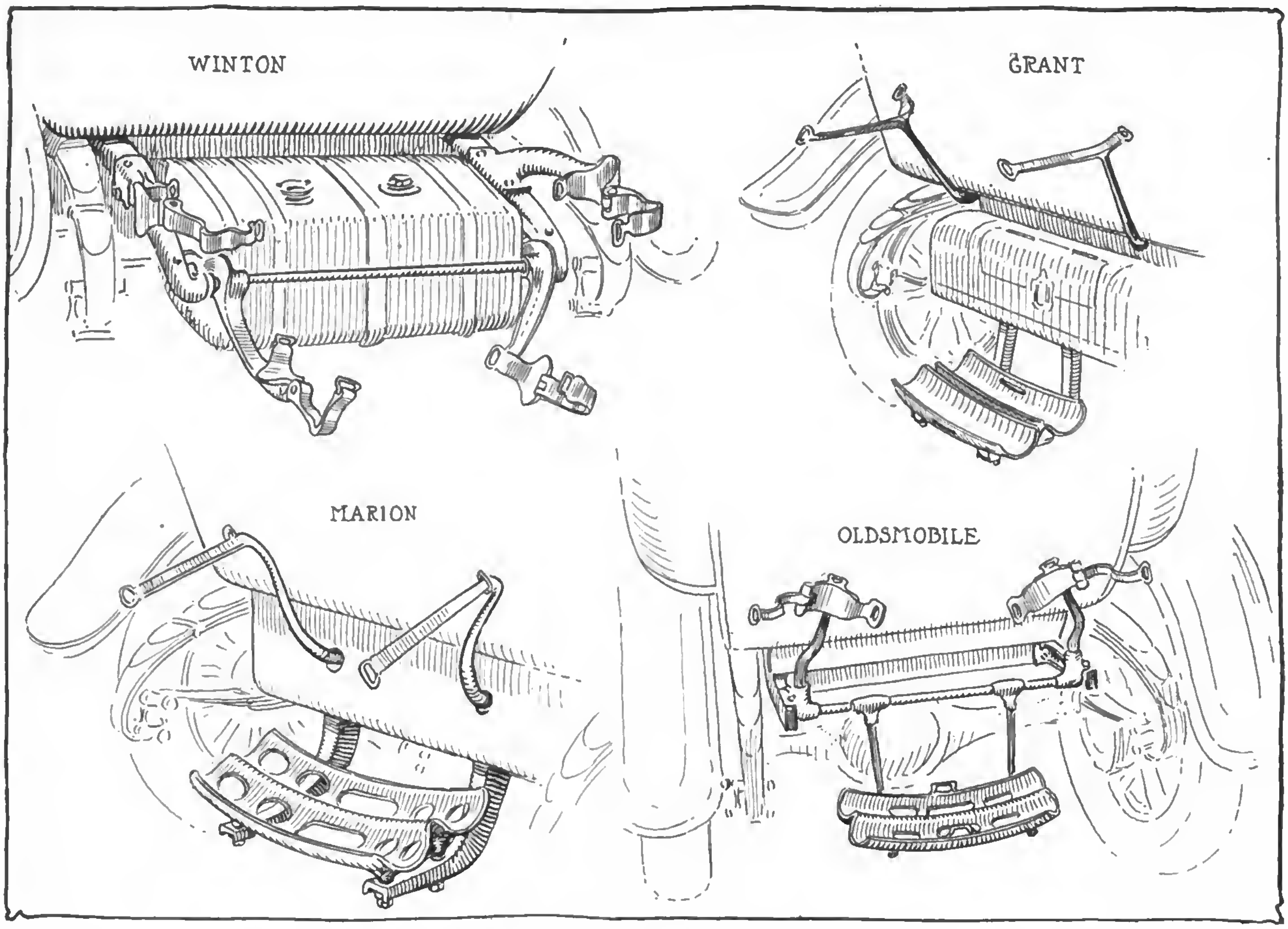


Fig. 4—Rear tire carriers often made integrally with chassis frame

model are absolutely clean, the extra 34 by 4-inch tires being carried on brackets in the rear. The design of this car is similar to the 40 in its improved state. The same 4.5 by 5.25-inch motor is used as last year, but the wheelbase has been increased to 124 inches, whereas last year it was 120 inches. The wheels are now 37 by 4.5 inches instead of 36 by 4. The rear springs are underslung, a Westinghouse electric starting system has been added, Remy dual takes the place of Remy single ignition, pressure gasoline system is used in place of gravity, and the equipment has been rendered more complete.

Cameron—Makes Four Models

Air cooling continues to be the feature of Cameron cars. Four models are produced, as last year, styled 28, 29-A, 30 and 32. These designations refer to body styles, models 28 and 29-A being a two-passenger runabout and five-passenger touring car, respectively, mounted on the same four-cylinder chassis. Models 30 and 32 are corresponding bodies on the six-cylinder chassis. Model 28 has a wheelbase of 104 inches; model 29-A, 110 inches; model 30, 114 inches, and model 32, 130. The valve-in-the-head, individually-cast, air-cooled motor, the cone clutch, the full elliptic springs in the rear, the Cameron transverse, direct-drive rear axle gearset and floating axle are all retained, as formerly.

Chalmers—Adds a Six

Three models of Chalmers cars are now on the market for 1913. Two of these are fours and the other is a six. This is the same as last season and the changes made have been all of a minor nature, reduction in price being the most important. The cylinder dimensions of the three models are the same as last year, the bores of the three models being 4.25 inches for the four and the six, while the strokes are 5.25 for the six and larger four, and 4.5 inches on the smaller four. Monobloc castings are used in the four-cylinder models, while the six uses two groups of three. A slight change in the air-starting system consists in the installation of Kellogg pumps to take the place of the cylinder check valves used to take the pressure from the cylinders and convey it to the storage tank. The transmission service brake has been omitted in the smaller four this season and both brakes placed upon the rear wheels. More luxurious upholstery, sheet steel bodies, long cowl dashes and seats to which a pitch of 2 inches is given form some of the other refinements worth of comment. The Gray & Davis lighting system is used in these cars which are fully equipped.

Chevrolet—Has New Six

The Chevrolet 40 of 1913 is a six-cylinder car with motor composed of two block castings containing three cylinders each. The measurement of the cylinders is 3.5625 by 5 inches. It is of the T-head type and the valves are 2.25 inches in diameter. The pistons are convex. Connecting-rods of I-beam forging equipped with die-cast babbitt bearings. The crankshaft is a drop forging with counterweights forged integrally with the shaft. The four main bearings are of babbitt metal, as are also those of the camshaft. Lubrication is by automatic and mechanical oiling system. The carbureter is heated from the exhaust and is automatic in its action. Dual magnetos are used in ignition. The clutch is leather-faced cone type with adjustable compensating springs. The gearset provides for three selective speeds forward and reverse. Cooling is by centrifugal pump and belt driven fan. The front axle is a drooped forged I-beam and the rear is of the full floating type. Sixteen-inch drums are used for the brakes. Three-quarter elliptic springs are used in the rear with semi-elliptics in front. Steering is by worm and gear. The car has an electric generator for lighting and is

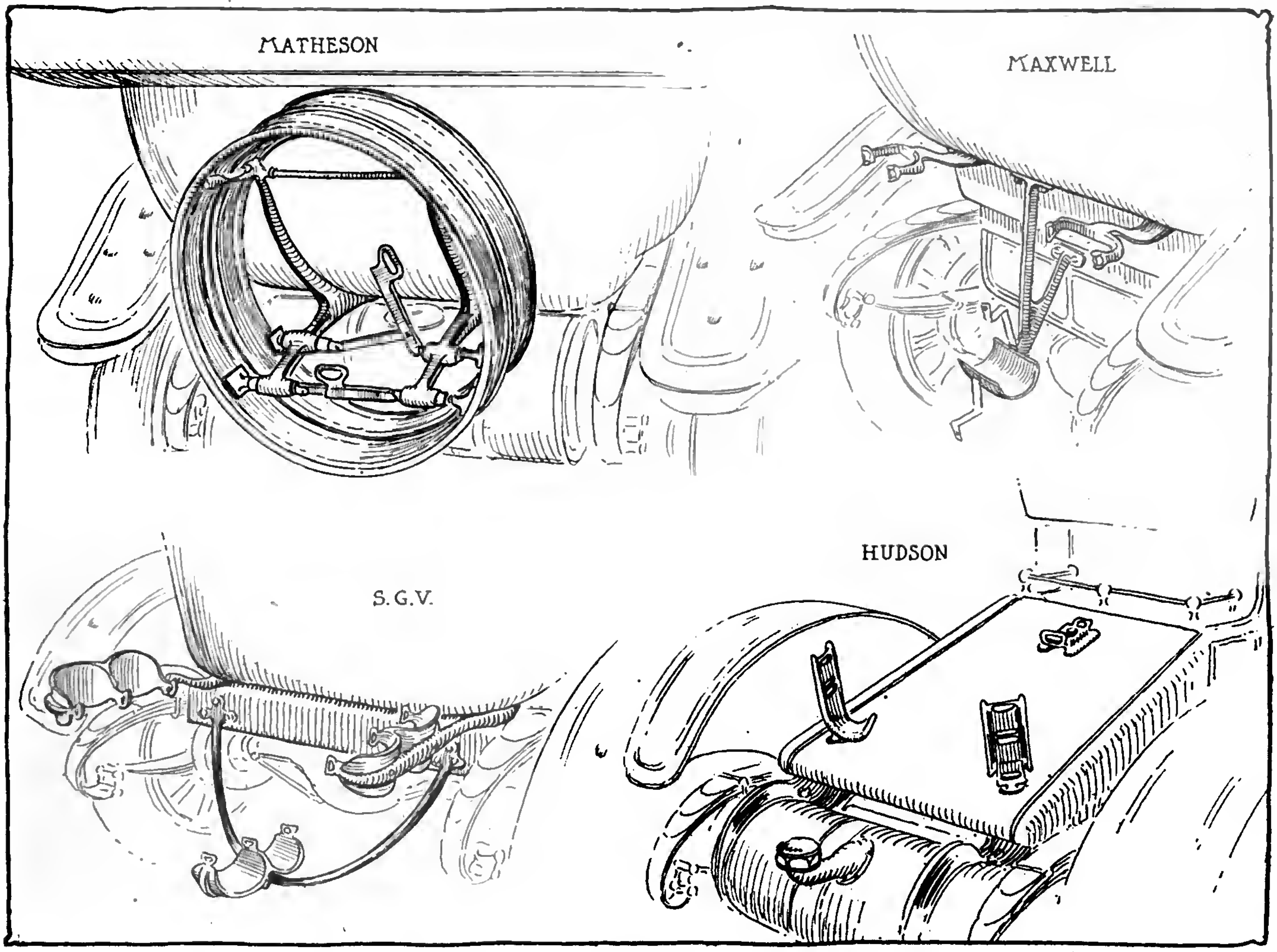


Fig. 5—Accessibility and sightliness favor rear carriers

equipped with a pneumatic starter. Wheelbase is 120 inches with standard tread.

Correja—Puts Out a Six

A six-cylinder Correja has been added to the line for 1913. On this model the cylinders are cast in pairs, are of the T-head type, and have a bore of 4.5 inches and a stroke of 5 inches. The car is rated at from 55 to 60 horsepower and ignition is taken care of by a Simms high tension magneto with a set spark. Carbureter is the new model O Schebler with concentric jets. Lubrication is taken care of by gear-driven pumps which deliver the oil through a hollow crankshaft; the oil being carried in the lower part of the crankcase. A cone clutch with flat springs under the leather casing is used and delivers the power to a three-speed selective gearset located on the rear axle. One universal joint is used in the propeller shaft, this being of the double type and located at the forward end. It is inclosed in a torsion tube. The rear axle is floating and has a removable housing cover through which the differential gears may be examined and adjustments made. Three-quarter elliptic springs, 44 inches in length are used in the rear and semi-elliptic springs in the front. The brakes are mounted on the rear wheels operating on pressed steel drums, and equalized by differential levers.

Cole—Adopts a Six

For the 1913 season the series 8 Cole is now on the market. A new six-cylinder, 55-horsepower car is the greatest innovation for this season. It has a bore of 4 1-8 inches and a stroke of 4.75 inches, with a rated horsepower of 55. The other two models, known as the 40 and 50, have four cylinders. The smaller has a bore of 4.125 inches and a stroke of 4.75 inches. while the 50 has a bore of 4.5 inches and the stroke 5.25 inches. The motors are all of Northway manufacture and are of unit construction, the gearset and clutch housing forming the rear portion of the structure, and so arranged as to give the rear support in a three-point suspension. Some of the other features of Cole construction for 1913 are the gas pressure feed with small plunger pump driven off camshaft, leather disk drive for generator, ventilating attachment on windshield, air control on steering column, 4-inch longer rear and 2-inch longer front springs, gasoline gauge on tank having 21-gallon capacity and rear tire holders. Cylinders are of L-head type and are mounted on an angle of 2 1-2 degrees to the vertical, producing a straight-line drive when the car is loaded. There are no radical features of design about the motor, although the external shafting has been so arranged as to incorporate the Delco starting and lighting system. The motor generator is located on the right side of the motor and is driven through one of the gears of the timing set. The Cole automobile is one of those upon which no starting crank is carried, the latter being kept in the tool box for use in case of emergency. Rakish and gracefuly body designs distinguish the Cole line for 1913. Not the least noticeable feature is the polished cowl board carrying the speedometer, sight-feed, pressure gauge, switch and starter.

Crane—Has New Six

This is a new car which has just been placed on the market. It is made in one chassis embodying a six-cylinder motor having a bore of 4.375 inches and stroke of 6.25 inches. A direct force feed system of lubrication is used, the oil being delivered to the main bearings under 3-pound pressure. A single disk clutch, four-speed gearset, transmission brake, floating axle,

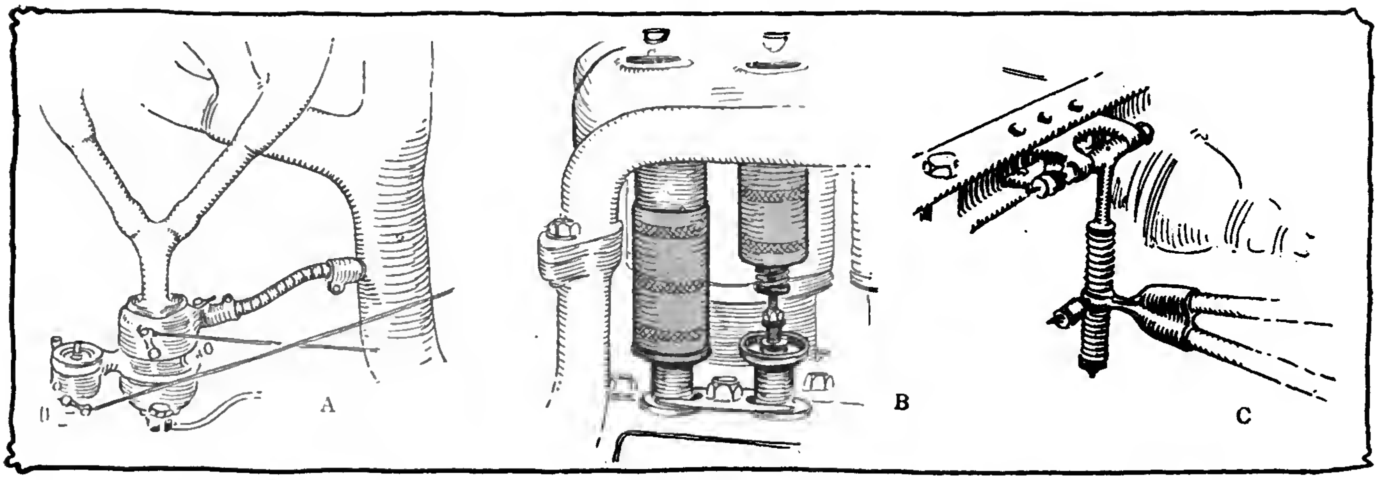


Fig. 6—A, Buick hot-air carbureter jacket; B, Cadillac valve action covers; C, Cadillac torque connection

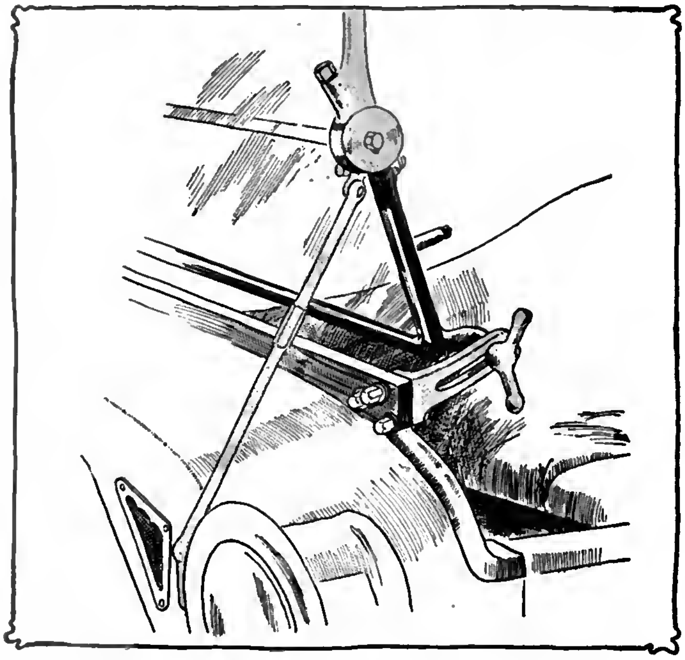


Fig. 7—Cole ventilating shield attachment

chrome nickel steel frame are among the prominent features of the car.

Simplex—Makes Three Chassis

As before, the Simplex Automobile Company will produce three chassis with bodies to order. Two of the chassis offered last year are continued with no mechanical alterations whatever, although a generator electric lighting system has been installed in all models. The 90-horsepower model will be continued in small quantities for those who demand great power, and in its place a chassis practically identical with Louis Disbrow's Simplex Zip has been installed in the line. This model has flat springs and sets much closer to the ground than former Simplex productions. The cylinders, four in number, are 5 3-4 inches square, and, while this engine is allowed 53 horsepower by the S. A. E. rating, it is said to develop 90 on the brake. This model is chain-drive, and will be furnished either as a chassis or in a racy two-passenger roadster. It will be remembered that the other models are a 38-horsepower, shaft-driven chassis with a 4 7-8 by 6 1-2-inch motor and two wheelbases, 127 and 137 inches, respectively; and a 50-horsepower, chain- or shaft-driven chassis, with four cylinders 5 3-4 square. This chassis has wheelbases 129 and 139 inches, respectively. While the bore and stroke of this motor are the same as the new model, the latter motor differs in design, notably in the size of the valves, which are the same as used in the 90-horsepower model, thus deriving its additional power. The new model is termed the 75. The Simplex body policy will be continued. This policy is to furnish bodies partially finished on each chassis, which are carried out in detail to suit the individual preferences of the purchaser, at his order. An especial body production is a semi-steam-line coach limousine with a curved roof and sloping hood.

Crow—Adds a Six

Five chassis and nine body models constitute the 1913 Crow line. The horsepower ratings of these models are 25, 33, 35, 45 and 50, the last mentioned is an entirely new design and is known as the C-6. It has six cylinders and is equipped with both roadster and touring bodies. The smaller two models have four cylinders and are monobloc castings. The exhaust and water manifolds are cast integrally with the cylinders in the case of these two. The four-45 as well as the new six-cylinder models are all of the L-head type with the cylinders cast in pairs. Cooling in all models is accomplished by the thermo-syphon system, and the radiators are mounted on trunnions. Ignition is by a Briggs dual system. Some of the new features included for this season are the gasoline gauge for the gas tank placed under the left front cushion, the arrangement for carrying dry batteries by means of a wooden drawer, and a space for the storage of tools and a compartment to the left of the tank. Baffle plates are placed in the gasoline tank to prevent the fuel from splashing back and forth. The wheelbase on the new six-cylinder car is 137 inches and it is equipped with 37 by 4.5 wheels with demountable rims all around. A feature on the Crow car which is interesting in view of the large number of automobile thefts recently, is the lock on the control set. A small boss is cast on the H-plate and on the gearshift lever. These bosses are pierced by a 3-8-inch hole, making it possible to fit a padlock to the gearset, holding it in neutral position and rendering it impossible for anyone to engage the gears unless provided with a key. The center control was used on the 1912 cars and the cane handle gearshift lever is also used, the ball on the top of the lever being 1.5 inches in diameter. The distance through which the gearshift lever has to be moved is very short.

Cunningham—Makes One Model

One model, a four-cylinder type, is placed on the market for the 1913 season by the Cunningham company. The bore and stroke are 4.75 x 5.75 inches. The cylinders are of the valve-in-the-head type and are offset from the crankshaft. A three-speed gearset, cone clutch with cork inserts, floating axle and screw-and-nut steering gear are other features. An electric starter and generator are regular equipment.

Cutting—Adopts Unit Plant

Two up-to-date styles of body, a roadster and touring car, are now fitted to the single Cutting chassis on the market for 1913. Although the basic principles of construction are the same this season as last, some important refinements have been made. Among these are the adoption of the unit power plant with three-point suspension. Other prominent features are increased wheelbase, demountable rims, 36-inch wheel on all models, electric side and tail lights, gas headlights, roomy metal bodies and acetylene starter. Roadster and touring car bodies are interchangeable. The four cylinders are cast in one block and have a bore of 4 inches and a stroke of 5 inches. Lubrication is by force-feed through a hollow crankshaft direct to the main and connecting-rod bearings. The connecting-rods do not dip into the oil in this system of lubrication. The force feed given by the pump, which is driven off the crankshaft, is relied upon to furnish a sufficient supply of oil for all the bearings throughout the motor. Timing gears receive their oil from the crankshaft gear which runs in a pocket that is always kept full of lubricant. The clutch is of the dry-plate disk type, the disks being seven in number and composed of cast iron. The oil pump is of the gear type. A three-speed gearset is used, and the axle is floating. Full electric lighting and starting are furnished at extra cost.

Davis—Adds Larger Model

Continuing Model 40 in series A, the Davis Motor Car Company announces a new model, larger than the first. Model 50 A is built along very similar lines to the 40 A, but employs a 50-horsepower Continental motor. The older model shows several improvements over the original design. The wheelbase has been lengthened from 112 inches to 118 inches, and the equipment amplified by the addition of a Gray & Davis lighting system, with a Disco starter, with option of the Gray & Davis starter. The new 50A uses a Continental 4.5 by 5.5-inch motor with cylinders cast en bloc. Otherwise it is identical with the smaller car. A Stromberg is used. Bodies include five-passenger and four passenger touring bodies and a two-passenger roadster with a streamline rear deck. Refinements in the bodies have been made throughout the line of touring cars.

Detroiter—Better Finish

No changes have been made in the Detroiter car for this season except minor refinements and betterments in finish. The motor is of the block type, in this car, with the intake manifold passing through the casting between the center cylinder. The bore of this motor is 3 3-8 inches and the stroke 4 3-4 inches. Three-point suspension, inclosed valves, multiple disk clutch, thermo-syphon cooling and spiral timing gears are among the other features. Left drive and center control are also incorporated, together with the long cowl and straight-line body of accepted design.

Dorris—Refined Motor

Fundamental design has undergone no change in the Dorris cars for 1913, unit construction in the 4.375 x 5-inch four-cylinder valve-in-the-head power plant still being retained. The motor changes are in a better valve action, a three-way sight feed on the oiling system and an additional gear on the timing set to take care of the Apple dynamo-motor for electric lighting and starting. The clutch, gearset and rear axles disclose no change. Six inches have been added to the wheelbase, making it now 121 inches, and the flush-sided body with the cowl dash has been adopted.

Edwards—Uses Knight Motor

One of the newest American cars is the Edwards-Knight, which was announced less than a month ago and which was described in detail in these columns, issue of December 12. In addition to using the Knight two-sleeve motor the car has numerous other constructions, many of which are incorporated in the latest European models. Among these details are detachable wire wheels with Q-D rims, with wood wheels optional; and Lanchester type of rear spring in which the weight of the spring is carried on the frame and so reduces the dead weight on the axle. The motor has a new non-splash forced-feed system of oiling in which the throttle controls the oil pressure, which ranges from 2 pounds with practically closed throttle to 20 pounds with the throttle open. It is one of the few cars to use forged connecting-rods of round section with the insides drilled out to reduce weight, leaving a wall thickness of .125 inch. The U. S. electric flywheel starter is fitted, and the motor carries a Simms magneto and S. U. carbureter. In the transmission system the multiple dry-disk clutch and gearset are in the gearbox in separate compartments. The clutch is in the front part. The rear axle is worm-

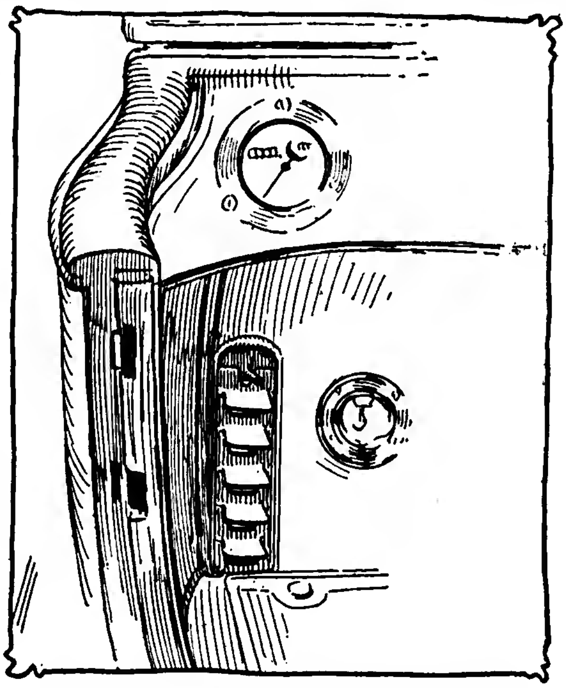


Fig. 8—Ventilating device on Chalmers dash

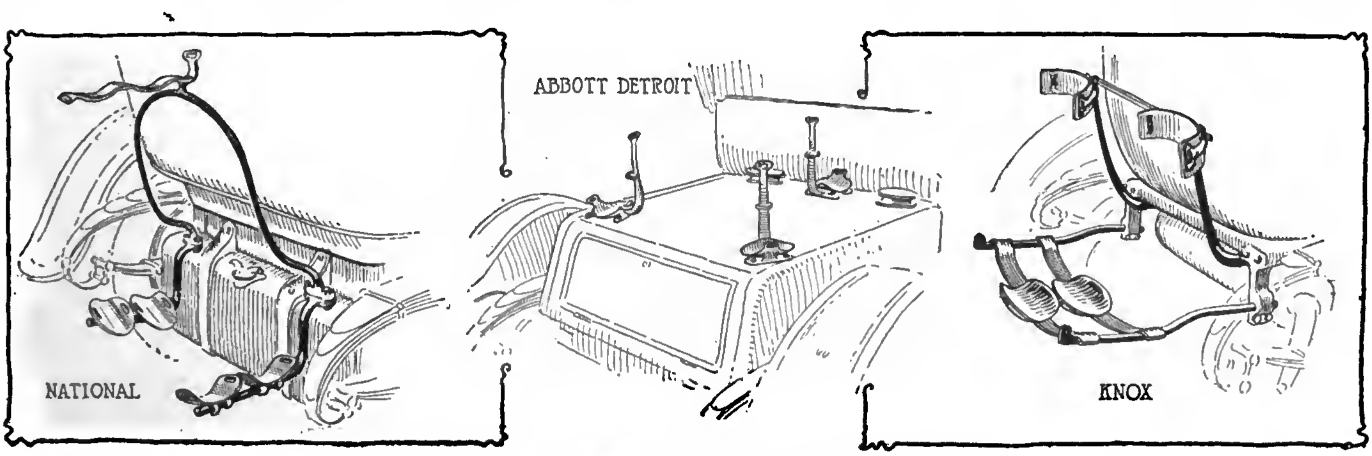


Fig. 9—Three distinct types of rear tire carriers which give rigidity

driven with the worm underneath, yet affording an axle clearance of 9.25 inches. The axle is a Timken construction fitted with worm and worm wheel made by David Brown, of England. It is a straight type worm carried on Timken rollers, which bearings also take up end thrust. The car has straight-line drive in that both motor and gearbox are mounted to decline rearward at an angle of 4 deg., so that with the car loaded the crankshaft, gearset shaft, propeller shaft and worm shaft align. The propeller shaft has two universal joints, two radius rods take the driving action of the rear axle, and in addition there is a torque tube. The radius rods, torque tube and propeller shaft are so designed that there is not any slipping of the universal joints and by having the same angle of drive through the front universal as through the rear one, the retardation and acceleration which occurs twice in each revolution of the joint is neutralized. Various body types are mounted on the same 120-inch chassis. It has left-hand steering and center control with a double-dropped frame.

Empire—Uses Unit Plant

Larger, more powerful and more complete in every particular the Empire car appears for 1913 in Model 25, a big brother to the former 20. This model was announced early in June. The design embodies the features of an inclosed unit power plant, with cylinders cast in pairs, 3.5 by 4.5 inches bore and stroke. The valves are all on the left side, their mechanisms inclosed in cylindrical individual housings. The crankshaft is supported on three bearings and lubrication is by the circulating-splash system. Fixed adjustment is used in the Eisemann high-tension single ignition system. Thermo-syphon cooling is employed. The car is steered from the right side, and the control lever is in the center. A five-passenger touring body with fore-doors is fitted.

Enger—Encloses Valve Action

Models F, J and E of Enger cars are continued, while a new model P has been announced for the present season. The new model differs little mechanically from models F, J and E, using the same 4.5 by 5.25-inch motor with inclosed valves arranged on the left side. An especial feature is the means of closing the valve chambers. The cylinders are cast in pairs, and the valve chamber of each pair is covered by a single plate which carries the spark-plugs and pet-cocks, and which, when removed, permits ready accessibility to the valves. Multiple-disk clutches, three-speed selective gearsets and floating axles are used on all models. Model P is fitted regularly with the North East electric lighting and starting system, all models being equipped with a top and envelope, windshield, speedometer, horn and tools. All models are listed with full equipment.

Fiat—Adds Large Four

The American as well as the foreign Fiat is built in three chassis models, the parts in the American factory being made from the foreign drawings and superintended by foreign engineers so that the domestic and foreign models are duplicates in respect to design, material and workmanship. To the four- and six-cylinder models of last year a large four has been added which coincides in nearly every respect with its two predecessors. These chassis are characterized by block cylinder castings with a transverse front end shaft to drive the magneto and water pump, four-speed gearbox and combined pressed steel rear axle and torque tube, in which two stampings constitute the entire housing, these two being specially light, their total weight in the rough being but 80 pounds. The motor has a forced-feed non-splash oiling system, supplied from an exceedingly compact gear pump mounted on the rear end of the camshaft and delivering its oil through a large diameter conduit, incorporated within the crankcase when cast, from which conduit the three crankshaft bearings are supplied. The crankshaft throws and crankpins are drilled and the connecting-rods carry copper tubes to convey the oil to the wristpins. The exceedingly compact four-speed gearset is a Fiat feature, the total length between bearings being but 10 inches. The new tour has a compression release fitted. All models carry electric lights, but engine starters are not listed. For the first time all Fiat models have the full-dinner-pail equipment which includes everything that the owner requires. Fiat chassis are internationally renowned for their clean-cut appearance; every detail has been designed for its duty and place and looks the part. An example is carrying the magneto control through the crankcase from front to rear thereby eliminating unseemly connections and more fool-proof control. Another example is the clean-cut block casting, with enclosed valve springs and abbreviated manifolds and water connections.

Firestone-Columbus—Electric Starter

Three different chassis are made by the Firestone-Columbus Company. One is a six and the others are four-cylinder models. The six-cylinder motor is cast in groups of three and is of the L-head type with enclosed valve mechanism. Double ignition with two independent sets of spark plugs is used on this model. The wheelbase of this car is 130 inches. The bore of the motor is 4.5 inches and the stroke 5.5 inches. The largest four-cylinder has a bore of 4.5 inches and a stroke of 5.5 inches. Double ignition is used on this also, while on the smaller four dual ignition is used. All models have electric lighting and starting systems, three-speed gearsets and demountable rims.

Flanders—Nothing But Sixes

The Flanders company is another of the increasing number who make nothing but six-cylinder cars. The two chassis put out by this concern are known as the 50-Six and the 40-Six. Both of these cars are newly on the market. The 40-Six has an en bloc motor with a bore of 3.625 inches and a stroke of 4.5 inches. The oil system has a 2.5 gallon capacity, and is of the combination force and splash type actuated by a gear pump driven from the camshaft. The Gray & Davis starting and lighting system has been fitted to this motor as well as to the larger 50-Six. The motor of the latter is also of the block type, has a bore of 4 inches and stroke of 4.75 inches. It is lubricated by the same system as the smaller car and is of the same general design throughout. The control on both models has been arranged so that the gearset lever does not operate with an H-plate, but by a rocking motion. Both the clutch and brake pedals are adjustable. The gearsets have three speeds forward and reverse and are geared 3.5 to 1 on high on the 40-Six and 3.75 to 1 on the 50-Six. A trouble lamp on a longcord, cigar lighter, rear tire irons and hub cap wrench are part of the equipment of both models.

Ford—Heavier Axle

The only important change in the Ford cars for the coming season is in the price, which has been cut since the first of October, 1912. A two-passenger roadster, five-passenger touring car and a six-passenger town car make up the Ford pleasure line. Improvements which have been made in the Ford line consist largely of changes which tend to better the appearance and to increase the comfort of the passenger. The bodies are dropped 2 inches lower and the roadster has been redesigned so that it is now possible to convert the turtle back into a seat for a third passenger. The axle housing has been made heavier.

Franklin—Electric Starting

Electric starting and lighting on the new Franklin series 3, six-cylinder cars is the biggest change presented in this line, which is now listed in series instead of the yearly models. The Entz system which has been installed consists of three parts: an electric motor generator, storage battery and a three-point double-throw switch. The system operates at 18 volts and has the motor generator connected permanently to the crankshaft by a silent-chain drive. The motor-generator is so constructed that it will turn over the motor at low speed, but as soon as the car has picked up speed it will act as a generator and start charging the battery. The winding employed on this starting system is such that it is a natural function of the motor-generator for it to become a generator after the speed of rotation has mounted to a car speed of 12 miles. Below this speed it performs the functions of a motor. This does away with automatic devices. Another addition to the Franklin line is the little six two-passenger victoria phaeton which has an auxiliary seat in the rear for two, the latter folding into a deck when not in use. Otherwise the Franklin series 3 is the same as series 2.

Garford—Makes a Six

Garford production in the pleasure car line will be confined to one entirely new six-cylinder model in 1913. The car has a construction of 1912 in the essential elements. The car bas a wheelbase of 128 inches. Its overall length is 178 inches. The cylinders are of L-head type, the bore being 3.75 inches by 6-inch stroke. Under the S. A. E. formula the rating is 33.75 horsepower, but in the catalogue the motor is called 60-horsepower. The cylinders are cast en bloc with valves on the right side fully enclosed. The crankshaft is a steel forging with four bearings of babbitt-lined bronze. Lubrication is by gear-driven pump with the oiler in the crankcase. Copper tubes lead to the main bearings and oil leads through the crankshaft to connecting-rod bearing and wristpins provide for lubrication of those parts. In addition there is a splash system. High tension ignition with waterproof magneto and battery is installed. The cooling system consists of a honeycomb radiator and fan as last year. A cone-faced clutch with cork inserts, having a face 2.125 inches, is slightly changed from last year. Four speed, selective transmission gives direct on third and final drive is by bevel gear and pinion to floating rear axle; Garford worm and gear steering; Krupp steel springs, three-quarter elliptic in the rear; kick-up pressed steel frame and an electric starter, tbe motor generator of which takes the place of the flywheel, are some of the details of the new car.

Glide—Adds New Four

An entirely new four-cylinder Glide has been put on the market for the 1913 season. This car, which is known as the 36-42, is being built along similar lines to its predecessor of last year. The improvements incorporated are a 4-inch longer wheelbase, making 118 inches, a larger motor having a bore of 4 1-8 and a stroke of 5 1-4 inches, and larger and heavier parts throughout to take care of the additional weight due to the longer wheelbase and more powerful motor action. The four cylinders are a monobloc casting tested under hydraulic pressure for casting flaws. The valves are all located on the left side of the motor and are covered by cast-iron removable plates to silence their action. The flywheel housing is a unit with the crankcase and is cast of nickel aluminum alloy. Acetylene starters are fitted on the Glide touring and roadster cars, while the lighting system is the Ward Leonard. A motor-driven tire pump is included in the equipment of these cars.

Great Western—One Chassis

Great Western cars are built for the season of 1913 in four body types upon a single chassis model. This chassis is known as the 40, as it has been for the past few years, but this year the motor is larger, the stroke being 5.5 inches in place of 5 inches, while the bore remains 4.25 inches as formerly. A more radical change of design is the placing of the exhaust valves on the side of the motor in a regular L-type construction in place of in the head of the motor, as they were formerly. In connection with the change in the valve location is a new feature in the use of roller valve lifters acting directly on the cams. The valves themselves are cast iron electrically welded to carbon steel stems. The power plant is the unit type with lubrication by splash. The new Remy dual system with concealed coil is also used. A slight change has been made in the clutch in that the angle of the cone has been flattened so that it will act easier. Other features of the car are the floating axle running on a double roll of New Departure ball bearings with Hyatt rollers for the differential and the worm and full gear type of steering. The wheelbase shows an increase of 4 inches over last year's product; it is now 118 inches.

Grant—Makes a Six

One of the new cars to be first seen on the market for 1913 is the Grant Six. It embodies a T-head 50-horsepower Wisconsin motor, a multiple disk dry-plate Grant-Lees clutch and a gearset having three speeds forward made by the same concern. The motor clutch and gearset when assembled make a complete unit power plant. Timken axles are used, and the body is made of three-ply laminated wood. Marvel carbureter, Esterline generator, Gray & Davis lamps, mohair top, Gemmer steering gear and complete equipment are furnished.

Westcott—New Light Six

In line with the present trend in favor of light, medium-priced sixes, the Westcott Motor Car Company announces a six in addition to its continued four. The four differs little from its predecessors, the chief change in mechanical features being the installation of an electric starting and illumination system. The six-cylinder is one of the many new sixes of this season. An aim has been made in its manufacture to effect simplification of structural features following the same general lines laid out in the four-cylinder cars. The motor is cast en bloc, 4 by 6-inch bore and stroke with valves arranged opposite instead of in an L-head as previously. The car is claimed to develop 67 horsepower and to weigh 3,500 pounds, or to have 1 horsepower to every 52 pounds in weight.

Warren—Adds a Six

Continuing its three four-cylinder models and adding a six-cylinder type, the Warren Motor Company enters the 1913 selling season well equipped to meet the demands of all comers. All three of the fours have different cylinder dimensions, none of which correspond to those of the new six, which has a bore of 4 inches and a stroke of 5 inches. The fours are identical in all but the most minor details with their counterparts for last season. The six adheres to the monobloc cylinder construction, the upper part of the waterjacket being cast open. It is covered by an aluminum plate with which the water outlet is formed integrally. The new motor, like the Warren fours, is of tbe L-head type, valves being located on the left. The crankshaft has three bearings which are anchored to the upper half of the crankcase in the usual way. The support of the engine is at four points on a subframe. Splash lubrication, positive water cooling, double ignition and pressure gasoline feed are features of the six-power plant. It also is fitted with an electric self-starting and lighting system of the Northeast make. The combined motor-generator is mounted on the right side of the engine and connects to the crankshaft by a 1-inch silent chain. It operates either as a motor for starting or a generator for lighting, as the case may be. Control of the car is on the right. The standard body furnished on the new six-cylinder chassis is a metal foredoor type with swelled back. Door latches being inside, the body is flush-sided, while the bottom line is straight and not cut away to follow the frame drops. Nickel trimmings are fitted, as well as all equipment for immediate road work.

Richmond—Larger Cars

Larger cars are being produced by the Wayne Works for 1913 than for 1912. The same 30 and 40-horsepower motors, of 4 by 4.5 and 4.5 by 5, are used. These motors are of four individually cast cylinders. The valves are located in side pockets on the left side, their springs and lifters inclosed in telescopic tubes. The crankshaft is supported on five bearings. The clutch is of the inverted-cone type with a bronze ring thrust, so arranged that it is bathed in grease upon pressure being applied on it, permitting slippage of the clutch with no harmful results. The three-speed gearset is located behind the clutch, to which it is coupled by a

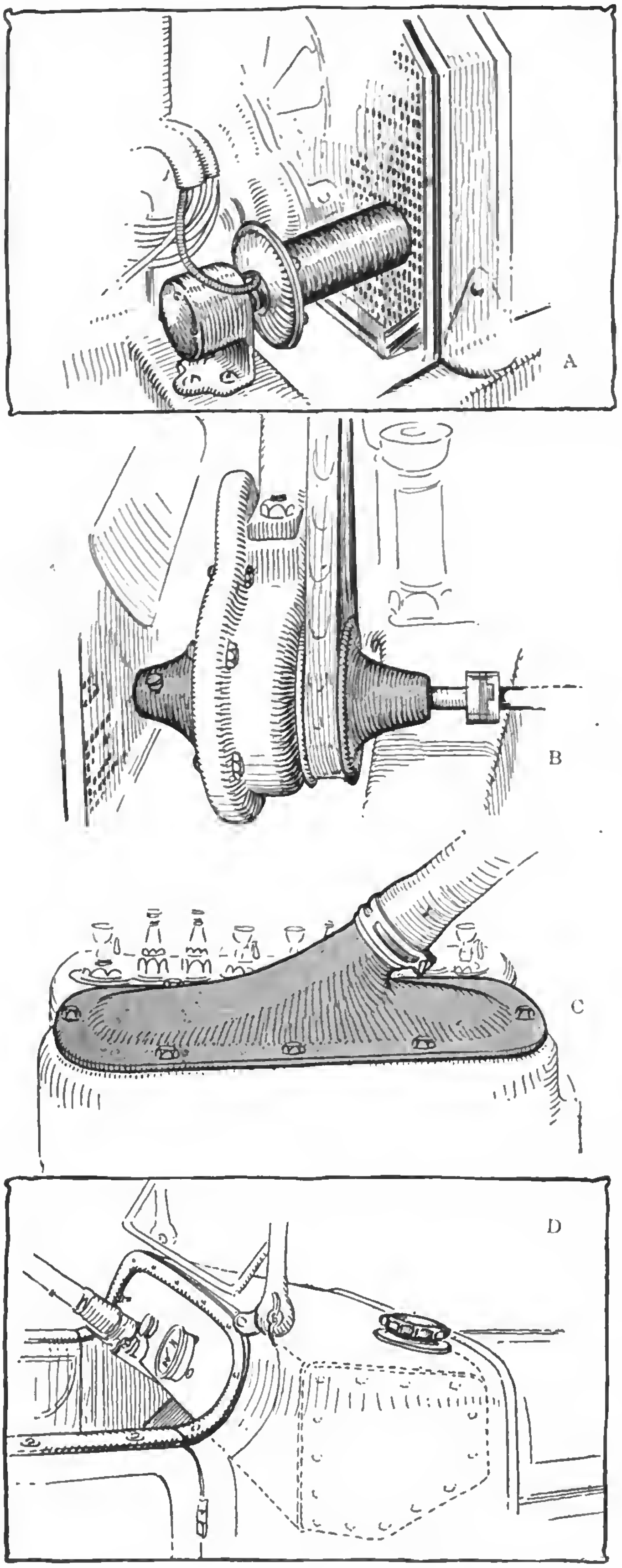


Fig. 10—A, horn on Grant car is attached rigidly to the supporting frame of the motor, the projector being directed through the radiator

B, In order to secure stiffness at the timing gear, the Grant car has a bearing on either side of the gearcase

C, the water manifold and the waterjacket cover are a unit on the Herreshoff car and are removable

D, In order to mount the carbureter as high as possible the gasoline tank is carried under the cowl on the Henderson car

universal joint. Thermo-syphon cooling, formerly supplied on the 40 only, is now provided on both models, and the tubular type of radiator is used. The former dual ignition system has given place to single magneto ignition. A change to Schebler carbureters has been made, and the wheelbase and tire sizes on both models enlarged. Model O, formerly model N, has a wheelbase increased from 106 to 112, and tires from 32 by 3.5 to 34 by 3.5 inches. Model P, formerly model M, has a wheelbase of 120 instead of 112, and tires 36 by 4 instead of 34 by 4. Springs have likewise increased slightly in length. Model P, the 40-horsepower model, is equipped with electric lights, supplied by a dynamo and storage battery. Model O is fitted with an improved foredoor touring car and a Bumblebee roadster. Model P carries a touring car only.

Havers—Only Sixes

No four-cylinder models are included in the Havers line for 1913. Continuing its former six and adding another and larger chassis, the Havers company enters the 1913 season with two sixes. The smaller model is known as the Six-44 and the larger as the Six-55. The former has a bore of 3.75 inches and a stroke of 5 inches, while the latter has a bore of 4 inches and a stroke of 5 inches. On both models the cylinders are cast in pairs and are of L-head design with the valve springs and stems inclosed by aluminum cover plates. Four bearing camshafts, spiral timing gears, combined force and splash-feed oil, thermo-syphon cooling, Northeast starter and lighting, Bosch dual ignition, three-speed gearsets, and floating axles are features of both chassis. Right drive and control are used in the Havers models, which are put up in touring and roadster bodies. The Knickerbocker speedster is worthy of comment in that it is a new effort for the Havers company which believes there is a demand for a machine of raceabout type built along low lines.

Haynes—Adopts Left Drive

A brand new car, model 24, with left drive and left control, distinguishes the Haynes line. The first starting system used by the Haynes company will be on this year's car. It has been designed by the Haynes engineering staff and is of the electric type geared to the flywheel. The alterations which have been made in the model 22, which is a continuation of the model 21, are very slight, the principle one being an alteration of the suspension design. Models 24 and 22 are L-head and T-head respectively, the bore and stroke of the former are 4.25 and 5.5 inches. The oiling system has been changed slightly in this year's models, the pump now being located at the top and outside of the crankcase instead of within it at the bottom. The modification of the spring suspension consists in the attachment of the spring hanger bracket to the end of the frame. The three lowest spring leaves in the upper set have been continued back of the clip for a distance of 3 1-2 inches to act as a stop by striking on the rubber bumper located at the center of the lower half of the spring. In model 22 the frame end is dropped 2 inches lower than in the model 21. The motor has four cylinders cast in pairs, with a bore of 4.5 inches and a stroke of 5.5 inches. The waterjackets are removable at their upper extremity. An Eisemann dual-ignition system is used with a storage battery for starting. The balance of the electric equipment includes the Haynes electric starting and lighting system. The starting system is operated in the seat of the car by first placing the switch on the battery side and then placing a right foot on the brake pedal. With the heel of the left foot a lever on the left side of the chain-gear quadrant is depressed and the change-gear lever brought into the starting slot and pushed firmly and quickly down as far as it will go. When the motor starts the lever is released and springs back into neutral position again. As in the past, the Haynes clutch is of the contracting band type on both models, but instead of using a bronze drum this year the drum is of hardened steel. Right control and right drive are maintained for this year on model 22. The starting crank is omitted on both models. Model 24 has just been brought out and is newer than model 22, which was announced some time ago. The first cars of this type to arrive in New York City will be those exhibited at the New York shows.

Henderson—Uses Wire Wheels

Four new models, the 45 Roadster and 47, 48 and 49 Touring car have been placed on the market by tbe Henderson company. The 45, 47 and 49 models are equipped with wire wheels. While retaining the same general features as the previous model 46, touring car, such as gasoline tank on dash, dynamo lighting system and left drive, and using the same motor, the wheel equipment has been altered to suit the new system. An extra wheel is carried at the rear of the car on a false hub. These wire wheels have quick detachable rims of the Marsh type. Models 48 and 49, both five-passenger touring cars, differ from the model 47 in the following respects: Cellular type radiator; combination tail light and license holder; electric dash and trouble light; one-piece windshield with hand holds on bracket and rubber skirt on bottom of shield; Ward Leonard electric starter system; Bosch ignition; clock on instrument board. These bodies will be built on the same standard chassis as 45 and 47 but will be longer bodies with roomier tonneaus, finished in olive green and gray with Turkish upholstering of genuine machine-buffed black and Spanish gray leathers. Model 48 will be equipped with wood wheels of the artillery type, demountable rim and extra rim. Model 49 will be equipped with McCue wire wheels having the Marsh type QD rims and spare demountable wheel. Mechanical features of the Henderson cars are practically the same for all models. The motor is of the block type and has four 4.125 by 5.25-inch cylinders; force-feed lubrication combined with splash; thermo-syphon cooling; Remy dual ignition; Rayfield carbureter, and Ward Leonard lighting system. The gear shift lever placed between the two front seats is retained. The Ward Leonard starting and lighting system is used and has the control handle together with the ignition switch and other dash equipment on a cowl board in easy reach of the operator.

Herreshoff—Makes a Six

Another six-cylinder model to make its first appearance in the 1913 season is the Herreshoff. The motor in this car which is known as the 6-36 is of the T-head type with the cylinedrs cast en bloc and has a bore of 3.375 inches and a stroke of 4 1-2 inches. It is rated by the maker at 36 horsepower and incorporates the three-point suspension feature. A three-bearing crankshaft is used, forged in one piece. The camshaft has also three bearings and is composed of carbon steel. Electric lighting and starting is secured by means of a Westinghouse generator and an 80-ampere-hour storage battery which is wired only to the side and tail lights. The headlights are electric. The wheelbase of this model is 124 inches. Among the other features incorporated in this car are a Herreshoff-Westinghouse electric starter, four-speed gearset, left drive, center control, full platform springs, 34 by 4-inch demountable rims all around with one extra rim, shrouded dash and clear vision windshield.

Hudson—Makes Six and Four

Two brand new chassis, one a six and the other a four, constitute the Hudson line for 1913. The six is known as model 54 and the four as model 37. Both are unlike the 1912 product in every way. The bore of the six-cylinder model is 4.125 inches and the stroke 5.25 inches. The new chassis wheelbase is 127 inches. All types of bodies are fitted to this chassis. Among the prominent features of the six-cylinder car are the cylinders, which are cast in threes, three-bearing crankshaft, pressure feed of oil to timing gears, Zenith carbureter, pressure gasoline feed, and Delco ignition, lighting and starting. Other features about the chassis which are worthy of comment are the use of roller bearings throughout; there are no ball bearings in the car. Longer springs are used on this chassis and 36 by 4.5 tires. The dash equipment differs from last year's in that a

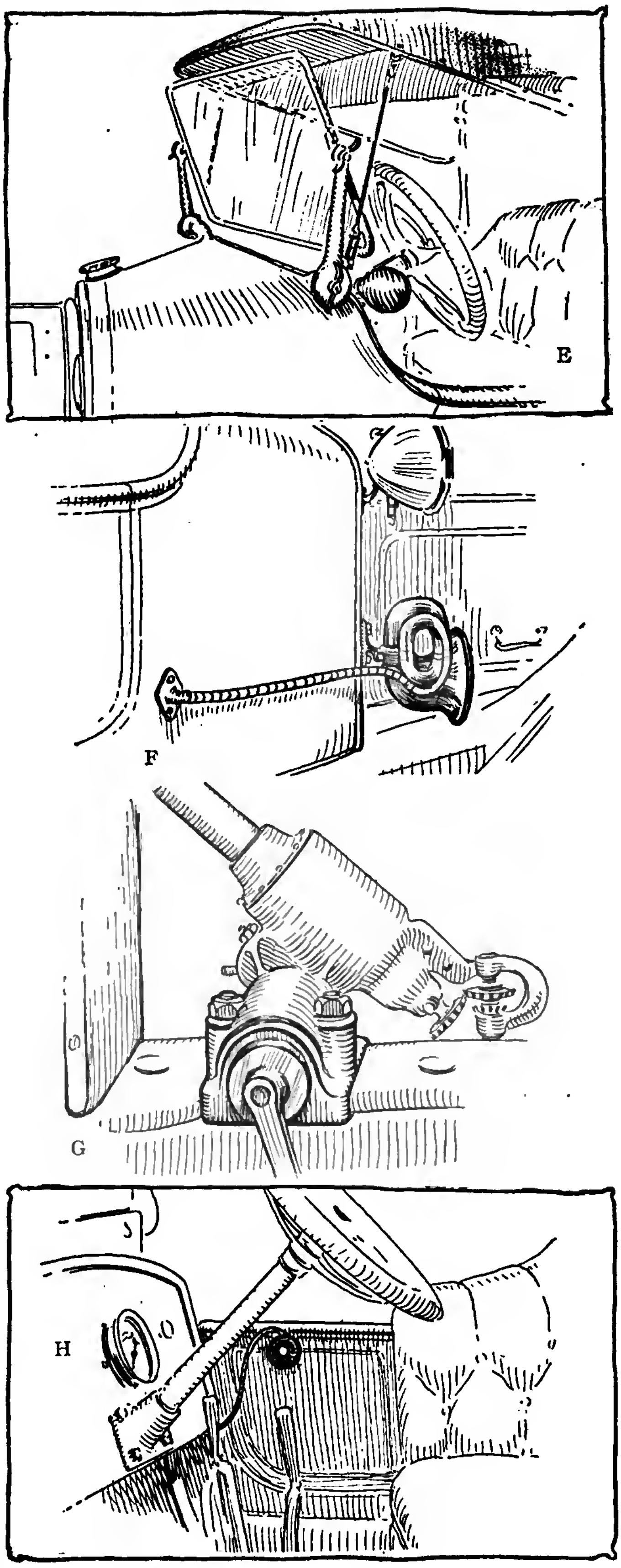


Fig. 11—E, Henderson has done away with the long top strap, fastening same to windshield

F, Hudson has a rigid attachment to the outside of the dash and body for the combination bulb and electric horn

G, Klaxl steering gear is mounted on trunnions on the car frame, and is independent of small deflections

H, on the Jackson car the horn pushbutton can be operated by hand or by the knee, leaving hand free for steering. Center control used speedometer and clock are fitted, and an oil pressure gauge takes the place of the sight feed formerly employed. Right drive and control are retained. Model 37, the four-cylinder car, is also quite different from any of the Hudson company's last year models. It has a new type of motor, the chassis is of radically different design, the self-starting system is different, the location of the gasoline tank is in the rear, and, in fact, an entirely new appearance is made by this car. The motor has four cylinders cast in one block. The bore is 4.125 inches and the stroke 5.25 inches, developing 37 horsepowers at 1,500 revolutions per minute. Interchangeable valves of solid nickel steel operated by conically wound springs are features of the mechanism. The valves are housed in by two large cover plates, which are readily removable. The timing gears are kept to a helical pitch and run in oil. Zenith carbureter is used on this model as in the six, while the gasoline is fed under a 2-lb. pressure furnished by a plunger pump driven off the camshaft. The starting system is the Delco, including the motor-generator and 80-ampere-hour storage battery. The clutch on this car is a multiple disk. The gearset is a three-speed selected type, and is similar in every respect to that used on the 33. A feature of the springs is their length and also the use of a large number of thin leaves which are tongued and grooved to prevent side motion. In addition to this, leaf retainers are used.

Hupmobile—New Six Passenger

With the addition of a six-passenger car on the 32 cbassis the Hupmobile line remains the same as the past year. The springs have been made larger and wheelbase has been increased on the 32, the latter now being 126 inches for the six-passenger car. The 32 touring car and roadster and the 20 roadster are continued. A new body model to be first seen at the shows is a coupé design.

Inter-State—A New Six

A new six-cylinder 45-horsepower motor will lead the Inter-State line for 1913. The motor is of the L-head type with the cylinders cast en bloc. The valves are all inclosed with an aluminum cover. The clutch and gearset being mounted rigidly to the rear end of the crankcase give a unit construction. An important feature of the equipment is the Alpco system for starting and lighting. The gasoline feed is by pressure.

Imperial—New Bloc Six

Five models of Imperial cars are offered for this season, built on four chassis. Most important is model 54, the new 4 by 5.5 en bloc six. It is fitted with electric starter and lights and has a 137-inch wheelbase. The other models are fours. The first of these, model 44, furnished in a touring car type, is very similar to model 44 of 1912, except that the cylinder sizes have been enlarged from 4.5 by 5.25 to 4.75 by 5.25 inches and the car is now equipped with an electric starting and lighting system. It has, furthermore, been lengthened in wheelbase by 2 inches, being now 122 inches. Model 34 differs in the extension of the wheelbase from 116 to 118 inches, and the motor size has been enlarged from 4.3125 by 5.25 to 4.5 by 5.25, and will also be provided with an electric lighting and starting system. Models 32 and 33, touring car and roadster, respectively, on the same chassis, will have a floating axle instead of the former semi-floating type, a motor 4.125 by 5.5 inches instead of 4 by 4.125 and tires 34 by 4 instead of 34 by 3.5 inches. The body types have been greatly improved, especially in the larger models, all bodies used in 1913 being of new design.

Jackson—Makes Big Six

The Jackson company also has its new six for the 1913 season. It is named the Sultanic, and incorporates a 55-horsepower motor and has a wheelbase of 138 inches. The model Majestic, equipped with electric starting and lighting system has a V-shaped radiator of the Metallurgique type. This car has 124-inch wheelbase and 36-inch wheels. All models have 15 gallon gasoline tanks in the rear, from which the gasoline is fed under pressure to a 7.5-gallon supply tank which is located under the shroud. The advantages claimed for this system are that if the air line to the storage tank should get out of order it would be possible to feed from the supply tank direct, the supply tank being located a foot or more above the carbureter and close to it, insures a steady flow of gasoline. All models have 10-inch upholstery, flush-sided bodies and are equipped with Firestone universal, quick-detachable, demountable rims except the Sultanic which has demountable wheels. The Olympic, a 35-horsepower model is equipped with a Disco starter.

Keeton—Follows French Design

Under foreign license, the Keeton, one of the two cars that are outgrowths of the former Croxton-Keeton Company, appear in two models, following French practices in design very closely. The two chassis are very similar in characteristic features of design, differing in size and number of cylinders. The Keeton six features a dynamo electric lighting system, optional wood or wire wheels and a wheelbase of 131 inches. The cylinders of this model are cast in pairs, 3.75 by 5.25, with inclosed valves arranged on the left side. The crankshaft is supporting on three bearings and ignition is fixed. The clutch is of the multiple-disk type, and the gearset, carried amidships, provides three speeds, selectively controlled by a single central lever. Internal expanding brakes on separate drums are provided, each set controlled by pedals, the clutch and service brakes being operated by the same pedal. On the four, cylinders are cast en bloc with manifolds integral, and a bore and stroke of 3.74 by 5.25. Gas starters are employed on both models. Left-hand drive is employed on both chassis, while five-passenger, two-passenger and coupé bodies are provided for each.

King—Makes New Four

In addition to its present four-cylinder type the King Motor Car Company will place upon the market another four-cylinder model, the features of which are somewhat of a departure from those incorporated in the model 36. The cantilever spring of the King, which has always been a distinctive feature, is absent in the new car, which has three-quarter elliptic rear springs and semi-elliptic front. The 36 makes use of half-elliptic rear springs which are mounted with the reverse side up as compared with the conventional construction. Drive through torque tube appears on the new creation as well as on its older running mate. This motor has an L-head design and is monobloc cast. Tbe new motor will have greater power than the model 36. Its dimensions and the type of design to be followed were not yet decided upon at the time of going to press.

KisselKar—Longer Wheelbase

1913 KisselKars are characterized by greater wheelbase, which this year measures 121 inches as compared to 118 inches on the Four-40 of last year; 132 incbes as compared to 124 on the Four-50 and 140 inches as compared to 132 on the Six-60. Some other important changes are the addition of a four-speed gearset on the 40-horsepower chassis, and of electric starting and lighting throughout the line, adjustable pedals, steering column carbureter adjustment and rear tire carriers. The Four-40 and Six-60 have the same bore and stroke, the motor dimensions being 4.5 by 5.25 inches. The Four-30 is a square motor with a bore and stroke of 4.25 inches. The Four-50 has a bore of 4.718 inches and a stroke of 5 inches. All cars are equipped with demountable rims and Timken bearings throughout except in the case of the gearset. Mea magnetos are used and 14 by 5-inch brake drums form a part of the control system. Right drive and control are used on all models. All models use silent-chain driven camshafts.

Krit—Better Equipment

Better equipment is the keynote of the change in the Krit cars for 1913. The trimmings are now nickel instead of brass, an acetylene tank is furnished instead of a generator and a cowl dash is used on the touring car. One change in the 3.75 x 4-inch motor which is of importance in the silencing of the action is the addition of cover plates over the valve stems and tappets. The wheelbase on this chassis remains 106 inches.

Knox—Adds New Six

Four models of Knox cars are now on the market for 1913. A new six-cylinder car which comes under classification of Little Sixes is the feature of the line. The Knox big six, known as model 66, is also continued along with two four-cylinder cars known as models 44 and 45. The two latter are of identical specifications except for the wheelbases. The model 46, or little six, is the only entirely new model added to the line, and while the other three are put out under the 1913 date only minor changes have been found necessary. About the most noticeable features of the new car are the V-shaped radiator which was adopted after the success attained with this type in racing competition, the cover over the overhead valves and the provisions for silence throughout the car. The changes made in the models which have been continued to this year have been principally on the line of body refinement except for one important change in the four-cylinder motor, that is, the increase of the stroke by .75 inch. The stroke of this motor was formerly shorter than the bore, the dimensions being 5 by 4.75 inches, a stroke-bore ratio of .863. The new ratio is 1.1. The other refinements incorporated in the 1913 models include a three instead of a two-blade fan, oil gauge on dash and clock-speedometer arranged on cowl board for easy reference slides over pedal slots. Perkins acetylene starting and lighting outfit, windshield base moved to top of cowl instead of at beginning of cowl, choice of horizontal or vertical tire carrier, changed body lines and concealed door latches. Departures from former usage in this cylinders are cast in pairs instead of singly, as has been former Knox practice. Other departures from former usage in this model are the placing of the intake and exhaust valve on opposite sides of the head, the use of bolted-on in place of clamped-on manifolds, 45-degree conical valves in place of flat-seated valves, springs inside the push-rod guide to hold the roller on the cam for the sake of silence, rounder cam contours, chain drive on the camshaft and magneto shaft. Silence has been made a special feature of the design throughout. To further this object springs are used to take up rattle in all linkage throughout the car, this includes brake connections, torsion lever connections, valve push rods, steering lever, mud-pan hangers, etc. Aluminum covers are fitted over the valve action. Lubricating system on the Knox car is absolutely non-splash. It is what is known as the DeDion circulating system, the oil being independently delivered to all bearings throughout the motor. Among the equipment features are a full electric lighting system and a motor-driven tire pump. Electric starting is optional at extra price. Jiffy curtains are fitted this year.

Lambert—Retains Friction Drive

Lambert model 99, which has been put on the market for 1913, incorporates the latest 40-horsepower Rutenber motor. The bore of this motor is 4.125 inches and the stroke, 5.25 inches. It is of the L-head type with the cylinders cast singly. This motor has the three-point suspension feature, Remy type R. D. ignition with the spark coil for the dual feature located underneath the hood. Two-inch valves for both the inlet and exhaust sides give interchangeability. The drive is taken through a cone clutch while the speed control is governed by the Lambert patented friction drive consisting of a composition disk operating against a specially surfaced wheel. The jackshaft is suspended on Gimbel bearings and the final drive is by Renolds silent chain, 2 inches in width and enclosed within a pressed housing. Full-elliptic rear springs and semi-elliptic front are used. The gear ratio on high is 3 to 1. The weight of the finished vehicle is 2,500 pounds. Beside this model two Buckeye models known as models 10 and 40 are made. These are similar to the larger model, but smaller. The bore and stroke of the model 99 is 4.25 by 5.25 inches, giving a stroke-bore ratio of 1.62. The stroke-bore ratio of model 99 is 1.23.

Lenox—Puts Out Six

A new six with a bore of 4 inches and a stroke of 5 inches will lead the Lenox line for the 1913 season. This new car is different from the old four-cylinder L-head motor in that it is of T-construction. The six-cylinder motor in tests at the Lenox factory developed 61.5 horsepower on the block. It is fitted to a chassis with 130-inch wheelbase, and has a three-speed gearset. Among the features of the design are a large leather-faced cone clutch and a double-jet carbureter. The Gray & Davis starting and lighting system is part of the electric equipment. The latter consists of a motor, generator and a 6-volt 90-ampere-hour storage battery. The starting motor has been added to the regular Gray & Davis lighting equipment, which remains otherwise the same in the new system. A cast aluminum cowl is fitted on all styles of body.

Little—Introduces Six

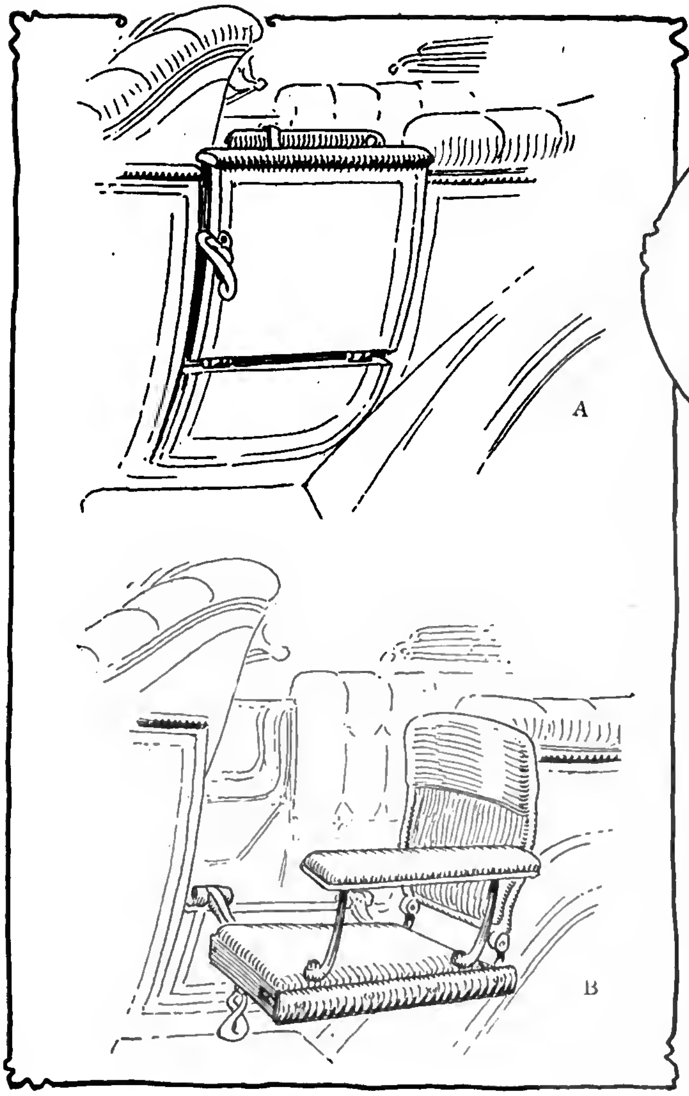
The most prominent feature of the Little line is the new six-cylinder car which has a wheelbase of 106 inches. The motor is of two block castings containing three cylinders each which measure 3 5-16 by 4 1-4 inches. It is of the L-head type. The valves are 1.375 inches in diameter. The motor is suspended at three points. Convex pistons; drop-forged crankshaft and camshaft with babbitt bearings; vacuum oil system; similar carbureter to that used in the Chevrolet; thermo-siphon circulatory system augmented by belt-driven fan are some of the structural details. The front axle is an I-beam section and the rear axle is semi-floating of special design. Brake drums, 12 inches in diameter, are used on the rear hubs. The wheels are 32 by 4 inches and the spring equipment the same as in the Chevrolet. The gasoline tank has a capacity of 18 gallons. Electric lighting is provided for by generator.

Locomobile—Adds a Six

Three models of Locomobile are now on the market for 1913. The newest of these is a little Six, rated at 38 horsepower. The big Six rated at 48 horsepower and the Four rated at 30 are continued. The principal changes to be noted are in the motor dimensions on the larger six-cylinder car. The stroke has been increased to 5.5 inches, necessitating changes in the connecting rods and cylinder lengths. An increase in horsepower has been affected by this change of motor dimensions, 82 horsepower having been developed at 1,800 revolutions per minute. Other changes which may be remarked are the increased valve sizes, changes in form, of the inlet and exhaust passages, and a new design of Locomobile carbureter. The latter differs from the former Locomobile product by its longer throat and the use of both hot air and hot water jackets. A larger magneto takes the place of the former type, while refinements in the oiling system of the 1913 cars consists of the shift of the oil pump drive from the exhaust to the inlet side of the motor. The oil-level pet-cock has been placed on the left side of the reservoir in the motor base, and a new type of oil lead has been designed to give an increase flow to the main bearings. Tires are now carried at the rear on brackets which are a unit with the frame of the car, and the running boards have been left clear to give a clean appearance. A motor tire pump forms part of the 1913 equipment. Electric starting and lighting systems are fitted to all models.

Lozier—Introduces Six

The Lozier light six, which has been introduced this season, is radically different in many respects from the other models produced by this company. Besides having a unit power plant and a motor in which the stroke-bore ratio is 1.52, the chassis involves other features which are new to Lozier practice. The wheelbase is 127.5 inches as compared with 130 inches on the other Lozier model. The cylinders are of the L-head type cast



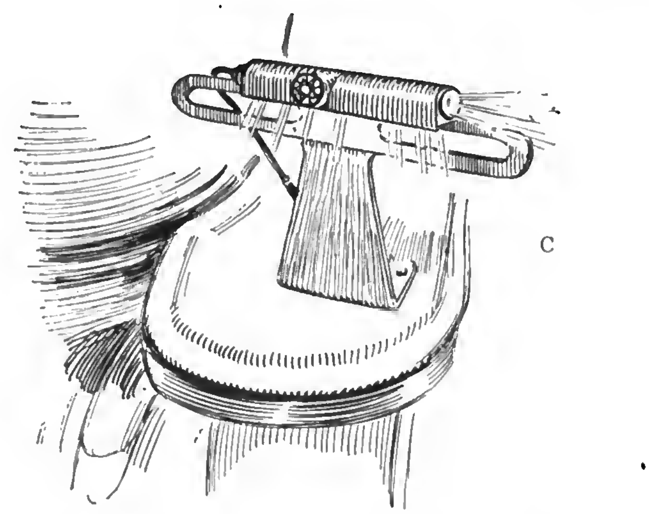
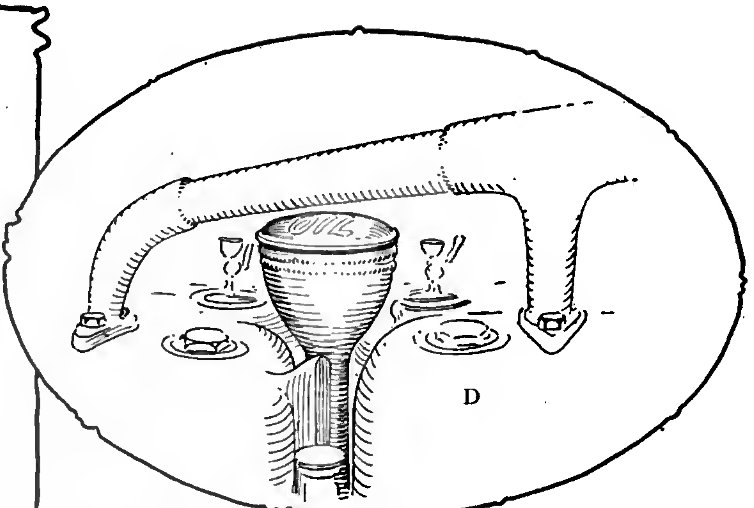


Fig. 12—A, Showing the Lozier door just lifted from its seating before it is swung to a horizontal plane to take the position of an extra seat

B, Showing seat of Lozier car in position after door has been folded down and arm rail lifted up

C, Rigid license plate holder which is furnished as part of the equipment of the Knox car of this year. It is riveted solidly to the mudguard, and is illuminated by electric light

D, Accessible oil filler hole between the cylinders of the Kissel-Kar



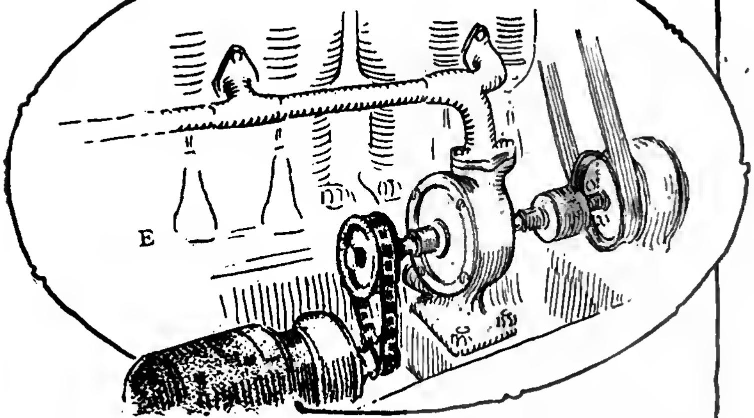
in blocks of three, while the large Lozier motor has T-head cylinders cast in pairs. A new design of intake manifold furnishing a separate connection to each cylinder is incorporated as are cover plates over the valve springs, cast-iron headed valves welded to carbon steel stems, rocker-arm valve lifters, plain bearing crankshafts, spiral timing gears, Bosch dual ignition, pressure gasoline feed, Gray & Davis starting and lighting, multiple-disk clutch with cork inserts on alternate disks, two sets of expanding brakes, and stream line bodies are incorporated. Of special note is the crankcase, the upper part of which is a large rectangle to which the cylinders are bolted and which extends out to the side frame members. This gives a shelf upon which the magneto and the lighting generator may be mounted. The larger Lozier, model 72, will be continued without change.

Marathon—Makes Bigger Motor

Three models of Marathon, designated Runner, Winner and Champion are on the market for 1913. Aside from the new names little difference will be discovered between these models and those which were upon the market last season, with the exception of an increased bore and stroke and the Runner, which was formerly known as the K-20. In all models, however, the axle shafts are incased in a one-piece steel housing, although the floating construction is only used in the two larger chassis, the smaller chassis having a semi-floating axle. The wheelbases have been lengthened in the Runner and Champion models. In the former from 96 to 104 and in the latter from 120 to 123. The Winner has a 116-inch wheelbase, same as in the model L-30 of the previous season. The tires are of the same size except in the case of the smallest model, where they have been increased from 32 by 3 inches to 32 by 4 inches. The springs have been lengthened in all three models to increase easy riding and give more comfort. Other changes in this respect have been the widening of the body and a greater length to give more leg room. In the two larger models the valves are inclosed by aluminum plates, one plate for each pair of cylinders, the castings being made in pairs. Roadster, touring and coupé bodies are furnished on the Runner and Winner, while roadster and touring bodies alone are fitted to the Champion.

Marmon—Uses Left Drive

A Marmon six and four are now on the market for 1913. The six is rated at 48-80 horsepower, and the four at 32-40. The bore of both models is 4.5 inches, and the stroke of the six is 6 inches, while the four-cylinder model has a stroke of 5 inches. Some of the features of construction on both models are force feed oiling through a hollow crankshaft, floating axles, two spark ignition, left steering and center control, cast aluminum bodies with sheet metal seat backs, electric starting and lighting, power tire pumps and combination clock speedometers. Marked differences in designs between the two models are only



seen in the clutch and in the wheelbase. In the four-cylinder model a cone clutch is used and in the six-cylinder model a dry plate multiple disk is fitted. The wheelbase on the four-cylinder model is 120 inches and on the six-cylinder model 145. A castor axle is now on the six.

Marion—Better Spring Material

Marion cars for 1913 consist of four models, two touring cars and two roadsters, and the only mechanical changes announced are small alterations and refinement. English steel in the springs increases resiliency; the throw of the brakes has been increased to give more effect to the retarding forces, and the steering wheel is of the grip type. The cars have been lowered about 1¾ inches; tool boxes are concealed between the running board and the frame, acting also as a dust shield. Decided refinements in body lines have been made, making use of straight flush sides and attractive curves. Cars are completely equipped. The models 36A, 37A and 38A have an acetylene self-starter and the model 48A a Westinghouse electric starter. The motors of the three 30-40-horsepower models are 4 x 5 inches in bore and stroke; the 48A, 4.125 x 5.5. The wheelbases are 112 inches and 120 inches respectively. Upholstery, fittings and small details have received careful attention and have been materially refined, but the mechanical changes over previous models are few.

Mason—Encloses Valves

Two chassis, one with a two-cylinder horizontal opposed motor and the other with a four-cylinder vertical characterize the Mason line for 1913. The double motor has a bore of 5 inches and a stroke of 5 inches. It is chain driven through a planetary gearset, with two forward and one reverse speed. The four-cylinder model has a bore of 4 inches and a stroke of 4.5 inches. The cylinders are cast en bloc with the valves all on the right side. The valve parts are inclosed. A multiple disk clutch, three-speed gearset and shaft drive are used. Both models are fully equipped.

Matheson—Only Sixes

The single-chassis creed has been adopted by the builders of the Matheson. The four-cylinder chassis of last year has been abandoned, while the silent six is continued in a series with past productions and without radical modifications in design. This model is known as Series C, being the third series of the original design of this car. No change has been made on the overhead valve arrangement, the multiple-disk clutch or the rear-axle gearset that are Matheson essentials. The center control and two-spark, high-tension dual ignition were last year's features to which have been added an electric starter and lighting system of Westinghouse manufacture and a full set of shock-absorbers as regular equipment. The chassis is the con-

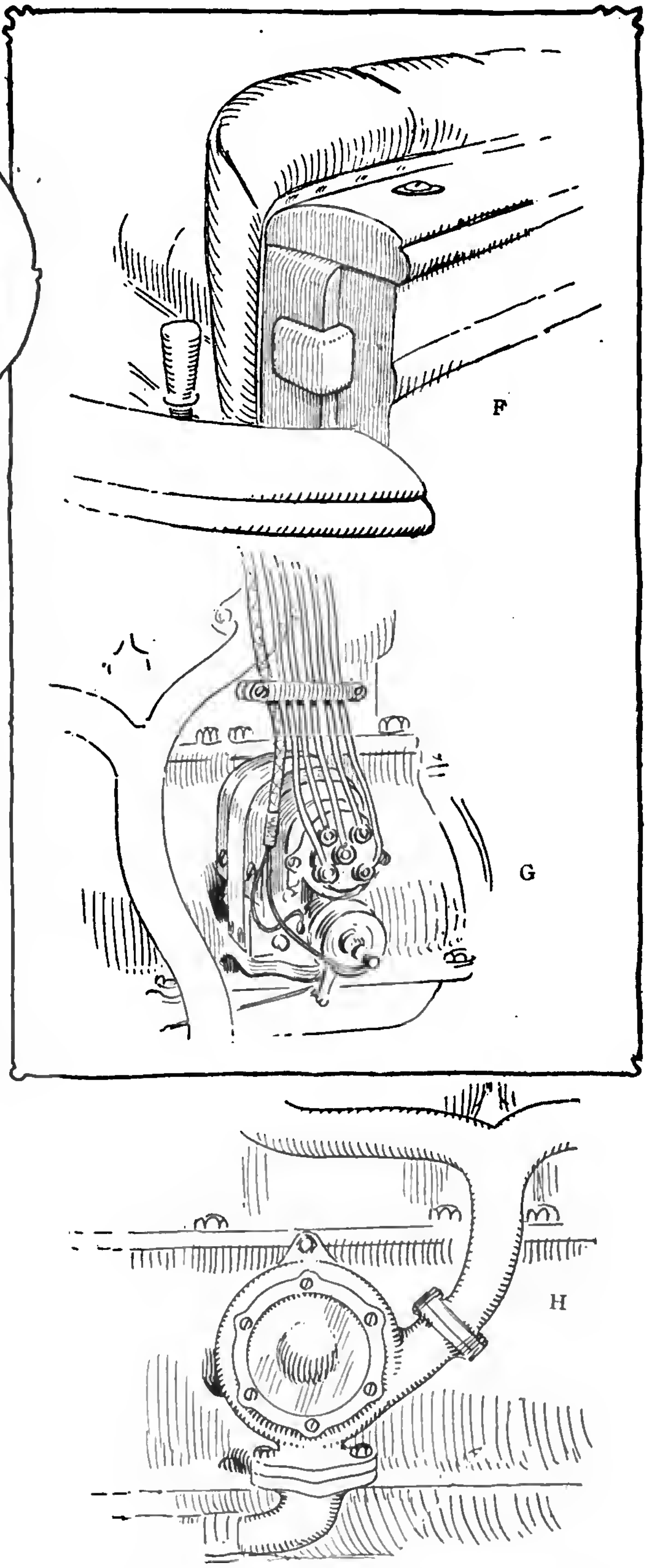


Fig. 13—E, Generator pump and fan drive arrangement on the side of the Lozier crankcase. Note fan casting fastened to crankcase arm

F, Rubber block inserted in door sill of Locomobile car to eliminate slamming noise

G, The magneto and water pump of the National car are driven by a horizontal shaft passing transversely through the crankcase. A bearing is provided on either side of the crankcase in the wall of the latter

H, This view shows the mounting of the water pump on the National car tinuation of the larger of the two sizes made last year, having the same wheelbase of 135 inches. Features in the body details are two sole leather suitcases, side-lockers inside and running-board webs, a new tire carrier, and refinements in the center control quadrant, including a horn bulb in the assembly.

Maxwell—Adopts Left Drive

The Maxwell models for 1913 will number as follows: Three are on a 40-horsepower chassis, one a 30-horsepower, and the other a 22-horsepower roadster. All these models are left drive and center control. The special, which won the Glidden in 1911, has been continued with modifications which will be noted. Instead of being known as the Special, this year's model is known as the 40. In addition to the 40 touring there is a 40 roadster which is an innovation for this season. It is of the touring roadster type, having ample facilities for carrying fuel and tires and is fitted with a waterproof luggage compartment in back of the seat. It can be reached by pulling forward a trap section in the upholstery on the seat back. The 22 roadster which is new this season and which replaces the two-cylinder Maxwell runabout which has been discontinued, is also a new model and is of the conventional small runabout type with the gasoline tank mounted in the rear. It incorporates left drive and center control; progressive gearset 93-inch wheelbase and 56-inch tread. The motor is of the T-head type with the cylinders cast in parts, and has a bore of 3.75 inches, and a stroke of 4 inches. The front axle is tubular and the rear axle semi-floating. The improvements in the model 40 outside of left drive, center control, selective gearset, self-starter, and 36-inch wheels are an increase in the wheelbase and clearance, two foredoors instead of one, spring suspension on underpan, frame lined with leather, and numerous motor improvements which may be noted as follows: Longer connecting-rods, lighter weight pistons with three rings instead of four, relief valves on the engine, larger scoops on the connecting-rod ends, copper inlet and exhaust pipe gaskets, new stuffingbox on the valve push rods, lower compression, new carbureter, new inlet manifold, fan bracket integral with the water discharge pipe, an increased water capacity, and a thermo-syphon cooling system. Throughout the chassis larger bearings have been fitted, notably in the clutch, gearset, steering connections and universal joints. In addition to having the steering wheel on the left and the gear lever in the center the changes which have been made in the control are an aluminum steering wheel, better shaped throttle and spark levers, a more accessible accelerator pedal and greatr breaking leverage. The body dimensions have been increased, the front seats lowered 1 inch and the rear 1.5 inches. In connection with the redesign and improved finish of the body several accessories were added. Among them are upholstery pockets in the tonneau, larger ventilators in the dash, improved hinges on the bonnet and a bulb horn concealed beneath the hood. Improvements in the Maxwell 30, which was last year's mascot, have been along the lines of better appearance. A front axle of dropped forged I-beam construction has been added, the frame lowered, the wheelbase lengthened, flatter spring used, and new design of fenders fitted. On all models the wiring is carried better this year than last.

McFarlan—Adopts Floating Axle

Although basic design in the McFarlan line has undergone little change, numerous minor refinements have been incorporated. Starting with the current season the McFarlan cars will not be made in yearly models, but will be designated in series. What has heretofore been known as the little six will be the series S; the big six will be series M and the new model which has just been added will be series T. The changes which have been incorporated in the line include the adoption of the floating rear axle on all models while heretofore the series M only was so equipped. The front axle has ben changed somewhat, also the steering connections now being behind and above the front axle, whereas formerly they were in front of the axle. All spring bushings are now bronze. The front springs are semi-elliptic, mounted under the frame and the rear springs are scroll elliptics with swivel seats. The most notable feature is an entirely new chassis incorporating a 4 by 6 block motor. Although the cylinder casting is a single unit, four main bearings are used on the crankshaft. The end bearings are 4.5 inches long, and the middle bearings 1.875 inches, the crankshaft is 2 inches in diameter. The motor is of the T-head type and has a fan in the flywheel as well as one directly behind the radiator. The valves are all enclosed giving the motor a compact and simple exterior appearance. With the exception of the motor, and a somewhat heavier clutch the series T chassis is identical with that of series S. The gearset is a unit with a rear axle, and the gasoline tank is mounted on the rear of the chassis giving a pressure feed of gasoline to the carbureter. A few minor changes have been made in the series S motor which are notably as follows: The valves are now enclosed; the motor is hung on three points instead of four; the water pump has been brought forward and the air pump for the starting system set behind it; the air pump is driven direct from the water pump shaft and not by offset gears and the dynamo takes the place vacated by the air pump being driven by silent chain. The series M, formerly the big six, remains unchanged, except for the addition of the electric lighting system, and the shifting of the tire carriers to the rear where all tires are carried in the 1913 models. The compressed air self-starting system, which was a feature of the McFarlan line last season has been continued. It is operated by a four-cylinder Kellogg pump storing air under 200 pounds pressure, and a single tank swung on the right frame member.

McIntyre—Only a Six

McIntyre cars now appear in a single six-cylinder chassis for 1913. This model is known as the 6-40 Limited and it sells at an unusually low price for a car of six cylinders. The motor is of the T-head type with the cylinders included in a single block. Cooling is by the thermo-syphon system, while ignition is dual battery and magneto. A gravity-fed Stromberg carbureter is used. A multiple-disk clutch and four-speed selective gearset is mounted in an extension of the crankcase in one unit, the only visible moving part of the power plant being the fan and road wheels. The rear axle is of the floating type. The wheelbase is 120 inches and the tires 35 by 4. Right-hand drive with center control by a single lever is used and starting is accomplished by an electric starting device. Equipment includes five demountable rims, mohair top and envelope, windshield, electric horn, speedometer, clock and dust cover for the car.

Mercer—Electric Starting

Although abandoning the annual model plan the Mercer company has brought out a new series incorporating four models known as G. H. J. and K. These are mounted on two chassis and are of the following types: Four-passenger touring, five-passenger touring raceabout and roadster. The changes which have been made over preceding series are as follows: The fitting of the Rushmore electric starting and lighting system, replacement of the Bosch D. R. 4 magneto by the Z. R. 4, the addition of a four-speed instead of a three-speed gearset on models J and K, and the substitution of direct drive on fourth speed instead of on third. In the fore-door bodies the control levers have been brought inside and on the model H the body has been widened somewhat. The fuel feed in all models is now controlled by a positively driven pump in place of the exhaust pressure formerly used. The horsepower ratings on model G and H, according to the S. A. E. formula are 32.4 and on Models J and K, 30.6. The wheelbase of the first two models is 118 inches and of the latter two, 108.

Metz—Adds Touring Car

The Metz 22 is continued without change for the 1913 season except that a four-passenger touring body will be fitted to the 22 chassis. The motor is a four-cylinder en bloc casting having a bore of 3 3-4 inches and a stroke of 4 inches. It is cooled by the thermo-syphon system in conjunction with a vertical tube radiator. It has a three-bearing crankshaft, is oiled by splash, has friction drive, left steer and center control. The friction numbers have been improved so that when a renewal of the surface is necessary a two-piece ring doweled together to form a complete ring can be put in place quickly and easily.

Michigan—Adopts Left Drive

Three Michigan models are on the market for 1913. Prominent features of these models are left drive, center control, electric lighting and four-speed gearsets. The motor has four cylinders cast en bloc and is of the L-head type, the valve being located on the right side. Mushroom push-rods operate the valves. The steering post is adjustable, the rake being made to suit the taste of any driver by a simple adjustment. The clutch and brake pedals are also adjustable, thereby making the whole control system to suit the driver's convenience. Either electric or gas starter is furnished at the option of the purchaser.

Midland—Produces a Six

Complying with the popular clamor for medium-priced sixes, the Midland Motor Company has produced a six in addition to the four, which it is continuing from last season. The new six has a T-head motor, 4 by 5 inches with a 135.5-inch wheelbase, 36 by 4.5-inch tires on demountable rims, left-hand drive with control levers in the center, a floating rear axle and the Gray & Davis electric lighting and starting system. The four-cylinder model has cylinders 4.5 by 5.25 instead of 4.5 by 5 as last year's motors measured, and with a 122-inch wheelbase, instead of wheelbases of 115 and 118 as on the former three models. Left-hand drive and center control are also new features. The rear axle is floating and the tires are 35 by 4.5 inches fitted on demountable rims, as in the former models. The Gray & Davis electric system is fitted on this model also, and both models are sold with full equipment. The bodies have been altered to fit the new chassis dimensions and in such redesigning has been brought up to date, and their lines greatly refined and improved.

Mitchell—Underslung Springs

Three types of cars are included in the Mitchell line for 1913, all of which differ from last year's construction in that they have double-dropped frames, with rear springs 7-8 elliptic, underslung, equipped with left-hand steering, center control, and have "T"-head motors of longer stroke in place of the L-head engine used in 1912. The motors of the four and bix six models are cast in pairs. The size is 4.25 by 7 inches. The little six cylinders are also east in pairs, but the displacement is smaller than the foregoing, cylinder measuring 4 by 6 inches. Lubrication is by combination of the circulating and splash systems operated in connection with a gear-driven rotary pump. The carbureter is the latest type Rayfield. Bosch duplex ignition is installed in all models. Cooling, transmission and axles are retained as in 1912, but the driving clutches in the hubs have been eliminated. The wheels are larger, the two smaller models taking tires 36 by 4 inches and the big six being equipped with tires 36 by 4.5 inches. Complete accessory equipment is included in the list prices. This embraces electric starter and lighting system as well as the usual liberal collection of sundries. The wheelbases of the three chassis types are respectively 120, 132 and 144 inches.

Moline—Increases Bore

Increased bore of the cylinders, a greater wheelbase and more drop to the frame are the leading features of the 1913 Moline cars as compared to those of the previous season. The increase in the bore of the cylinders decreases the stroke-bore ratio materially, and this car, which had the greatest ratio in the last season, now drops back among a large number of others possessing the same ratio. The bore of 4 inches and stroke of 6 inches gave a ratio of 1.5. The bore is now 4.125 inches and the stroke remains the same, reducing the ratio to 1.45. Briefly, the motors have four cylinders cast in pairs with the valves on the left side, thermo-syphon cooling, Bosch ignition, Ward Leonard lighting and starting dynamo, and force-feed and splash oiling system. The clutch is a leather cone with cork inserts and has a diameter of 16 inches. The three-speed gearset is carried on roller bearings. A change has been made in the gasoline system, two tanks instead of one being used. The first is located on the dash and has a capacity of 8 gallons. The other is under the seats and has a 12-gallon capacity. Right drive and control are maintained this year.

Moon—Brings Out a Six

Following the undoubted trend of the new season the Moon company has brought out its first six-cylinder model. Electric starting and lighting equipment will also be features for this season, as will the popular left steering and center control. Mechanical changes are few, even the six-cylinder car being nothing but a large edition of the smaller four-cylinder model, having the same bore of 4 inches and a stroke of 5.75 inches. Cylinders are cast in pairs and another pair has simply been added along with the necessary changes in making the six-cylinder model. The other four-cylinder model is rated at 48 horsepower and has a bore of 4.5 inches and a stroke of 5 inches. The latest Stromberg carbureter is used for this season on the Moon cars and for lighting the Wagner system has been employed. The clutch used on the Moon cars is of the multiple-disk type. The gearsets have three forward speeds and are housed within a solid aluminum non-resonant casing. Four-splined shafts are used in the gearset, while a copper-asbestos gasket placed between the cover and the box itself maintains an oil-tight condition.

Nance—Introduces a Six

The Touraine six, a new model turned out by the Nance Motor Company, a newcomer, is using a 4 by 5.5-inch motor, with the cylinders cast in blocks of three. The motors test to 61 horsepower at 2,220 revolutions per minute and are of the T-head type. The self-contained circulating system takes care of the lubrication, the oil supply being carried in the base. A multiple disk clutch with alternate disks faced with Raybestos transmits the power to a three-speed gearset. A straight line shaft drive is carried on crucible steel cross members. Axle is floating; brakes are located on rear wheels and act on 16.625 by .625-inch brake drums; stearing gear with worm and gear type and wheels are optional wood or wire. Wheelbase on the seven-passenger touring model is 134 inches. On the five-passenger Phaeton it is 124 inches and on the special roadster, 112 inches. A double jet carbureter which the makers claim delivers a mileage of 10 to 16 to the gallon of gasoline, is employed on all cars. The lighting is by the Gray and Davis electric dynamo system.

National—Electric Starting

The latest National "40" Series is known as the Improved Series V. Among the newest features of these cars, five of which are called regular models, are the Gray and Davis electric starter and lighting system. These models also include left-side drive; center control, long-stroke motor, 4.875 by 6 inches; tire pump integral part of the motor; Bosch dual double magneto; electric horn; Truffault-Hartford shock absorbers on rear; 128-inch wheelbase; adequate baggage-carrying compartment, concealed but easily accessible; adjustable ventilating and rain vision windshield; multiple jet carbureter; speedometer; tire carrier in rear; gasoline pressure feed tank with gauge in rear; plain, continuous inclosed metal guards; tool chest concealed by splasher and an extra Firestone demountable rim. The tire pump is capable of fully inflating a tire in 3 minutes.

Norwalk—Sixes Only

Six-cylinder cars will be specialized in the Norwalk 1913 line. These are made in two chassis known as Model A and Model B. The Model A underslung Six incorporates a T-head motor of

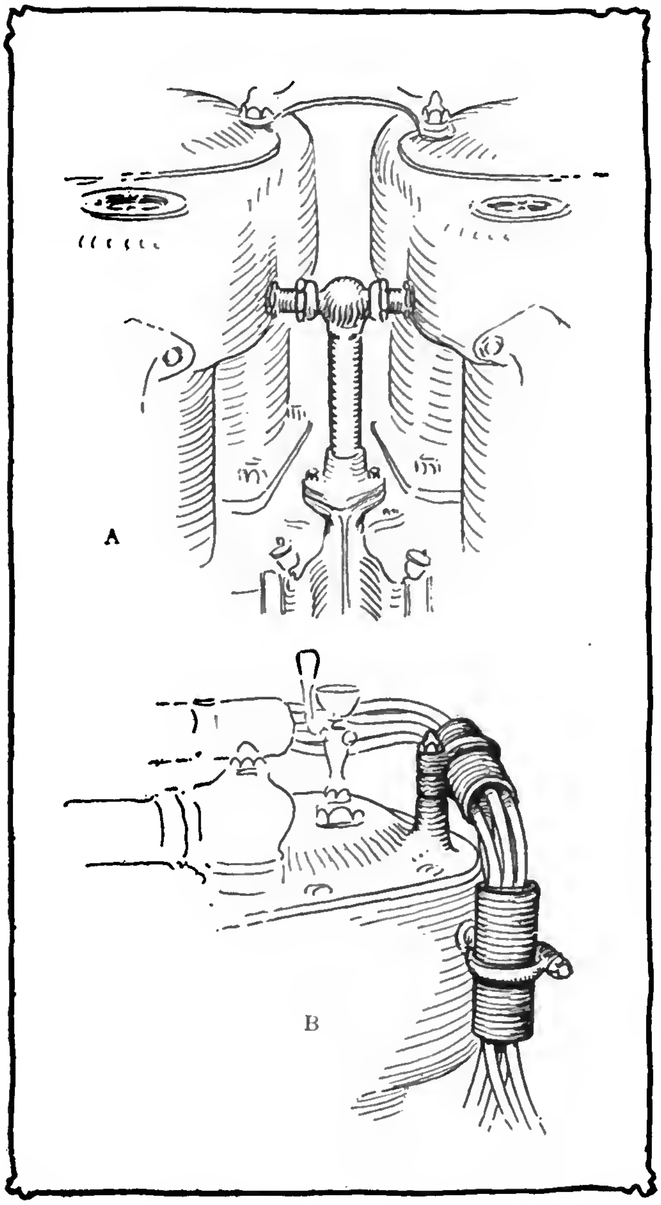


Fig. 14—A, Oldsmobile water intake manifold; B, National wire holder

4-inch bore and 5-inch stroke. The cylinders are cast three en bloc with integral water jackets. The valves are 2.125 inches in diameter and the valve action is covered by removable plates which are rendered rust-proof. A positively circulated splash system is used for lubrication. Among the fittings for the motor are the Carter double-jet six-cylinder carbureter, and the Gray and Davis electric starting device assembled integrally with the motor. The clutch is multiple disk having 30 saw-blade steel disks, each 8.125 inches in diameter and operated by 800-pound engaging spring. Three-point suspension of the motor gearset and clutch is used. Model B underslung Six has a motor of 4.25 inches bore and 5.5 inches stroke. It is also the T-head type and the cylinders cast in three. In general design it is similar to Model A, the valves being inclosed and the same oiling system. The electric starting and lighting system used in conjunction with this model is a unit with the flywheel instead of the Gray & Davis independent unit schemes employed on the other models.

Nyberg—Adds New Four

Four models of Nyberg car comprise the 1913 line. There were three last year, and these are continued under the name of the Four-40, Six-45 and Six-60. To these has been added the smallest car, which is known as the Four-37. The same general construction is employed throughout the four models, and they differ only in sizes of the various parts. On the three larger models two different wheelbases are employed, the small touring cars having 128-inch wheelbase and the large touring car 138 inches. All models have a unit power plant with three-point suspension, inclosed flywheel, disk clutch, rear spring bolted to rear cross-member and semi-elliptic front springs. The Four-37 model incorporated the new long-stroke Rutenber motor, having a bore of 3.75 inches and a stroke of 5.25 inches. Of chief interest in this motor is the fact that the magneto and water pump are located in the front instead of on the side and are driven by the same half-time gear that drives the camshaft. Another feature of this motor is that it is a monobloc casting. Every part of the motor is inclosed. The crankcase is of ribbed aluminum alloy. Ignition is supplied by Remy magneto and a Schebler or Stromberg carbureter forms a part of the equipment also. The two six-cylinder models are listed with full equipment, including electric starter, lights and horn, also top, windshield, speedometer and five demountable rims. Left-hand steering and center control are standard.

Oakland—Adds a Six

Another six to be introduced for the season of 1913 will be that manufactured by the Oakland Motor Car Company. The three four-cylinder types known as models 35, 40 and 42, comprise a group of four-cylinder models. The first of these has a 3.5 by 5-inch motor, while the other two are mounted on the same chassis equipped with a 4.125 by 4.75-inch motor. The cylinder dimensions on the latter are the same as those on the Six-60, which has just been introduced. Having one design in this way permits the concern to standardize a great many parts and thus cut down the cost of manufacture. The wheelbases of all four models are different, being 112, 114, 116 and 130 in the order named above. The difference in construction between the Six-60 and the Four-42 lies in the fact that the motor on the former has its magneto, water pump and camshaft driven by silent Coventry chain, whereas in the four-cylinder motor they are driven by gears. Models 35 and 40 differ from the other two in that their axles are semi-floating instead of floating; they have a single drop frame instead of a double drop; their radiators are flat and not curved or V-shaped; they carry 15-gallon gasoline tanks under the front seats, and feed the fuel by gravity in place of pressure as used on the other models, where the tanks are flung in the rear. A feature of the Oakland line for the coming season is the fact that the running board does not run the entire length of the car on the 42 or Six-60. It is broken in the center and forms two steps, one for the foredoor and the other for the rear. Deaco lighting and ignition will also be features of the 1913 car. Twelve different body types allow a wide range of selection.

Ohio—Makes a Six

Two fours and one six pleasure chassis are put out by the Ohio Company for the 1913 season. On these will be mounted all styles of body. The six and fours are made on the same general styles, the dimensions, however, being different. Six-cylinder car has a wheelbase of 138 inches and a motor of 4.5 x 6 inches. A seven-bearing crankshaft is used on this motor. Left steer and center control are also features. The equipment of the car is very complete, including electric light generator, electric lights, semaphore tail lights, storage battery, trouble finder, 37 x 4-inch demountable rims and customary tool equipment. Models 19, 20, 21, 22 and 23 are mounted on a four-cylinder chassis incorporating a motor rated at 47 horsepower of the four-cylinder type with T-head cylinders cast in pairs. The features of this model are the 2.125-inch valves, the helical timing gears, hot-water-jacketed carbureter and full equipment. The other four-cylinder chassis upon which are mounted models 13, 14, 15 and 16 also includes a unit power plant with three-point suspension. The motor has a 4.25-inch bore and a 4.75-inch stroke; 2.125-inch valves are also used in this motor. The general design of the motor is the same as that mentioned in the four-cylinder motor above.

Oldsmobile—New Light Six

A new light six Oldsmobile has been introduced for 1913. It incorporates a 40 to 50-horsepower motor, electric starting and lighting, three-point suspension, vanadium steel floating axle, 135-inch wheelbase, unit power plant, and a 30-gallon gasoline tank mounted on rear, a one-piece adjustable glass front and full equipment including a motor-driven tire pump. In addition to this car the four-cylinder Defender will be the only other model to be made for the coming season. This has a 4 by 6 motor and is practically the same as for 1912. The bore of the New Six is 4.125 inches and the stroke 4.75 inches. The cylinders are cast in pairs and are given a gray enamel finish.

Only—Now Has Four Cylinders

The Only car which has attracted considerable attention owing to its novel features of design will be continued with practically no changes for the 1913 season. The original car was a single cylinder model but within the last year the motor has been changed to the four-cylinder type. The bore is 4.25 inches and the stroke 7.875 inches. The valves have a head diameter of 2.5 inches and are actuated by roller followers on the cam. The car is guaranteed to operate at 30 miles on one gallon of gasoline and is also guaranteed to attain a speed of 75 miles an hour. The carbureter is a special design having three auxiliary gas and air intakes, the throttle actuating air, gas and gasoline passages at once. Thermo-syphon cooling is used in conjunction with a special design of radiator. The center of gravity of the car is in the same horizontal plane as the wheel hubs. The wheelbase is 112 inches and the tread 56 inches.

Overland—Bigger Wheels

Two Overland models are on the market for 1913. They are known as models 69 and 71 and replace the 1912 models 59 and 61. Although still retaining the principal features of Overland construction, a number of changes have been made in both these models. Model 69, the cheaper of the two, is a four-cylinder L-head type with its cylinders cast separately. The bore is 4 inches and the stroke 4.5 inches. Thermo-syphon cooling, combined splash and force-feed oiling, Remy dual ignition and Schebler carbureter take care of the functioning of the motor. Some of the changes made in this model are oil-tight guides around the valve tappets, oil grooves in the pistons, flanged in place of threaded intake manifold, new type of rear axle which is called by the Overland company a three-quarter floating, brakes increased in diameter to 13 inches, modified brake equalizing device which involves the use of ball-and-socket joints in place of ordinary linkage, the wheelbase has been increased to 110 inches, 4 inches more than last year, making an extreme length for the touring car of 168 inches and for the roadster 151 inches. The design of the model 71 chassis is practically the same as model 69. The motor is larger, having a bore of 4.375 inches and a stroke of 4.5 inches. It is rated at 32.6 horsepower. The differences between this car and the model 69 are its larger motor, and a full set of electric lights throughout, the oiling is all by splash, the three-speed gearset is mounted on the rear axle in the same manner as in the model just described, the wheels are 34 by 4 inches in place of 32 by 3.5 inches as on the model 69, the axle is floating, tool boxes are fitted and on both models, with the exception of coupé types, Presto starters form part of the equipment.

Paige—Adopts Left Drive

The Paige 36 is a new feature of the line of this company for 1913. It involves left drive, electric starting and lighting, silent-chain drive for camshaft, pump and generator and en bloc motor, which is a unit power plant, and other features of a modern nature. The Paige 25, which was on the market last year, has been continued with no changes in construction, a little more expensive equipment being added. The 36, which is now the leader, has a bore of 4 inches and a stroke of 5 inches with the entire motor, clutch and gearset in one unit. The aluminum crankcase is continued back and includes the two other members of the plant. The Gray & Davis system of lighting and starting and Bosch magneto for ignition complete the electric equipment. Both gas and spark control are mounted on stationary quadrants above the steering wheel, while the dash regulator for the carbureter is also supplied. Gasoline feed is by gravity, the tank being installed beneath the shroud and the filler cap being located just forward of the windshield. Nothing is carried on the running board, the tires being mounted on solid brackets to the rear of the car. One auxiliary dash or cowl board carries all the dash equipment, making the switches convenient to the operator. The clutch is multiple-disk with cork inserts, the rear axle is of the floating type, five demountable rims are furnished with the car and license brackets are a part of the equipment.

Packard—A New Six

Of chief interest in the Packard line for 1913 is the little six car, which has just been introduced. It is known as model 38 and incorporates a number of features not to be found in any of the other Packard models. Chief among these are the adoption of the left drive; left control; Delco starting, lighting and ignition; steering column control board for lighting, starting, ignition, carbureter and electric horn. The motor differs from the larger Packard six in that it involves L-head cylinders cast in pairs. The larger six has a T-head motor with cylinders cast in pairs. On the new model the valves are all inclosed by removable cover plates. The valves are on the left side of the motor and the carbureter on the other in the model 38, giving rise to a new shape of manifold for the Packard. This runs between each two blocks of cylinders to the valve side of the motor. According to block tests the rated horsepower of 38, according to the S. A. E. formula, is attained at 800 revolutions

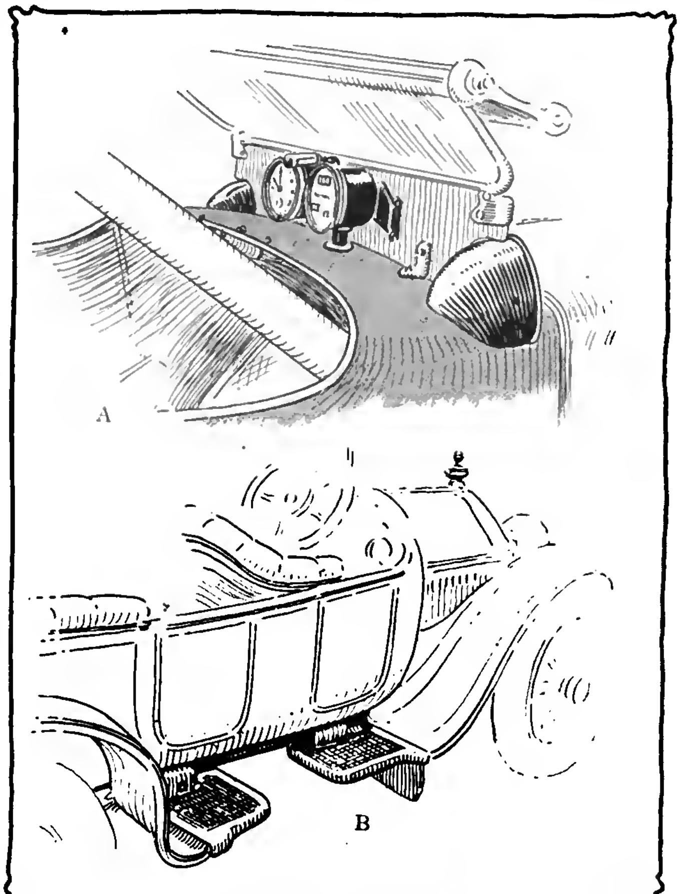


Fig. 15—A, National speedometer mounting above cowl; B, Oakland non-continuous side steps

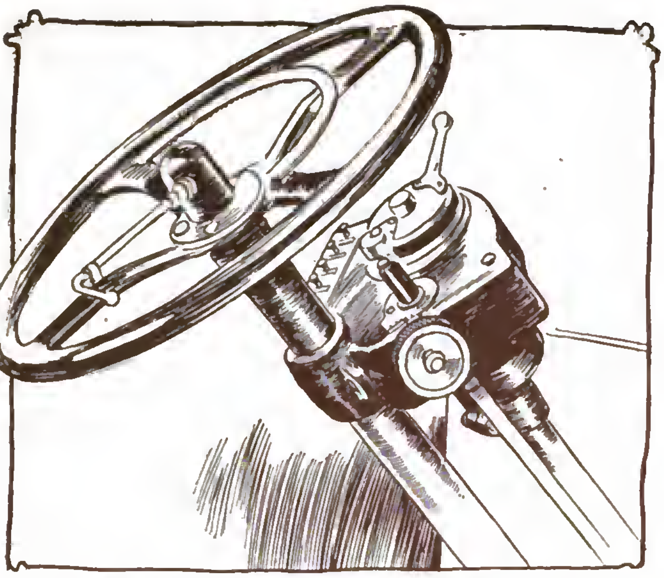


Fig. 16—Packard electric control board on steering post

per minute. The bore of the little six is 4 inches and the stroke 5.5 inches. Other features of interest in this model are the use of exterior brake adjustments, grease cups, the gearset and differential which can be removed as a unit in case of desiring to make any repairs, an auxiliary oiling system which comes into play when the throttle has been opened a distance equal to that necessary to cause the car to go 30 miles an hour on level ground. This is interconnected with the throttle.

Palmer-Singer—A New Six

For 1913 the Palmer and Singer Manufacturing Company is putting on the market a six-cylinder, 60-horsepower model and a six-cylinder, 45-horsepower model. Both of these will be fitted with a two and five-passenger body at the purchaser's option. The Six-60 remains unchanged for 1913. The changes on the Six-40 or Brighton model are the fitting of 36-inch wheels in place of the 34-inch, the floating axle with radius rods connecting the frame and very slight body refinements. The big six has its cylinders cast in pairs and is of the T-head type. A four-speed gearset and multiple disk clutch are also features of this model. The Brighton six has its cylinders cast in triplets, is of the T-head type with 4 by 5-inch cylinders, and uses a three-speed gearset and a multiple disk clutch. The wheelbase on this model is 127 inches, and on the Brighton 138 inches. Electric lighting and air starting and tire pumping outfits are included in the equipment of both models.

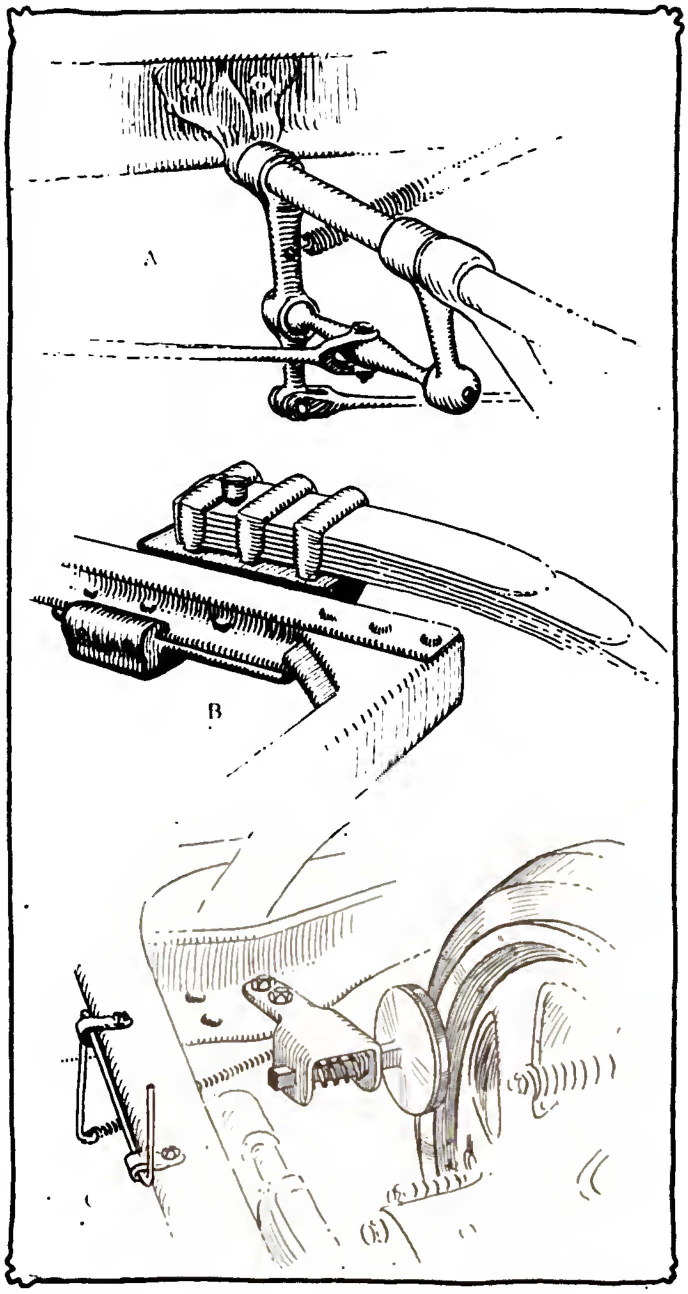


Fig. 17—A, Overland brake equalizer; B, Overland triple spring clips; C, Overland clutch brake

Paterson—Unit Plant

Four models comprising two chassis constitute the 1913 line of the W. A. Paterson Company, Flint, Mich. On the smaller chassis are built models 43, 43-A and 41, identical except in equipment. On the larger chassis is built model 47. The chassis of model 43 has a motor of four cylinders, 4.13 by 4.75 inches, cast in pairs with valves on the left side. Their mechanisms are fully inclosed and the motor, flywheel, clutch and gearset are assembled as a unit. The clutch is of the cone type, and the gearset provides three speeds forward and one reverse. An electric lighting and starting device is installed and demountable rims. The rear axle is of the floating type, the wheelbase is 116 inches and the tires are 34 by 4 inches. Type 47 has a motor of 4.5 by 5.25 inches and a wheelbase of 122 inches, with 36 by 4-inch tires. The smaller models are all provided with five-passenger bodies, while the larger carries seven pasengers.

Pathfinder—Electric Starting

Instead of four models the Pathfinder line for 1913 consists of six, all mounted on one chassis. No radical changes have been made in the chassis except those that would be entailed by the installation of the Gray and Davis electric starting system. The motor is the latest Continental type of L-head design with cylinders cast en bloc. The bore is 4.125 inches, and the stroke 5.25. The motor develops 42 horsepower at 1,330 revolutions per minute. Lubrication is taken care of by two plunger pumps, one delivering a stream of oil to the gears, and the other to the main bearings in the crankcase. Thermo-syphon cooling is used; a cone clutch; three speed gearsets; irreversible steering and chariot type wheels.

Peerless—Refines Motor

Pioneers in 1913 announcements, the Peerless Company produces for the new year five models whose features differ from former productions only in refined detail, as yearly models are contrary to the manufacturing policy of this company. The Bosch double-dual ignition system tried out in the 1912 cars has been discarded in favor of the simple dual system for reasons in simplicity. The piston throttle valve formerly used has been abandoned in favor of the damper type. The Gray & Davis lighting generator is now driven from the fan shaft instead of from the pump shaft, and operates at higher speed. A unique arrangement is provided to prevent loss of oil through leaving the oil drains in the crankcase open. This consists of a lever linkage which makes it impossible to close down the hood with the oil petcocks open. A small force pump on the dash is provided to prime the motor by drawing gasoline from the float-chamber and spraying it into the valve chambers. The models are designated 38, 48, 60, all sixes, and 24 and 40, fours. The Gray & Davis lighting and starting system is regular equipment on all models.

Pierce-Arrow—All Sixes

While the Pierce-Arrow line is continued with three six-cylinder models as has been the policy of the company for years since it dropped four-cylinder constructions, all three models have undergone a thorough housecleaning which places them

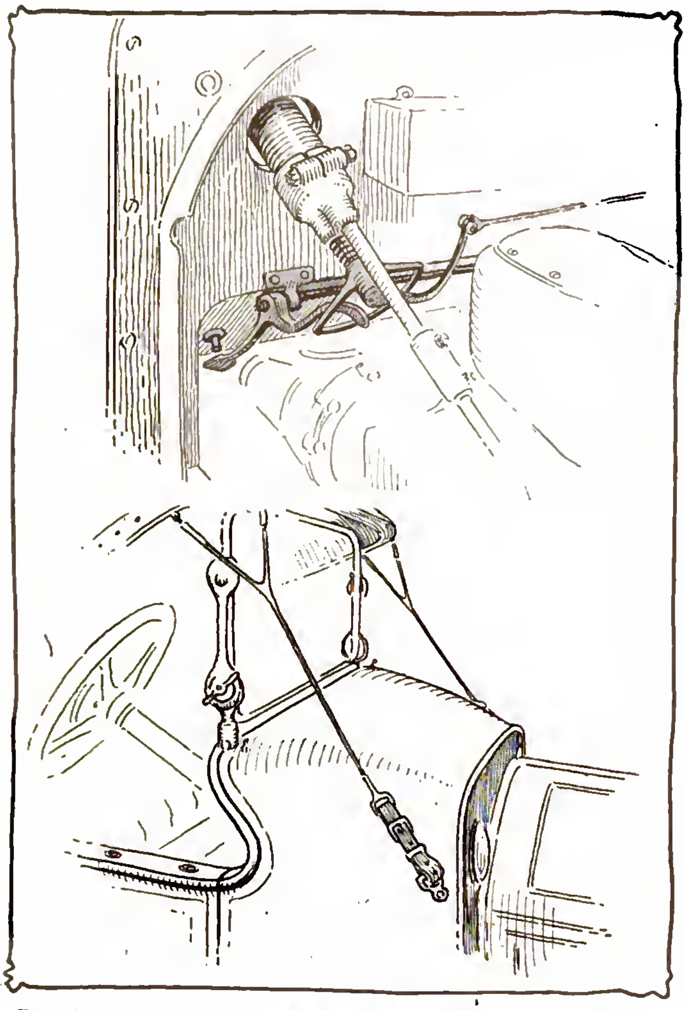


Fig. 18—A, Paige throttle and spark cam control; B, Oakland top strap attachment

much in advance of other makes in not a few engineering details. While generally classed as conservative this company has also been a pioneer, and when changes were deemed improvements, there never was any hesitation in making them, irrespective of other makers. This year shows much improvement and some pioneering. Only one model has a larger motor, namely the 36, which has been changed to 38, its stroke now being 5.5 inches instead of 5.125 inches. It has larger valves and more power, hence the increase in its rating. Now for the general improvements that agree in all models. Gravity motor oiling is superseded by direct pressure feed up to 20 pounds to seven crankshaft bearings and gears, and thence to cranks and wrist-pins. The old gravity oil tank above the cylinder is gone and the motor looks much cleaner. It is still a non-splash system. A compressed air starter is fitted. The 200 pounds air pressure is created by a four-cylinder pump mounted on the front end of the gearbox and driven from the gearset countershaft. It delivers to a reservoir on the chassis from which the motor draws. In addition to this there is the usual air piping and air distributer with dash control. The gasoline primer on the dash connected with a nozzle in the manifold to facilitate starting, is continued and now all models are fitted with compression releases. The carbureter has been overhauled. It is a two-jet design; the auxiliary nozzle located in the juncture of the auxiliary air passage with the mixing chamher does not come into operation until speeds of 800 or over are reached and the auxiliary air valve has opened. The two nozzles give better motor performances on low and high speeds. The needle valve in the main nozzle is improved by a protection, which prevents the tapered end of the valve being injured when screwed up to finer adjustments. Leather disk couplings now are used in the magneto and water-pump shafts. These are quiet. Leaving the motor there are several other improvements. The German bronze facing on the clutch cone has been dropped and leather substituted, it being lighter and thereby facilitating gear-shifting. Another clutch improvement is that the clutch rocker shaft is shorter than formerly and carried on two brackets from the motor rear support instead of the frame side members. Electric lights are standard, the motor carrying a Westinghouse generator.

Pilot—A New Six

In addition to the 40 there is a Pilot 50 on the market for this year and also following the general trend a six-cylinder, 60-horsepower model. All three models have T-head, Teetor motors. Both four-cylinder models have a bore of 4 1-2 inches, the strokes being 5 inches for the model 40, and 6 inches for the model 50. The Six-60 has a bore of 4 inches and a stroke of 6 inches. All three models are fitted with floating axles, Brown-Lipe differentials, semi-elliptic, front and rear springs, cone clutches. Electric starting and lighting is also a feature with the Pilot line this season.

Pope-Hartford—New Four

Electric lighting and starting and one new model have been added to the Pope-Hartford line for 1913, making a total of three models on the market for 1913. They are known as the 31, 33, and 29, and are rated at 40, 50 and 60 horsepower respectively. The new model 31, rated at 40 horsepower, is made in five body styles, a touring car, phaeton, roadster, limousine and coupé. It embodies a four-cylinder motor cast in pairs having a

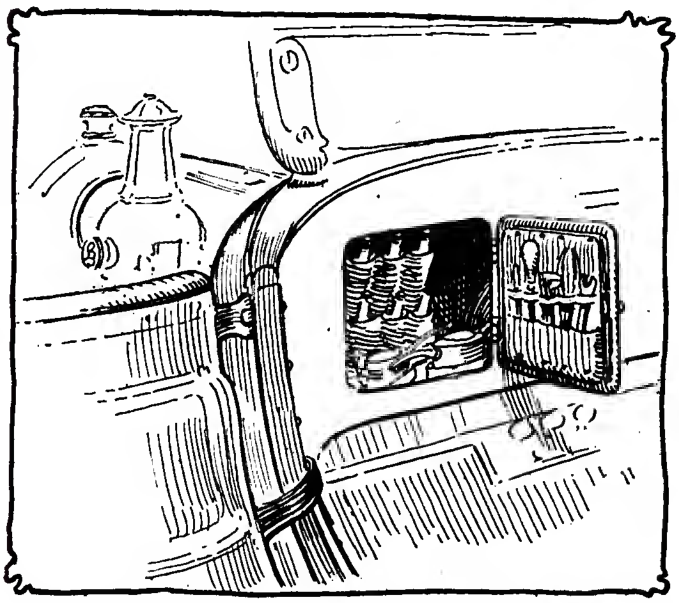
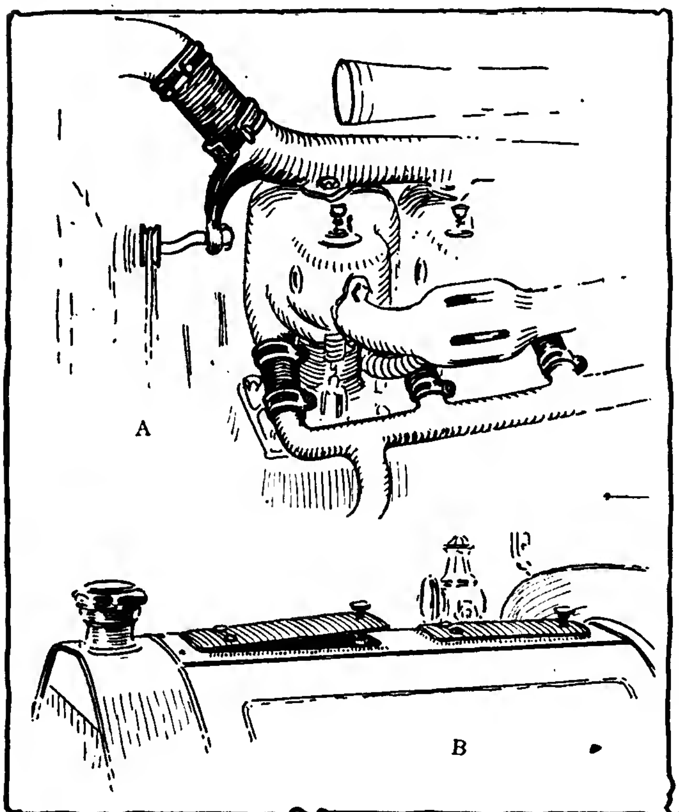


Fig. 19—Pierce tool boxes mounted in dash on either side

bore of 4.3125 inches, and a stroke of 5.125 inches. The Pope-Hartford carbureter which has been used in connection with Pope models in the past is fitted to this new model. A planetic radiator of distinct Pope-Hartford design is a feature of the cooling system while the ignition is taken care of by Bosch dual system. A leather-faced cone clutch with cork inserts transmits the power to a four-speed gearset having its direct drive on fourth and composed of chrome nickel steel gears, and shafts mounted on Timken roller bearings. The worm-and-gear steering is used and another feature of the control is the double brakes acting on drums of 15.5 inches diameter with 2.5-inch faces located on the rear wheel. Thirty-six by four and one-half wheels running on Timken roller bearings are used all around and are fitted with Firestone demountable rims. A metal body with mahogany dash hooded and provided with a panel in front of the forward seat is used on this car. The tool box is connected rigidly to the body of the car at the rear and is composed of pressed steel. The gasoline tank is removable and can be removed without removing the body, and has a capacity of 18 gallons. Gray and Davis starting has been fitted to this model. The big four-cylinder model rated at 50 horsepower, having a bore of 4.75 inches and a stroke of 5.5 inches, has been continued and numerous improvements and refinements incorporated. Among these are the addition of the Gray & Davis electric lighting and starting systems, a more complete equipment including adjustable windshield, cape top and curtains, trunk rack, demountable rims, etc. The Pope-Hartford model 29 six-cylinder rated at 60 horsepower is similarly equipped and is now in its third year. Among the features of the six-cylinder model are the double drop frame, its four-speed roller bearing transmission, full floating roller bearing rear axle.



Premier—Only Makes Sixes

Starting with this year the Premier company has abandoned the manufacture of four-cylinder models and has concentrated its attention on two sizes. The big six car is practically the same as that marketed as the model M six of 1912. It has the 4.5 by 5.25-inch motor cast in pairs. The little six is a new model but differs only in the size of its motor and in chassis dimensions from the big six. In the latter the only change of importance from the 1912 style construction is the use of a universal joint in place of the ball joint formerly used in the steering-rod connection. In general, it may be said that Premier construction embodies a T-head motor with a movable disk clutch as a unit working through a three-speed sliding gearset to bevel-gear rear axle. The motor of the little six, with a bore of 4 inches and a stroke of 5 inches, has its cylinders, unlike the big six, cast in threes. As is customary with Premier practice, the upper water-jacket is a light, removable aluminum plate. The valves are inclosed by aluminum side plates, which are readily removable, and are operated by push-rods having rollers 1 inch in diameter. The cooling system is so arranged that should the pump become disabled a natural thermo-syphon action would be set up and the danger minimized. Left drive and center control are features of the 1913 Premier, as are also the spare tire carrier on the rear and the gasoline filler pipe between the two front seats, which may be reached by lifting the seat arm.

Pullman—Drops One Model

Instead of four models the Pullman company has placed three on the market for the coming season. The models made this year are known as the 4-36, 4-44 and 6-66. The first number in each case refers to the number of cylinders, while the second refers to the rated horsepower. Last year the models were known as the 4-30, 4-40, 4-50 and 6-60. The 4-50 has been dropped and the other three continued with modifications. The principle changes lie along the lines of improvement in manufacture, the selection of better material and working to closer limits. For all three models the following changes will be noted: Larger radiators, lighter wristpins, dash carbureter primer, larger steering wheel and longer springs, both front and rear. Besides

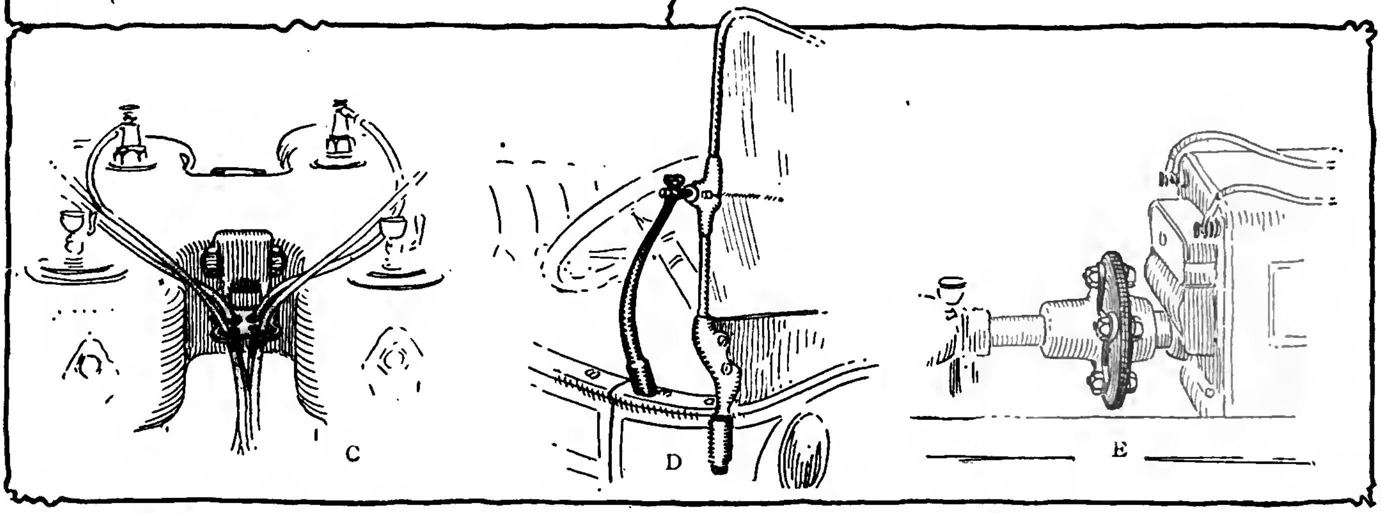


Fig. 20—A, Maxwell rubber water manifold connections; B, Pierce hood cover plates; C, Pullman wire clip; D, Peerless windshield bracket; E, Pierce leather-disk magneto drive coupling

these there are changes which have only been made on the 4-44 and 6-66. These include a new and stiffer crankcase bottom pan, an extra bearing on the camshaft, a dash oil control, a flywheel 2 inches larger in diameter, and extra bearing of the shifter dog of the gearset, an electric lighting generator and, on the 6-66 only, embossed yokes on the rear wheels. Careful manufacture throughout the entire chassis is shown by the use of nickel-steel bolts, the cam contours are the same for all models and grinding work in this field is standardized. Bosch dual ignition is used on all models. An Ever-Ready starter is fitted to the larger models, while a feature of the equipment is an electric vulcanizer.

Rambler—Electric Starting

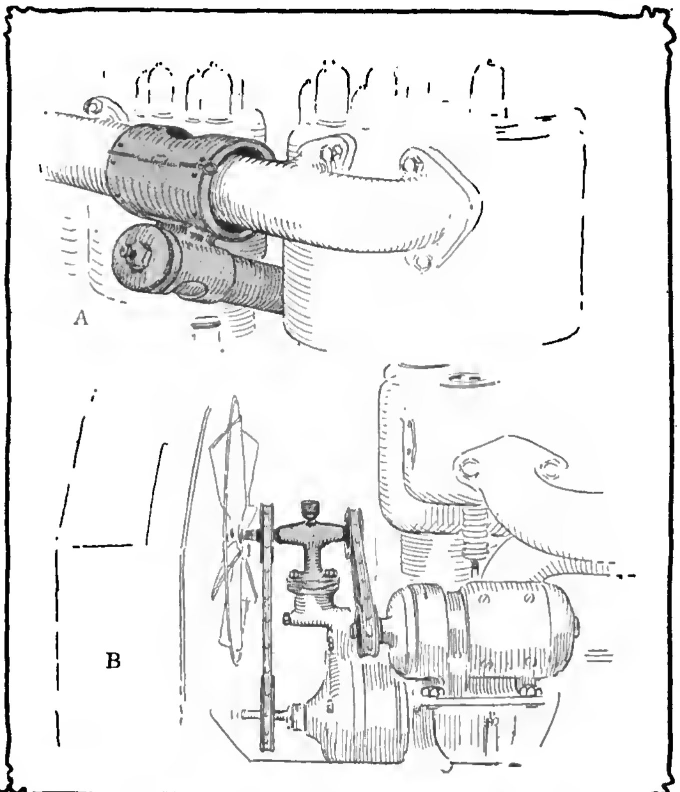
A new Rambler model is now on the market for 1913; it incorporates what the makers call a gasoline-electric motor. The starting system being combined with the flywheel end of the motor in such a way as to be a unit with it. Other changes in the Rambler line, which are all made on the single chassis embodying the 4.5 by 5-inch motor, include the adoption of the cone clutch, a modification of the gearset giving a 1-inch shorter gear shift, adjustable steering column upon which the angle of rake may be altered, and, in the motor, larger valves, a Stromberg carbureter, longer connecting-rods and a better placing of the wiring. The offset construction of the cylinders has been continued as in the past. A new oiling system composed of the Detroit mechanical oiler of 2 gallons capacity mounted on the side of the motor and its corresponding leads to the cylinders and bearings, has been mounted on the 1913 car. The new radiator introduced for the 1912 season has been continued. Three-point suspension is continued for this season, a tubular cross-piece 2 inches in diameter forming the front supporting member. The entire motor is mounted on a slant to secure straight-line drive. In place of the expanding band type of clutch, which has been a Rambler feature, a leather-faced cone has been fitted. Instead of two brake rockershafts which were formerly carried separately, there is now but one, which is a combination of both, one within the other. The U. S. L. starting system consists of a motor-generator mounted integrally with the flywheel, a foot control, an automatic switch, and accumulator, a regulator and a large conduit.

R-C-H—Long Wheelbase Roadster

Full equipment is the slogan of the R. C. H. company and nothing has been spared in doing everything possible in this way for the new line. Little change in constructional details have been made, the principal innovation being the introduction of the long wheelbase roadster. This is placed on the touring car chassis of last year, the roadster of the 1912 season having been mounted on a chassis of shorter wheelbase. Electric lighting, rear-vision mirror, top cover, slip, Jiffy curtains, extra rim holders and Warner auto-meter are a part of the equipment which is fitted to these cars. Other refinements in the nature of changes are the mounting of the throttle control lever on the steering column and the mounting of a hand emergency brake, which was omitted on last year's car. No change whatever has been made in the four-cylinder monobloc motor. The gearset is mounted as a unit with the rear axle.

Regal—Overslung Model

In addition to the line of underslung cars, the Regal company has added a model which has the frame suspended over the axles. The new design is called model C and is a five-passenger touring car incorporating a new motor which has been specially designed for this chassis. The other models, of which there are four, are made on two chassis types, models T, N coupé being mounted on the smaller of the two and models H and S on the larger. These are both four-cylinder models and differ only in size. The new model has a four-cylinder monobloc motor with



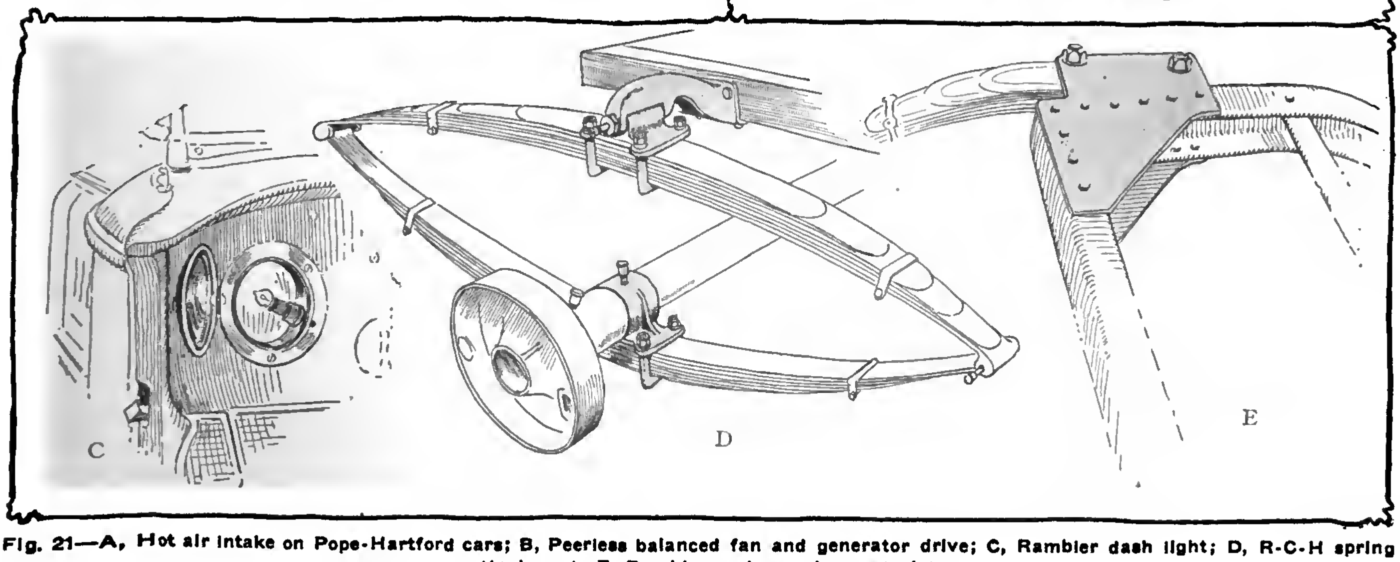


Fig. 21—A, Hot air intake on Pope-Hartford cars; B, Peerless balanced fan and generator drive; C, Rambler dash light; D, R-C-H spring attachment; E, Rambler spring and gusset plate

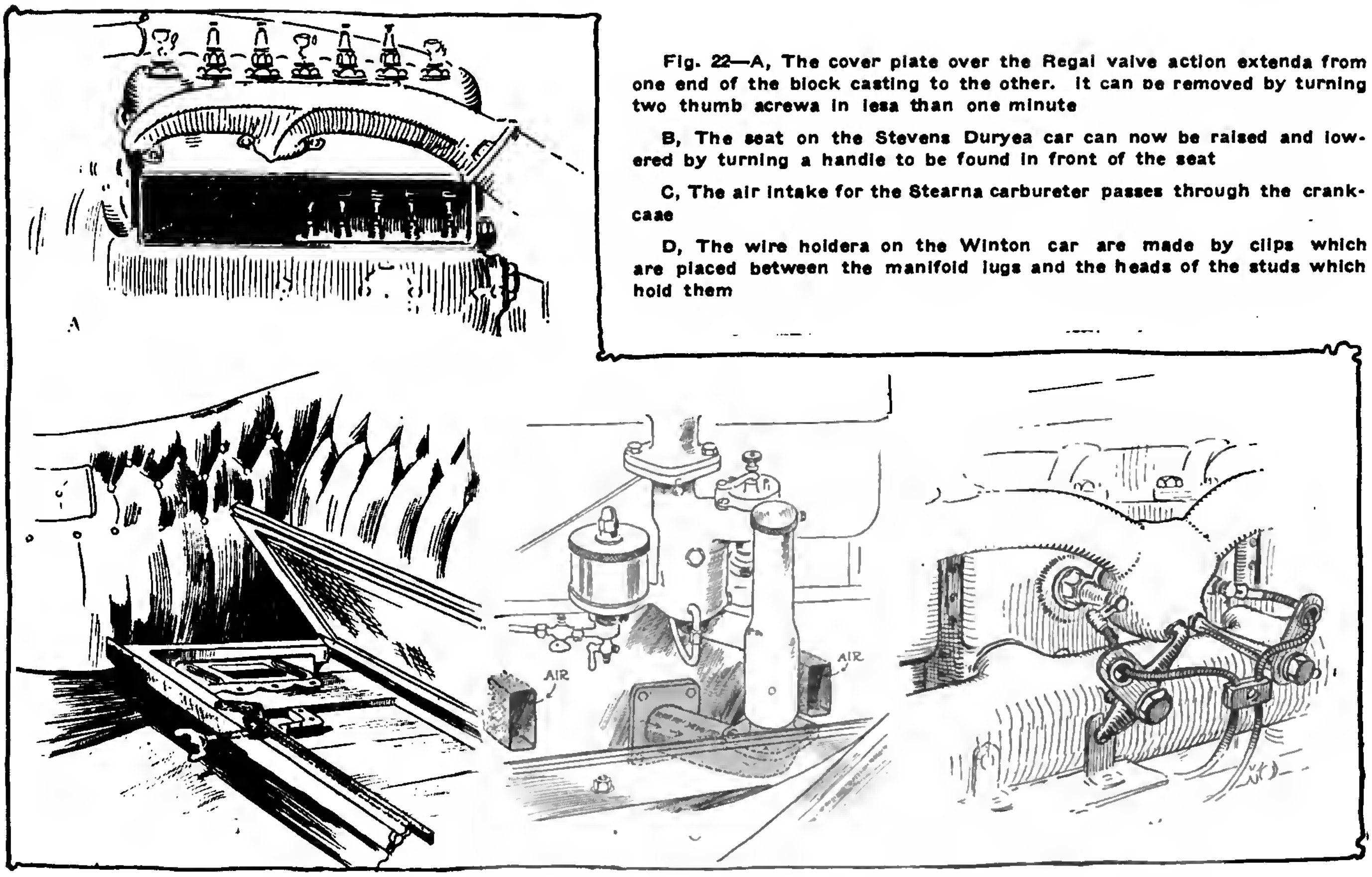


Fig. 22—A, The cover plate over the Regal valve action extends from one end of the block casting to the other. It can be removed by turning two thumb screws in less than one minute

B, The seat on the Stevens Duryea car can now be raised and lowered by turning a handle to be found in front of the seat

C, The air intake for the Stearns carbureter passes through the crankcase

D, The wire holders on the Winton car are made by clips which are placed between the manifold lugs and the heads of the studs which hold them

a bore of 4 inches and a stroke of 5 inches. The exhaust passages are integral with the block casting. The crankcase is aluminum and contains the constant-level splash system of lubrication. The clutch, gearset and springs are very similar to those used on the former Regal model, the frame, however, differs from the former frames in that it is overhung instead of the underslung type. The overhung frame permits of a direct suspension of the motor from the frame and three-quarter elliptic springs. Electric lights, demountable rims and speedometer are part of the equipment. Small changes in body construction, such as furnishing a greater curve to the seat backs and placing of fittings, form about the only changes in the models which have been continued.

Reo—Better Body

Among the improvements made by the Reo concern are greater size of tire both front and rear; electric side and tail lights, and a more expensive magneto. The motor which is rated at 30 horsepower, has four cylinders, cast in pairs. The bore is 4 inches and the stroke 4.5 inches. The valves are in the head of the cylinders. The carbureter is jacketed both for hot air and hot water. The 1913 body is wider and longer than that of the previous year, and it is also more highly and comfortably finished. Seventeen coats of paint are given the bodies while the hood, fenders, etc., have two coats of rubber enamel baked on. Left drive and center control are maintained. A storage battery provides current for the dash and tail lights which are of the combination electric and oil type.

Republic—Adds a Six

The most important development in the Republic line is the addition of the six-cylinder, 4.5 by 5-inch motor. This has its cylinders cast in pairs and its 2.25-inch valves on opposite sides of the cylinders. It is equipped with a special Stromberg carbureter to which the gasoline is fed under a pressure system. The gearset has four speeds and reverse. The clutch is a leather-faced cone with cork inserts. The wheelbase of this car is 133 inches. It is made in four standard styles of body, for two, four, five and seven passengers. It is magnificently upholstered and fully equipped. Delco lighting, starting and ignition is used. The Republic four appears on the 1913 market little different from a year ago. Small refinements have been made, and the equipment is more complete. The later production will be known as Series E and will embrace one more body than was offered prior to this series. This body is a two-passenger runabout which is applied to the same chassis as the other body styles, with the exception the 34 by 4-inch tires are used instead of 36 by 4 as on the other types. The leather-faced cone clutch with which the Republic is equipped is this year fitted with cork inserts. A special feature of the roadster is a trundle auxiliary seat which pulls out over the running board from beneath the front seat. An electric generator furnishes current for lighting and ignition.

Schacht—Electric Starting

The Schacht line for 1913 consists of two distinct body models built on one standard chassis. The touring model, N-S, and the model K-L roadster are both of the fore-door type. The motor for this season is 4.25 inches bore by 5.5 inches stroke and both cars have a wheelbase of 120 inches. Another feature of the line for this season is electric lighting and starting system which is operated with generator and storage battery. The cylinders on the motor are offset .625 inch from the center of the crankshaft. All bearings are Parsons white brass, and the crankcase is an aluminum casting. Floating rear axle, left drive and center control, 36 by 4 demountable rims, with one extra, and deep upholstery are features of this year's car.

Selden—Single Chassis

In conformance with its previous manner of production, the Selden enters the 1913 market with a single chassis, continued with few changes from former years. The effort that has been expended on the new series has been directed towards development of the design, in close adherence to former ideals. The Selden four-cylinder motor is practically unchanged, while the

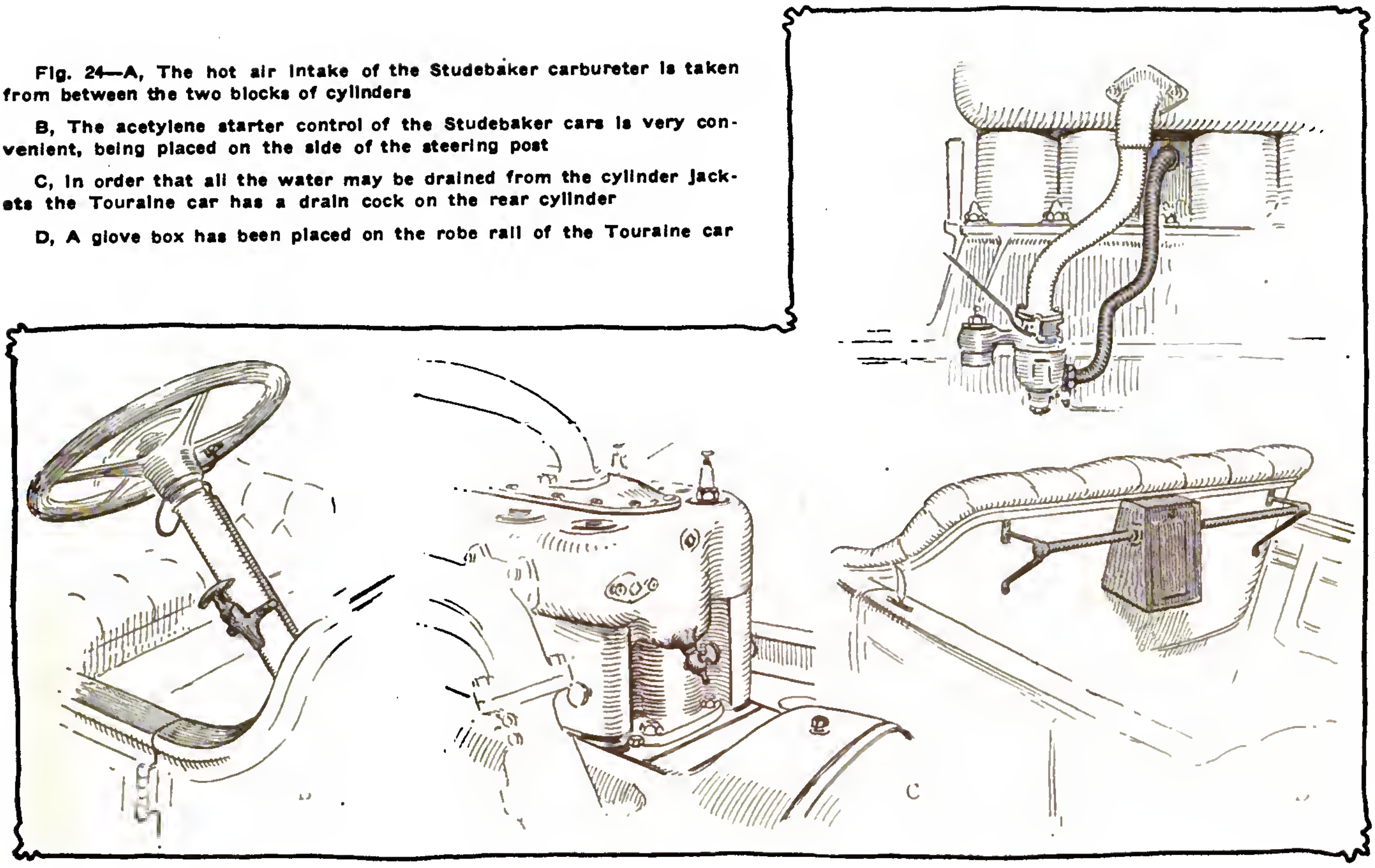


Fig. 24—A, The hot air intake of the Studebaker carbureter is taken from between the two blocks of cylinders

B, The acetylene starter control of the Studebaker cars is very convenient, being placed on the side of the steering post

C, In order that all the water may be drained from the cylinder jackets the Touraine car has a drain cock on the rear cylinder

D, A glove box has been placed on the robe rail of the Touraine car

dry multiple-disk clutch, adopted last year, has undergone no modifications. The principle changes are in the rear axle and in the use of the Gray & Davis starting system, in addition to the lighting system formerly employed. The brakes, formerly both internal, 14 by 1 3-4 inches, have been changed. The service brake operates on the outside of the same drum on which the internal emergency brake operates. The size of each has been increased to 16 by 2 inches. Five body styles will be furnished on this chassis, consisting of a two-passenger roadster, a four-passenger torpedo, a five-passenger touring car, a seven-passenger touring car and a seven-passenger limousine.

S. G. V.—Pressure Gasoline

The only change noted on the S. G. V. model is the substitution of pressure in place of gravity fuel feed on the Model A. Otherwise the line remains the same. The model D, 35-horsepower, differs from Model A, in that there are only three motor gears instead of five, the pump and magneto being operated on the same shaft. There is a spark advance on the Model D and none on the Model A.

Speedwell—Adopts Rotary Valve

Speedwell has made a most radical change in their policy for 1913. The rotary Mead valve motor has been adopted for a six-cylinder car just put on the market. The valves consist of two rotating cylinders carried in the head of the combustion space. They are driven by silent chain from the crankshaft and are lubricated by the oil which is mixed with the fuel. The cylinders have a bore of 4.125 inches and a stroke of 5.25 inches. The cars are equipped with Wagner starting and lighting system. The Mead motor weighs 754 pounds as compared to the 824 pounds of the poppet type used by the Speedwell company. Both have the same cylinder dimensions.

Staver—Adds a Four

Three Staver chassis will be on the market for 1913. They will be known as the 45, 55 and 65. The latest model, and the one which has been added to the line for this season, is the 45. It has a 4.5 by 5-inch motor giving an S. A. E. rating of 32.4 horsepower and developing on the brake, according to the makers, 49.6. The motor is of the T-head type with the cylinders cast en bloc. It is mounted on a sub-frame consisting of parallel members swung inside the side members of the main frame. An electric starting and lighting system is fitted to the car, although air starting is optional with the purchaser. Working in conjunction with the motor there is a Rayfield carbureter, Remy R. D. X. magneto, honeycomb radiator, and a splash system of lubrication. The clutch on this new model is a 38 disk type running in oil. The gearset has three speeds forward and is carried on Rhineland imported ball bearings. Left drive and center control has been incorporated, and all pedals are adjustable to suit the leg length of the driver. Semi-elliptic front and three-quarter elliptic rear springs are used held by a new type of double spring clip which is of square section to prevent loosening of nuts.

Stearns—New Knight Six

Although continuing its Knight type of motor practically unchanged since its adoption a little over a year ago, the F. B. Stearns Company has just announced a six-cylinder Knight motor equipped car. The bore of the six-cylinder car is the same as the four, namely, 4.5 inches, while the stroke is .25 inch longer than that of the four, or 5.75 inches. This new Knight creation adheres to the design principles which have been so carefully worked out for the earlier type, in most respects. The front end of the motor is hung on an arched cross-piece, bolted to the side rails of the frame, replacing the aluminum arm construction usually employed. A separate cross-member supports the radiator. The rear end of the motor is bolted to the side members of the frame by integral crankcase arms. A four-speed gearset is used, while final drive is through a propeller shaft equipped with two universal joints. Gray & Davis lighting and starting systems are fitted as standard equipment on the sixes. The new chassis is made in two lengths having 134 and 140-inch wheelbases for which six body styles are provided. The 134-inch wheelbase

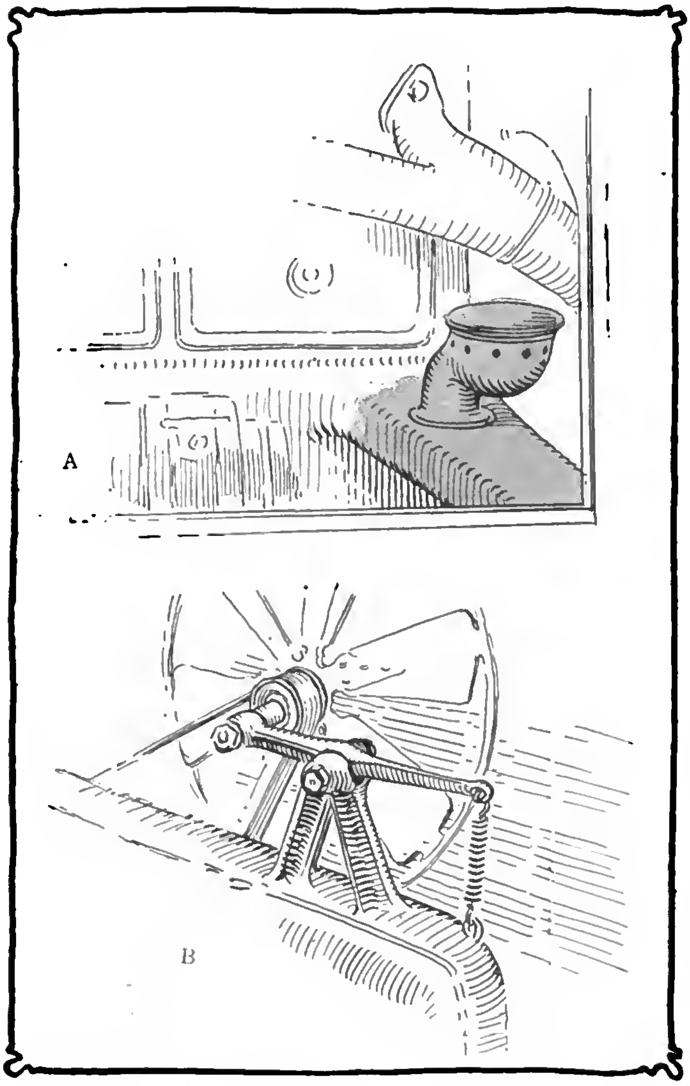


Fig. 24—A, Oil filler on S.G.V. cars; B, Spring tension on Velie fan belt

takes the three-passenger roadster, four-passenger light touring and five-passenger touring bodies, while the 140-inch wheelbase carries the seven-passenger touring type. Landaulet and limousine bodies are furnished for either chassis. The touring car bodies are all flush-sided with a narrow moulding around the bodies and doors. Running boards are clear, tires being carried at the rear on special brackets. Equipment is complete in every respect.

Stevens-Duryea—Only Sixes

Two six-cylinder chassis are made by the Stevens-Duryea Company for 1913. This is in line with the policy of this concern last year, but some minor refinements have been made. The motor is rated at 44.6 horsepower and has a bore of 4.3125 inches and a stroke of 5.5 inches. All types of bodies are fitted to this chassis. The Westlake dynamo will be incorporated on this year's cars, the valves will be inclosed, the oil leads will be inclosed, and one bolted-on valve cap will be placed over each exhaust and intake vave, one cap covering each pair of valves. The gravity feed gasoline is retained, but the running boards has been cleared. The tires are carried on the side. The starting system is by acetylene, the Prest-O-Lite tank being used in conjunction with a distributor of the Stevens-Duryea type. The wheelbases are 131 and 138 inches.

Stoddard-Dayton—Four Knights

Four models of Stoddard-Dayton cars will be produced by the United States Motor Car Company for the present season. The six-cylinder Knight car is, of course, the leader, while but one of the characteristic valve-in-the-head Stoddard-Dayton motors remains. Two smaller cars now use the L-head type of engine. Beginning with the sleeve-valve six, this car is fitted with left-hand drive and center control as last year's model was, and offers the option of wire wheels. Changes have been made in the design of the front axle, a new type of worm-and-sector steering gear is used, the radiator has been enlarged, new wheel-hub bearings have been fitted, and the control has been simplified. Model 48 is the only remaining model using the valve-in-the-head motor. It remains the same as last year in mechanical features, except for a few minor details which have been refined. The two L-head models 30 and 38 use engines cast en bloc with valve mechanisms inclosed, and show little deviation from former practices. All standard body types are fitted on each chassis with the exception of the 30, which takes a five-passenger touring, and a two-passenger roadster only. All body types have undergone refinement.

Studebaker—Adds a Six

Studebaker opens the season with three entirely new cars, two of them are four-cylinder types and the other is a six. Besides these three chassis, models 20 and 30 of last year are continued without radical change, making five distinct types now on the market. It will be remembered that the Flanders and E.M.F. cars are now given the name of Studebaker and that the model 20 referred to above was the Flanders 20, while the model 30 was the E.M.F. 30. Of particular interest are the three new models, which involve features new to Studebaker construction. A large number of parts are interchangeable on these three models. All the new motors of the L-head type with the cylinders cast en bloc and the valves on the left side. The exhaust and intake manifolds are cast integrally and so arranged that the gas enters the intake manifold on the side opposite the intake valves. The three models are known as the 25, 35 and 6. They all have the same stroke of 5 inches and models 25 and 6 have the same bore of 3.5 inches. The bore of the larger four-cylinder model is 4.125 inches. Three-bearing crankshafts are used in the four-cylinder cars and four-bearing crankshafts in the six-cylinder. The camshaft gears are of cast iron, while the crankshaft gear is of steel. A spiral pitch is used on these gears. The cams are integral with the camshaft as are also the oil-pump eccentrics. One feature of the new motors is the location of the water pump and magneto on brackets which bolt to the front end of the crankcase. The drive of these is accomplished by a transverse shaft driven by spiral gearing at its center from the crankshaft. Splash lubrication and Splitdorf dual ignition take care of these two important features, while starting and lighting is accomplished by the Wagner electric system. This system contains a motor-generator, geared 2.65 to 1, in relation to the crankshaft, furnishes the starting power and storing a six-cell, nine-plate storage battery of a capacity of 60 ampere-hours at a voltage of 12. The storage battery is placed on the left running board and the generator on the right side to maintain balance. On the 25 there is no starter, but an acetylene primer instead. The small car, model 25, has its driveshaft inclosed in a torque tube, but on the larger cars a stamped steel torque member is used. Three-speed gearsets are provided on all models, as is also the case with right control and drive.

Stutz—Puts Out a Sixes

In addition to the Stutz four-cylinder models a six is now on the market. Both have Esterline lighting and starting. It is of a similar design to the Stutz four-cylinder motors, but has a smaller bore and stroke, these dimensions being 4.25 by 5 inches. The Stutz four-cylinder motors, which are the same this year as last, have a bore of 4.75 inches and a stroke of 5.5 inches. It is of the T-head type with 2.5-inch valve. One of the added refinements this year is a hot waterjacket added to the intake manifold to warm the mixture before it enters the cylinders. In these motors the cylinders are offset .75 inch, and the connecting-rods are held at their big end by a four-bolt bearing cap giving a bearing 2 inches in diameter and 3.5 inches in length, The motors are lubricated by force feed through hollow crankshafts, the oil ducts being integral with the crankcase. Ignition system are the Splitdorf double distributer magneto on the four-cylinder roadster and the latest Eisemann magneto on all the other models. Exactly the same bodies are used on the four and six-cylinder models. The four-cylinder touring and the six roadster have a wheelbase of 120 inches, while all other bodies are put on a 124-inch wheelbase chassis. The six has a 130-inch wheelbase for the touring body. Some changes have been made in the Stutz rear system, although the general design is the same as has been used for the past 5 years, the differential case being about 2 inches larger in diameter. An outside adjustment has also been provided for adjusting the mesh between the drive pinion and the bevel gear. By removing two small plates on either side of the differential case an adjusting collar can be reached to move the drive gear in either direction. Right drive and control with inside levers are used on all models.

Spaulding—Drops Small Model

In the third year of motor car manufacture the Spaulding Manufacturing Company, Grinnell, Ia., has made additions to its plant, and expects to greatly increase its production for 1913. The Spaulding is designed along recognized and conservative lines, and has been little modified in its 1913 model. The small model has been dropped and the large one continued. The principal changes that have been made are the installation of the Gray & Davis electric lighting and starting system; an electric heating system; left-hand drive with center control; demountable rims with a spare; a tire holder in the rear, and modifications in the motor size. The motor has been changed from 4.125 x 5.25 to 4.25 x 5.5. Modifications are to be noticed in the oiling system; the valve-mechanisms have been inclosed; and the intake manifold is not cast integral with the cylinders, which are this year en bloc, instead of separate. A pressed-steel rear axle of the floating type is used. The wheelbase is 120 inches, and the tires are 36 by 4 instead of the corresponding dimensions of 117 and 34 inches of last year.

Velie—Adds New Four

In addition to the model 40 the Velie Dispatch has been put on the market. This is a new motor incorporating a large stroke bore ratio, the cylinder dimensions being 3.75 by 5.5 inches. The motor is rated at 32 horsepower at 1,000 revolutions. The cylinders are cast en bloc and many other features common to modern cars are involved. Among these may be mentioned silent chain drive for magneto and camshaft; enclosed valves and thermo-syphon cooling. The crankshaft is carried on three main bearings and has a diameter of 3.25 inches. The valves have a clear diameter of 7.125 inches. Among the other chassis features on this model are left drive and center control. A floating axle carried on roller bearings is also incorporated. The Velie 40, which is continued, has a bore of 4.5 inches, and a stroke of 5.25 inches. The makers claim that it develops 40 horsepower of 1,000 revolutions per minute and 50 horsepower at 1,600 revolutions per minute. A 1.25-inch double jet Stromberg carbureter is used on this model, while the ignition includes a Splitdorf high-tension magneto, and an Atwater Kent unit sparker. The clutch is a three-disk drive-plate type, fitted with an automatic clutch brake. The dynamo electric lighting system with five lamps and a Disko starter are included in the Velie equipment.

Winton—Changes Springs

Three-quarter elliptic rear springs, suspended outside the frame rails, are the chief point of difference between the Winton car of 1913 and its predecessors. Otherwise the current line presents small variation from last year's cars. The cowl is given a trifle less angle and the doors have been trimmed slightly with handles placed inside the body. Ventilation has been improved in minor details. The change in springs gives the opportunity to curve down the rear of the body without a break, which has been done with pleasing effect. Trifling changes have been made in the upholstering, designed to augment riding comfort.

White—Three Models

Monoblock castings and long stroke are characteristics of White gasoline productions. The leader of the line is the White six cylinder which is now in its second season, having been shown first in 1912. Embodying many refinements, this model, with the 30 and 40 of last year, has been continued on the series production plan. The new 30 has been redesigned with left-side drive and center control the same as the six and the 40. The current models are in the order mentioned, models GF, GAF and GEB. The six model has its six cylinders in a single casting, all valves on the right side with inclosed mechanisms and 4.25 by 5.75-inch bore and stroke. Three ball bearings are used as engine journals and both manifolds are integral with the cylinders. This, with conduited wires and concealed water passages, imparts a pleasing, clean appearance to the motor. Two fans are used in connection with the pump-circulated water-cooling system, one of which is behind the radiator and the other the vaned flywheel. A carbureter of White design is used, and a compression-relief is fitted for starting. The electric starter is a part of the White electric lighting and starting system, which is of the single-unit type, the dynamo fulfilling both the functions of a motor and a generator for charging the battery. This system is used on all models. General chassis details on the six differ only in dimensions from the other models. Body types include touring cars, roadsters, limousines and Berline limousines and coupés.

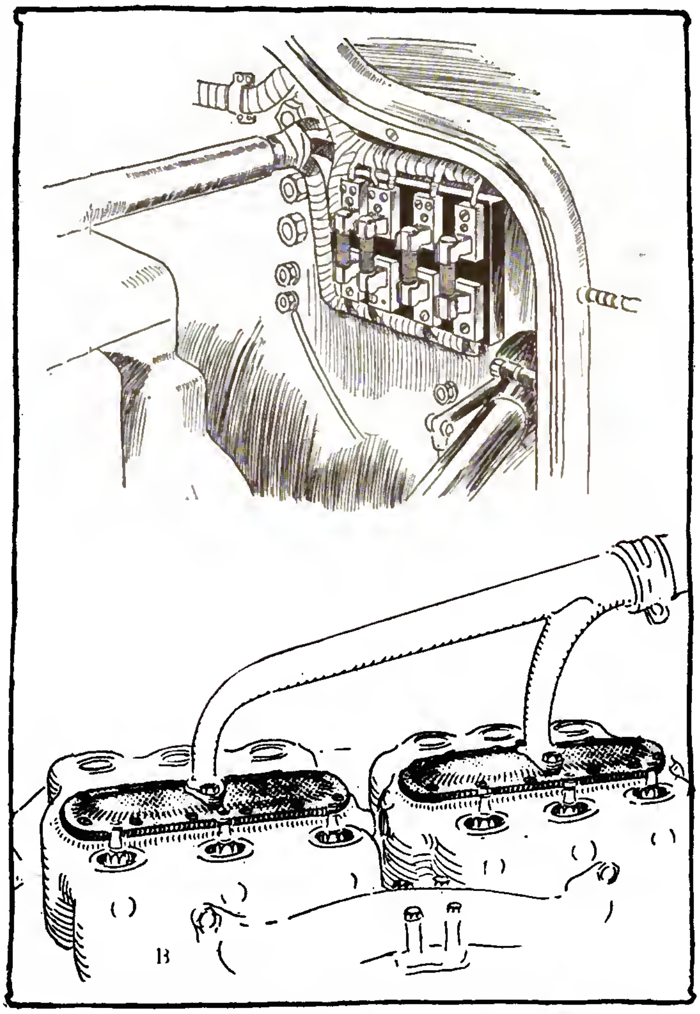


Fig. 25—A, Fuse box of White dash; B, Jacket plates on Touraine six

Passenger Car Chassis Listed for 1913

THE AUTOMOBILE Publishes Herewith Its Annual Table of Complete Mechanical Specifications of Practically Every Gasoline Passenger Chassis Produced by the Automobile Factories of America for the Season of 1913

1					CYLINDERS		VALVES			COOLING		LUBRICATION		IGNITION			CARBURETION		ENGINE STARTER	
NAME AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	Shape	How Cast	Type	Location	Camshaft Drive	Circulation	Radiator	System	Type of Pump	System	Magneto Generator	Control	Make of Carburetor	Fuel Feed	Type	Make
Abbott-Detroit, D	4	4.13x5.25	27.30	280.6	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Spld'rf	Hand	Mayer	Grav	Elec	Auto-Lite
Abbott-Detroit, E	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Spld'rf	Hand	Mayer	Grav	Elec	Auto-Lite
Adams-Farwell, 9	5	5.50x5.00	60.00	594.0	Straight	Sep'rt	Poppet	Head	Gear	Air		Pressure	Noncir	Dual	Optional	Hand	Own	Pres	Lever	Own
A. E. C., 6-45	6	3.75x5.50	33.80	364.4	L Head	Block	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Rayfield	Pres	Elec	Own
A. E. C., 6-60	6	4.25x5.00	43.80	425.4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Rayfield	Pres	Air	
Alco, 7-16	4	3.94x4.25	24.00	207.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-pres	Gear	Sing	Bosch	Fixed	Stromberg	Grav		
Alco, 11-60	6	4.75x5.50	54.10	584.9	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-pres	Gear	Dual	Bosch	Hand	Newcomb	Pres		
Alpena, N-50	6	3.75x5.25	33.75	347.8	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash		Dual		Hand	Zenith	Pres	Elec	Electro
Alpena, P-40	4	3.75x5.25	22.50	272.1	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash		Dual		Hand	Zenith	Pres	Elec	Electro
American Scout, 22 A*	4	3.75x5.00	22 50	220.9	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Rayfield	Pres	Acet	Disco
American Tour., 34 A*	4	4.50x5.00	32 40	318.1	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Rayfield	Pres	Acet	Disco
American Trav., 54 A*	4	5.38x5.50	46.00	499 2	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Rayfield	Pres	Elec	Peru
American Trav., 56 A*	4	5.38x5.50	46 00	499.2	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Rayfield	Pres	Elec	Peru
American Road, 32 A*	4	4.50x5.00	32.40	318.1	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Rayfield	Pres	Acet	Disco
Ames, 44 & 45	4	4.13x5.25	27.30	280.6	L Head	Block	Poppet	Left	Gear	Pump	Tub	Spl-pres	Piston	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Apperson, 4-45	4	4.50x5.00	32.40	318.1	T Head	Sep'rt	Poppet	Head	Gear	Pump	Cell	Splash	Gear	Dual	National	Hand	Rayfield	Grav	Elec	Ward-L'd
Apperson, 4-55	4	4.75x5.00	36.10	354.4	T Head	Sep'rt	Poppet	Head	Gear	Pump	Cell	Splash	Gear	Dual	National	Hand	Rayfield	Grav	Elec	Ward-L'd
Apperson, 4-55	4	4.75x5.00	36.10	354.4	T Head	Sep'rt	Poppet	Head	Gear	Pump	Cell	Splash	Gear	Dual	National	Hand	Rayfield	Grav	Elec	Ward-L'd
[illegible], F. G. H	4	4.13x5.50	27.30	294.0	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Spl-pres	Gear	Dual		Hand	Schebler	Grav	Elec	
[illegible]	4	4.50x5.50	32.40	349.9	Knight	Pairs	Sleeve	Opp	Chain	Pump	Tub	Pressure	Piston	Sing	Deaco	Hand	Stromberg	Grav	Elec	Gray & Da.
Auburn, 33L	4	3.75x5.25	22 50	231.9	L Head	Block	Poppet	Opp	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav		
Auburn, 37L	4	4.25x4.75	28.90	269.4	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav		
Auburn, 40L	4	4.50x5.00	32.40	318.1	L Head	Sep'rt	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav		
Auburn, 6-45	6	3.75x5.25	33.75	347.8	L Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav		
Auburn, 6-50	6	4.13x5.25	40.80	420.9	L Head	Sep'rt	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Doub	Bosch	Hand	Schebler	Grav		
Austin, 55	6	4.00x5.00	38.40	376.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Dual 2	Spld'rf	Hand	Rayfield	Grav	Air	Own
Austin, 66	6	4 50x7.00	48 60	667.9	T Head	Sep'rt	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual 2	Spld'rf	Hand	Rayfield	Grav	Air	Own
Austin, 77	6	4.50x7.00	48.60	667.9	T Head	Sep'rt	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual 2	Spld'rf	Hand	Rayfield	Grav	Air	Own
Bergdoll, 30	4	4.00x4.50	25.60	226.2	L Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Piston	Sing	Bosch	Hand	Schebler	Grav	Elec	U. S. L.
Bergdoll, 40	4	4 00x5.94	25.60	298.5	L Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Piston	Sing	Bosch	Hand	Schebler	Grav	Elec	U. S. L.
Bergdoll, 40	4	4.00x5.94	25.60	298.5	L Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Piston	Sing	Bosch	Hand	Schebler	Grav	Elec	U. S. L.
Buick, 25, 24	4	3.75x3.75	22.50	165.5	Straight	Pairs	Poppet	Head	Hel'l	Pump	Tub	Splash	Gear	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Buick, 31, 30	4	4.00x4.00	25.60	201.1	Straight	Pairs	Poppet	Head	Hel'l	Pump	Tub	Splash	Noncir	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Buick, 40	4	4.25x4.50	28.90	255.3	Straight	Pairs	Poppet	Head	Hel'l	Pump	Tub	Splash	Noncir	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Burg, S	6	3.75x5.25	33.75	347.8	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Spl-pres	Piston	Dual	Bosch	Hand				
Burg, R	6	4.13x5.25	40.80	420.9	L Head	Sep'rt	Poppet	Right	Gear	Pump	Cell	Spl-pres	Piston	Dual	Bosch	Hand				
Cadillac, 1913	4	4.50x5.75	32.40	365.8	L Head	Sep'rt	Poppet	Right	Chain	Pump	Tub	Splash		Doub	Delco	Hand	Own	Grav	Elec	Delco
Cameron, 29 A	4	3.88x3.75	24.00	176.9	Straight	Sep'rt	Poppet	Head	Gear	Air		Spl-pres	Gear	Sing		Hand	Kingston	Grav		
Cameron, 28	4	3.88x3.75	24.00	176.9	Straight	Sep'rt	Poppet	Head	Gear	Air		Spl-pres	Gear	Sing		Hand	Kingston	Grav		
Cameron, 30	6	3.88x3.75	36.07	265.4	Straight	Sep'rt	Poppet	Head	Gear	Air		Spl-pres	Gear	Sing		Hand	Kingston	Grav		
Cameron, 32	6	3.88x3.75	36.07	265.4	Straight	Sep'rt	Poppet	Head	Gear	Air		Spl-pres	Gear	Sing		Hand	Kingston	Grav		
Carhartt, K	4	4 07x4.50	26.40	285 0	L Head	Block	Poppet	Right	Gear	Pump	Cell	Splash		Doub		Hand	Stromberg			
Carhartt, B	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet		Gear	Pump	Cell	Splash		Dual		Hand	Stromberg	Grav		
Carroll, 4 E	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash		Doub	Optional	Hand	Rayfield	Pres	Mech	National
Carroll, 4 D	4	5.00x5.00	40 00	392.7	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Doub	Optional	Hand	Rayfield	Pres	Mech	National
Carroll, 6 C	6	4.13x5.25	40.90	420.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash		Doub	Optional	Hand	Rayfield	Pres	Mech	National
Cartercar, 5	4	4.13x4.75	27.25	253.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-pres	Noncir	Dual		Hand	Schebler	Grav	Elec	Jesco
Case, N	4	4.13x5.25	27.25	420.9	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Opt	Remy	Hand	Rayfield	Pres		
Case, O	4	4.50x5.25	32.40	334.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Opt	Optional	Hand	Rayfield	Pres	Elec	Westing'se
Chadwick, 19—Road	6	5 00x6.00	60.00	706.8	L Head	Pairs	Poppet	L&H.	Gear	Pump	Cell	Pressure	Noncir	Doub	Bosch	Hand	Own	Pres	Opt	Optional
Chadwick, 19—Touring	6	5.00x6.00	60.00	706.8	L Head	Pairs	Poppet	L&H.	Gear	Pump	Cell	Pressure	Noncir	Doub	Bosch	Hand	Own	Pres	Opt	Optional
Chalmers, 17	4	4 25x5.25	28.90	297.8	Straight	Block	Poppet	L&H.	Gear	Pump	Cell	Splash	Gear	Dual	Spld'rf	Hand	Rayfield	Pres	Air	Own
Chalmers, 18	6	4.25x5.25	43.80	446.7	Straight	Threes	Poppet	L&H.	Gear	Pump	Cell	Splash	Gear	Dual	Spld'rf	Hand	Rayfield	Pres	Air	Own
Chevrolet, C	6	3.55x5.00	30.20	298.9	T Head	Threes	Poppet	Opp	Gear	Pump		Splash	Noncir	Dual		Hand		Grav	Air	English
Cino, 450	4	4.50x6.00	32.40	381.7	T Head	Block	Poppet	Opp		Pump	Tub	Spl-Pres	Gear	Dual	Optional	Hand	Rayfield	Grav		
Cino 440	4	4 50x5.00	32.40	318.1	T Head	Block	Poppet	Opp	Hel'l	Pump	Tub	Spl-Pres	Gear	Dual	Optional	Hand	Rayfield	Grav		
Cino, 660	6	4.00x6 00	38 40	452 4	T Head	Block	Poppet	Opp	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Optional	Hand	Rayfield	Grav	Elec	Electro

*Underslung Frame. †Has six wheels.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate. **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo, thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noncir. **Ignition:** Sing single; Doub, double; Dual 2, double distributer; Gov, governor; Atw Kent, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric; Acet, acetlyene; Mech, mechanical; Opt, optional; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as 4.25=$4\frac{1}{4}$, etc., .06=$\frac{1}{16}$, .19=$\frac{3}{16}$, .13=$\frac{1}{8}$, .25=$\frac{1}{4}$, .31$\frac{5}{16}$=, .38=$\frac{3}{8}$, .44=$\frac{7}{16}$, .5=$\frac{1}{2}$, .56=$\frac{9}{16}$, .63=$\frac{5}{8}$, .69=$\frac{11}{16}$, .75=$\frac{3}{4}$, .81=$\frac{13}{16}$, .88=$\frac{7}{8}$.

Horsepower and Mechanical Details

In Calculating the Horsepower of the Motors Given in the Table the S. A. E. Formula Was Followed—That Is, Horsepower Equals Cylinder Bore Squared, Multiplied by the Number of Cylinders Divided by 2.5.

TRANSMISSION								RUNNING GEAR								CONTROL			BEARINGS				1
	GEARSET								TIRES		WHEELS		SPRINGS										
Clutch Type	Type	Location	Forward Speeds	Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Wheelbase	Front	Rear	Kind	Attachment	Front	Rear	Front Axle	Location Steering Wheel	Gearshift Location	Emergency Brake Control	Crankshaft Type and No.	Gearset	Rear Axle	Front Wheel	Chassis Weight, Lbs.
Disk	Sel	Unit M	3	Bevel	Rad. Rd	Float	3.50-1	116	34x4	34x4	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2.250
Disk	Sel	Unit M	3	Bevel	Rad. Rd	Float	3.50-1	121	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,850
Cone	Sel	Amid	3	Chain	Rad. Rd	Semi F	....	120	36x4½	36x4½	Wood	....	½ Ell	½ Ell	Square	Right	Right	Right	Plain, 2	Ball	Roll	Roll	....
Disk	Sel	Unit M	3	Bevel	Rad. Rd	Float	3.50-1	130	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	1-Beam	Left	Cent.	Cent.	Plain, 4	Ball	Roll	Roll	2,000
Disk	Sel	Amid	4	Bevel	Rad. Rd	Float	2.63-1	138	37x5	37x5	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Plain, 4	Ball	Roll	Roll	2,500
Disk	Sel	Amid	3	Bevel	Rad. Rd	Float	3.80-1	104	32x4	32x4	Wood	....	½ Ell	½ Ell	1-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,420
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	3.61.1	133½	36x4½	37x5	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Plain, 5	Ball	Ball	Ball	3,560
Disk	Sel	....	....	Bevel	Springs	Float	3.50-1	135	36x4	36x4	....	....	....	....	I-Beam	Opt	Cent.	Cent.	Plain, 4	Plain	Ball	Ball	....
Disk	Sel	....	....	Bevel	Springs	Float	3.50-1	135	36x4	36x4	....	....	....	....	I-Beam	Opt	Cent.	Cent.	Plain, 4	Plain	Ball	Ball	....
Cone	Sel	Amid	3	Bevel	Tor T	Eloat	4.07-1	106	36x3½	36x3½	Wood	....	½ Ell	½ Ell	1-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,000
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.20-1	118	37x4	37x4	Wood	....	½ Ell	½ Ell	1-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,150
Cone	Sel	Amid	4	Bevel	Tor T	Float	4.02-1	124	40x4	41x4½	Wood	....	½ Ell	½ Ell	1-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,000
Cone	Sel	Amid	4	Bevel	Tor T	Float	4.29-1	140	41x4½	41x4½	Wood	....	½ Ell	½ Ell	1-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,100
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.20-1	118	37x4	37x4	Wood	....	½ Ell	½ Ell	1-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,150
Disk	Sel	Uint M	3	Bevel	Springs	Float	3.50-1	118	36x4	36x4	Wood	....	½ Ell	¾ Ell	1-Beam	Left	Cent.	Cent.	Plain, 3	Roll	Ball	Ball	2,100
Con Bd	Sel	Amid	3	Bevel	Tor T	Semi F	3.50-1	114	34x4	34x4	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Plain, 5	Ball	B&R.	Ball	2,300
Con Bd	Sel	Amid	3	Bevel	Tor T	Semi F	3.50-1	118	36x4	36x4	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Plain, 5	Ball	B&R.	Ball	2,800
Con Bd	Sel	Amid	3	Bevel	Tor T	Semi F	3.50-1	122	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Plain, 5	Ball	B&R.	Ball	3,000
Cone	Sel	Unit X	3	Bevel	Rad Rd	Float	....	120	36x4	36x4	Wood	....	½ Ell	¾ Ell	1-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Ball	Roll	2,900
Disk	Sel	Unit X	3	Wnrm	Tor T	Float	3.85-1	130	37x5	37x5	Wood	....	½ Ell	¾ Ell	1-Beam	Left	Cent.	Cent.	Plain, 5	Ball	Ball	Roll	3,000
Cone	Sel	Amid	3	Bevel	Rad Rd	Semi F	3.50-1	112	34x3½	34x3½	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Roll	2,500
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.50-1	115	35x4	35x4	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,850
Cone	Sel	Amid	3	Bevel	Rad Rd	Float	3.50-1	122	36x4	36x4	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Plain, 5	Ball	Ball	Ball	2,950
Cone	Sel	Amid	3	Bevel	Rad Rd	Float	3.50-1	130	36x4	36x4	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	3,100
Disk	Sel	Amid	3	Bevel	Rad Rd	Float	3.50-1	135	37x4½	37x4½	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Plain, 7	Ball	Ball	Ball	3,450
Disk	Sel	Amid	4	Bevel	Springs	Float	....	141	37x5	37x5	Wood	....	½ Ell	¾ Ell	1-Beam	Left	Cent.	Pedal	Plain, 4	Ball	Ball	Ball	....
Disk	Sel	Amid	4	Bevel	Springs	Float	....	141	37x5	37x5	Wood	....	½ Ell	¾ Ell	1-Beam	Left	Cent.	Pedal	Plain, 7	Ball	Ball	Ball	....
Disk	Sel	Amid	4	Bevel	Springs	Float	....	141	37x5	37x5	Wood	....	½ Ell	¾ Ell	1-Beam	Left	Cent.	Pedal	Plain, 7	Ball	Ball	Ball	....
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.75-1	115	34x4	34x4	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Ball, 2	Ball	Ball	Ball	2,500
Disk	Sel	Unit M	4	Bevel	Springs	Float	2 80-1	121	36x4	36x4	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Ball, 2	Ball	Ball	Ball	2,600
Disk	Sel	Unit M	4	Bevel	Springs	Float	2.80-1	115	34x4	34x4	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Ball, 2	Ball	Ball	Ball	2,500
Cone	Sel	Amid	3	Bevel	Rad Rd	Semi F	4.00-1	106	32x3½	32x3½	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Plain, 3	Roll	B&R	Ball	2,000
Cone	Sel	Unit M	3	Bevel	Tor T	Semi F	4.00-1	108	34x4	34x4	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Plain, 3	Ball	B&R.	Ball	2,600
Cone	Sel	Unit M	3	Bevel	Tor T	Float	3.75-1	115	36x4	36x4	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Plain, 3	B&P	Ball	Ball	2,870
Disk	Sel	Unit M	3	Bevel	S & T T	....	....	124	36x4	36x4	Wood	....	½ Ell	¾ Ell	1-Beam	Opt	Cent.	Pedal	Plain, 5	Ball	Ball	Ball	2,000
Disk	Sel	Unit M	3	Bevel	S & T T	Float	4.00-1	134	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Cent.	Cent.	Plain, 7	Ball	Ball	Ball	2,700
Cone	Sel	Amid	3	Bevel	S& T T	Float	3.50-1	120	36x4½	36x4½	Wood	....	½ Ell	¾ Plat	1-Beam	Right	Right	Right	Plain, 5	Ball	Roll	Roll	....
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00-1	110	32x3½	32x3½	Wood	....	½ Ell	Ell	Tube	Right	Right	Cent.	Plain, 3	Plain	Ball	Ball	1,700
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00-1	104	32x3	32x3	Wood	....	½ Ell	Ell	Tube	Right	Right	Right	Plain, 3	Plain	Ball	Ball	1,485
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00-1	114	34x3½	34x3½	Wood	....	½ Ell	Ell	Tnbe	Right	Right	Right	Plain, 3	Plain	Ball	Ball	1,600
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00-1	120	34x3½	34x3½	Wood	....	½ Ell	Ell	Tube	Right	Cent.	Cent.	Plain, 3	Plain	Ball	Ball	1,800
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.50-1	109	34x4	34x4	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Plain, 3	....	Roll	Ball	2,350
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.50-1	119	34x4	34x4	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Plain, 3	....	Roll	Roll	2,950
Disk	Sel	Amid	4	Bevel	R & T R	Float	....	118	36x4	36x4	Wood	....	½ Ell	¾ Ell	1-Beam	Opt	Right	Right	Plain, 3	Ball	Roll	Roll	2,850
Disk	Sel	Amid	4	Bevel	R & T R	Float	....	128	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	1-Beam	Opt	Right	Right	Plain, 3	Ball	Roll	Roll	3,500
Disk	Sel	Amid	4	Bevel	R & T R	Float	....	128	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	1-Beam	Opt	Right	Right	Plain, 5	Ball	Roll	Roll	3,750
....	Frict	....	....	Chain	Rad Rd	Float	....	116	36x4	36x4	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Plain, 3	Plain	Ball	Ball	2,350
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.50-1	115	34x4	34x4	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Cent.	Cent.	Plain, 3	Plain	Ball	Ball	....
Disk	Sel	Amid	3	Bevel	Springs	Float	3.50-1	125	37x4½	37x4½	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	3,500
Exp Bd	Sel	Amid	4	Chain	Rad Rd	Dead	2.00-1	112	36x4½	36x4½	Wood	....	½ Ell	Plat	1-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	2,700
Exp Bd	Sel	Amid	4	Chain	Rad Rd	Dead	2.25-1	133	36x4½	37x5	Wood	....	½ Ell	Plat	1-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	3,000
Disk	Sel	Unit M	4	Bevel	Tor R	Float	3.75-1	118	36x4	36x4	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Ball, 2	Roll	Roll	Roll	2,774
Disk	Sel	Unit M	4	Bevel	Tor R	Float	3.75-1	130	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Right	Right	Ball, 3	Roll	Roll	Roll	3,173
Cone	Sel	Unit X	3	Bevel	Tnr T	Float	....	120	35x4½	35x4½	Wood	....	½ Ell	¾ Plat	1-Beam	Left	Cent.	Right	Plain, 3	Plain	Roll	Ball	....
Cone	Sel	....	3	Bevel	....	Float	....	120	34x4	34x4	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Cent.	Cent.	Plain, 3	Ball	Ball	Roll	....
Cone	Sel	Unit X	3	Bevel	....	Float	3.50-1	120	34x4	34x4	Wood	....	½ Ell	¾ Ell	1-Beam	Right	Cent.	Cent.	Plain, 3	Ball	Ball	Roll	2,422
Cone	Sel	....	3	Bevel	S & T T	Float	3.75-1	132	36x4½	36x4½	Opt	....	½ Ell	¾ Ell	1-Beam	Right	Cent	Cent.	Plain, 3	Ball	Ball	Roll	3,560

ABBREVIATIONS:—Clutch Type: Exp Bd, expanding band; Con Bd, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, frictinn; Unit M, unit with motor; Unit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Wnrm, shaft with worm gear at rear axle. **Car Drives through:** Tor T, torsion tube; S & T T, springs and torsion tube; R & T R, radius rods and torsion rod; Rad Rd, radius rods; S & R R, springs and radius rods; Tor Rd, torsion rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¾ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, center. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

Passenger Car Chassis Listed for 1913

2

NAME AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	CYLINDERS		VALVES			COOLING		LUBRICATION		IGNITION			CARBURETION		ENGINE STARTER	
					Shape	How Cast	Type	Location	Camshaft Drive	Circulation	Radiator	System	Type of Pump	System	Magneto Generator	Control	Make of Carburetor	Fuel Feed	Type	Make
Cosy	6	4 00x5 00	38 40	376 9	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Splash		Dual		Hand	Schebler	Pres		
Colby, C	4	4 13x5 25	27 25	290 6	L Head	Block	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Eisemann	Hand	Rayfield	Grav	Air	Thurber
Colby, E	4	4 50x5 50	32 40	349 9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Eisemann	Hand	Rayfield	Pres	Air	Thurber
Colby, C-6-60	6	4 13x5 25	40 56	420 9	L Head	Threes	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Doub	Eisemann	Hand	Rayfield	Pres	Elec	Gray & Da.
Cole, 40	4	4 13x4 75	27 25	253 9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual	Delco	Hand	Schebler	Pres	Elec	Delco
Cole, 50	4	4 50x5 25	32 40	334 0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual	Delco	Hand	Schebler	Pres	Elec	Delco
Cole, 60	6	4 13x4 75	40 90	380 8	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual	Delco	Hand	Schebler	Pres	Elec	Delco
Columbia, Mark 90	4	4 98x5 13	38 00	382 6	Knight	Pairs	Sleeve	Opp	Chain	Pump	Cell	Splash	Piston	Doub	Bosch	Hand	Stromberg	Pres		
Columbia, Mark 85	4	4 98x5 13	38 00	410 6	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Bosch	Hand	Stromberg	Pres		
Corbitt, D, E, & F	4	4 00x4 50	25 60	226 2	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Sing	U. & H	Hand	Stromberg	Grav	Elec	Northeast
Correja, T & D	4	4 25x5 00	28 90	283 6	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Simms	Hand	Schebler	Pres	Mech	Volkmer
Correja, A, B & C	4	4 25x5 00	28 90	283 6	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Sing	Simms	Fixed	Schebler	Grav		
Correja, S & R	6	4 25x5 00	43 35	425 4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Simms	Hand	Schebler	Pres	Mech	Volkmer
Correja, C & J	6	3 50x5 00	29 40	288 6	T Head	Threes	Poppet	Opp	Chain	Thermo	Tub	Spl-Pres	Gear	Doub	Eisemann	Hand		Pres	Elec	
Correja, R & S	6	4 00x6 00	38 40	452 4	T Head	Threes	Poppet	Opp	Gear	Pump	Tub	Spl-Pres	Gear	Doub	Eisemann	Hand		Pres		
Crane, 3	6	4 38x6 25	46 90	563 7	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand		Pres	Air	Own
Crawford, 13-30	4	4 13x5 25	27 25	290 6	L Head	Block	Poppet	Left	Spi'l	Pump	Tub	Spl-Pres	Piston	Dual	Remy	Hand	Stromberg	Grav	Elec	Gray & Da.
Crawford, 13-40	4	4 50x5 50	32 40	349 9	L Head	Pairs	Poppet	Left	Spi'l	Pump	Tub	Spl-Pres	Gear	Dual	Bosch	Hand	Stromberg	Grav	Elec	Gray & Da.
Crow Elkhart, C-1	4	3 75x4 50	22 50	198 8	L Head	Block	Poppet	Right	Gear	Thermo	Cell	Splash	Piston	Dual	Briggs	Hand	Schebler	Grav	Acet	Prestolite
Crow-Elkhart, C-2-3-4, D-T	4	4 00x4 50	25 60	226 2	L Head	Block	Poppet	Right	Gear	Thermo	Cell	Splash	Piston	Dual	Briggs	Hand	Schebler	Grav	Acet	Prestolite
Crow Elkhart, C-5	4	4 13x5 00	27 25	267 3	T Head	Block	Poppet	Opp	Gear	Thermo	Cell	Splash	Piston	Dual	Briggs	Hand	Schebler	Grav		
Crow Elkhart, C-7-8-9	4	4 50x5 00	32 40	318 1	L Head	Pairs	Poppet	Left	Gear	Thermo	Cell	Splash	Gear	Dual	Briggs	Hand	Schebler	Grav	Acet	Prestolite
Crow Elkhart, C-6A	6	4 13x5 25	40 90	420 9	L Head	Pairs	Poppet	Left	Gear	Thermo	Cell	Splash		Dual	Briggs	Hand	Schebler	Grav	Acet	Prestolite
Crow Elkhart, C-6-B	6	3.75x5 00	33 75	331.4	L Head	Pairs	Poppet	Left	Gear	Thermo	Cell	Spl-Pres	Piston	Dual	Briggs	Hand	Stromberg	Grav	Elec	
Croxton, A	4	4.13x5.50	27 30	294 0	L Head	Block	Poppet	Right	Gear	Thermo	Cell	Splash		Sing	Eisemann	Fixed	Schebler	Grav	Elec	Northeast
Croxton, 36	6	4.25x5.50	43 80	468.0	L Head	Threes	Poppet	Right	Gear	Thermo	Cell	Splash		Sing	Eisemann	Fixed	Schebler	Grav	Elec	Northeast
Cunningham, M	4	4.75x5 75	36.10	407.6	Straight	Pairs	Poppet	Head	Gear	Pump	Cell	Pressure	Gear	Dual		Hand		Pres	Elec	
Cutting, 40	4	4 00x5.00	25 60	251.3	L Head	Block	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Dual	Remy	Hand	Rayfield	Grav	Acet	Haman
Davis, 40	4	4 13x5 25	27 25	290 6	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual		Hand	Stromberg	Grav	Opt	Optional
Davis, 50	4	4 50x5 50	32 40	349 9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual		Hand	Stromberg	Grav	Opt	Optional
Day, Utility, D	4	4.00x4 50	25 60	267 3	L Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash		Doub	Remy	Hand	Schebler	Grav		
Detroiter, A	4	3.38x4.75	18 25	170.0	L Head	Block	Poppet	Left	Gear	Thermo	Tub	Splash	Gear	Sing	Bosch	Fixed	Kingston	Grav		
Diamond, T F	4	5 00x5 50	40 00	431 4	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Dual	Bosch	Hand	Rayfield	Pres		
Dispatch, G-2	4	3.50x.500		192 4	2 Cycle	Sep'rt				Air		Splash		Dual	Optional	Hand	Maro	Grav		
Dorris, H	4	4 38x5.00	30 73	300.7	Straight	Pairs	Poppet	Head	Gear	Pump	Tub	Splash	Gear	Sing	Bosch	Hand	Stromberg	Pres	Elec	Apple Co.
Duquesne, 50	4	4.75x5 50	36 10	389 9	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Mea	Hand		Pres	Elec	
Duquesne, Six	6	3.75x5 50	33.75	364.4	L Head	Block	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Dual	Mea	Hand		Pres	Elec	
Duryea, Victoria	2	3 75x3 75		82 8	2 Cycle	Sep'rt				Air		Io fuel		Sing	Dry Cells	Hand	Heitger	Grav	Lever	Own
Duryea, Runabout	2	3 75x3.75		82 8	2 Cycle	Sep'rt				Air		In fuel		Sing	Dry Cells	Hand	Heitger	Grav	Lever	Own
Duryea, Buggy	2	3.75x3.75		82.8	2 Cycle	Sep'rt				Air		In fuel		Sing	Dry Cells	Hand	Heitger	Grav	Lever	Own
Duryea, Surry	2	3.75x3.75		82.8	2 Cycle	Sep'rt				Air		Io fuel		Sing	Dry Cells	Hand	Heitger	Grav	Lever	Own
Edwards, 25	4	4.00x5.50	25 60	276 5	Knight	Pairs	Sleeve		Chain	Pump	Cell	Pressure	Piston		Simms	Hand	S.U	Pres	Elec	W. S. L.
Empire, Touring	4	3.50x4.50	19.60	173.2	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Sing	Eisemann	Fixed	Holley	Grav		
Enger, F, J, E	4	4.50x5.25	32 40	334 0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav		
Enger, P	4	4.50x5.25	32 40	334.0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav	Elec	Northeast
Falcar, 40	4	4.13x5.25	27.25	280.6	L Head	Sep'rt	Poppet	Right	Gear	Pump	Tub	Spl-Pres		Dual	Bosch	Hand	Rayfield	Grav		
Fiat, 54	4	4 40x6 00	30 63	371.2	L Head	Block	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Bosch	Hand	Own	Pres		
Fiat, 56	6	4 40x6 00	45 95	556 8	L Head	Block	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Bosch	Hand	Own	Pres		
Fiat, 55	4	5.13x6.75	42.00	557.0	L Head	Block	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Bosch	Hand	Own	Pres		
Firestone-Col., 86E	4	4 13x5 25	27.25	280 6	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Splt'rf	Hand	Schebler	Grav	Elec	Northeast
Firestone-Col., 60	4	4 50x5 50	32 40	349.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Doub	Conn.	Hand	Schebler	Grav	Elec	Northeast
Firestone-Col., 86	6	4.13x5 25	40 90	420.9	L Head	Threes	Poppet	Right	Gear	Pump	Cell	Splash	Piston	Doub	Conn.	Hand		Pres	Elec	Northeast
Flanders, 40	6	3 63x4 50	31 60	278 7	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Splt'rf	Hand	Holley	Pres	Elec	Gray & Da.
Flanders, 50	6	4 00x4.75	38.40	358.2	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Splt'rf	Hand	Holley	Pres	Elec	Gray & Da.
Ford, T	4	3.75x4.00	22.50	176.7	L Head	Block	Poppet	Right	Gear	Thermo	Tub	Splash	Flywheel	Sing	Own	Hand	Holley	Grav		
Franklin, G Run	4	4.00x4 00	25 60	201.1	Straight	Sep'rt	Poppet	Head	Gear	Air		Pressure	Gear	Dual	Bosch	Gov	Own	Grav		
Franklin, G Tour	4	4 00x4 00	25 60	201.1	Straight	Sep'rt	Poppet	Head	Gear	Air		Pressure	Gear	Dual	Bosch	Gov	Own	Grav		
Franklin, M	6	3 63x4 00	31 60	247.7	Straight	Sep'rt	Poppet	Head	Gear	Air		Pressure	Gear	Dual	Bosch	Gov	Own	Grav	Elec	Entz
Franklin, D	6	4 00x4 00	38 40	301 7	Straight	Sep'rt	Poppet	Head	Gear	Air		Pressure	Gear	Dual	Bosch	Gov	Own	Grav	Elec	Entz
Franklin H	6	4 00x4.00	38 40	301 7	Straight	Sep'rt	Poppet	Head	Gear	Air		Pressure	Gear	Dual	Bosch	Gov	Own	Grav	Elec	Entz
Garford, 14	6	4 25x5 25	43.50	456.7	L Head	Threes	Poppet	Left	Spir'l	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand				
Garford, G15	6	3.75x6 00	33.75	497.5	L Head	Block	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Gear	Sing	Bosch	Hand	Own	Pres	Elec	U. S. L.
Gleason, R	2	4.75x4.00	18.00	141.8	L Head	Sep'rt	Poppet	Side	Gear	Thermo	Tub	Spl-Pres	Noncir.	Dual	Remy	Hand	Schebler	Grav		
Glide, 36-42	4	4.13x5 25	27 25	280 6	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Gear	Dual	Remy	Hand	Stromberg	Grav	Acet	Disco
Glide, 45	4	4.75x5.00	36.10	354.4	L Head	Sep'rt	Poppet	Left	Gear	Pump	Tub	Splash	Gear	Dual	Eisemann	Hand	Schebler	Grav	Acet	Disco
Great Eagle, B	4	4 75x5 00	36 10	354.4	L Head	Sep'rt	Poppet	S&H	Gear	Pump	Cell			Dual	Remy	Hand	Stromberg	Grav		

*Underslung Frame. †Has six wheels.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate. **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo, thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noncir. **Ignition:** Sing, single; Doub, double; Dual 2, double distributer; Gov, governor; Atw Kent, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric; Acet, acetylene; Mech, mechanical; Opt, optional; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as 4.25=4¼, etc., .06=1/16, .19=3/16, .13=⅛, .25=¼, .31=5/16, .38=⅜, .44=7/16, .5=½, .56=9/16, .63=⅝, .69=11/16, .75=¾, .81=13/16, .88=⅞.

Horsepower and Mechanical Details

TRANSMISSION								RUNNING GEAR								CONTROL			BEARINGS				2
Clutch Type	Gearset Type	Gearset Location	Gearset Forward Speeds	Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Wheelbase	Tires Front	Tires Rear	Wheels Kind	Wheels Attachment	Springs Front	Springs Rear	Front Axle	Location Steering Wheel	Gearshift Location	Emergency Brake Control	Crankshaft Type and No.	Gearset	Rear Axle	Front Wheel	Chassis Weight, Lbs.
Disk	Sel	Unit X	3	Bevel	Tor T	Float		128	36x4	36x4	Wood		½ Ell.	¾ Ell.	1-Beam	Opt	Cent.	Cent.	Plain, 3	Plain	Roll	Ball	2,100
Disk	Sel	Unit M	3	Bevel	Tor Rd	Float	Opt.	118	34x4½	34x4½	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Cent.	Cent.	Plain, 3	Roll	Roll	Roll	2,800
Disk	Sel	Unit M	3	Bevel	Tor Rd	Float	Opt.	128	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Cent.	Cent.	Plain, 3	Roll	Roll	Roll	32,00
Disk	Sel	Unit M	3	Bevel	Tor Rd	Float	Opt.	138	37x5	37x5	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Cent.	Cent.	Plain, 3	Roll	Roll	Roll	34.00
Cone	Sel	Unit M	3	Bevel	Tor Rd.	Float		116	36x4	36x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	
Cone	Sel	Unit M	3	Bevel	Tor Rd.	Float		122	36x4	36x4	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	
Cone	Sel	Unit M	3	Bevel	Tor Rd.	Float		132	37x4½	37x4½	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	
Cone	Sel	Amid	4	Bevel	Rad Rd	Float	3.75-1	129	36x4½	36x4½	Wood		½ Ell.	½ Ell.	1-Beam	Right	Cent.	Cent.	Plain, 5	Ball	Roll	Roll	3,800
Cone	Sel	Amid	3	Bevel	Springs	Float	3.38-1	120	36x4½	36x4½	Wood		½ Ell.	½ Ell.	1-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	3,700
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.85-1	120	34x4	34x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Cent.	Cent.	Plain, 3	Ball	Ball	Ball	2,200
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.50-1	125	36x4	36x4	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,400
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00-1	105	34x3½	34x3½	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,100
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00-1	125	36x4	36x4	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Right	Right	Plain, 4	Roll	Roll	Roll	2,600
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00-1	125	34x4	34x4	Wood		½ Ell.	¾ Ell.	1-Beam	Left	Cent.	Cent.	Plain, 3	Roll	Roll	Ball	
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.50-1	125	34x4	34x4	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Right	Right	Plain, 7	Roll	Roll	Ball	
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	3.00-1	135	36x4½	37x5	Wood		½ Ell.	Plat		Right	Right	Right	Plain, 7	Ball	Ball	Ball	3,100
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.50-1	115	34x4	34x4	Wood		½ Ell.	Ell	1-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,600
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.50-1	125	36x4	36x4	Wood		½ Ell.	Ell	1-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,800
Disk	Sel	Unit M	3	Bevel	Rad Rd	Semi F		112	32x3½	32x3½	Wood		½ Ell.	Ell	1-Beam	Right	Cent.	Cent.	Plain, 2	Roll	Roll	Ball	
Disk	Sel	Unit M	3	Bevel	Rad Rd	¾Float		114	34x3½	34x3½	Wood		½ Ell.	Ell	1-Beam	Right	Cent.	Cent.	Plain, 2	Roll	Roll	Ball	
Disk	Sel	Unit M	3	Bevel	Rad Rd	¾Float		122	35x4	35x4	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Cent.	Cent.	Plain, 2	Roll	Roll	Ball	
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float		122	36x4	36x4	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Cent.	Cent.	Plain, 3	Roll	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	S & R R	Float		137	37x4½	37x4½	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Cent.	Cent.	Plain, 4	Roll	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	4.00-1	122	35x4½	35x4½	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Cent.	Cent.	Plain, 4	Ball	Roll	Ball	
Disk	Sel	Amid	3	Bevel	Rad Rd	Float	4.00-1	121	36x4	36x4	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Plain	Ball	Roll	2,350
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	4.50-1	138	36x4½	36x4½	Wood		½ Ell.	¾ Plat	I-Beam	Left	Cent.	Cent.	Plain, 3	Plain	Ball	Roll	2,750
Cone	Sel	Unit M	3	Bevel	Springs	Float	3.43-1	124	36x4½	36x4½	Wood		½ Ell.	½ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Roll	Roll	
Disk	Sel	Unit M	3	Bevel	Tor T	Semi F		120	36x4	36x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Ball	2,200
Cone	Sel		3	Bevel	Rad Rd	Float	3.50-1	118	36x4	36x4	Wood		½ Ell.	¾ Plat	1-Beam	Right	Cent.	Cent.	Plain, 3	Ball	Ball	Ball	
Cone	Sel		3	Bevel	Rad Rd	Float	3.50-1	118	36x4	36x4	Wood		½ Ell.	¾ Plat	1-Beam	Right	Cent.	Cent.	Plain, 3	Ball	B&R	Ball	
Disk	Pro		3	Bevel	Springs	Float		115	34x4	34x4	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Roll	Ball	
Disk	Sel	Unit M	3	Bevel	Tor T	Float	4.00-1	104	32x3½	32x3½	Wood		½ Ell.	Plat	I-Beam	Left	Cent.	Pedal	Ball, 2	Ball	Ball	Roll	2,000
Disk	Sel	Amid	3	Bevel	Tor R	Float		126	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	3,300
	Frict	Amid		Chain	S&RR	Dead	6.25-1	120	36x3½	36x3½	Wood		Ell.	Ell.	Tube	Right	Pedal	Right	Plain, 5	Roll	Roll	Roll	1,200
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.66-1	121	36x4	36x4	Wood		½ Ell.	½ Ell.	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	
Disk	Sel	Unit M	3	Bevel	Springs	Float		124	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Roll	Roll	2,600
Disk	Sel	Unit M	3	Bevel	Springs	Float		133	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	1-Beam	Left	Cent.	Cent.	Plain, 4	Ball	Roll	Roll	2,700
	Frict	Unit X	2	Roller	Tor T	Dead		100	30x3	36x3	Wood		½ Ell.	½ Ell.	Tube	Cent.	Cent.		Plain, 4	Roll	Ball	Ball	650
	Frict	Unit X	2	Roller	Tor T	Dead		80	30x3	36x3	Wood		½ Ell.	½ Ell.	Tube	Cent.	Cent.		Plain, 4	Roll	Ball	Ball	650
	Frict	Unit X	2	Roller	Tor T	Dead		80	1½	1½	Wood		½ Ell.	½ Ell.	Tube	Cent.	Cent.		Plain, 4	Roll	Ball	Ball	650
	Frict	Unit X	2	Roller	Tor T	Dead		90	1½	1½	Wood		½ Ell.	½ Ell.	Tube	Cent.	Cent.		Plain, 4	Roll	Ball	Ball	650
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	3.00-1	120	36x4½	36x4½	Wire	Dem	½ Ell.	½ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 5	Roll	Roll	Roll	
Disk	Sel	Unit M	3	Bevel	S & T T	Semi F		104	32x3½	32x3½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Cent.	Pedal	Plain, 3	Ball	B&R	Ball	1,550
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.50-1	120	34x4	34x4	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Cent.	Pedal	Plain, 3	Ball	Ball	Ball	2,400
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.50-1	120	36x4	36x4	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Cent.	Pedal	Plain, 3	Ball	Ball	Ball	
Cone	Sel	Amid	3	Bevel	S & R R	Float	3.50-1	116	34x4	34x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,400
Disk	Sel	Amid	4	Bevel	Springs	Semi F	3.33-1	123	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,800
Disk	Sel	Amid	4	Bevel	Springs	Semi F	3.50-1	135	36x4½	37x5	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	3,300
Disk	Sel	Amid	4	Bevel	Springs	Semi F	3.00-1	128	36x4½	37x5	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,150
Cone	Sel	Amid	3	Bevel	Springs	Float		116	34x4	34x4	Opt		½ Ell.	¾ Ell.	1-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Ball	Ball	
Cone	Sel	Amid	3	Bevel	Springs	Float		122	36x4	36x4	Opt		½ Ell.	¾ Ell.	1-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	Springs	Float		130	36x4½	36x4½	Opt		½ Ell.	¾ Ell.	1-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Ball	Ball	
Cone	Sel	Unit X	3	Bevel	Tor T	¾Float	3.50-1	118	34x4	34x4	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Right	Right	Plain, 3	P&R	Roll	Ball	2,600
Cone	Sel	Unit X	3	Bevel	Tor T	¾ Float	3.75-1	130	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Right	Right	Plain, 3	P&R	Roll	Roll	3,750
Disk	Plan.	Unit M	2	Bevel	Tor T	Semi F	3.64-1	100	30x3	30x3½	Wood		Cross	Cross	1-Beam	Left	Pedal	Left	Plain, 3		Roll	Ball	1,000
Disk	Sel	Amid	3	Bevel	Springs	Semi F		100	32x3½	32x3½	Wood		Ell	Ell	Tube	Right	Right	Right	Plain, 5	Ball	B&R.	Roll	1,800
Disk	Sel	Amid	3	Bevel	Springs	Semi F		103	32x4	32x4	Wood		Ell	Ell	Tube	Right	Right	Right	Plain, 5	Ball	B&R.	Roll	2,300
Disk	Sel	Amid	3	Bevel	Springs	Semi F		116	34x4½	34x4½	Wood		Ell	Ell	Tube	Right	Right	Right	Plain, 7	Ball	B&R.	Roll	2,400
Disk	Sel	Amid	3	Bevel	Springs	Semi F		123	36x4½	37x5	Wood		Ell	Ell	Tube	Right	Right	Right	Plain, 7	Ball	B&R.	Roll	2,900
Disk	Sel	Amid	3	Bevel	Springs	Semi F		126	37x5	37x5	Wood		Ell	Ell	Tube	Right	Right	Right	Plain, 7	Ball	B&R.	Roll	3,000
Cone	Sel	Amid	4	Bevel	Tor T	Float	2.73-1	139	36x4½	37x5	Wood		½ Ell.	¾ Plat	1-Beam				Plain, 3	Ball	B&R.	Roll	3,050
Cone	Sel	Unit M	4	Bevel	Tor T	Float		128	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	1-Beam	Left	Cent.	Cent.	Plain, 4	Ball	B&R.	Roll	3,050
Disk	Sel	Unit M	3	Bevel	Tor R	Float	6.00-1	96	36x2	36x2	Wood		½ Ell.	Ell	I-Beam	Right	Right	Right	Plain, 2	Plain	Roll	Ball	1,500
Disk	Sel	Unit M	3	Bevel	Springs	¾Float		118	34x4	34x4	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Roll	Ball	Ball	2,300
Disk	Sel	Unit X	3	Bevel	Tor T	Float		120	36x4½	36x4½	Wood		½ Ell.	½ Ell.	1-Beam	Right	Cent.	Cent.	Plain, 6	Roll	Roll	Roll	2,800
Cone	Sel	Amid	3	Bevel		Float		135	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	1-Beam	Right	Right	Right					

ABBREVIATIONS:—Clutch Type: Exp Bd, expanding band; Con Bd, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; Unit M, unit with motor; Unit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Worm, shaft with worm gear at rear axle. **Car Drives through:** Tor T, torsion tube; S & T T, springs and torsinn tube; R & T R, radius rods and torsion rod. Rad Rd, radius rods; S & R R, springs and radius rods; Tor Rd, torsinn rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¾ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, center. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

Passenger Car Chassis Listed for 1913

MAKE AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	CYLINDERS Shape	CYLINDERS How Cast	VALVES Type	VALVES Location	VALVES Camshaft Drive	COOLING Circulation	COOLING Radiator	LUBRICATION System	LUBRICATION Type of Pump	IGNITION System	IGNITION Magneto Generator	IGNITION Control	CARBURETION Make of Carbureter	CARBURETION Fuel Feed	ENGINE STARTER Type	ENGINE STARTER Make
Great Eagle, C	6	4.13x5.25	40.90	420.9	L Head	Sep'rt	Poppet	S&H	Gear	Pump	Cell			Dual	Remy	Hand	Rayfield	Grav		
Great Southern, 30	4	4.00x4.50	25.60	226.6	L Head	Block	Poppet	Right	Gear	Thermo	Tub	Spl-Pres	Piston	Dual	Bosch	Hand	Schebler	Grav	Acet	Prestolite
Great Southern, 51	4	5.19x6.00	47.90	507.2	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand	Stromberg	Grav	Opt	Optional
Great Western	4	4.25x5.50	28.90	312.0	L Head	Sep'rt	Poppet	Right	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav	Acet	Prestolite
Grout, 35	4	4.50x5.50	32.40	349.0	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Splash		Dual		Hand	Schebler	Grav	Elec	Ward-L'd
Grout, 45	4	4.75x5.00	38.00	354.4	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual		Hand	Schebler	Grav	Elec	Ward-L'd
Halladay, 32	4	3.75x5.25	22.50	231.9	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Dual	Briggs	Hand	Schebler	Grav		
Halladay, 40	4	4.50x5.00	32.40	318.1	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Doub	Bosch	Hand	Schebler	Grav	Elec	Jones
Havers, 44	6	3.75x5.00	33.75	330.4	L Head	Pairs	Poppet	Left	Gear	Thermo	Cell	Spl-Pres	Gear	Dual		Hand	Stromberg	Pres	Acet	Disco
Havers, 55	6	4.00x5.00	38.40	376.9	L Head	Pairs	Poppet	Left	Gear	Thermo	Cell	Spl-Pres	Gear	Sing	Atw Kent	Hand	Stromberg	Pres	Elec	Northeast
Haynes, 22	4	4.50x5.50	32.40	349.9	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Spl-Pres	Piston	Dual	Eisemann	Hand	Stromberg	Grav	Elec	Own
Henderson	4	4.13x5.25	27.25	220.9	L Head	Block	Poppet	Right	Gear	Thermo	Tub	Spl-Pres	Piston	Dual	Remy	Hand	Rayfield	Grav	Acet	Disco
Herreshoff, 4-30	4	3.38x4.50	18.25	161.0	T Head	Block	Poppet	Opp	Gear	Thermo	Tub	Splash	Piston	Dual	Briggs	Fixed	Stromberg	Grav		
Herreshoff, 6-36	6	3.38x4.50	27.40	241.5	T Head	Block	Poppet	Opp	Gear	Thermo	Tub	Splash	Piston	Dual	Briggs	Fixed	Stromberg	Grav		
Holly, A	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Doub	Remy	Opt	Grav		Opt	
Hudson, 37	4	4.13x5.25	27.25	280.6	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual	Delco	Hand	Zenith	Pres	Elec	Delco
Hudson, 54	6	4.13x5.50	40.90	441.0	L Head	Threes	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual	Delco	Hand	Zenith	Pres	Elec	Delco
Hupmobile, C	4	3.25x3.38	16.90	112.0	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Splash	Noncir	Sing	Bosch	Fixed	Breeze	Grav		
Hupmobile, E	4	3.25x3.38	16.90	112.0	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Splash	Noncir	Sing	Bosch	Fixed	Breeze	Grav		
Hupmobile, H	4	3.25x5.50	16.90	182.5	L Head	Block	Poppet	Left	Chain	Thermo	Cell	Splash	Flywheel	Sing	Bosch	Hand	Zenith	Grav		
Imperial, 34	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav	Elec	Northeast
Imperial, 44	4	4.75x5.25	36.10	272.1	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav	Elec	Northeast
Interstate, 45	6	4.00x5.00	38.40	376.9	L Head	Block	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Mea	Hand	Optional	Pres	Elec	Apple
Jackson, Olympic	4	4.13x4.75	27.25	253.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Jackson, Majestic	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Jackson, Sultanic	6	4.13x4.75	40.90	380.8	L Head	Pairs	Poppet	Left	Chain	Pump	Cell	Spl-Pres	Piston	Dual	Remy	Hand	Schebler	Grav	Elec	
Keeton, 48	6	3.75x5.50	33.75	364.4	L Head	Block	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Gear	Sing	Bosch	Fixed	Own	Grav	Elec	
King, Roadster	4	3.83x5.13	22.50	226.4	L Head	Block	Poppet	Side	Gear	Thermo	Tub	Pressure		Dual	Briggs	Hand	Stromberg	Grav		
King, Touring	4	4.00x5.50	25.60	276.5	L Head	Block	Poppet	Side	Gear	Thermo	Tub	Pressure		Dual	Briggs	Hand	Stromberg	Grav		
Kissel, 30	4	4.25x4.25	28.90	241.1	L Head	Pairs	Poppet	Left	Chain	Pump	Cell	Splash	Gear	Dual	Esterline	Hand	Stromberg	Grav	Elec	Own
Kissel, 40	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Chain	Pump	Cell	Splash	Gear	Dual	Esterline	Hand	Stromberg	Grav	Elec	Own
Kissel, 50	4	4.88x5.00	38.00	373.3	L Head	Pairs	Poppet	Left	Chain	Pump	Cell	Splash	Gear	Dual	Esterline	Hand	Stromberg	Grav	Elec	Own
Kissel, 60	6	4.50x5.25	48.60	501.0	L Head	Pairs	Poppet	Left	Chain	Pump	Cell	Splash	Gear	Dual	Esterline	Hand	Stromberg	Grav	Elec	Own
Klinekar, 30	4	4.00x4.63	25.60	232.5	T Head	Sep'rt	Poppet	Right	Gear	Pump	Tub	Splash	Gear	Doub	Bosch	Hand		Grav	Opt	Optional
Klinekar, 40	4	4.25x5.50	28.90	312.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Gear	Doub	Bosch	Hand		Grav	Mech	Everready
Klinekar, 50	6	4.10x5.00	39.90	389.5	T Head	Sep'rt	Poppet	Opp	Gear	Pump	Tub	Splash	Gear	Doub	Bosch	Hand		Grav	Mech	Everready
Klinekar, 60	6	4.25x5.50	43.40	468.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Gear	Doub	Bosch	Hand		Grav	Mech	Everready
Knox, 44	4	5.00x5.50	40.00	431.3	Straight	Sep'rt	Poppet	Head	Gear	Pump	Cell	Pressure	Gear	Doub	Bosch	Hand	Stromberg	Grav	Acet	Perkins
Knox, 45	4	5.00x5.50	40.00	431.3	Straight	Sep'rt	Poppet	Head	Gear	Pump	Cell	Pressure	Gear	Doub	Bosch	Hand	Stromberg	Grav	Acet	Perkins
Knox, 46	6	4.38x5.50	45.94	496.0	Straight	Pairs	Poppet	Head	Gear	Pump	Cell	Pressure	Gear	Doub	Bosch	Hand	Rayfield	Grav	Acet	Perkins
Knox, 66	6	5.00x5.50	60.00	646.7	Straight	Pairs	Poppet	Head	Gear	Pump	Cell	Pressure	Gear	Doub	Bosch	Hand	Stromberg	Grav	Acet	Perkins
Krit, K	4	3.70x4.00	22.50	176.7	L Head	Block	Poppet	Right	Hel'l	Thermo	Tub	Splash	Piston	Sing	Bosch	Fixed	Stromberg	Grav		
Lambert, Buckeye, 40	4	3.25x5.25	16.90	174.2	L Head	Block	Poppet	Right	Gear	Pump	Tub	Splash	Gear	Dual	Remy	Hand	Schebler	Grav		
Lambert, 99	4	4.25x5.25	28.90	297.8	L Head	Sep'rt	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Remy	Hand	Schebler	Grav		
Lenox, Four	4	4.25x5.50	28.90	312.0	L Head	Block	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Spld'rf	Hand	Own	Grav	Elec	Gray & Da.
Lenox, Six	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Piston	Sing	Mea	Hand	Own	Grav	Elec	Gray & Da.
Lexington, 13	6	4.13x5.25	40.90	420.9	L Head	Threes	Poppet	Right	Gear	Pump	Cell	Pressure	Piston	Doub		Hand		Pres	Elec	E. L. & S.
Lion, 30	4	3.50x5.00	19.60	192.4	L Head	Block	Poppet	Right	Hel'l	Thermo	Cell	Splash	Piston	Dual	Remy	Hand	Own	Grav		
Little Four, A	4	3.50x3.28	19.60	129.9	L Head		Poppet	Left	Gear	Thermo	Tub	Splash	Noncir	Doub	Briggs	Hand	Kingston	Grav		
Locomobile, L	4	4.50x4.50	32.40	286.3	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand	Own	Grav	Acet	Disco
Locomobile, R	6	4.25x5.00	43.40	425.4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand	Own	Grav	Acet	Disco.
Locomobile, M	6	4.50x5.50	48.60	524.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand	Own	Grav	Acet	Disco
Lozier, 77	6	3.63x5.50	31.60	340.7	L Head	Threes	Poppet	Right	Gear	Pump	Tub	Spl-Pres	Gear	Sing	Bosch	Hand	Rayfield	Pres	Elec	Gray & Da.
Lozier, 72	6	4.63x5.50	51.60	554.4	T Head	Pairs	Poppet	Opp	Spiral	Pump	Tub	Spl-Pres	Gear	Dual 2	Bosch	Hand	Own	Pres	Elec	Gray & Da.
Luverne, 760	6	4.25x5.25	43.40	446.7	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Splash	Gear	Dual		Hand	Schebler	Grav	Elec	Gray & Da.
Marathon, Runner	4	3.50x4.50	19.60	173.2	L Head	Pairs	Poppet	Right	Gear	Thermo	Tub	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav		
Marathon, Winner	4	4.25x4.50	28.90	255.3	L Head	Pairs	Poppet	Right	Gear	Thermo	Tub	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav		
Marathon, Champion	4	4.50x5.13	32.40	326.1	L Head	Pairs	Poppet	Right	Gear	Thermo	Tub	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav		
Marion, 36A & 37A	4	4.00x5.00	25.60	251.3	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Spld'rf	Hand	Schebler	Grav	Acet	Disco
Marion, 48A	4	4.13x5.50	27.25	204.0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Spld'rf	Hand	Schebler	Grav	Elec	
Marmon, 32	4	4.50x5.00	32.40	318.1	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual 2	Bosch	Hand	Harroun	Grav	Elec	Northeast
Marmon, Six	6	4.50x6.00	48.60	572.5	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual 2	Bosch	Hand	Harroun	Pres	Elec	Northeast
Mason, A, B, C	2	5.00x5.00	20.00	196.4	Straight	Sep'rt	Poppet	Head	Gear	Pump	Tub	Splash		Dual	Spld'rf	Hand	Schebler	Grav		
Mason, K	4	4.00x4.50	25.60	226.2	L Head	Block	Poppet	Right	Gear	Thermo	Cell	Splash	Piston	Dual	Spld'rf	Hand	Schebler	Grav		
Matheson, C	6	4.50x5.00	48.60	477.1	Straight	Pairs	Poppet	Head	Gear	Pump	Cell	Splash	Gear	Doub	Bosch	Hand	Stromberg	Pres	Elec	Westing'se

*Underslung Frame. †Has six wheels.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate; **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noncir. **Ignition:** Sing, single; Doub, double; Dual, 2, double distributer; Gov, governor; Atw Kent, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric; Acet, acetylene; Mech, mechanical; Opt, optional; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as 4.25 = 4¼, etc., .06 = 1/16, .19 = 3/16, .13 = ⅛, .25 = ¼, .31 = 5/16, .38 = ⅜, .44 = 7/16, .5 = ½, .56 = 9/16, .63 = ⅝, .69 = 11/16, .75 = ¾, .81 = 13/16, .88 = ⅞.

Horsepower and Mechanical Details

	TRANSMISSION							RUNNING GEAR								CONTROL			BEARINGS				3
	GEARSET								TIRES		WHEELS		SPRINGS										
Clutch Type	Type	Location	Forward Speeds	Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Wheelbase	Front	Rear	Kind	Attachment	Front	Rear	Front Axle	Location Steering Wheel	Gearshift Location	Emergency Brake Control	Crankshaft Type and No.	Gearset	Rear Axle	Front Wheel	Chassis Weight, Lbs.
Cone	Sel	Amid	3	Bevel		Float		142	37x5	37x5	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right					
Disk	Sel	Unit M	3	Bevel	Tor T	Float		113	34x4	34x4	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 2	Ball	B&R	Ball	2,000
Cone	Sel	Amid	3	Bevel	Tor T	Semi F		128	36x4	36x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Roll	Roll	Roll	2,600
Cone	Sel	Unit M	3	Bevel	Tor T	Float	3.53-1	118	36x4	36x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 5	Ball	Ball	Ball	2,000
Cone	Sel	Amid	3	Bevel	Springs	Semi F		116	34x4	35x4½	Wood		½ Ell.	Plat	I-Beam	Right	Right	Right	Plain, 5	Roll	Roll	Ball	2,600
Cone	Sel	Amid	3	Bevel	Rad Rd	Float		123	36x4	37x4½	Wood		½ Ell.	Plat	I-Beam	Right	Right	Right	Plain, 5	Roll	Roll	Ball	2,960
Cone	Sel	Amid	3	Bevel	Rad Rd	Semi F	4.50-1	112	33x4	33x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Ball	2,650
Disk	Sel	Amid	3	Bevel	Rad Rd	Float	4.50-1	118	36x4	36x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 5	Ball	Ball	Ball	3,400
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.75-1	122	36x4	36x4	Wood		½ Ell.	Plat	I-Beam	Right	Right	Right	Plain, 4	Ball	B&R	Ball	
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.50-1	128	36x4	36x4	Wood		½ Ell.	Plat	I-Beam	Right	Right	Right	Plain, 4	Ball	B&R	Ball	
Con Bd	Sel	Amid	3	Bevel	Tor T	Float	3.66-1	120	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,340
Cone	Sel	Unit X	3	Bevel	Springs	Semi F	3.64-1	116	34x4	34x4	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Pedal	Plain, 3	Ball	Roll	Ball	2,200
Disk	Sel	Unit M	4	Bevel	Tor T	Semi F	4.00-1	100	34x4	34x4	Wood		½ Ell.	Plat	I-Beam	Left	Cent.	Pedal	Plain, 3	B&P	B&R	Ball	1,600
Disk	Sel	Unit M	4	Bevel	Tor T	Semi F	4.00-1	124	34x4	34x4	Wood		½ Ell.	Plat	I-Beam	Left	Cent.	Pedal	Plain, 3	B&P	B&R	Ball	1,600
Cone	Sel	Unit X		Bevel	Tor T	¾ Float	3.50-1	130	36x4½	36x4½	Wire	Dem	½ Ell.	½ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.90-1	118	36x4	36x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,600
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.43-1	127	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	3,000
Disk	Sel	Unit M	2	Bevel	Rad Rd		4.50-1	86	30x3	30x3	Wood		½ Ell.	Cross	I-Beam	Right	Right	Right	Plain, 3	B&P	Roll	Roll	1,500
Disk	Sel	Unit M	2	Bevel	Rad Rd		4.50-1	110	30x3	30x3	Wood		½ Ell.	Cross	I-Beam	Right	Right	Right	Plain, 3	B&P	Roll	Roll	1,600
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.86-1	106	32x3½	32x3½	Wood		½ Ell.	Cross	I-Beam	Right	Cent.	Cent.	Plain, 3	B&R	Roll	Roll	1,800
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.50-1	118	34x4	34x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Cent.	Cent.	Plain, 3	Ball	B&R	Roll	
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.50-1	122	36x4	36x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Cent.	Cent.	Plain, 3	Ball	B&R	Ball	
Disk	Sel	Unit M	4	Bevel	Springs	Float	3.50-1	132	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Ball	Ball	2,800
Cone	Sel	Unit M	3	Bevel	Rad Rd	Semi F	3.50-1	115	34x4	34x4	Wood		Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Ball	2,000
Cone	Sel	Unit M	3	Bevel	Rad Rd	Semi F	3.50-1	124	36x4	36x4	Wood		Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Ball	2,400
Cone	Sel	Unit M	3	Bevel	Rad Rd	Float	3.50-1	138	36x4½	36x4½	Wood	Dem	Ell	Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	2,800
Disk	Sel	Amid	4	Bevel	Tor T	Float	Opt	131	36x4	37x4½	Wire	Dem	½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 4	Ball	Ball	Ball	3,200
Disk	Sel	Unit M	3	Bevel	Tor T	Float		110	32x3½	32x3½	Wood		½ Ell.	Flat		Left	Cent.	Cent.	Plain				
Disk	Sel	Unit M	3	Bevel	Tor T	Float		115	34x4	34x4	Wood		½ Ell.	Flat		Left	Cent.	Cent.	Plain				
Cone	Sel	Amid	3	Bevel	Springs	Float	3.75-1	116	34x4	34x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	
Cone	Sel	Amid	4	Bevel	Springs	Float	3.75-1	121	35x4½	35x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	
Cone	Sel	Amid	4	Bevel	Springs	Float	3.75-1	132	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	
Cone	Sel	Amid	4	Bevel	Springs	Float	3.75-1	140	37x5	37x5	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 4	Ball	Roll	Roll	
Cone	Sel	Amid	4	Bevel	Tor T	¾ Float		115	34x4	34x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 5	Ball	Ball	Ball	
Cone	Sel	Amid	4	Bevel	Tor T	¾ Float		118	36x4	36x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 5	Ball	Ball	Ball	
Cone	Sel	Amid	4	Bevel	Tor T	¾ Float		126	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 7	Ball	Ball	Ball	
Cone	Sel	Amid	4	Bevel	Tor T	¾ Float		132	37x5	37x5	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 7	Ball	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.50-1	122	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Cent.	Cent.	Plain, 5	Ball	Ball	Roll	2,200
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.30-1	126	37x5	37x5	Wood		½ Ell.	¾ Ell.	I-Beam	Opt	Cent.	Cent.	Plain, 5	Ball	Ball	Roll	2,740
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.50-1	134	38x5	38x5	Wood		½ Ell.	¾ Ell.	I-Beam	Opt	Cent.	Cent.	Plain, 4	Ball	Ball	Roll	3,700
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.00-1	134	38x5½	38x5½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Cent.	Cent.	Plain, 4	Ball	Ball	Roll	3,120
Disk	Sel	Unit M	3	Bevel	Tor T	Semi F	4.00-1	106	32x3½	32x3½	Wood		½ Ell.	Ell	I-Beam	Left	Left	Left	Ball, 2	Ball	Roll	Ball	1 500
	Frict	Amid		Chain	Rad Rd	Semi F		112	32x3½	32x3½	Wood		½ Ell.	Ell	I-Beam	Right	Right	Right	Plain, 5		Roll	Ball	2.000
	Frict	Amid		Chain	Rad Rd	Semi F		117	34x3½	34x3½	Wood		½ Ell.	Ell	I-Beam	Right	Right	Right	Plain, 5		Roll	Ball	2,100
Cone	Sel	Unit X	3	Bevel	Tor T	Float		118	34x4	34x4	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Ball	Ball	
Cone	Sel	Unit X	3	Bevel	Tor T	Float		130	35x4½	35x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Ball	Ball	
Cone	Sel	Unit M	3	Bevel	Springs	Float	3.33-1	129	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Roll	Roll	
Cone	Sel	Amid	3	Bevel	Springs	Semi F	4.00-1	110	32x3½	32x3½	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Left	Cent.	Plain, 3	Roll	Roll	Ball	1,800
Cone	Sel		2		Springs	Semi F		90	30x3½	30x3½	Wood		½ Ell.	¾ Ell.	Tub	Right	Right		Plain, 3	Plain	B&R	Ball	1,640
Cone	Sel	Amid	4	Bevel	Rad Rd	Float	3.54-1	120	34x4½	34x4½	Wood		½ Ell.	½ Ell.	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Roll	3,430
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	3.54-1	128	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 7	Ball	Ball	Roll	4,180
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	3.21-1	136	36x4½	37x5	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 7	Ball	Ball	Roll	4,380
Disk	Sel	Unit M	3	Bevel	Tor T	Semi F	3.75.1	127½	36x4½	36x4½	Wood		½ Ell.	½ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Ball	Ball	
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	2.76-1	131	36x4½	37x5	Wood		½ Ell.	Plat	I-Beam	Left	Cent.	Cent.	Ball, 4	Ball	Ball	Roll	2,990
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.75-1	130	37x5	37x5	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Left	Plain, 5	Ball	B&R	Ball	2,600
Disk	Sel	Unit M	3	Bevel	Tor T	Semi F	4.00-1	104	32x3½	32x3½	Wood		½ Ell.	Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Ball	2,200
Disk	Sel	Unit M	3	Bevel	Tor T	Float	4.00-1	116	34x4	34x4	Wood		½ Ell.	Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,000
Disk	Sel	Unit M	3	Bevel	Tor T	Float	4.00-1	123	36x4	36x4	Wood		½ Ell.	Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2.400
Cone	Sel	Unit X	3	Bevel	S & T T	Semi F	3.50-1	112	34x4	34x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Cent.	Cent.	Plain, 3	Ball	Roll	Ball	2,540
Cone	Sel	Unit X	3	Bevel	S & T T	Float	3.50-1	120	36x4	36x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Cent.	Cent.	Plain, 3	Ball	Roll	Roll	2,865
Cone	Sel	Unit X	3	Bevel	Tor T	Float	Opt	120	35x4½	35x4½	Wood		½ Ell.	Ell	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Ball	Roll	2,800
Disk	Sel	Unit X	3	Bevel	Tor T	Float	Opt	145	36x4½	37x5	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 7	Ball	Ball	Roll	3,250
Cone	Plan	Unit M	2	Chain	Rad Rd	Dead	3.50-1	96	32x3½	32x3½	Wood		½ Ell.	Ell	Tube	Right	Right	Right	Plain, 2	Plain	Roll	Roll	
Disk	Sel	Unit M	3	Bevel	Springs	Semi F	3.50-1	116	36x3½	36x3½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right	Right	Plain, 2	Ball	Roll	Ball	
Disk	Sel	Unit X	3	Bevel	Rad Rd	Float	3.00-1	135	37x5	37x5	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Cent.	Cent.	Plain, 4	Ball	Ball	Roll	2.950

ABBREVIATIONS:—Clutch Type: Exp Bd, expanding band; Con Bd, contracting hand. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; Unit M, unit with motor; Unit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Worm, shaft with worm gear at rear axle. **Car Drives through:** Tor T, torsion tube; S & T T, springs and torsion tube; R & T R, radius rods and torsion rod; Rad Rd, radius rods; S & R R, springs and radius rods; Tor Rd, torsion rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¾ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, center. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

Passenger Car Chassis Listed for 1913

4 NAME AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic In.hes	CYLINDERS Shape	CYLINDERS How Cast	VALVES Type	VALVES Location	VALVES Camshaft Drive	COOLING Circulation	COOLING Radiator	LUBRICATION System	LUBRICATION Type of Pump	IGNITION System	IGNITION Magneto Generator	IGNITION Control	CARBURETION Make of Carbureter	CARBURETION Fuel Feed	ENGINE STARTER Type	ENGINE STARTER Make
Maxwell, 4	4	3.75x4 00	22 50	176 7	T Head	Pairs	Poppet	Opp	Gear	Thermo	Cell	Splash	Pistou	Dual	Spld'rf	Hand.	Own	Grav	Acet	Own
Maxwell, 8	4	4 00x4 63	25 60	232 5	T Head	Pairs	Poppet	Opp	Gear	Thermo	Cell	Splash	Gear	Dual	Spld'rf	Hand.	Own	Grav	Acet	Own
Maxwell, 10	4	4 25x5.25	28.90	297.8	T Head	Sep'rt	Poppet	Opp	Gear	Thermo	Cell	Splash	Gear	Dual	Spld'rf	Hand.	Own	Grav	Acet	Own
McFarlan, S.	6	4 00x5.00	38 40	376.9	T Head	Threes	Poppet	Opp	Hel'l	Pump	Cell	Spl-Pres	Gear	Dual	Eisemann	Hand.	Stromberg	Pres	Air	Own
McFarlan, T	6	4 00x6 00	38 40	452 4	T Head	Block	Poppet	Opp	Hel'l	Pump	Cell	Splash	...	Dual	Eisemann	Hand.	Stromberg	Pres	Air	Own
McFarlan, M	6	4 25x5 00	43 40	425.4	Straight	Pairs	Poppet	Head	Hel'l	Pump	Cell	Splash	Flywheel	Dual	Eisemann	Hand.	Stromberg	Grav	Air	Own
McIntyre, G	6	3 50x4 50	29 40	259 8	T Head	Block	Poppet	Opp	Gear	Thermo	Cell	Splash	Piston	Dual	....	Hand.	Stromberg	Grav	....	....
McIntyre	6	3 50x4 50	29 40	259.8	T Head	Block	Poppet	Opp	Spiral	Thermo	Cell	Splash	Piston	Dual	....	Hand.	Stromberg	Grav	Elec	....
Mercer, J&K	4	4 38x5 00	30 63	300 7	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Dual 2	Bosch	Hand.	Fletcher	Pres	....	....
Mercer, G&H	4	4.50x5.00	32 40	318.1	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Dual 2	Bosch	Hand.	Fletcher	Pres	....	....
Metz, 22	4	3.75x4.00	22.50	176.7	L Head	Block	Poppet	Right	Gear	Thermo	Tub	Splash	Gear	Sing	Bosch	Fixed	....	Grav	....	....
Michigan, R & S	4	4 25x5 25	28 90	297 8	L Head	Block	Poppet	Right	Gear	Pump	Cell	Splash	Piston	Dual	Briggs	Hand.	Schebler	Grav	Opt	....
Michigan, L & O	4	4.06x4.50	26.40	233.3	L Head	Block	Poppet	Right	Gear	Pump	Cell	Splash	Piston	Dual	Briggs	Hand.	Schebler	Grav	Opt	....
Midland, T-4	4	4 50x5.00	32 40	318 1	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Sing	Gray & Da.	Hand.	Optional	Pres	Elec	Gray & Da.
Midland, T-6	6	4.00x5.00	38 40	376.9	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Sing	Gray & Da.	Hand.	Optional	Pres	Elec	Gray & Da.
Miller, 40	4	4.13x5.15	27.25	234 0	L Head	Block	Poppet	Right	Gear	Pump	Cell	Pressure	Piston	Dual	Kingston	Hand.	Chapin	Grav	....	....
Mitchell, 5-4	4	4 25x7 00	28.90	397 2	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand.	....	Pres	Elec	Esterline
Mitchell, 5-6	6	3 75x6.00	33 75	397 5	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand.	....	Pres	Elec	Esterline
Mitchell, 7-8	6	4 25x7.00	43 80	595.8	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand.	....	Pres	Elec	Esterline
Moline, M-40	4	4.13x6.00	27 25	327 4	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Noncir.	Doub	Bosch	Hand.	Schebler	Grav	Elec	Ward-Le'd.
Moon, 39	4	4 00x5 75	25 60	289 0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand.	Stromberg	Grav	Elec	Wagner
Moon, 48	4	4 50x5 00	32.40	318 1	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand.	Stromberg	Grav	Elec	Wagner
Moon, 65	6	4 00x5.75	38 40	433 5	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand.	Stromberg	Grav	Elec	Wagner
Morse	4	4.63x5.00	34.25	336.0	Straight	Sep'rt	Poppet	Head	Gear	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand.	Stromberg	Grav	Opt	Optional
Motorette, L, M & R	2	3.75x3 75	11 25	82.8	L Head	Sep'rt	Poppet	Side	Gear	Thermo	Tub	Splash	Gear	Sing	Bosch	Fixed	Holley	Grav	....	....
Moyer, B & E	4	4 50x5 00	32 40	318.1	T Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Mea	Hand.	Schebler	....	....	....
Moyer, D & F	6	4 00x5.00	38 40	376 9	T Head	Threes	Poppet	Opp	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Mea	Hand.	Schebler	....	....	....
National, Series V	4	4 88x6 00	38 00	448 0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Bosch	Hand.	Rayfield	Pres	Elec	Gray & Da.
National, Series V	4	4 88x6 00	38 00	448 0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Bosch	Hand.	Rayfield	Pres	Elec	Gray & Da.
National, Series V	4	4 88x6.00	38 00	448.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Bosch	Hand.	Rayfield	Pres	Elec	Gray & Da.
Norwalk, A*	6	4 00x5 00	38 40	376 9	T Head	Threes	Poppet	Opp	Spi'l.	Pump	Tub	Splash	Gear	Sing	Atw Kent	Hand.	Carter	Grav	Elec	Gray & Da.
Norwalk, A*	6	4 00x5 00	38 40	376 9	T Head	Threes	Poppet	Opp	Spi'l.	Pump	Tub	Splash	Gear	Sing	Atw Kent	Hand.	Carter	Pres	Elec	Gray & Da.
Norwalk, B*	6	4.50x5.50	48 60	524.8	T Head	Threes	Poppet	Opp	Spi'l.	Pump	Tub	Splash	Gear	Sing	....	Hand.	Carter	Pres	Elec	....
Nyberg, 437	4	3.75x5.25	22 50	231 9	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Doub	Remy	Hand.	Optional	Pres	Opt	Optional
Nyberg, 440	4	4.25x5.25	28 90	297.8	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Doub	Remy	Hand.	Optional	Pres	Opt	Optional
Nyberg, 645R	6	3.75x6.00	43 80	397 5	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand.	Optional	Pres	Opt	Optional
Nyberg, 645T	6	3.75x6.00	43.80	397.5	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand.	Optional	Pres	Opt	Optional
Nyberg, 660R	6	4.25x5.25	43 80	446.7	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Remy	Hand.	Optional	Pres	Opt	Electric
Nyberg, 660T	6	4.25x5.25	43 80	446.7	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Remy	Hand.	Optional	Pres	Opt	Electric
Oakland, 35	4	3 50x5 00	19 60	192.4	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Doub	Deaco	Hand.	....	Grav	....	....
Oakland, 42	4	4 13x4 75	27 25	253 9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Doub	Deaco	Hand.	Schebler	Pres	Air	Own
Oakland, 6-60	6	4 13x4 75	40 90	380.8	L Head	Pairs	Poppet	Left	Chain	Pump	Cell	Splash	Piston	Doub	Deaco	Hand.	Stromberg	Pres	Air	Own
Oldsmobile, 53	6	4.13x4 75	40 90	380.8	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	....	Sing	Delco	Hand.	Stromberg	Pres	Elec	Delco
Omaha, 30*	4	4 06x4 50	26 40	233 3	L Head	Block	Poppet	Right	Gear	Pump	Tub	Splash	Piston	Dual	Spld'rf	Hand.	Rayfield	Grav	....	....
Only, A	4	4 25x7.88	28.90	446 8	T Head	Block	Poppet	Opp	Gear	Pump	Tub	Spl-Pres	Gear	Doub	Bosch	Hand.	Own	Pres	....	....
Overland, 69	4	4 00x4 50	25 60	226 2	L Head	Sep'rt	Poppet	Left	Gear	Thermo	Cell	Spl-Pres	Noncir.	Dual	Remy	Hand.	Schebler	Grav	Acet	Own
Overland, 71	4	4 38x4 50	30 63	270 6	L Head	Sep'rt	Poppet	Left	Gear	Thermo	Cell	Splash	Gear	Dual	Remy	Hand.	Schebler	Grav	Acet	Own
Pacific Special, A & B	4	4 50x5.00	32 40	318 1	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Splash	Gear	Dual	Bosch	Hand.	Stromberg	Grav	Acet	Prestolite
Packard, Runabout, 38	6	4 00x5 50	38 40	414 8	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand.	Own	Pres	Elec	Delco
Packard, Touring, 38	6	4 00x5 50	38 40	414 8	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand.	Own	Pres	Elec	Delco
Packard, Phaeton, 38.	6	4 00x5 50	38 40	414 8	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand.	Own	Pres	Elec	Delco
Packard, Runabout, 48	6	4 50x5 50	48 60	524 8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand.	Own	Pres	....	....
Packard, Touring, 48	6	4 50x5 50	48 60	524 8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand.	Own	Pres	....	....
Paige, 25	4	3 75x4 00	22 50	176 7	L Head	Block	Poppet	Left	Gear	Thermo	Cell	Splash	Piston	Dual	Spld'rf	Hand.	Mayer	Grav	....	....
Paige, 36	4	4 00x5.00	25 60	251 3	L Head	Block	Poppet	Left	Chain	Pump	Tub	Spl-Pres	Piston	Sing	Bosch	Hand.	Own	Grav	Elec	Gray & Da.
Palmer-Singer, Brighton	6	4 00x5 00	38 40	376 9	T Head	Threes	Poppet	Opp	Spi'l	Pump	Cell	Spl-Pres	Gear	Dual	Eisemann	Hand.	C. R. G	Pres	Air	Own
Palmer-Singer, LXIV	6	4 88x5 50	57.00	615 0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Eisemann	Hand.	C. R. G	Pres	Air	Own
Paterson, 43	4	4 13x4 75	27 25	253.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Deaco	Hand.	Schebler	Grav	Elec	Deaco
Paterson, 47.	4	4 50x5.25	32 40	334 0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Deaco	Hand.	Schebler	Grav	Elec	Deaco
Pathfinder	4	4.13x5 25	27 25	280 6	L Head	Block	Poppet	Left	Gear	Thermo	Cell	Splash	Piston	Dual	Eisemann	Hand.	Schebler	Grav	Elec	Gray & Da.
Peerless, 29	4	4 00x4 63	25 60	232 5	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Dual	Bosch	Hand.	Own	Grav	....	....
Peerless, 35	6	4 00x5 50	38 40	414 8	T Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Piston	Dual	Bosch	Hand.	Own	Pres	Elec	Own
Peerless, 36	6	4 50x6 00	48 60	572 5	T Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Piston	Dual	Bosch	Hand.	Own	Pres	Elec	Own
Peerless, 37	6	5.00x7 00	60 00	824 8	T Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Piston	Dual	Bosch	Hand.	Own	Pres	Elec	Own
Perfex, 2	4	3 75x4.50	22 50	198 8	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Spld'rf	Hand.	Stromberg	Grav	....	....
Pierce-Arrow, 38C	6	4 00x5.50	38 40	414 8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Doub	Bosch	Hand.	Own	Grav	Air	Own
Pierce-Arrow, 48D	6	4 50x5 50	48 60	524 8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand.	Own	Pres	Acet	Disco
Pierce-Arrow, 48B	6	4 50x5 50	48 60	524 8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Doub	Bosch	Hand.	Own	Grav	Air	Own
Pierce-Arrow, 66A	6	5 00x7 00	60 00	824 8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand.	Own	Grav	Air	Own

*Underslung Frame. †Has six wheels.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate; **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo, thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noncir. **Ignition:** Sing, single; Doub, double; Dual 2, double distributor; Gov, governor; Atw Kent, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric; Acet, acetylene; Mech, mechanical; Opt, optional; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as 4.25=$4\frac{1}{4}$, etc., .06=$\frac{1}{16}$, .19=$\frac{3}{16}$, .13=$\frac{1}{8}$, .25=$\frac{1}{4}$, .31=$\frac{5}{16}$, .38=$\frac{3}{8}$, .44=$\frac{7}{16}$, .5=$\frac{1}{2}$, .56=$\frac{9}{16}$, .63=$\frac{5}{8}$, .69=$\frac{11}{16}$, .75=$\frac{3}{4}$, .81=$\frac{13}{16}$, .88=$\frac{7}{8}$.

Horsepower and Mechanical Details

Transmission: Clutch Type	Gearset: Type	Gearset: Location	Gearset: Forward Speeds	Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Running Gear: Wheelbase	Tires: Front	Tires: Rear	Wheels: Kind	Wheels: Attachment	Springs: Front	Springs: Rear	Front Axle	Control: Location Steering Wheel	Gearshift Location	Emergency Brake Control	Bearings: Crank-shaft Type and No.	Gearset	Rear Axle	Front Wheel	4: Chassis Weight, Lbs.
Disk	Pro	Unit M	3	Bevel	Springs	Semi F	3.50-1	93	30x3½	30x3½	Wood		½ Ell	¾ Ell	Tub	Left	Cent	Cent	Plain, 3	P&R	B&B	Ball	1,550
Disk	Pro	Unit M	3	Bevel	Springs	Semi F	3.82-1	106	32x3½	32x3½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	P&R	B&R	Ball	2,000
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.50-1	115	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 5	P&R	Roll	Roll	2,900
Disk	Sel	Unit X	3	Bevel	Tor T	Float	Opt	124	37x4½	37x4½	Wood		½ Ell	Ell	I-Beam	Right	Cent	Cent	Plain, 3	B&R	Ball	Ball	2,400
Disk	Sel	Unit X	3	Bevel	Tor T	Float	Opt	124	37x4½	37x4½	Wood		½ Ell	Ell	I-Beam	Right	Cent	Cent	Plain, 4	B&R	Ball	Ball	2,400
Disk	Sel	Unit M	3	Bevel	T & R R	Float	Opt	128	37x4½	37x4½	Wood		½ Ell	Ell	I-Beam	Right	Cent	Cent	Plain, 4	Ball	Ball	Ball	2,600
Disk	Sel	Unit M	4	Bevel	Springs	Float	3.43-1	116	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Pedal	Plain, 3	P&B	Ball	Roll	2,100
Disk	Sel	Unit M	4	Bevel	S & T T	Float	3.43-1	116	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Pedal	Plain, 3	P&B	Ball	Roll	2,100
Disk	Sel	Amid	4	Bevel	Rad Rd	Float		108	32x4	32x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	
Disk	Sel	Amid	4	Bevel	Rad Rd	Float		118	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,550
	Frict	Amid	5	Chain	Rad Rd	Dead	3.00-1	90	30x3	30x3	Wood		Ell	Ell	Tube	Left	Cent	Cent	Plain, 3	Ball	Ball	Ball	
Cone	Sel	Amid	4	Bevel	Springs	Float	3.50-1	118	35x4½	35x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Ball	3,100
Cone	Sel	Amid	3	Bevel	Springs	Float	3.50-1	114	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 2	Roll	Roll	Ball	2,850
Disk	Sel	Amid	3	Bevel	Springs	Float	3.75-1	121	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Roll	2,650
Disk	Sel	Amid	3	Bevel	Springs	Float	3.00-1	134	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Roll	3,600
Cone	Sel	Amid	3	Bevel	Rad Rd	Semi F		116	34x4	34x4	Wood		½ Ell	Ell	I-Beam	Right	Opt	Cent	Plain, 3	Plain	Roll	Ball	2,300
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.60-1	120	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	B&R	Roll	Roll	2,800
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.60-1	132	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 4	B&R	Roll	Roll	3,400
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.60-1	144	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 4	B&R	Roll	Roll	3,800
Cone	Sel	Unit M	3	Bevel	Tor T	Semi F	3.50-1	124	36x4	36x4	Wood		½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	B&R	Ball	2,225
Disk	Sel	Amid	3	Bevel	Springs	Float	3.50-1	116	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	B&R	Roll	
Disk	Sel	Amid	3	Bevel	Springs	Float		121	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Opt	Opt	Opt	Plain, 3	Ball	B&R	Roll	2,700
Disk	Sel	Amid	3	Bevel	Springs	Float	3.38-1	132	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 4	Ball	B&R	Roll	
Disk	Sel	Amid	4	Bevel	Tor T	Semi F		127	36x4½	36x4½	Wood		½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Ball	Ball	2,650
Cone	Plan	Unit M	2	Chain	Springs	Dead	4.50-1	72	28x3	29x3½	Wood		Ell	½ Ell	I-Beam	Right	Right	Pedal	Plain, 2	Plain	Ball	Ball	970
Cone	Sel	Amid	3	Bevel	Rad Rd	Float		117	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain 3	Roll	Ball	Ball	2,800
Cone	Sel	Amid	3	Bevel	Rad Rd	Float		122	35x4½	35x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Ball	Ball	3,100
Cone	Sel	Amid	3	Bevel	Springs	Float	3.00-1	128	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Roll	2,700
Cone	Sel	Amid	3	Bevel	Springs	Float	3.21-1	128	36x5	36x5	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Roll	2,700
Cone	Sel	Amid	3	Bevel	Springs	Float	2.64-1	120	34x4½	34x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Roll	2,600
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.78-1	127	38x4½	38x4½	Wood		½ Ell	½ Ell	I-Beam	Opt	Cent	Cent	Plain, 3	Ball	Ball	Ball	2,100
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.72-1	136	40x4½	40x4½	Wood		½ Ell	½ Ell	I-Beam	Opt	Cent	Cent	Plain, 3	Ball	Ball	Ball	2,360
Disk	Sel	Unit M	4	Bevel	Springs	Float		144	41x5	41x5	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Ball	Ball	2,635
Disk	Sel	Unit M	3	Bevel		Float	3.50-1	118	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Ball	
Disk	Sel	Unit M	3	Bevel		Float	3.50-1	128	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 4	Ball	Ball	Ball	
Disk	Sel	Unit M	3	Bevel		Float	3.50-1	126	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 4	Ball	Ball	Ball	
Disk	Sel	Unit M	3	Bevel		Float	3.50-1	136	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 4	Ball	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.50-1	128	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 7	Ball	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.50-1	138	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 7	Ball	Ball	Ball	
Cone	Sel	Unit M	3	Bevel	Springs	Semi F	3.50-1	112	32x3½	32x3½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Ball	2,350
Cone	Sel	Unit M	3	Bevel	Springs	Float	4.00-1	116	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,350
Cone	Sel	Unit M	3	Bevel	Springs	Float	4.00-1	130	34x4½	34x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	3,900
Cone	Sel	Unit M	3	Bevel	Tor T	Float	3.75-1	135	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	3,700
Cone	Sel	Unit X	3	Bevel	Tor T	Semi F	3.50-1	116	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 2	Roll	B&R	Ball	2,000
Cone	Sel	Amid	3	Bevel	Tor T	Float		112	32x3½	32x3½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Ball, 4	Ball		Ball	2,400
Cone	Sel	Unit X	3	Bevel	S & T T	¾ Float	Opt	110	32x3½	32x3½	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 5	Ball	B&R	Roll	1,900
Cone	Sel	Unit X	3	Bevel	S & T T	Float	Opt	114	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 5	Ball	Roll	Roll	2,100
Disk	Sel		3	Bevel	Tor T	Float	3.50-1	121	34x4	34x4	Wood				I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,700
Disk	Pro	Unit X	3	Bevel	T & R R	Semi F	3.80-1	115½	36x4½	37x5	Wood		½ Ell	¾ Ell	I-Beam	Left	Left	Left	Plain, 7	Ball	Ball	Roll	3,500
Disk	Pro	Unit X	3	Bevel	T & R R	Semi F	3.80-1	134	36x4½	37x5	Wood		½ Ell	¾ Ell	I-Beam	Left	Left	Left	Plain, 7	Ball	Ball	Roll	3,500
Disk	Pro	Unit X	3	Bevel	T & R R	Semi F	3.80-1	138	36x4½	37x5	Wood		½ Ell	¾ Ell	I-Beam	Left	Left	Left	Plain, 7	Ball	Ball	Roll	3,500
Disk	Pro	Unit X	3	Bevel	T & R R	Semi F	3.80-1	121½	36x4½	37x5	Wood		½ Ell	¾ Ell	Tub	Right	Right	Right	Plain, 4	Ball	Ball	Roll	4,050
Disk	Pro	Unit X	3	Bevel	T & R R	Semi F	3.80-1	139	36x4½	37x5	Wood		½ Ell	¾ Ell	Tub	Right	Right	Right	Plain, 4	Ball	Ball	Roll	4,050
Disk	Sel	Unit M	3	Bevel	Rad Rd	Semi F	4.00-1	110	32x3½	32x3½	Wood		½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 2	B&R	B&R	Ball	2,180
Disk	Sel	Unit M	3	Bevel	Rad Rd	¾ Float	3.53-1	116	34x4	34x4	Wood		½ Ell	Ell	I-Beam	Left	Cent	Cent	Plain, 3	B&R	B&R	Ball	2,700
Disk	Sel	Unit X	3	Bevel	Rad Rd	Float	3.69-1	127	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	B&R	Ball	2,510
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	3.30-1	138	36x4	36x5	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Roll	2,929
Cone	Sel	Unit M	3	Bevel	Springs	Float	4.00-1	116	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,700
Cone	Sel	Unit M	3	Bevel	Springs	Float	4.00-1	122	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,100
Cone	Sel	Unit M	3	Bevel	Tor T	Float	Opt	120	36x4	36x4	Opt		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Roll	2,300
Exp Bd	Sel	Amid	4	Bevel	Tor T	Float		113	34x4½	34x4½	Wood		½ Ell	Plat	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Roll	
Exp Bd	Sel	Amid	4	Bevel	Rad Rd	Float	3.60-1	125	36x4½	36x4½	Wood		½ Ell	Plat	I-Beam	Right	Right	Right	Plain, 7	Ball	Ball	Roll	
Exp Bd	Sel	Amid	4	Bevel	Rad Rd	Float	3.20-1	137	36x4½	37x5	Wood		½ Ell	Plat	I-Beam	Right	Right	Right	Plain, 7	Ball	Ball	Roll	4,750
Exp Bd	Sel	Amid	4	Bevel	Rad Rd	Float	2.60-1	140	38x5½	38x5½	Wood		½ Ell	Plat	I-Beam	Right	Right	Right	Plain, 7	Ball	Ball	Roll	
Disk	Sel	Unit M	3	Bevel	Rad Rd	Semi F		106	32x3½	32x3½	Wood		Ell	Ell	I-Beam	Right	Cent		Plain, 3		Ball	Ball	1,800
Cone	Sel	Amid	4	Bevel	Springs	Semi F		132	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	B&R	Roll	3,030
Cone	Sel	Amid	4	Bevel	Springs	Semi F		134½	37x5	37x5	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	B&R	Roll	3,335
Cone	Sel	Amid	4	Bevel	Springs	Semi F		142	37x5	37x5	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	B&R	Roll	3,510
Cone	Sel	Amid	4	Bevel	Springs	Semi F		147½	37x5	38x5½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	B&R	Roll	3,980

ABREVIATIONS:—Clutch Type: Exp Bd, expanding band; Con Bd, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, frictinn; Unit M, unit with mntor; Unit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Worm, shaft with worm gear at rear axle. **Car Drives through:** Tnr T, torsinn tube; S & T T, springs and torsinn tube; R & T R, radius rods and torsinn rod; Rad Rd, radius rods; S & R R, springs and radius rods; Tnr Rd, torsion rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¾ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, center. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

Passenger Car Chassis Listed for 1913

5

MAKE AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	CYLINDERS Shape	How Cast	VALVES Type	Location	Camshaft Drive	COOLING Circulation	Radiator	LUBRICATION System	Type of Pump	IGNITION System	Magneto Generator	Control	CARBURETION Make of Carburetor	Fuel Feed	ENGINE STARTER Type	Make
Pilot, 50	4	4.50x6.00	32.40	381.7	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash		Dual	Opt	Hand	Optional	Grav	Elec	Gray & Da.
Pilot, 60	6	4.00x6.00	38.40	452.4	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash		Dual	Opt	Hand	Optional	Grav	Elec	Gray & Da.
Pope-Hartford, 31	4	4.32x5.13	30.90	299.9	Straight	Pairs	Poppet	Head	Gear	Pump	Tub	Spl-Pres	Piston	Dual		Hand	Own	Grav	Elec	Gray & Da.
Pope-Hartford, 33	4	4.75x5.50	36.10	389.9	Straight	Pairs	Poppet	Head	Gear	Pump	Tub	Spl-Pres	Piston	Dual	Bosch	Hand	Own	Grav	Elec	Gray & Da.
Pope-Hartford, 29	6	4.32x5.38	46.35	471.9	Straight	Pairs	Poppet	Head	Gear	Pump	Tub	Spl-Pres	Piston	Dual	Bosch	Hand	Own	Grav	Elec	Gray & Da.
Pratt, 30	4	4.00x4.50	25.60	226.2	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Splash	Gear	Dual	Deaco	Hand	Schebler	Grav	Acet	Prestolite
Pratt, 40	4	4.50x4.75	32.40	302.2	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Schebler	Grav	Acet	Prestolite
Pratt, 50	4	4.50x5.75	32.40	365.8	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Schebler	Grav	Elec	Gray & Da.
Premier, 6-40	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Spi'l	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Optional	Grav	Air	Own
Premier, 6-60	6	4.50x5.25	48.60	501.0	T Head	Pairs	Poppet	Opp	Spi'l	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Carter	Grav	Air	Own
Pullman, 36	4	4.06x5.00	26.40	259.2	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Stromberg	Grav		
Pullman, 44	4	4.50x5.50	32.40	349.9	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Stromberg	Grav	Spring	Everready
Pullman, 66	6	4.50x5.50	48.60	523.5	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Stromberg	Grav	Spring	Everready
Rambler, Cross-Country	4	4.50x4.50	32.40	286.3	L Head	Sep'rt	Poppet	Right	Gear	Pump	Tub	Spl-Pres	Piston	Sing	U.S.L	Hand	Stromberg	Grav	Elec	U. S. L.
Rayfield, C	6	3.50x5.50	29.40	317.4	T Head	Pairs	Poppet	Opp	Chain	Thermo	Cell	Pressure		Sing	Mea	Hand	Rayfield	Pres		
R. C. H	4	3.25x5.00	16.90	165.9	L Head	Block	Poppet	Left	Gear	Thermo	Tub	Splash	Wheel	Sing	Bosch	Fixed	B. D	Grav		
Reeves, Sexteautot†	4	4.75x5.50	36.10	389.9	T Head		Poppet	Opp	Gear	Pump	Cell	Pressure		Dual	Eisemann	Hand	Optional	Grav		
Regal, T & N*	4	3.75x4.50	22.50	198.8	L Head	Block	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Dual	Michigan	Hand	Own	Grav		
Regal, Coupe*	4	3.75x4.50	22.50	198.8	L Head	Block	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Dual	Michigan	Hand	Own	Grav		
Regal, H*	4	4.25x4.50	28.90	255.3	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Dual	Michigan	Hand	Own	Grav		
Regal, C	4	4.00x5.00	25.60	251.3	L Head	Block	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Piston	Dual	Michigan	Hand	Schebler	Grav		
Reo, The Fifth	4	4.00x4.50	25.60	226.2	L Head	Pairs	Poppet	S&H	Gear	Pump	Tub	Spl-Pres	Piston	Dual	National	Hand	Holley	Grav	Acet	Own
Republic, D	4	4.25x5.00	28.90	283.6	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Delco	Hand	Stromberg	Grav		
Republic, E	6	4.25x5.00	43.35	425.4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Delco	Hand	Stromberg	Pres	Elec	Delco
Richmond, O	4	4.00x4.50	25.60	251.3	L Head	Sep'rt	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Sing	Michigan	Hand	Schebler	Grav	Opt	Optional
Richmond, P	4	4.50x5.00	32.40	318.1	L Head	Sep'rt	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Sing	Michigan	Hand	Schebler	Grav	Elec	
Schacht, NS, KL	4	4.25x5.50	28.90	312.0	L Head	Block	Poppet	Right	Spi'l	Pump	Cell	Spl-Pres	Piston	Dual		Hand	Optional	Grav	Elec	
Schlosser	4	5.00x6.00	40.00	471.2	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Noncir	Dual	Bosch	Hand	G. & A.	Pres		
Selden, 48	4	4.75x5.00	36.10	354.4	L Head	Pairs	Poppet	Left	Spir'l	Pump	Tub	Splash	Gear	Doub	Bosch	Hand	Stromberg	Grav	Acet	Disco
S. G. V., A	4	3.75x4.38	22.50	193.3	L Head	Block	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Sing	Bosch	Fixed	Own	Pres		
S. G. V., D	4	4.00x5.25	25.60	263.9	L Head	Block	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Sing	Bosch	Hand	Own	Pres		
Simplex, 127	4	4.88x6.50	38.00	485.3	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual	Bosch	Hand	Own	Pres	Acet	Disco
Simplex, 137	4	4.88x6.50	38.00	485.3	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual	Bosch	Hand	Own	Pres	Acet	Disco
Simplex, 129	4	5.75x5.75	53.00	597.2	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual	Bosch	Hand	Own	Pres	Acet	Disco
Simplex, 130	4	5.75x5.75	53.00	597.2	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual	Bosch	Hand	Own	Pres	Acet	Disco
Spaulding, G	4	4.25x5.50	28.90	312.0	L Head	Block	Poppet	Right	Gear	Pump	Cell	Splash	Piston	Dual	Eisemann	Hand	Schebler	Grav	Elec	Gray & Da.
Speedwell, G	6	4.13x5.25	40.90	420.9	L Head	Threes	Poppet	Left	Hel'l	Pump	Cell	Splash	Piston	Dual	Bosch	Hand	Schebler	Pres	Elec	Aplco
Spoerer, 40-C	4	4.88x5.50	38.00	410.6	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand		Grav	Elec	Berdon
Spoerer, 25-A	4	4.13x5.50	27.25	294.0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand		Grav	Elec	Berdon
Staver, 40	4	4.50x5.00	32.40	318.1	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Schebler	Grav	Air	Own
Staver, 45	4	4.50x5.00	32.40	318.1	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Schebler	Pres	Air	Own
Staver, 55	4	4.50x6.00	32.40	381.7	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Schebler	Grav	Air	Own
Staver, 55	4	4.50x6.00	32.40	381.7	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Schebler	Pres	Air	Own
Staver, 65	6	4.00x6.00	38.40	452.4	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Rayfield	Pres	Air	Own
Stearns, Knight, 4	4	4.25x5.50	28.90	312.0	Knight	Pairs	Sleeve	Opp	Chain	Pump	Cell	Spl-Pres	Gear	Dual	Mea	Hand	Stromberg	Pres	Spring	Everready
Stearns, Knight, 4 Road	4	4.25x5.50	28.90	312.0	Knight	Pairs	Sleeve	Opp	Chain	Pump	Cell	Spl-Pres	Gear	Dual	Mea	Hand	Stromberg	Pres	Spring	Everready
Stearns, Knight, Light Tour	4	4.25x5.50	28.90	312.0	Knight	Pairs	Sleeve	Opp	Chain	Pump	Cell	Spl-Pres	Gear	Dual	Mea	Hand	Stromberg	Pres	Spring	Everready
Stearns, Knight, 6 Road	6	4.25x5.75	43.80	489.4	Knight	Pairs	Sleeve	Opp	Chain	Pump	Cell	Spl-Pres	Gear	Dual	Mea	Hand	Stromberg	Pres	Elec	Gray & Da.
Stearns, Knight, 6	6	4.25x5.75	43.80	489.4	Knight	Pairs	Sleeve	Opp	Chain	Pump	Cell	Spl-Pres	Gear	Dual	Mea	Hand	Stromberg	Pres	Elec	Gray & Da.
Stevens-Duryea, C	6	4.32x5.50	46.33	481.9	L Head	Pairs	Poppet	Left	Hel'l	Pump	Cell	Spl-Pres		Doub	Bosch	Hand	Own	Grav	Acet	Disco
Stevens-Duryea	6	4.32x5.50	46.33	481.9	L Head	Pairs	Poppet	Left	Hel'l	Pump	Cell	Spl-Pres		Doub	Bosch	Hand	Own	Grav	Acet	Disco
Stoddard-Day, 30	4	4.00x4.50	25.60	226.2	L Head	Block	Poppet	Right	Gear	Thermo	Cell	Splash	Piston	Dual	Spld'rf	Hand	Stromberg	Grav	Acet	Own
Stoddard-Day, 38	4	4.25x5.13	28.90	290.7	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual	Bosch	Hand	Stromberg	Grav	Acet	Own
Stoddard-Day, 48	4	4.75x5.00	36.10	354.4	Straight	Pairs	Poppet	S&H	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Bosch	Hand	Stromberg	Pres		
Stoddard-Day, Knight	6	4.50x5.50	48.60	524.8	Knight	Threes	Sleeve	Opp	Chain	Pump	Cell	Splash	Gear	Doub	Bosch	Hand	Stromberg	Pres		
Studebaker, 20	4	3.62x3.75	20.30	154.8	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav		
Studebaker, 25	4	3.50x5.00	19.60	192.4	L Head	Block	Poppet	Left	Spi'l	Pump	Tub	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav	Acet	
Studebaker, 30	4	4.00x4.50	25.60	226.2	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav		
Studebaker, 35	4	4.13x5.00	27.25	267.3	L Head	Block	Poppet	Left	Spi'l	Pump	Tub	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav	Elec	Wagner
Studebaker, Six	6	3.50x5.00	29.40	288.6	L Head	Block	Poppet	Left	Spi'l	Pump	Tub	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav	Elec	Wagner
Stutz, 4 Bearcat	4	4.75x5.50	36.10	389.9	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Eisemann	Hand	Optional	Grav		
Stutz, 4 Tour	4	4.75x5.50	36.10	389.9	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Eisemann	Hand	Optional	Grav		
Stutz, 6 Bearcat	6	4.25x5.00	43.80	425.4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Doub	Spld'rf	Hand	Stromberg	Grav		
Stutz, 6 Touring	6	4.25x5.00	43.80	425.4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Eisemann	Hand	Stromberg	Grav		
Touraine, Race	6	4.00x5.25	38.40	395.8	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Fletcher	Pres		
Touraine, 6	6	4.00x5.25	38.40	395.8	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Fletcher	Pres		
Touraine, 7	6	4.00x5.25	38.40	395.8	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Fletcher	Pres		
Triumph, A&B	4	4.75x5.50	36.10	389.9	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Gear	Dual	Bosch	Hand	Stromberg	Grav	Air	Own
Velie, Dispatch	4	3.75x5.50	22.50	231.1	L Head	Block	Poppet	Left	Chain	Thermo	Tub	Splash	Piston	Dual	Bosch	Hand	Stromberg	Grav	Elec	Gray & Da.

*Underslung Frame. †Has six wheels.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate; **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; S & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo, thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noncir. **Ignition:** Sing, single; Doub, double; Dual 2, double distributer; Gov, governor; Atw Kent, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric; Acet, acetylene; Mech, mechanical; Opt, optional; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as 4.25=4¼, etc., .06=1/16, .19=3/16, .13=⅛, .25=¼, .31=5/16, .38=⅜, .44=7/16, .5=½, .56=9/16, .63=⅝, .69=11/16, .75=¾, .81=13/16, .88=⅞.

Horsepower and Mechanical Details

TRANSMISSION								RUNNING GEAR								CONTROL			BEARINGS				5
Clutch Type	GEARSET Type	GEARSET Location	GEARSET Forward Speeds	Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Wheelbase	TIRES Front	TIRES Rear	WHEELS Kind	WHEELS Attachment	SPRINGS Front	SPRINGS Rear	Front Axle	Location Steering Wheel	Gearshift Location	Emergency Brake Control	Crankshaft Type and No.	Gearset	Rear Axle	Front Wheel	Chassis Weight, Lbs.
Cone	Sel	Amid	3	Bevel	Springs	Float	3.50-1	126	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Cent.	Cent.	Plain, 3	Ball	Ball	Ball	2,400
Cone	Sel	Amid	3	Bevel	Springs	Float	3.50-1	132	37x4½	37x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Cent.	Cent.	Plain, 4	Ball	Ball	Ball	2,600
Cone	Sel	Amid.	4	Bevel	Springs	Float		118½	38x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	
Cone	Sel	Amid	4	Bevel	Rad Rd	Float		124	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Plain	Roll	Roll	
Cone	Sel	Amid	4	Bevel	Rad Rd	Float		133	37x5	37x5	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Roll	Roll	Roll	
Disk	Sel		3	Bevel	Rad Rd	¾ Float		114	34x3½	34x3½	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent.	Cent.	Plain, 3	Roll	Roll	Ball	
Cone	Sel		3	Bevel	Rad Rd	Float		120	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	
Disk	Sel		3	Bevel	Springs	Float		122	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	
Disk	Sel	Amid	3	Bevel	S & T R	Semi F		132	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	B&R	Roll	3,000
Disk	Sel	Amid	3	Bevel	S & T R	Semi F		139	37x5	37x5	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent.	Cent.	Plain, 4	Ball	B&R	Roll	3,200
Cone	Sel	Amid	3	Bevel	Springs	Float		118	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	
Cone	Sel	Amid	4	Bevel	Springs	Float		122	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Roll	
Cone	Sel	Amid	4	Bevel	Springs	Float		138	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Roll	Roll	
Cone	Sel	Amid	3	Bevel	Rad Rd	Semi F	3.71-1	120	36x4	36x4	Wood	Dem	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,700
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.44-1	117	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	
Cone	Sel	Unit X	3	Bevel	Tor T	Semi F	4.25-1	110	32x3½	32x3½	Wood		½ Ell	Ell	I-Beam	Left	Cent.	Cent.	Plain, 2	P&R	B&R	Ball	1,300
Disk	Sel	Unit X	3	Bevel	Tor T	Float		158	34x4½	34x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right		Ball	Roll	Roll	
Cone	Sel	Unit X	3	Bevel	Rad Rd	Semi F	3.70-1	108	32x3½	32x3½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 2	Roll	Roll	Ball	2,000
Cone	Sel	Unit X	3	Bevel	Rad Rd	Semi F	4.00-1	100	32x3½	32x3½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 2	Roll	Roll	Ball	2,365
Cone	Sel	Unit X	3	Bevel	Rad Rd	Semi F	3.50-1	118	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Ball	2,650
Cone	Sel	Unit X	3	Bevel	Rad Rd	Semi F	4.00-1	116	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Ball	
Disk	Sel	Amid	3	Bevel	Springs	Semi F	3.75-1		34x4	34x4	Wood				I-Beam	Left	Cent.	Cent.	Plain, 3	Roll	Roll	Roll	2,700
Cone	Sel	Unit X	3	Bevel	Rad Rd	Float	3.50-1	120	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent.	Cent.	Plain, 3	Ball	Ball	Ball	2,800
Cone	Sel	Amid	4	Bevel	Springs	Float	3.00-1	132	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent.	Pedal	Plain, 5	Ball	Ball	Ball	3,300
Cone	Sel	Amid	3	Bevel	S & T T	Semi F	3.20-1	112	34x3½	34x3½	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent.	Cent.	Plain, 5	Ball	B&R	Ball	
Cone	Sel	Amid	3	Bevel	S & T T	Semi F	3.20-1	120	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent.	Cent.	Plain, 5	Ball	B&R	Ball	
Cone	Sel	Amid	3	Bevel	Springs	Float		120	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	B&R	Ball	
Disk	Sel	Amid	4	Bevel	Rad Rd	Float		124	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,000
Disk	Sel	Amid	3	Bevel	Springs	Float	3.50-1	125	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	B&R	Ball	2,370
Disk	Sel	Amid	4	Bevel	Springs	Semi F		116	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,400
Disk	Sel	Amid	4	Bevel	Springs	Semi F		118	35x4½	35x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,600
Disk	Sel	Amid	4	Bevel	Tor T	Semi F	2.75-1	127	35x5	35x5	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,800
Disk	Sel	Amid	4	Bevel	Tor T	Semi F	2.75-1	137	35x5	35x5	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,825
Disk	Sel	Amid	4	Chain	Rad Rd	Dead	2.13-1	129	36x4	36x5	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,910
Disk	Sel	Amid	4	Chain	Rad Rd	Dead	2.13-1	139	36x5	36x5	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,925
Cone	Sel	Amid	3	Bevel	Springs	Float		120	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent.	Cent.	Plain, 3	Roll	Roll	Roll	
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.00-1	134	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Roll	Roll	3,490
Cone	Sel	Ami ǐ	3	Bevel	Rad Rd	Float		120	37x4½	37x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Bali	Roll	Roll	
Cone	Sel	Unit X	3	Bevel	Tor T	Semi F		120	35x4	35x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Ball	2,300
Disk	Sel	Amid	3	Bevel	Rad Rd	Float	3.50-1	113	34x4	34x4	Wood		½ Ell	Ell	Tube	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,250
Disk	Sel	Amid	3	Bevel	Springs	Float	3.50-1	116	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Ball	Ball	2,300
Disk	Sel	Amid	3	Bevel	Springs	Float	3.50-1	120	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,575
Disk	Sel	Amid	3	Bevel	Springs	Float	3.50-1	124	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,600
Disk	Sel	Amid	4	Bevel	Springs	Float	3.50-1	136	37x4½	37x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent.	Cent.	Plain, 5	Ball	Ball	Ball	2,950
Disk	Sel	Unit X	3	Bevel	Tor T	Float	3.90-1	127	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Roll	Roll	3,200
Disk	Sel	Unit X	3	Bevel	Tor T	Float	3.90-1	116	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Roll	Roll	3,200
Disk	Sel	Unit X	3	Bevel	Tor T	Float	3.90-1	121	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Roll	Roll	3,200
Disk	Sel	Unit X	4	Bevel	Springs	Float	3.40-1	134	37x5	37x5	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	Roll	Roll	3,500
Disk	Sel	Unit M	4	Bevel	Springs	Float	3.40-1	140	37x5	37x5	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	Roll	Roll	3,500
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.70-1	131	37x4½	37x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	B&P	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.70-1	138	37x4½	37x5	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	B&P	Ball	Ball	
Cone	Sel	Unit X	3	Bevel	Rad Rd	Semi F	4.00-1	112	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 2	Roll	Roll	Roll	2,600
Cone	Sel	Unit X	3	Bevel	Rad Rd	Float	3.53-1	114	35x4½	35x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	3,300
Cone	Sel	Amid	3	Bevel	Rad Rd	Float	3.30-1	122½	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Roll	3,700
Cone	Sel	Amid	3	Bevel	Rad Rd	Float	3.50-1	133	36x5	36x5	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent.	Cent.	Plain, 7	Ball	B&R	Roll	4,400
Cone	Sel	Unit X	3	Bevel	Tor T	Semi F		102	32x3	32x3	Wood		½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 2	B&R	Roll	Ball	
Cone	Sel	Unit X	3	Bevel	Tor T	Semi F	3.58-1	101	30x3½	30x3½	Wood		½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	BR&P	Roll	Ball	
Cone	Sel	Unit X	3	Bevel	Tor T	Semi F	3.58-1	112	32x3½	32x3½	Wood		½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	B&R	Roll	Ball	
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.58-1	115½	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	BR&P	B&R	Ball	
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.58-1	121	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	BR&P	B&R	Ball	
Disk	Sel	Unit X	3	Bevel	Tor T	Semi F	Opt	120	34x4½	34x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Roll	2,400
Disk	Sel	Unit X	3	Bevel	Tor T	Semi F	Opt	124	34x4½	34x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Roll	2,400
Disk	Sel	Unit X	3	Bevel	Tor T	Semi F	Opt	124	34x4½	34x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Rell	2,500
Disk	Sel	Unit X	3	Bevel	Tor T	Semi F	Opt	130	34x4½	34x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Roll	2,500
Disk	Sel		3	Bevel	Tor T	Float		114	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,200
Disk	Sel		3	Bevel	Tor T	Float		124	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,200
Disk	Sel		3	Bevel	Tor T	Float		133	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,200
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.33-1	114	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,800
Disk	Sel	Unit X	3	Bevel	Springs	Semi F		113	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent.	Cent.	Plain, 3	B&P	Roll	Ball	2,150

ABBREVIATIONS:—Clutch Type: Exp Bd, expanding band; Con Bd, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; Unit M, unit with motor; Unit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Worm, shaft with worm gear at rear axle. **Car Drives through:** Tor T, torsion tube; S & T T, springs and torsion tube; R & T R, radius rods and torsion rod; Rad Rd, radius rods; S & R R, springs and radius rods; Tor Rd, torsion rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¾ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell; semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, center. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

Passenger Car Chassis Listed for 1913

6 NAME AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	CYLINDERS Shape	CYLINDERS How Cast	VALVES Type	VALVES Location	VALVES Camshaft Drive	COOLING Circulation	COOLING Radiator	LUBRICATION System	LUBRICATION Type of Pump	IGNITION System	IGNITION Magneto Generator	IGNITION Control	CARBURETION Make of Carbureter	CARBURETION Fuel Feed	ENGINE STARTER Type	ENGINE STARTER Make
Velie, 32	4	3.75x5.50	22.50	231.1	L Head	Block	Poppet	Left	Chain	Thermo	Tub	Splash	Piston	Dual	Spld'rf	Hand	Stromberg	Grav		
Velie, 40	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Chain	Thermo	Tub	Splash	Piston	Dual	Bosch	Hand	Stromberg	Pres	Elec	Gray & Da.
Warren, Wolverine	4	4.13x4.50	27.25	240.5	L Head	Block	Poppet	Right	Gear	Pump	Cell	Splash	Gear	Doub	Bosch	Hand	Stromberg	Grav		
Warren, Pilgrim	4	4.25x4.75	28.90	269.4	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Stromberg	Opt		
Warren, Resolute	6	4.00x5.00	38.40	376.9	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Stromberg	Pres	Elec	Northeast
Westcott, 40	4	4.50x5.00	32.40	318.1	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Sing	Connectic't		Schebler	Grav	Elec.	Electro
Westcott, 50	6	4.00x6.00	38.40	452.4	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash		Siag	Electro			Grav	Elec.	Electro
White, GRE	4	3.75x5.13	22.50	226.4	L Head	Block	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Noacir	Sing	Mea	Hand	Own	Grav	Elec	Own
White, GEB	4	4.25x5.75	28.90	326.3	L Head	Block	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Noncir	Sing	Mea	Hand	Own	Grav	Elec	Own
White, GF	6	4.25x5.75	43.80	489.4	L Head	Block	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Noncir	Sing	Mea	Head	Own	Grav	Elec	Own
Winton, 17D	6	4.50x5.00	48.60	477.2	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Splash	Piston	Dual	Bosch	Hand	Stromberg	Grav	Air	Own
Zimmerman, Z-40	4	4.32x5.00	30.25	292.1	L Head	Pairs	Poppet	Left	Gear	Thermo	Cell	Spl-Pres	Gear	Dual		Fixed	Schebler	Grav		
Zimmerman, Z-6	6	3.75x5.00	33.75	331.4	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Gear	Sing	Deaco	Hand	Schebler	Pres		

*Underslung Frame. †Has six wheels.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate; **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo, thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noacir. **Ignition:** Sing, single; Doub, double; Dual 2, double distributer; Gov, governor; Atw Keat, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric; Acet, acetylene; Mech, mechanical; Opt, optional; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as $4.25=4\frac{1}{4}$, etc., $.06=\frac{1}{16}$, $.19=\frac{3}{16}$, $.13=\frac{1}{8}$, $.25=\frac{1}{4}$, $.31=\frac{5}{16}$, $.38=\frac{3}{8}$, $.44=\frac{7}{16}$, $.5=\frac{1}{2}$, $.56=\frac{9}{16}$, $.63=\frac{5}{8}$, $.69=\frac{11}{16}$, $.75=\frac{3}{4}$, $.81=\frac{13}{16}$, $.88=\frac{7}{8}$.

Adams-Farwell, horsepower should be 60.50 instead of 60.00. Alpena, P-40, piston displacement should be 231.9 instead of 272.1.

Sizes of Motors of Twenty Concerns for the Past 3 Years

Name and Model	1913 Number Cylinder	1913 Bore	1913 Stroke	1913 P.D.	1912 Model	1912 Bore	1912 Stroke	1912 P.D.	1911 Model	1911 Bore	1911 Stroke	1911 P.D.
Pierce Arrow 66A	6	5.	7.	824.8	66T	5.	7.	824.8	66T	5.25	5.50	714.3
Peerless 29	4	4.	4.63	232.5	D	4.	4.63	232.5	29	4.	4.63	232.5
Peerless 35	6	4.	5.50	414.8	J	4.	5.50	414.8				
Peerless 38	6	4.50	6.	572.5	K	4.50	6.	572.5				
Peerless 37	6	5.	7.	824.8	L	5.	7.	824.8	32	5.	5.50	647.9
	4				H	5.	5.50	431.9	31	5.	5.50	431.9
Packard 38	6	4.	5.50	414.8								
Packard 48	6	4.50	5.50	524.8	6	4.50	5.50	524.8				
	4				30	5.	6.	471.2	30	5.	6.	471.2
	4				18	4.06	5.13	265.7	18	4.06	5.13	265.7
Locomobile L	4	4.50	4.50	286.3	L4	4.50	4.50	286.3	L	4.50	4.50	286.3
Locomobile R	6	4.25	5.	425.4								
Locomobile M	6	4.50	5.50	524.8	M2	4.50	4.50	429.5	M	4.50	4.50	429.5
Premier 6.40	6	4.	5.	376.9								
Premier 6.60	6	4.50	5.25	501.0	M6	4.50	5.25	501.0	6-60	4.50	5.25	501.0
	4				M4	4.50	5.25	334.0	4-40	4.50	5.25	334.0
Lozier 77	6	3.63	5.50	340.7								
Lozier 72	6	4.63	5.50	554.4	51	4.63	5.50	554.4	51	4.63	5.50	554.4
	4				46	5.38	6.	544.6	46	5.38	6.	544.6
Marmon 32	4	4.50	5.	318.1	32	4.50	5.	318.1	32	4.50	5.	318.1
Marmon Six	6	4.50	6.	572.5								
Cadillac 1913	4	4.50	5.75	365.8	1912	4.50	4.50	286.3	Thirty	4.50	4.50	286.3
Chalmers 17	4	4.25	5.25	297.8	36	4.25	5.25	297.8				
Chalmers 18	6	4.25	5.25	446.7	12	4.25	5.25	446.7				
	4				30	4.	4.50	226.2	30	4.	4.75	238.8
Cole 40	4	4.13	4.75	253.9	1912							
Cole 50	4	4.50	5.25	334.0		4.50	5.25	334.0	30	4.25	4.50	255.3
Cole 60	6	4.13	4.75	380.8								

Tendencies in Regard to Piston Displacement Among the American Automobile Manufacturers for 1913

Looking back over the last 3 years, there is a decided trend on the part of manufacturers who continue the same model over this period, to increase the amount of the piston displacement. This is graphically shown in Fig. —. With the exception of a few cases where the piston displacement has remained the same, this table shows that it is general practice to make the same model for 2 years and then to increase the motor size, or to have increased the size in 1912 over that of 1911 and leaving the 1913 models the same as 1912.

In many cases this increase can be directly traced to the practice now prevalent in lengthening the stroke. An example of this can be found by referring to the table on page — wherein comparisons of twenty various makes of cars are shown in their different models for the last 2 years, including 1913. The Model 32 Peerless in 1911 had a bore and stroke of 5 and 5.5-inches respectively giving a piston displacement of 647.9 cubic inches. In 1912 the stroke was increased to 7 inches, leaving the bore at 5 inches. This increase in stroke gives 174.9 cubic inches more piston displacement and this size is being continued for 1913, the total piston displacement of the engine with the increased stroke being 824.8 cubic inches.

Another example is the 1913 Cadillac, in which the stroke of the motor has been increased from 4.50 inches to 5.75 inces, the bore remaining 4.50-inches as heretofore. This increase of 1.5 inches in the stroke corresponds to an increase of 79.5 cubic inches piston displacement.

In drawing comparisons among the various models, the question of bore has been the main point upon which the similarity between the model of one

Horsepower and Mechanical Details

TRANSMISSION								RUNNING GEAR								CONTROL			BEARINGS				∂
Clutch Type	GEARSET			Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Wheelbase	TIRES		WHEELS		SPRINGS		Front Axle	Location Steering Wheel	Gearshift Location	Emergency Brake Control	Crank-shaft Type and No.	Gearset	Rear Axle	Front Wheel	Chassis Weight, Lbs.
	Type	Location	Forward Speeds						Front	Rear	Kind	Attach-ment	Front	Rear									
Cone ...	Sel ...	Unit X .	3	Bevel...	Springs....	Semi F	....	113	34x3½	34x3½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right .	Right.	Plaio, 3 .	B&P .	Roll ..	Ball ..	2,000
Disk....	Sel ...	Amid ...	3	Bevel...	S & T T ..	Float .	....	118	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Ceot..	Ceot..	Plaio, 3 .	Roll .	Roll ..	Roll ..	2,550
Cone ...	Sel ...	Amid ...	3	Bevel...	Springs....	Semi F	3.75-1	110	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Roll ..	Roll ..	Ball ..	2,200
Cone ...	Sel ...	Amid ...	3	Bevel...	Tor T.....	Float .	4.00-1	115	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	1-Beam .	Right...	Right.	Right.	Plaio, 3 .	Roll ..	Roll ..	Ball ..	2,350
Cone ...	Sel ...	Amid ...	3	Bevel...	Tnr T.....	Float .	3.75-1	130	36x4½	36x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Roll ..	Roll ..	Ball ..	2,900
Cone ...	Sel ...	Amid ...	3	Bevel...	Springs....	Float .	3.80-1	120	36x4	36x4	......	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 5 .	Ball ..	Roll ..	Roll ..	3,000
Cone ...	Sel ...	Amid ...	3	Bevel...	Springs....	Float .	3.66-1	127	37x4½	37x4½	......	....	½ Ell..	¾ Ell..	1-Beam .	Right...	Right.	Right.	Plaio, 4 .	Blal ..	Roll ..	Roll ..	3,500
Cone ...	Sel ...	Amid ...	4	Bevel...	S & R R ..	Semi F	....	110	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Ceot..	Left ..	Ball, 2..	Ball ..	Ball ..	Ball ..	2,750
Cone ...	Sel ...	Amid ...	4	Bevel...	S & R R ..	Semi F	....	120	36x4½	36x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Cent.	Left ..	Ball, 2 ..	Ball ..	Ball ..	Ball ..	3,700
Cone ...	Sel ...	Amid ...	4	Bevel...	S & R R ..	Semi F	....	132	37x5	37x5	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Cent..	Left ..	P&R, 3 .	Ball ..	Ball ..	Ball ..	4,500
Disk....	Sel ...	Amid ...	4	Shaft ...	Rad Rd...	Float .	2.73-1	130	36x4½	36x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 4 .	Ball ..	Roll ..	Roll ..	....
Cone ...	Sel ...	Amid ...	3	Shaft ...	Rad Rd...	Semi F	....	116	35x4	35x4	Wood	....	½ Ell..	Ell ...	I-Beam .	Right...	Cent..	Cent..	Plain, 3 .	Roll ..	Roll ..	Ball ..	1,750
Disk....	Sel ...	Unit M .	3	Shaft ...	Rad Rd...	Float .	....	128	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	1-Beam .	Right...	Cent..	Cent..	Plain, 4 .	Ball ..	Ball ..	Ball ..	2,850

ABBREVIATIONS:—Clutch Type: Exp Bd, expanding band; Con Bd, cootracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, plaoetary; Fric, frictioo; Unit M, unit with motor; Uoit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Worm, shaft with worm gear at rear axle. **Car Drives through:** Tor T, torsion tube; S & T T, springs and torsion tube; R & T R, radius rods and torsion rod; Rad Rd, radius rods; S & R R, springs and radius rods; Tor Rd, torsino rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¾ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell; semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, ceoter. **Bearings:** Roll, roller; B & R, ball aod roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

Garford G-15, piston displacement should be 446.7 instead of 497.5. Henderson, piston displacement should be 280.6 instead of 220.9.

Sizes of Motors of Twenty Concerns for the Past 3 Years

Name and Model	1913				1912				1911			
	Number Cylin-ders	Bnre	Strnke	P.D.	Model	Bnre	Stroke	P.D.	Model	Bnre	Strnke	P.D.
Franklin G	4	4.	4.	201.1	25	4.	4.	201.1	M	4.	4.	201.1
Franklin M	6	3.63	4.	247.7	M	3.63	4.	247.6	......	......	......	......
Franklin H	6	4.	4.	301.7	H	4.	4.	301.7	D	4.	4.	301.7
	4	......	......	......	G	3.38	4.	143.1	G	4.	3.38	169.7
Hudson 37	4	4.13	5.25	280.6	33	4.	4.50	226.2	33	4.	4.50	226.2
Hudson 54	6	4.13	5.50	441.0	......	......	......	......	......	......	......	......
Winter 17D	6	4.50	5.	477.2	17C	4.50	5.	477.2	Six	4.50	5.	477.2
White GRE	4	3.75	5.13	226.4	GAD	3.75	5.13	226.4	GA	3.75	5.13	226.4
White GEB	4	4.25	5.75	326.3	GE	4.75	5.13	363.3	......	......	......	......
White GF	6	4.25	5.75	489.4	......	......	......	......	......	......	......	......
Stearns Knight 4	4	4.25	5.50	312.0	......	4.25	5.50	312.0	......	......	......	......
Stearns Knight 6	6	4.25	5.75	480.4	......	......	......	......	......	......	......	......
Rambler Cross Country	4	4.50	4.50	286.3	......	4.50	4.50	286.3	55	4.50	4.50	286.3
	......	......	......	......	......	5.	5.50	431.9	64	5.	5.50	431.9
Hupmnbile C	4	3.25	3.38	112.0	......	3.25	3.38	112.0	......	3.25	3.38	112.0
Hupmnbile H	4	3.25	5.50	182.5	......	......	......	......	......	......	......	......
Jackson Olympic	4	4.13	4.75	253.9	32	4.	4.	201.1	30	4.	4.	201.1
Jackson Majestic	4	4.50	5.25	334.0	42	4.50	4.50	286.3	41	4.50	4.50	286.3
Jacksnn Sultanic	6	4.13	4.75	380.8	......	......	......	......	......	......	......	......
	4	......	......	......	52	4.75	4.75	336.7	51	4.75	4.75	336.7
	4	......	......	......	......	......	......	......	......	......	......	......
	4	......	......	......	......	......	......	......	......	......	......	......
Haynes	4	......	......	......	20	4.25	5.	283.6	20	4.25	5.	283.6
	4	......	......	......	Y	5.	5.50	431.9	Y	5.	5.50	431.9
Haynes 22	4	4.50	5.50	349.9	21	4.50	5.50	349.9	......	......	......	......
Pierce Arrow 38C	6	4.	5.50	414.8	36T	4.	5.13	395.8	36T	4.	5.13	395.8
Pierce Arrow 48B	6	4.50	5.50	524.8	48T	4.50	5.50	524.8	48T	4.50	5.50	524.8

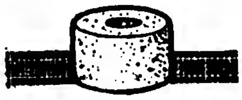
Together with a Brief Résumé of the Changes Made by the Various Companies for the New Season

year and that nf another have been compared, aa this shows how the modela nf the same rated horsepower have varied nver the period uoder review. In this connection the ease nf the Locomobile reveals how dealing with bore alnne is liable to be very misleading. In 1911 and 1912 this make of car was offered, amnng other models, with a six-cylinder motor, having a bore and stroke of 4.50 inches, in other words, a sqnarc engine. The piston displacement of tbis engine was 429.5 cobic inches. In 1913, apart from any structural alterations, the bore was retained as before at 4.50 inches, while the stroke was increased to 5.50 loches, bringing the pistnn displacement np tn 524.8 cubic inches. A new model has been added with a bore and stroke nf 4.25 and 5 inches, giving a piston displacement nf 425.4 cnbic inches nr 4.1 cubic incbes less than the 4.50-inch sqosre enginc of 1911.

Several concerns such aa the Packard, Chalmers, Haynes, Franklin and Stearns whn brooght nnt new models for last season, have retained them in exactly the samc sizes for 1913, which bears out what has already been stated, namely, that in most cases the same size engine is marketed for 2 years without alteration as to piston displacement. The Packard models are now all six-cylinder designs, and while it might not be correct to contrast a six agaiost a fnnr, nevertheless a comparison nf pistnn displacement shows that the new six-cylinder is smaller than the largest fnnr previously manufactured. Reference to tbe table shows that while it is not moch smaller than the large four-cylinder motor nf last year, it is considerably larger than the 18 which was the smaller model. The displacement nf the fonr-cylinder 40 Premier for last year was 884.0 enbic inches, while the new six-cylinder type has a displacement of 376.9 cubic loches nr 42.9 cubie inches mnre than the preceding four cylinder.

The Carbureters for 1913

Many Companies Add New Models—Multi-jet Design Makes Steady Gains—Various Devices Attached to Facilitate Starting—Several European Products Now on the Market—Absence of Moving Parts a Pronounced Foreign Trend—Auxiliary Air Valve Continues in Popularity in America.



THAT the season of 1912 was an active one in carbureter research and invention is proven by the changes in many of the standard models as compared with their predecessors and also by the number of new models listed for this year, not a few of these being introduced by the largest makers. The heavier weight of gasoline used has been largely responsible for much of the carbureter activity, and coupled with this is the demand for extreme motor flexibility over an ever-increasing range of speeds.

The keen rivalry among the carbureter makers has played its part in this work of evolution, and while there is much that is new to be seen at the shows, there is also more behind the screens. One or two of the makers have announced that they have ready to show to the engineers new models which they are not going to announce to the public for some time.

To summarize whither the tide of carburetion is flowing is somewhat difficult, but in a sentence, it is leading in the direction of multi-jets and the reduction of moving parts, this conclusion being reached by a survey of the score or more of American carbureters, and also from the dozen European types that are now on the American market. Schebler has joined the multi-jet ranks with a new model, O, fitted with main and supplementary jets; Stromberg in its new models uses two jets, although this concern has used the double-jet idea in one of its models for several seasons; and Pierce in its new carbureter, which it makes for its own product, has added a supplementary jet. More could be cited. Up to the present the single-jet type is practically a 75 per cent. leader over the multi type.

There are various reasons which indicate the direction in which the wind is blowing when it comes to the reduction of moving parts, although at this date it is quite beyond the realm of speculation as to what the eventual type will be, and it is more than probable that the time will not arrive for years when any one type will be the adopted standard, because most satisfactory results can be had with different types.

In Europe the situation to-day is more defined. R. W. A. Brewer in writing on the subject to THE AUTOMOBILE, at the close of the recent Olympia show, said: "I think I am perfectly correct in saying that there was not a single European car at the Olympia fitted with any sort of extra-air-inlet device; the general tendency seems to be in the direction of a combination of jets or some type of varying jet orifice."

Very pronounced progress has been made in American carbureters in the fitting of easy-starting arangements. This movement started 2 years ago with the fitting of shutter valves to obstruct the normal air passage in order to increase the motor suction or pull on the gasoline in the spraying nozzle and thereby obtain a very rich mixture. At that time a few of the leading carbureter engineers fitted an interconnection between this shutter valve and the auxiliary air valve so that the latter could also be held shut when the shutter valve was closed. Today these concerns are going a step further and are fitting what may best be termed a gasoline by-pass pipe which connects direct between the float chamber or the nozzle and the intake manifold above the throttle; the modus operandi being that to start, the throttle can be practically closed so that the entire motor suction is on the upper end of the by-pass tube, this suction being sufficient to draw the pure gasoline through, giving the necessary richness. The different ways in which these starting by-passes are fitted are shown in the different illustrations which follow.

A problem in carburetion is to maintain a requisite suction or pulling force on the gasoline in the nozzle at the different motor speeds, so that the mixture will be of the desired composition, having the proper proportion of air and gasoline. There are many difficulties in this job. For example: At low speeds a richer mixture may be needed, and if enough gasoline is issuing from the nozzle there will be too much flowing when the motor speeds up and the pull or suction of the air passing the nozzle has increased in direct proportion with the increase in motor speed. To relieve such a situation means must be provided to keep the suction down and, instead of giving a mixture richer in gasoline at high speeds, give a mixture that is leaner.

There are several ways of establishing the desired balance at the nozzle. The oldest and best known method in America is by the auxiliary air valve. It operates as follows: All of the air enters the air passage surrounding the nozzle up to predetermined motor speeds, but when the motor speed increases the auxiliary valve opens and allows air to enter, which has not to pass the nozzle, but preferably enters the mixing chamber at a point higher up. The entrance of this air naturally cuts down the velocity of the main air supply entering around the nozzle, and so, with its velocity reduced, there is a corresponding reduction in the amount of gasoline issuing.

A second class of makers, who are apparently opposed to the spring or dashpot-regulated auxiliary air valve, uses what may be designated a variable venturi, the venturi being the hourglass air passage in which the nozzle is located. The object gained by increasing the cross-section area of this passage on high speeds is identical with that in the auxiliary air valve, in that with the cross area increased the velocity of the air to the motor is kept constant and so the pull on the fuel in the nozzle is kept down. There are various ways of accomplishing this; one does it by a plunger piston which is controlled by the motor suction and which piston partially obstructs the air passage; another does it by a series of varying-diameter ring valves, and a third accomplishes it in a different manner.

There is a third class that uses neither the auxiliary air valve nor the variable air passage, but, on the other hand, regulate the suction by atmospheric pressure, this type of carbureter generally being one without moving parts.

There is a fourth class that aims to control this nozzle suction by mechanical means Generally a moving needle is fitted in the tip of the nozzle. This needle is interconnected with the throttle, and as the throttle is opened the needle is raised only in proportion as additional gasoline is needed. Then, too, there are some who use the moving needle in the nozzle, and also use the auxiliary valve in combination with it.

In the following pages the leading types of various carbureters now before the American buying public are briefly described, without any attempt being made to opinionate on their respective merits, a task left to the reader. Vertical-section illustrations, made from blue prints, are used wherever possible to show the principle on which the different types operate. The modus operandi of each is explained.

Schebler—Introduces Multi-Jet

There is a new Schebler carbureter for this year. Its official name is model O and it differs from all previous Schebler models in that it uses two spraying nozzles or jets, one known as the main jet C, is located in the venturi-shaped air passage which is concentric with the float and the other or secondary jet D is mounted higher up in the carbureter wall. This secondary jet is under the control of a plunger valve, which is raised from its seating by motor suction and permits the flow of gasoline past it. The main jet with the venturi forms the low-speed feature of the carbureter and performs all of the functions up to motor speeds of 400 revolutions per minute. Above this speed, the suction at the jet is reduced by the admission of extra air through a spring-regulated auxiliary air valve A. This auxiliary air valve governs the mixture between the range of 400 and 800 revolutions per minute. Above the latter figure the auxiliary jet D comes into play. The suction at this point lifts a small poppet valve at D, closing what may be called the auxiliary mixing chamber, and allows a mixture of gasoline and air to join the mixture secured from the jet in the venturi. The auxiliary jet is formed by the space left between the small poppet valve and its seating when the former is raised by the suction against the spiral spring holding it in place and by a tube which carries the gasoline from the float chamber to the auxiliary mixing chamber. The air for the auxiliary mixing chamber enters through a port in the casting, leading to the outside air. This carbureter is supplied with a hot-water jacket and with an easy starting shutter, which is operated by a bell-crank lever which closes by means of a butterfly valve B, in the main air inlet and locks the auxiliary air inlet through an inter-connection. The carbureter has three adjustment points; one, the needle valve which determines the size of the main jet; and the other, a knurled screw which determines the tension on the spring controlling the poppet valve for the secondary jet.

The Schebler L, Fig. 2, has been improved over the 1912 style. It operates on the same principle as the model O, but has but one jet. The suction at this jet is determined and governed by a spring-regulated auxiliary air valve V. This carbureter is provided with a modified Venturi mixing chamber B, the smallest section of which is at L, the point where the fuel is sprayed from the nozzle N. The needle valve regulates the flow of gasoline through X and from the supply source. The auxiliary air valve is regulated by an adjustment screw which varies the tension in the conically wound spring. This spring acts against the suction of the motor, and the greater the speed of the latter, and hence the greater the suction, the more the auxiliary air is admitted due to the increased opening of this air valve, which is also provided with dash control through the rack and pinion shown.

In operation, the main air supply enters vertically through the main air passage, mixing with the atomized fuel at L. The needle valve may be externally adjusted by means of a thumbscrew. The nozzle extends diagonally into the mixing chamber and is provided with a long tapering needle which admits of fine adjustment. There are means of regulating fuel supply and air supply relative to one another externally by dials playing over graduated scales and thus indicating the proportions of the mixture ingredients. This type is waterjacketed around the outlet passage to the manifold. A spring pin provided with a bell-crank lever also makes it possible to depress the float, thus raising the needle valve and flooding the carbureter when necessary. A very good feature of this construction is the provision for the removal of the entire float chamber, float and its needle-valve mechanism. A single nut working on the threaded lower por-

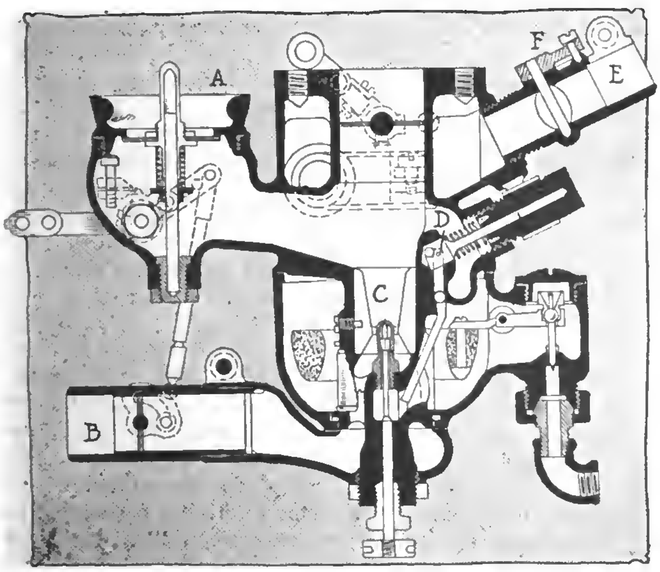


Fig. 1—Schebler O has a poppet shaped secondary jet

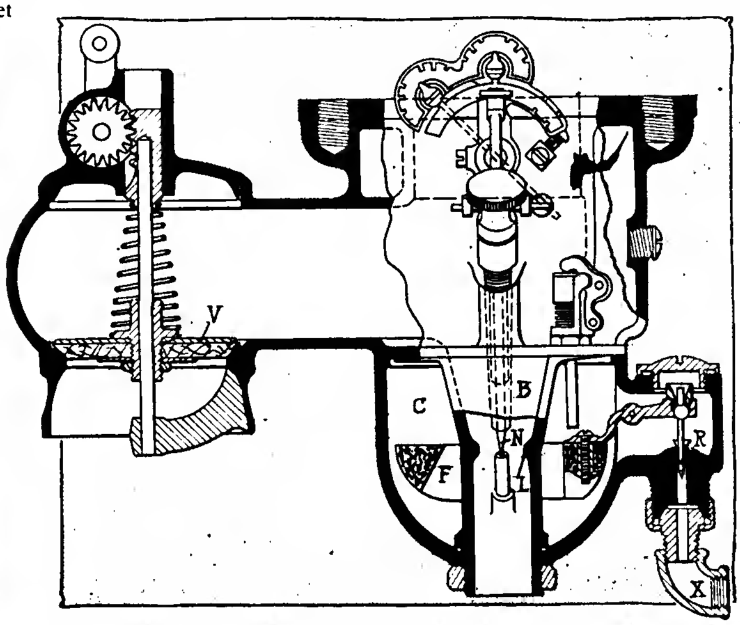


Fig. 2—Schebler L has concentric float and spring auxiliary valve

tion of the main air inlet tube holds the fuel chamber in place, and for cleaning purposes this accessibility feature should prove of great value.

The other Schebler models are continued as during 1912.

Stromberg—Two New Multi-jet Models

To the three Stromberg carbureter models of last year have been added two new models which, while built along general Stromberg lines, incorporate some new features by way of improvements.

The three models of last year, A, B and C, have all been improved in that they are fitted with a new funnel-shaped venturi tube in the center of which is located the main nozzle. This venturi threads into the body of the carbureter. Of these models, A and B are single-jet types and C is a double-jet design. B has a concentric-float construction for small motors, while A and C are not concentric designs.

Of the new models, G is quite similar to model A, Fig. 5, excepting that it is made without a waterjacket. It is also a double-jet type, the supplementary jet being located in the horizontal passage between the mixing chamber and the auxiliary air valve. This jet has an adjustable needle-valve regulation. The venturi is threaded into the carbureter body and this part is so grooved that an opening extends around the venturi. The side of this opening towards the float chamber opens through the main body of the carbureter to the atmosphere and the other side opens in the gasoline tube leading to the auxiliary nozzle at a point above the gasoline level. Its operation is as follows: Low speeds are supplied by the primary nozzle in the venturi; as the motor speed increases, the suction on the auxiliary gasoline nozzle also increases, but no gasoline issues from this nozzle until the suction of the motor on it becomes greater than the capacity of the bleeder hole connecting with the atmosphere through the groove around the venturi. After this point is reached, gasoline flows through the supplementary nozzle, its flow increasing or decreasing with the motor speed.

Model D, the other newcomer, Fig. 4, is a two-jet type with the auxiliary nozzle I located in the passage between the mixing chamber and the auxiliary air valve and controlled by the latter so that the needle K controlling the nozzle is raised when the auxiliary air valve opens. The air valve is a new design of balanced construction and works in a chamber surrounded by a sleeve which can be operated from the dash. This sleeve fixes the size of the air opening for the valve. The hollow valve stem

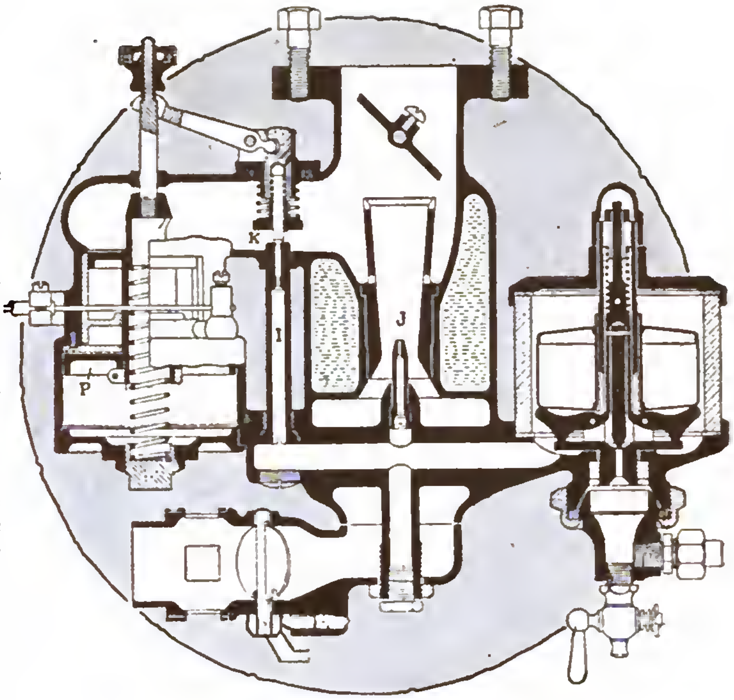


Fig. 4—Stromberg new double jet with eccentric float

carries two pistons operating in a dashpot, so as to give a richer or leaner mixture from the auxiliary jet, depending on whether the sleeve-controlled air opening is exposed to a lesser or greater extent. No adjustments are required with this carbureter, save for the use of the correct size of main nozzle and auxiliary-jet needle, a variety of sizes being provided by the manufacturer.

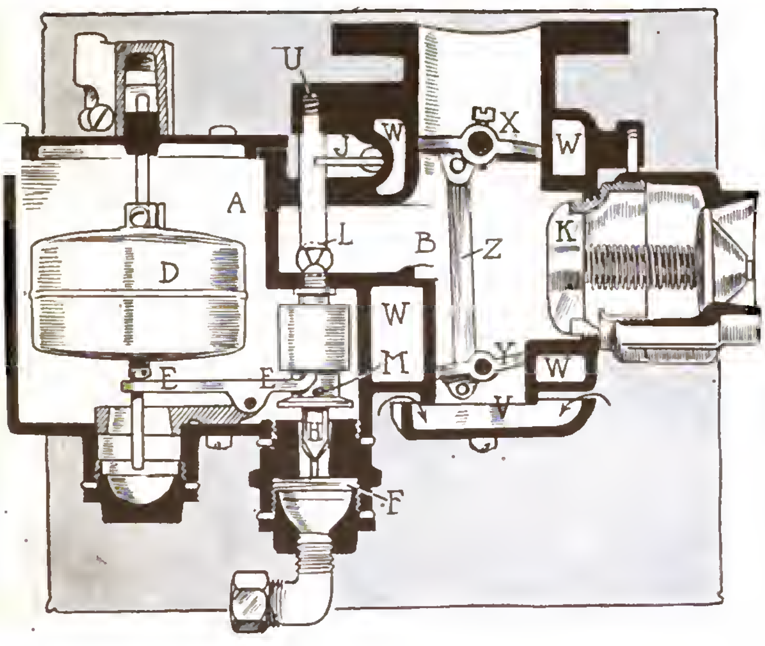


Fig. 3—Rayfield model D carbureter with interconnected throttle and air

Rayfield—Continues Mechanical Type

The Rayfield carbureter, Fig. 3, belongs to that class in which the flow of gasoline from a single nozzle is controlled by a needle valve interconnected with the throttle, so that with wider throttle opening there is a wider opening in the nozzle. But this interconnection with the throttle goes further in that the main air entrance is controlled by a butterfly Y linked to the throttle X, thereby regulating the primary air supply, according to the throttle position. There is also an auxiliary air valve K under spring regulation. The variable needle valve L is held seated by the spring U and is operated by the arm J. It is interconnected with the throttle and air shutter X and Y, these two valves being linked together by the bar Z. These valves have provision for adjustment so that they may be so operated relative to each other that the proper proportions of air and fuel are combined in the mixing chamber B. The auxiliary air valve K is so adjusted as to open under the greater suction of high speeds and to allow the entrance of the needed air for such increased speeds. The stationary air intakes are seen at V and back of the needle valve, L, opening ino the mixing chamber, as shown. Referring to air valves X and Y it will be noticed that butterfly throttle has a slight lead on the valve Y. This provides for slow running with closed or very low throttle, allowing just enough air to pass in proportion to the very small nozzle opening.

The Rayfield reveals standard float construction so far as the float mechanism is concerned, in that the float D is of metal playing in the float chamber A, and connecting with the inlet needle valve through the pivoted lever E. As the fuel enters from the supply source it is strained through the screen F before passing through the needle valve. Admission to the mixing chamber is through the center of the nozzle, which is opened and closed by the needle L. The lower end of this nozzle which communicates with the float chamber is provided with several radial holes M running to the hollow center. The gasoline enters

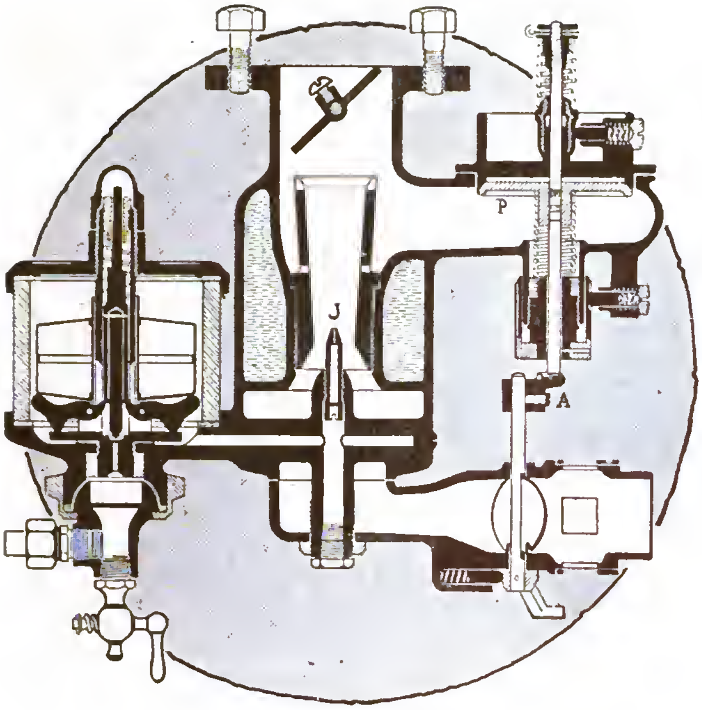


Fig. 5—Stromberg single jet model with eccentric float feed

these holes and thence flows up through the nozzle to its orifice.

Waterjacketing is extensive, the mixing chamber being fully covered where possible, as shown at W. A dam at the point where the fuel passage merges with the air chamber allows for the collection of a small amount of gasoline when the engine is not running. When started, this pure fuel is drawn directly into the motor, priming it in the usual way.

It should be especially noted in a consideration of the Rayfield instrument that the mixing is entirely automatic, no suction or vacuum principle being utilized to regulate the amount of fuel supplied, this being mechanically apportioned by the driver when he opens the throttle. Such an instrument must be adjusted for every variable, there being four points for regulation. However, when these are properly related the instrument has proven remarkably efficient. This carbureter was used on the winning Mercedes in the 1912 Vanderbilt and Elgin races.

Zenith—Without Moving Parts

There are in the Zenith carbureter, Fig. 6, three jets. Two of them are concentric, namely, G and H, and the third one is on the same level as the butterfly throttle valve at U. The outer annular jet H is connected at its lower end with the tube E, this tube being fed by a small orifice from the float chamber. The supply of petrol into this tube is constant for it depends merely upon the height of the petrol in the float chamber; thus the supply of gasoline to the annular jet does not increase when the engine suction increases; indeed this supply actually decreases for the jet is starved owing to an insufficient supply into the small tube E.

The action of the main jet G is similar to that of ordinary single-jet carbureters, so that it is of course possible to make it of such a size as to give the best results for a given speed. It is, however, patent that should this given speed be increased, or not reached, then the mixture will become too strong or too weak respectively. It is in this fact that the *raison d'être* of the subsidiary jet is to be found, and it will be seen that it is possible to strike the happy medium by drawing the necessary quantity of petrol from two jets which operate in diametrically opposite directions. As the speed of the engine increases, more and more gasoline is drawn by the suction from the main jet in direct proportion to the progressive diminution of the quantity of petrol per revolution of the other jet.

So much for the two main jets. Now a few remarks with reference to the small throttle jet situated at the upper end of the tube J; this tube which is for the purpose of adjusting for slow running is open at both ends and fits closely into a well. On the left-hand side of this well is cut a vertical groove terminating at U. On the lower portion of the tube O is cut a partial helix which coincides with the aforesaid vertical groove. It will thus be understood that by rotating the tube J by means of a milled screw the point of contact between the vertical groove and the helix will be raised or lowered according to which way the tube is rotated. Thus, if the point of contact be low, more petrol can be sucked through U, while if the point be raised the mixture becomes weaker. By this means the slow running of the engine can be adjusted from the exterior by rotating the small screw B, which is fixed to the tube. When the desired running has been obtained, the screw is tightened to permanently set the position.

Under ordinary running conditions the tube J does not come into action, the two jets providing all the petrol that is necessary. It is principally under starting and slow running conditions that this part of the carbureter comes into play. In order to start the engine the throttle is only opened very slightly, and on turning the engine over by hand, a very strong suction is set up at U, which draws the petrol through the vertical groove and out through U, where it is vaporized by the inrushing air. By this means, at the first turn of the crank, a quantity of suitable mixture is induced into the cylinder, causing the engine to start immediately.

When an engine is throttled down to run very slowly, out of gear, the depression around the concentric jets is extremely weak and not sufficient to draw petrol from them. The petrol will then rise in the tube J until it reaches the point of contact when it will be strongly sucked up and sprayed at U, thus providing the exact quantity of mixture necessary to keep the engine turning over slowly out of gear.

The carbureter is a simple one and its modus operandi is extremely ingenious especially the details connected with the tube U. The later models have a small glass window in the float chamber through which it is possible to at any time observe the level of the gasoline in the float chamber. This window is not, however, shown in the diagram.

Holley—1912 Type Continued

The Holley is a good example of the concentric-float type of carbureter in which the main air passage, Fig. 7, does not rise

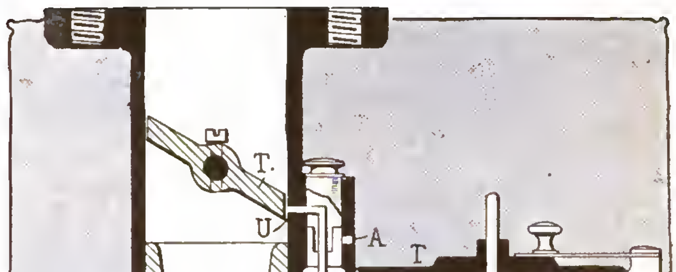


Fig. 6—Zenith carbureter employs auxiliary jet at butterfly valve edge

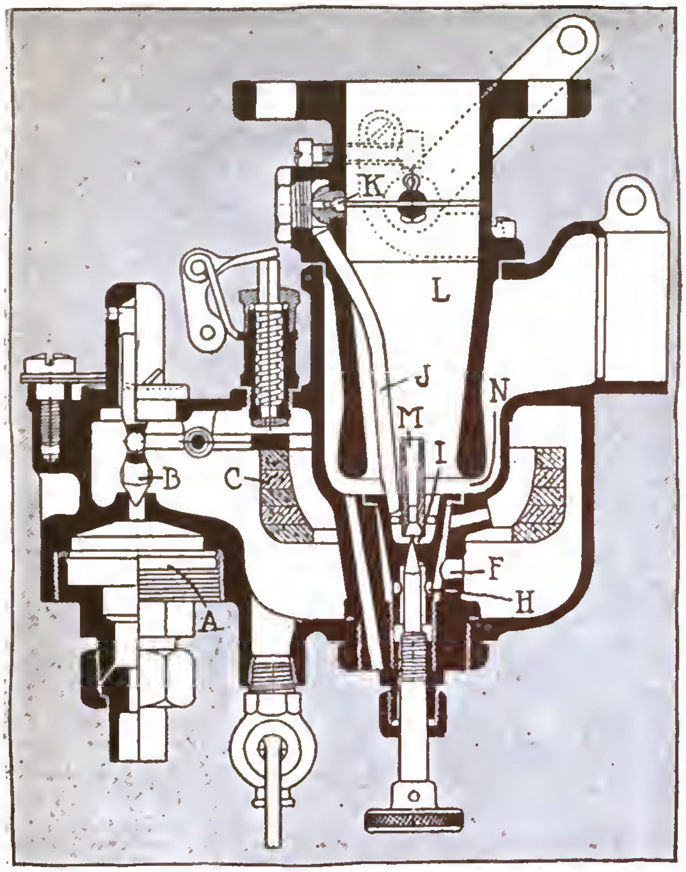


Fig. 7—Holly carbureter has concentric float with adjustable jet

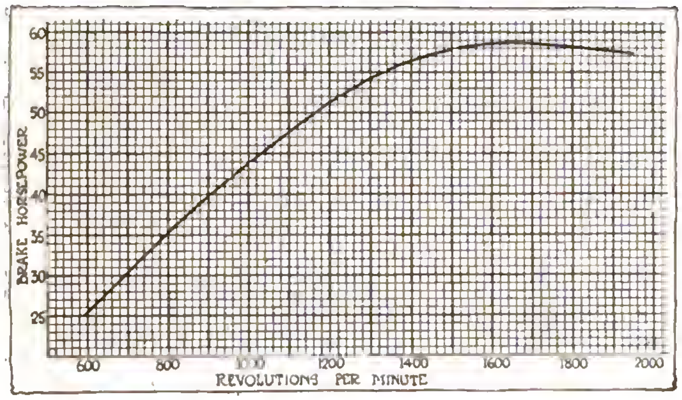


Fig. 8—Steady rise in horsepower curve of six-cylinder motor with 4.125 x 5.25-inch cylinders. Zenith carbureter

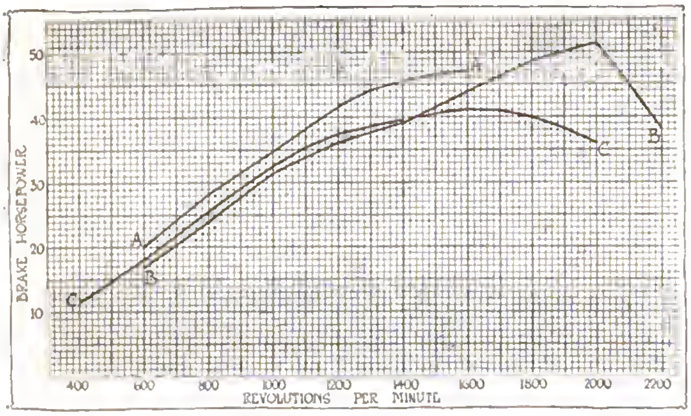


Fig. 9—Horsepower curves, Schebler L, carbureter. A, L-head four cylinder 4.5 x 5.25; B, valve in sides 3.8125 x 5; C, L-head 4.125 x 5.25

vertically from the base of the instrument, but through the side, at a point above the level of the float chamber, being deflected downwards by a venturi-shaped mixing chamber, the passage of the air being indicated at N.

In this type the entire air supply passes the spray nozzle. The cork float mechanism C is conventional, and fuel enters the float chamber through the needle valve B, after having passed through the strainer disk A. It passes from the float chamber through the opening F drilled through the wall separating the nozzle well and the float chamber. From this nozzle well E the fuel entered the nozzle proper through the holes H, rising past the needle valve I and lodging in the cup-shaped upper end, just submerging the lower end of the tube J, which extends to the edge of the throttle disk controlling the supply of fuel to the engine. Cranking the latter with the throttle nearly closed draws the fuel from the well through tube J and the calibrated plug K, and directly to the manifold, thus priming the motor and acting as an easy starting feature. After the engine is running the fuel sprays through the needle valve and up through the tube M, and thence directly on to the motor through L. When thus running, air is drawn through the holes N surrounding the standpipe M and part is drawn up through the tube J, keeping the starting well completely cleaned out.

It will be seen that there are no spring-controlled air valves, the suction being depended upon for control of the air supply. The standpipe M has a venturi shape, aiding in the fuel vaporization. The carbureter has only one adjustment, that being of the needle valve I. The principal feature of note in the carbureter is the utilization in the nozzle action of the pressure drop due to the velocity of the flow of air drawn through, rather than the pressure drop causing the air to flow, making the carbureter automatic in its proportioning functions. Having fixed the needle valve adjustment, the ratio of air to gasoline must be constant throughout the range of engine speeds.

Kingston—Uses Ball-Type Air Valve

The Kingston carbureter, a concentric-float design, continues to use a series of metal balls forming the auxiliary air supply, but has modified the general appearance in that the needle valve D, which controls the supply of fuel through the nozzle, is mounted at an angle, and has the usual external adjustment. In this carbureter the requisite vacuum at the nozzle is maintained through the medium of the auxiliary air valve. The weight of the balls constituting this valve being so regulated that they are lifted in rotation to supply the requisite demands of the energy.

The fuel is sprayed into the mixing chamber at E, where it comes in contact with the main air supply entering at F, the mixture passing on to the motor in proportion to the opening of the throttle G and through H. With greater engine suction the auxiliary ball-check valves come into operation, being raised from their seats and admitting additional air to the mixture. These opening areas are so arranged that the effect produced is similar to the action of an automatic expanding venturi.

This Kingston design includes a special provision for easy starting, in addition to the choke throttle placed in the air inlet at J, which, when closed, produces a very strong suction or vacuum at the spray nozzle drawing a very rich mixture.

The well K around the nozzle fills partially when the engine is not running, due to the greater height of the gasoline level in the float chamber C. This gives a reserve supply of fuel which is directly drawn through the inlet H to the motor, priming it on the first few suction strokes. After the engine is running the fuel is drawn swiftly through this well and there is no opportunity for it to collect here as long as the engine produces the vacuum around the nozzle.

Stewart—Has Floating Control

This Stewart precision is a concentric carbureter of the constant-suction type and the main working element consists of a vertical cylinder gunmetal valve E supported in the air stream and provided with a small tube dipping into the float chamber, its upper end being level with the top of the valve. The illustration Fig. 12 shows the valve E off its seat as it is when in operation. Along the upper end of the tube is an annulus communicating by way of a series of holes with the lower or atmospheric side of the valve and the air passes through the valve head up the annulus drawing gasoline up the center tube T. The main hole through the valve head is .375 inch diameter, while the inside diameter of the gasoline tube is .125 inch. The small tube reaches down into a gasoline well and formed within the valve stem, and the valve stem is provided with a lower extension tube H which regulates the supply of fuel to the engine. When the floating valve E is upon its seat, sufficient air passes through tubes C and by way of holes R admitting air from below. This air is concentrated round the orifice of the central tube, thus providing a suction effect sufficient for starting purposes. Increased suction effect lifts the valve E to a greater extent and slides the small tube surrounding the needle P; this needle is tapered so that the sliding up and down of the tube varies the size of the annulus formed by the tube and needle and this varies the quantity of gasoline passing into the chamber O. In its seated position the lower tube H seats around the metering pin P, but with sufficient clearance so that enough fuel can pass for starting purposes. In the lower part of the instrument there is a dashpot to prevent the too rapid movement of the valve E. The cork-hinged float and its valve need little description. After the motor is cranked the vacuum increases, the valve E lifts from its seat, allowing additional fuel to pass the regulating pin P in proportion to the suction. This raising of E also allows a proportionate quantity of air to pass through V to combine with the additional fuel. Thus in running, the valve E is held up an amount in proportion to the vacuum created by the demands of the motor and is entirely automatic except insofar as the regulating pin must be adjusted.

Flechter—Single or Multi-Jet

The Fletcher carbureter is made in either single or double-jet types, the latter being for use in larger cars. The carbureter is of the concentric float type with a fixed jet working within a modified venturi. The additional air supply for intermediate and high speeds is furnished by an auxiliary air valve. In models above the 1.25-inch size the auxiliary air valve is controlled by a piston and dashpot arrangement which prevents chattering, below this size the auxiliary air valve is controlled by a spring. The main fixed jet within the venturi and the air which enters the venturi passage from the lower extremity take care

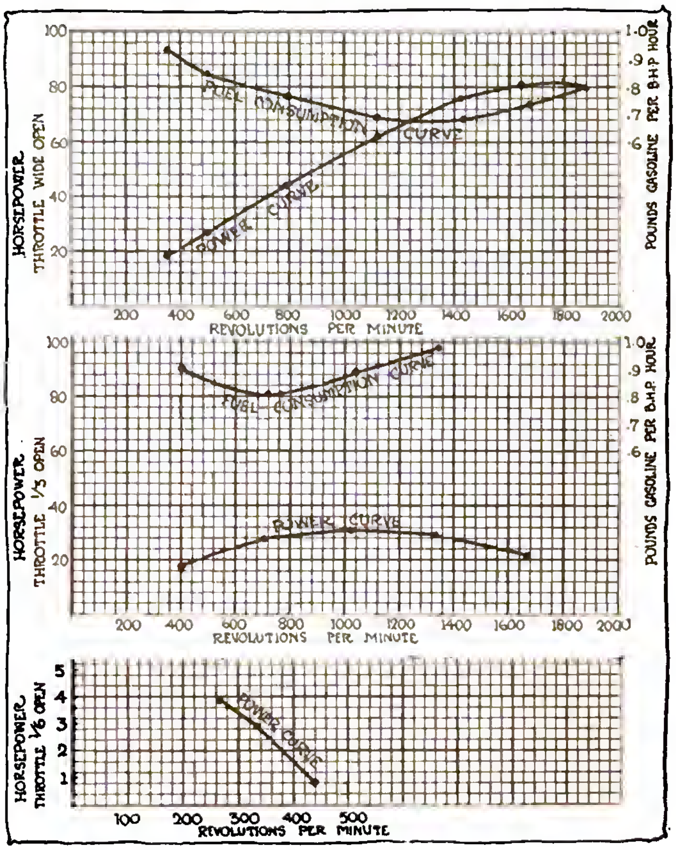


Fig. 11—Horsepower curves with different throttle openings using Newcomb carbureter. In each case A is the power curve and B the fuel consumption curve. These curves are plotted on a basis of revolutions per minute and in the case of the fuel consumption read in pounds of gasoline. There are roughly 6 pounds to a gallon of gasoline

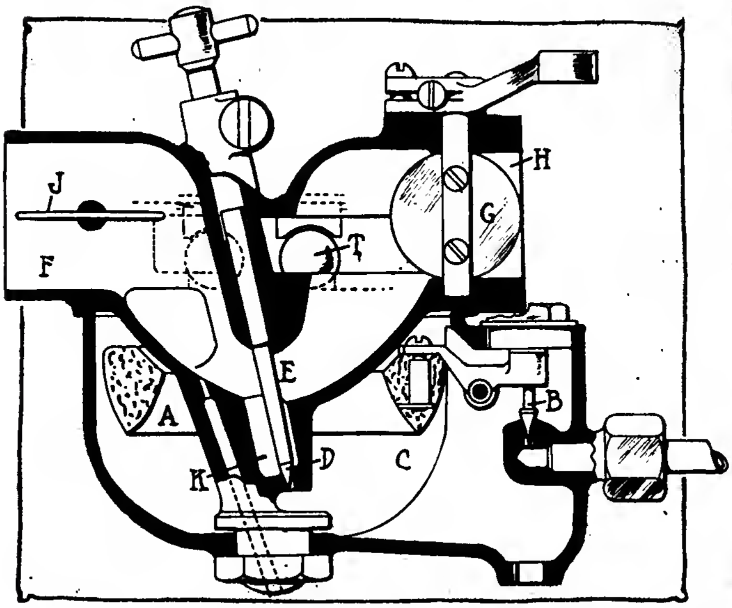


Fig. 10—Kingston carbureter uses concentric float and ball auxiliary air valves

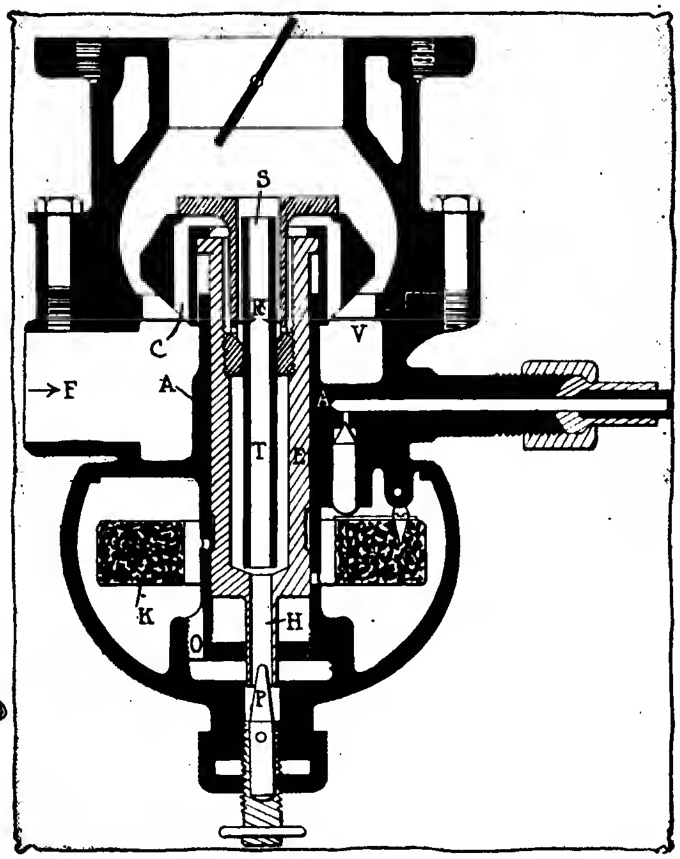


Fig. 12—Stewart precision multiple concentric jet carbureter one adjustment

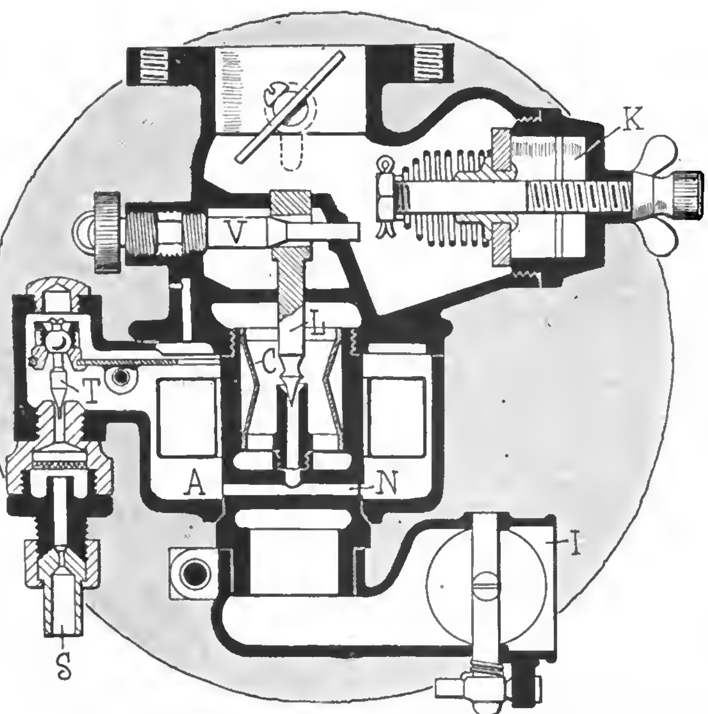


Fig. 13—Breeze carbureter uses variable jet in modified venturi passage

of the low-speed requirements of the motor. As soon as the motor speeds up and additional air is required, the auxiliary air valve opens. The second jet in the larger carbureter is placed between the auxiliary air valve and the intake passage. When the auxiliary air valve opens a stream of air passes across this secondary jet, creating sufficient suction to draw gasoline from it. An easy starting device which closes the main air supply except for a small opening and which holds the auxiliary valve tightly on its seat is furnished in the later carbureters. The priming device works on a ring and depresses the whole float instead of one particular part of it. The float arrangement is conventional, but the needle valve for fuel admission is bronze with a chrome-nickel steel seat welded in place. Outside finish is acid dipped and treated with a sand blast.

Breeze—Unique Jet Control

In the Breeze model, Fig. 13, the relative positions of the air passages are seen, there being two separate inlets I and K, instead of bringing both passages to a common opening. In the Breeze there is a venturi mixing chamber C, the spray nozzle and its adjustment being concentric with it. Fuel enters at S by the needle valve T, under control of the concentric float and flows into the chamber A. The tube N connects with the nozzle. A rather unusual needle valve adjusting feature appears on this device. The needle L is regulated by the horizontal stem V, which is tapered where it is in contact with the slot in the needle. This taper acts to vary the height of the needle as the stem is screwed in or out. It works against a spring fitted around the needle and seating on a collar just below the taper stem slot. This type is known as model SL. Model H, which is similar in principle, has been improved so as to embody an easy-starting feature. When the carbureter is primed in the regular way, a jet of gasoline is injected and confined in a pocket on the top of the air valve. When the engine is cranked, this fuel is drawn in.

S. U.—Variable Venturi Opening

In the S. U. carbureter, an English importation which, however, is now being manufactured in America, the main variation from other designs is found in the fact that the jet is set at an angle of 45 degrees in the choke portion of the jet chamber, in which chamber the passage of air is blocked by the interposition of a concentric piston P. The piston is slidable either upwards or downwards in its cylinder, being guided by a piston rod, the said piston rod carrying at its upper end the mushroom suction disk of a pair of bellows B in the suction chamber. The lower end of this piston rod carries a tapered valve, which enters the center of the gasoline jet. Between the upper portion of the jet chamber and the butterfly throttle, a duct is formed connecting to the interior of the bellows suction chamber. While the engine is running slowly, the piston obstructs the air passage across the jet, the clearance being about .031 inch. This very small area allows the air to pass with sufficient velocity thoroughly to atomize the fuel delivered. Obviously, as the throttle is opened, the suction increases, not only on the jet but also on the bellows above the disk in the suction chamber, as the said chamber is connected as aforementioned through a passageway. This has the effect of contracting the bellows, and drawing the piston further away from the jet, so affording a larger area for the passage of the air, while at the same time the tapered needle-valve is drawn further up the jet, the orifice is enlarged, and a proportionately larger portion of fuel is delivered. The taper of the needle is made such as to give a correct mixture for any position of the concentric piston. The needle is secured in the piston by a grub-screw, and can be altered in position relative to the piston. By this simple means a primary alteration of the jet orifice can be made which obtains proportionately through-

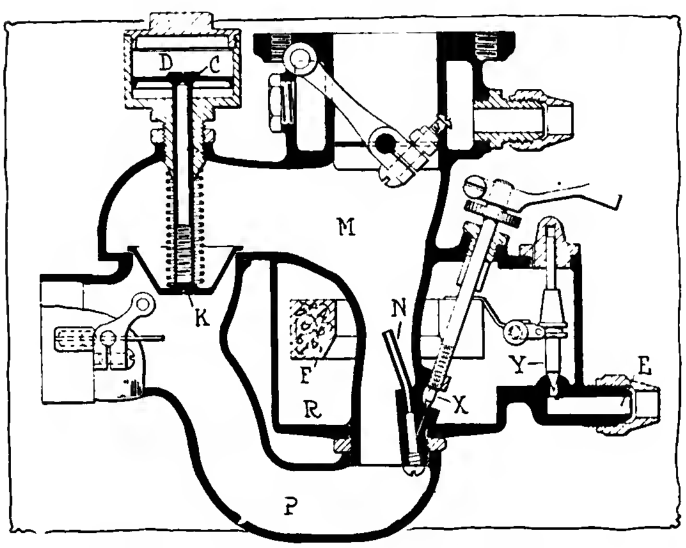


Fig. 14—Mayer model K employs fixed jet and concentric modified venturi

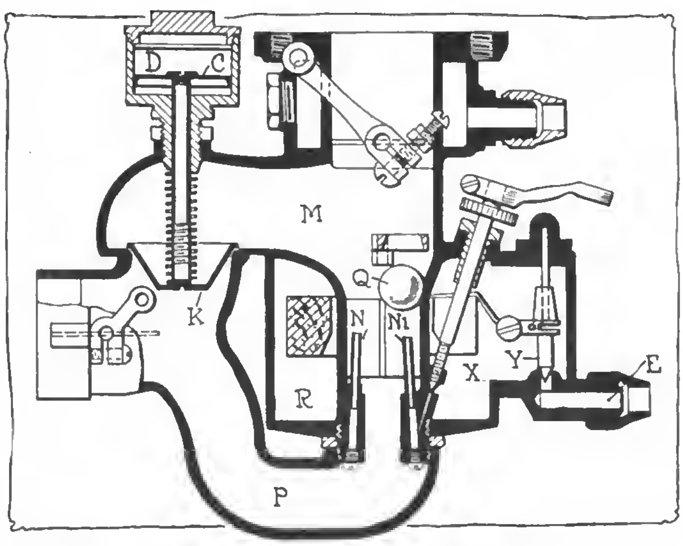


Fig. 15—Mayer carbureter uses a ball regulated auxiliary jet in new model

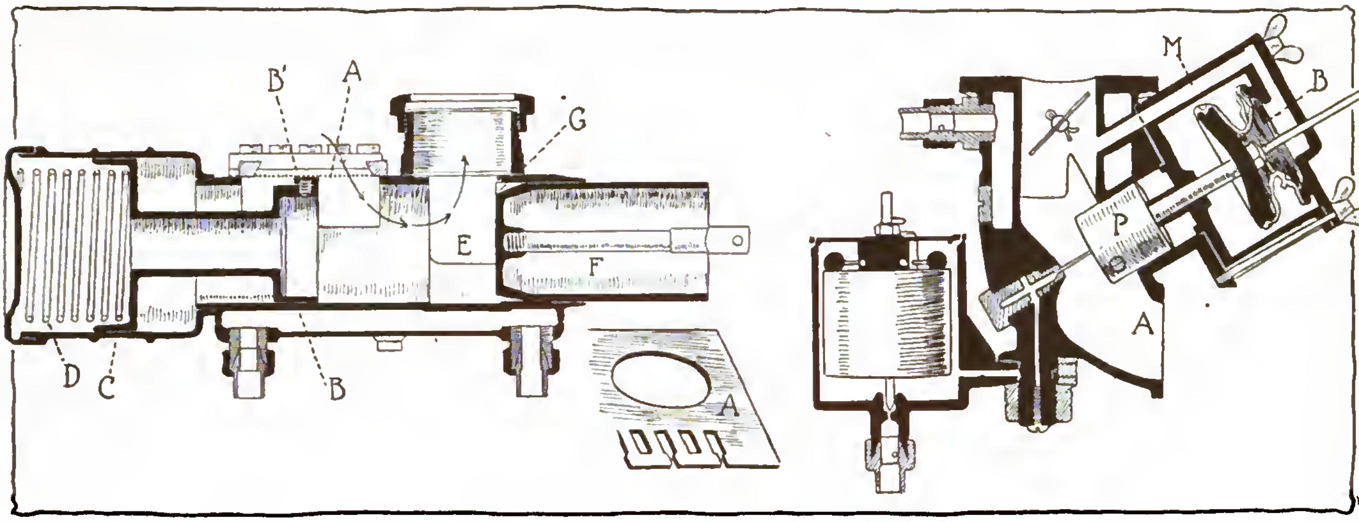


Fig. 16—Polyrhoe carbureter uses variable number of jets contained in flat plates. S. U. carbureter piston suction valve governed by leather bellows

out the scale of throttle opening, and is, in fact, an adjustable jet effect. At the same time the longitudinal section of the needle can be altered by emery paper or filing to suit the particular requirements of any engine in any particular position of throttle opening.

This instrument has behaved so satisfactorily in Europe that it has not been necessary to make any changes in it for the coming year. One of its chief merits advanced is its ability to operate for long periods with the engine turning over slowly and at the same time having the ability to accelerate rapidly without choking. When the instrument is fully open, it gives an unusually free air passage to the engine, and in tests has run a standard six-cylinder car at a speed of 3,700 revolutions per minute on the bench, and yet giving the ability to throttle for ordinary running without difficulty. A special type of this instrument is manufactured for sleeve-valve motors.

Air-Friction—Variable Air Passage

The Air Friction carbureter, Fig. 17, is so called for the reason that the air passing through the conical valve V surrounding the nozzle R raises or lowers this valve in proportion to the throttle opening, thus automatically controlling the mixture. The rising and falling of this valve gives a variable venturi action, thereby controlling the air pull on the gasoline issuing from the jet. The spray nozzle R serves to spread the fuel, and presenting a large wetted surface to the incoming air entering through S. The nozzle opening is regulated by the thumbnut N, and is held in position by nut Y. There is a single air inlet screened at A and which may be closed by a butterfly B. The float mechanism is conventional, consisting of float X linked to needle valve F. The entering fuel is strained at G. The outlet tube is very short, being controlled by throttle L.

Mayer—Adds Double-Jet Model

With the object of preventing the tendency to flutter and to fly wide open with more or less of a jerk on account of suddenly increased suction, the Mayer carbureter has its auxiliary air valve provided with a dashpot which controls the operation of the valve. This feature is indicated by D, while the piston which works in the small cylinder C. In addition to working against the air in this cylinder, the valve K acts against a spring as well. Such a construction necessarily requires accurate adjustment of the spring with relation to the dashpot position, but once properly mated relative to each other, the feature should prove of advantage.

Fig. 15, which shows the latest Mayer type, a two-jet device, illustrates the placing of both of these nozzles N and N_1 directly in the main air passage P. The slow-speed nozzle N communicates directly with the mixing chamber, whereas the auxiliary jet N_1 comes into play only at higher speeds, or when the vacuum created is great enough to overbalance the weight of the ball Q, lifting it from its seat and allowing the entrance of additional fuel to supply the greater demand.

The constructional features of the Mayer carbureters, which appear in three models, G, H and K, are all along the same lines, except that type G is not provided with dashpot air control, and both G and H are single-jet instruments. In these two models the jet is located in the position which the auxiliary jet N_1 occupies in model K, Fig. 14. The needle valve adjustment is at X, while the gasoline enters the float chamber R at E, its flow being controlled in the usual way by the needle valve Y linked to the float F. The primary air passage P extends under the float chamber and passes the nozzles, while the auxiliary air combines with the mixture at M. Water-jacketing of the passage to the manifold is done.

Polyrhoe—A Multi-Jet Example

The constructional peculiarity of the Polyrhoe carbureter, a foreign one, lies principally in connection with the jets. These take the form of a series of slots cut in brass plates of known gauge. Fig. 16 shows on an enlarged scale a portion of one of these plates A of which there are two to a carbureter. The actual jet orifice is rectangular or nearly so in section. B is

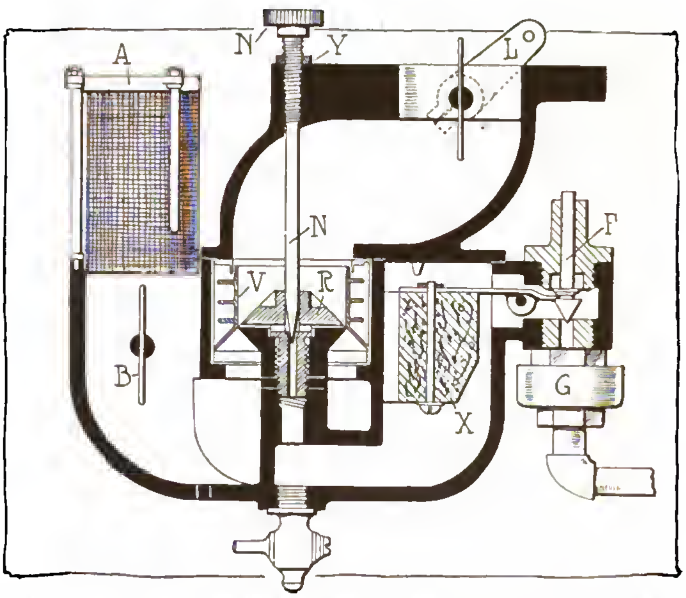


Fig. 17—Air Friction variable jet carbureter with single adjustment

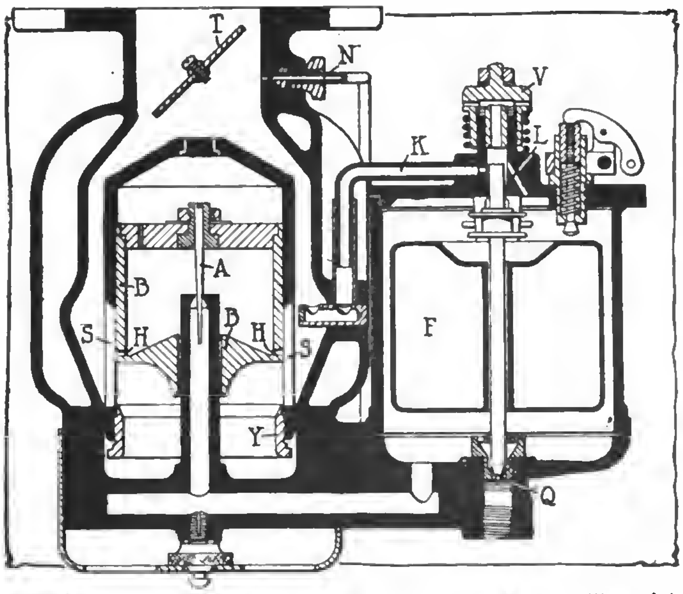


Fig. 18—Newcomb carbureter has eccentric float and auxiliary jet feature

a piston sliding freely in the body of the carbureter and having on its upper part a lip B^1 secured to it. This lip controls the quantity of air passing, the passage of which air is suggested by the arrow shown. Air flowing into the carbureter therefore must of necessity pass in close proximity to the series of jets A and its inductive influence is felt on all the jets that are situated on the right hand of the lip. To the piston B is attached by a neck a second piston C of larger diameter and this piston has at the back of it a helical spring D. The purpose of this spring is to tend to close the air supply when there is only a small negative pressure in the mixture chamber E. It will be understood that the pressure or rather negative pressure in E is at once communicated to the spring side of the large piston C. Thus when the suction of the engine is a strong one a considerable negative pressure is caused at the back of the piston C and the pressure of the atmosphere acting upon the other side of the piston compresses the helical spring and moves the small piston B to the left, thus by means of the lip B^1 permitting more air to flow and at the same time opening up a greater number of jets.

F is a piston throttle of usual construction, having a slot G close to the engine branch for permitting slow running with an all but closed throttle. It should be stated that the row of jets is situated slightly above the level of gasoline in the float chamber and the difference of pressure under which the instrument works is just sufficient to cause the fuel to flow from the jets which happen to be in operation at the time and to cause an effective spray.

The proportion of air and gasoline opening are constant at all throttle positions, but in order that these may be varied at times to suit existing weather conditions, an air slide is provided over the rectangular air opening and having in view the fact that this slide works at right angles to the movement of the control piston and lip its effect upon the air supply will be readily understood.

The Polyrhoe carbureter belongs in the true sense of the word to the multi-jet type, for there is one jet to each .063 inch of air port—or as the makers call it throat—opening. The size of the jet is about .006 inch deep by .025 inch wide. That the carbureter is good for slow running is proved by the fact that a four-cylinder engine has been run down to 140 revolutions per minute and a six-cylinder to 100 revolutions per minute.

There exists in the case of this carbureter a very small percentage of carbon monoxide in the exhaust gases for the percentage does not exceed 0.2 when the engine is loaded and 0.8 when the engine is running light. The proportion of CO_2 varies from 13.4 per cent. to 13.8 per cent. when the engine is loaded, and from 13.2 per cent. to 13.5 per cent. when the engine is running light, the consumption of spirit of 0.760 specific gravity being at the rate of 4 to 10 miles per gallon on the track at a speed of 20 miles per hour.

The salient features of this carbureter are: A large number of rectangular jets formed by the superimposing of two perforated and slotted plates, the jets being controlled by a slide which also governs the air supply, such slide being operated by the air suction. A hand-operated shutter which varies the proportion of air in the mixture throughout the entire range of the carbureter.

Feps—No Ball or Spring Valves

The Feps carbureter is of the fixed-venturi type with an auxiliary gasoline jet and an auxiliary air valve for controlling the suction at the jet when the engine speeds rise to such an extent that an incorrect mixture is given by the main fixed jet in the venturi. The carbureter is free from springs and ball checks. Fuel is admitted by a conventional concentric float, the only unusual feature being the insertion of a conical screen C, Fig. 19, in the gasoline line through which all the fuel must pass.

The passage to the inlet manifold rises vertically from the venturi and the course of the fuel is through the low-speed jet J, after which it is mixed with the air which enters the venturi passage at the bottom. After the speed of the engine has increased to such an extent that the suction on the jet is great enough to give too rich a mixture, or, in other words, at intermediate engine speeds, additional air is admitted through the auxiliary air valve H. This leather-faced valve is held on its seat solely by its own weight. Greater suction lifts the valve higher as the suction increases, thereby increasing the air passage formed between the edge of the valve and its seat. An adjustable stop limits its final lift. This stop is controlled by the knurled screw F. When the suction increases beyond that necessary to lift the auxiliary air valve against the stop, the auxiliary jet comes into play: Increased suction causes the pull on the auxiliary air valve to increase, and this causes it to pull against the stop which limits its lift. The stop is movable and is attached to the metering pin which controls the opening of the auxiliary jet, hence when the pull increases the metering pin is lifted and the auxiliary jet comes into play. The supply of air is still further increased by the augmented lift of the

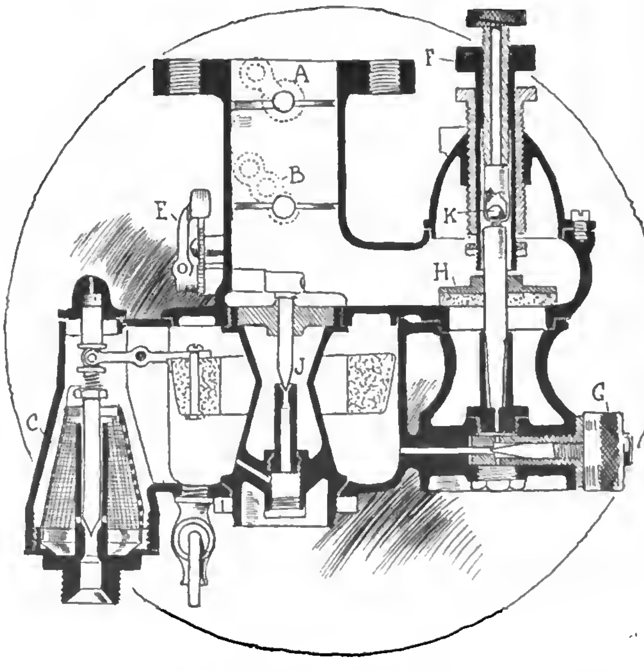


Fig. 19—Feps new carbureter without any spring or ball valves

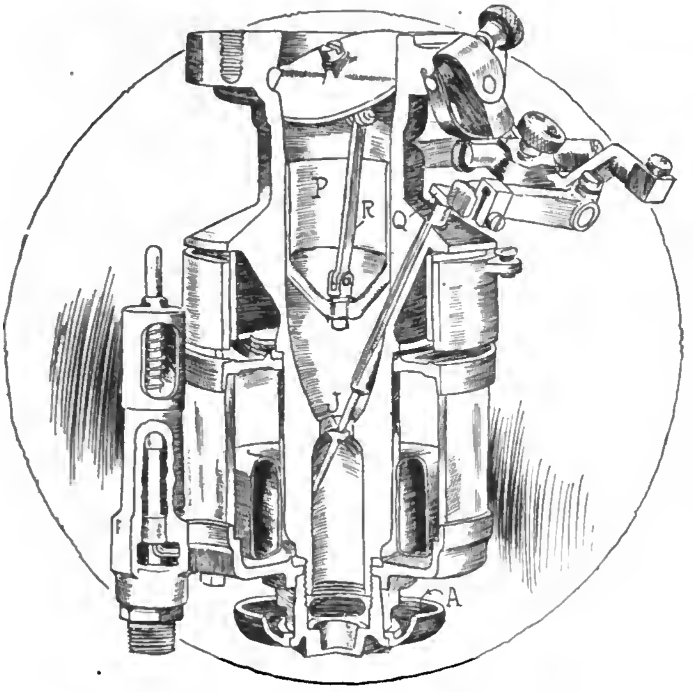


Fig. 20—New Miller has mechanical control for fuel and air supply

auxiliary air valve along the metering pin, and so the required lean mixture for high-speed running is obtained.

The carbureter has an easy-starting tube which extends from the float chamber to a point just below that at which the carbureter is connected to the manifold. All air supply may be cut off by a shutter A, confining the suction to the easy-starting by-pass and furnishing a supply of gasoline to the motor.

The carbureter has an adjustment for intermediate speed and another for high speed. The first is by means of the knurled screw F, which determines the lift of the auxiliary air valve, and the second is by the knurled screw G, which determines the gasoline flow to the auxiliary jet. Besides these two the primary jet can be regulated by means of the needle valve, the adjustment being made by turning the link E. The throttle is placed a little lower than usual at B.

Carter—Spirally Perforated Jet

In speaking of multiple jet carbureters, we ordinarily refer to the types which utilize two or more nozzles, one being the primary or main office and the others being merely auxiliary jets which come into play with increased motor suctions.

Although making use of this principle of supplying increasing amounts of fuel, automatically, by bringing additional jets into play in proportion to greater engine speeds, the Carter instrument, Fig. 21, accomplishes this result in a mechanically different way. Referring to the sectional view; the multiple-jet fuel tube B, located in the funnel K, has a multiplicity of small holes or jets arranged spirally around its cylindrical surface. As a vacuum is created in the carbureter by the suction of the motor, the fuel rises and falls in the tube B accordingly as the motor speed changes. The fuel in the tube sprays out through the small jets, the number operating depending upon the height of the fuel. By the use of a multiplicity of very small openings, the gasoline is finely divided up into a mist, which aids in its union with the air. By this spiral arrangement of the jets, each small emission of fuel receives its own proportion of the air supply. The main jet which is alone in operation at low speeds is located at the bottom of the tube B. The main air opening is above this lower orifice. It is located at D. The mixing chamber proper is at H. The carbureter has a spring controlled auxiliary air valve A, with the operation of which valves we are already acquainted.

A rather unusual feature of the Carter instrument is the ball float E which rests upon the lever F. The latter is pivoted and operates the needle supply valve G in the usual way. Another noticeable point is the tube C, which is a preventive of strangling at low speeds. It keeps the mixing chamber H dry and free from fuel which would tend to condense the vapor generated. This tube extends into the manifold above the throttle and receives the full motor suction. The tube B is provided with an adjustment so that the fuel supplied at low speeds may be regulated. This device should furnish a well saturated mixture at normal operating speeds due to the opportunity afforded for the spreading out and fine division of the fuel.

Miller—Manually Controlled Valves

The new Miller carbureter is positively actuated, Fig. 20, being without springs. Pressing the accelerator pedal or opening the throttle controls the suction at the jet just as mechanically as it does the opening of the butterfly valve admitting the gases to the intake manifold. The carbureter, a concentric-float design with a single jet in the venturi, has a fixed air opening at the bottom of the venturi, and the air passing through this in connection with the jet in the venturi takes care of low engine speeds. When the throttle is opened further, speeding up the motor and causing a greater suction to occur at the jet, an extra supply of air is furnished in the following manner: Connecting the throttle butterfly valve and an air piston P in the cylindrical passage above the venturi is a short connecting rod R. When the throttle is opened, the piston is pulled up by this rod and uncovers air ports in the wall of the passage. The further the throttle is opened the more air ports are uncovered by the piston and the more air admitted.

In order to supply the increase in fuel necessary at higher speeds the needle valve is opened by the throttle mechanism through a cam arrangement on the head of the needle valve Q, thereby opening same through a spring in the needle valve housing.

Easy starting is obtained by a primer which depresses the float and floods the float chamber. The points at which the needle valve is opened and at which the piston begins to admit air through the annular auxiliary opening are adjustable. A removable hot-air attachment is also a feature.

Newcomb—A Constant Suction Type

A type of carbureter which works on the constant-vacuum principle and which utilizes a metering pin arrangement for automatically controlling the amount of fuel in the mixture is the Newcomb, Fig. 18. The metering mechanism is shown at B, while the pin proper which regulates the flow of fuel from the

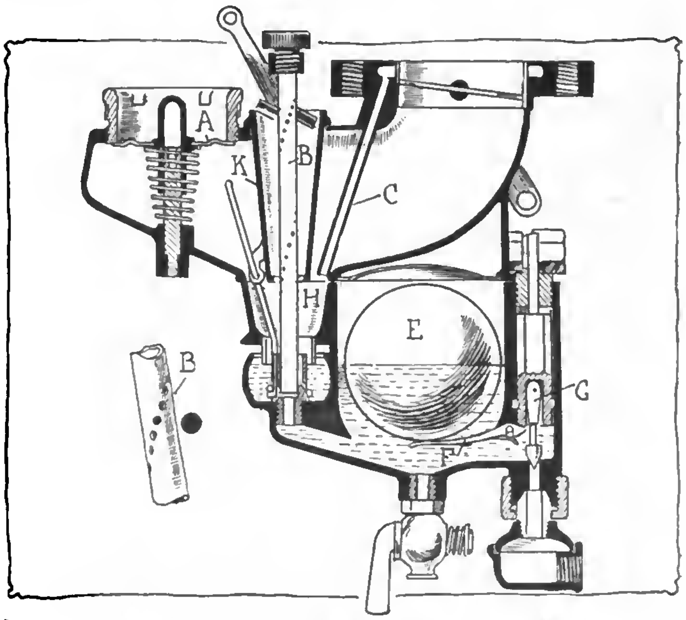


Fig. 21—Carter has ball float and numerous jets varying with suction

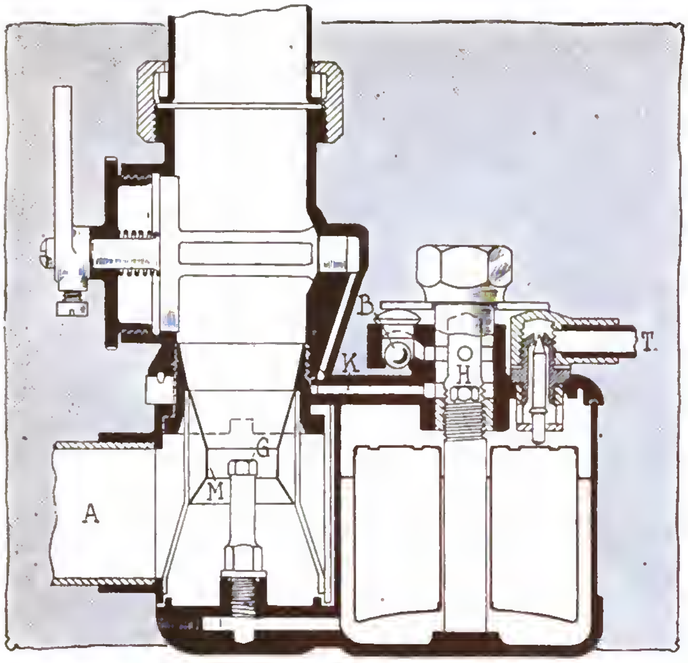


Fig. 22—Solex carbureter is a French eccentric float design

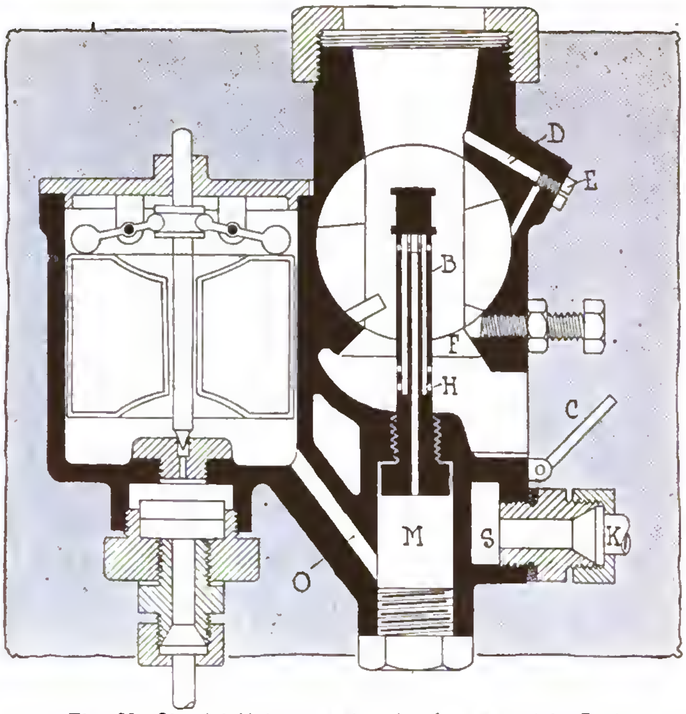


Fig. 23—Claudel-Hobson carbureter has eccentric float

nozzle C is indicated by A. This metering arrangement is really a small piston working up and down in the cylindrical body of the carbureter. When at its lowest position, B rests upon the upper edge of Y. In operation the metering mechanism floats in some such position as that shown.

Air enters through the bottom of the carbureter and flows through the slots S, the amount of opening of which is governed by the position of the plunger B. Holes H in the bottom of the plunger register with these slots S and allow the fuel issuing from the jet to flow through and combine with the air. The height of plnnger B is controlled by the throttle opening which increases or lessens the motor suction, and changing the pressure difference on the upper and lower faces of the plunger, that on the lower face is of course constantly atmospheric, being open and free.

Regulation for quality of mixture is done through the vacuum valve V above the float chamber. The valve V is so constructed that the flow of air from the outside may be increased or decreased by turning the valve up or down. The small passages are here shown wide open, allowing air to pass from the outside through the tube K to the mixing chamber. A tube L also connects this passage with the float chamber. When the valve V is adjusted for lean mixtures, it is screwed down so that there is little or no air passage to the outside. Thus when the motor suction becomes high enough, it draws through tubes K and L, communicating with the pressure above the gasoline in the float chamber and serving to prevent as great a flow to the nozzle, and making the mixture weak. When V is set for rich mixtures, the air passes directly from the outside to the mixing chamber and does not act against the flow to the nozzle, allowing proportionately more fuel for the same amount of air and giving a proportionately richer mixture.

This carbureter is fitted with a priming device for easy starting. It consists of an auxiliary fuel nozzle N connecting with a tube conveying gasoline from the float chamber. When the motor is running, very little fuel flows through this orifice, but when starting the throttle is turned backward through a slight angle, bringing it above the valve, and subjecting it to the strong suction which draws in pure fuel.

The float mechanism is standard and embodies the metal float F for raising and lowering the needle Q. For regulating the opening of the nozzle C provided by the pin A, the regulating collar V is provided, which raises or lowers the seating position of the plunger B. The needle is so positioned when normal that the fuel nozzle is nearly closed when plunger is on its seat, giving the fuel a slight lead over the air for slow running.

Claudel—Jet Inclosed in Tube

One of the foreign carbureters which has perhaps as big a European following as any is the Claudel-Hobson, Fig. 23, which has as its peculiarity the fact that its single jet H is inclosed in a small diameter vertical tube B perforated at the top and bottom. The throttle valve, which takes the form of a cylindrical shell or drum, is situated close to the jet, so that the valve practically takes the place of the usual choke tube.

The jet is covered by a tube B, as just stated, drilled at the bottom with holes H and also at the top at the same level as the jet. When the throttle is shut, the top part of the jet is in the mixing chamber and the gasoline is sucked through the top holes of the tube, while the suction is relieved by a proportionate quantity of air entering through the holes of the bottom of the jacketing tube, which is in direct communication with the atmosphere outside the regulator C, thus insuring a perfect spray and an accurate proportion of gasoline passing into the mixing chamber while the throttle and air strangler combined are so cut that, when opened to whatever extent, for the engine to pick up, accurate proportions of air and gasoline are claimed to pass into the cylinders.

Briefly, the action of the carbureter is as follows: When the throttle-drum is full open, there is a perfectly clear way through, so that the minimum possible obstruction is offered to the ingoing mixture, thus assuring as full a charge as possible. To further this end to an even greater extent still for maximum load that portion of the passage beneath the union-nut is tapered so as to gradually increase the diameter right through the throttle-drum and up to the induction-pipe fitting, while close beneath the throttle-drum is a sharper taper in the opposite direction, opening downwards, with the object of obtaining, injector fashion, all the flow that it is possible to get into the large bore of the induction pipe.

Projecting up into the throttle-drum, and therefore centrally placed within the main air passage when the throttle is fully opened, is the above-described special jet, in which the gasoline is maintained at an approximately constant normal level by a float of the usual character. Immediately beneath this jet there is a jacket through which some of the circulating water from the engine is allowed to flow, and which warms the gasoline before it actually enters the jet and assists in its atomization.

The shape of the throttle-drum already described is peculiar. The passage through it is such that the area round the lower portion of the jet is reduced at the same time that the outlet to the induction pipe is being diminished in size.

There is a small by-pass D which makes communication when the throttle is at a particular position, between the lower part of the carbureter and the upper part. The effective size of this by-pass orifice may be adjusted by means of the screw E, the end of which may be screwed so far in as to project across and thus restrict the lower part of the by-pass passage. A further adjustment is also provided by the screw which affects the richness of the mixture. When screwed out, the area of the choke tube is increased and the velocity of the air up round the jet is decreased. Though this adjustment makes but little difference when the throttle-drum is open, yet when nearly closed it becomes of considerable importance in regulating the air and fuel supply for slow running.

With this carbureter subsidiary warming is generally used.

Solex—Throttle Works Second Jet

The Solex, an imported carbureter of the twin-jet type, has the second jet in a most unusual position in that it is neither above nor below the throttle valve, located in the vertical pipe leading to the motor, Fig. 22, but, as a matter of fact, is precisely on the same level with this valve and enters the right end bearing of the throttle, which is explained as follows: The first or main jet G is of conventional construction and is surrounded by a bi-conical venturi M. Now for the secondary jet and its method of operation. To understand it, keep in mind that the throttle is capable of being moved axially by the simple expedient of screwing up or unscrewing the retaining cap, shown at the left end of the throttle. Between this retaining cap and the disk on the throttle shaft is a coil spring which aids in this adjustment. The throttle is composed of two thin walls inclosing a chamber and the pivot of the throttle on the right-hand side in the figure has a small hole in it; this hole communicates by means of the passages with a small chamber containing a ball valve B opening inwards towards this chamber. This same chamber has within it a supplementary jet deriving its supply of fuel from the main float chamber. These, briefly, are the constructional details, all of which are clearly shown in the illustration.

During slow running the throttle assumes a comparatively horizontal position. The induction current therefore passes through the crescent-shaped opening formed by the curved end of the throttle and the body of the carbureter. There is, then, in the float chamber formed in the throttle itself a depression intermediate between the extreme rarefaction in the region above the upper wall and the comparative absence of vacuum round the main jet below the lower wall. This depression is just sufficient to draw from the auxiliary jet the small amount of gasoline necessary to maintain a low rate of engine speed. The shut position of the throttle corresponds to a considerable angle so that no very nice adjustment is necessary for slow running; this adjustment is made in the first instance by operation of the screwed cap as just described. When the engine increases speed the depression increases and the small ball valve B lifts.

Hoyt—Metering Pin Regulation

The Hoyt carbureter, Fig. 26, operates on the constant-vacuum principle. It is provided with two jets, the low-speed jet A being adjustable for a fixed position while the auxiliary jet B is controlled by a metering pin mechanism C. The auxiliary needle has a long slim taper, but instead of being conical in form it is flat on three sides, the object of this being to produce three thin sprays, thus aiding in the splitting up of the fuel. This needle is raised or lowered by the plunger C, the amount which it is raised depending upon the suction; also the higher this plunger, the greater the amount of air passing through the auxiliary air valve E, which principle is similar to that of other metering pin types. The priming air passage supplies air to nozzle A when running at low speeds when the metering mechanism is seated is shown at D. Needle G controls a passage leading to the port F at the bottom of the air valve which when opened lowers the pressure under the valve, retarding its upward movement and thus putting greater pressure on the gasoline, making a richer mixture, the richness of which depends upon the amount G, is opened. In this carbureter the flow of gasoline is controlled by the air valve, a vacuum replacing springs.

Excelsior—Ball-Suction Control

A peculiar carbureter design which compensates for higher speeds by automatically admitting more air as the suction increases is the Excelsior instrument, Fig. 28. The distinguishing feature is the use of a ball B in the mixture tube. When the engine is running at low speed, the suction is small, hence there

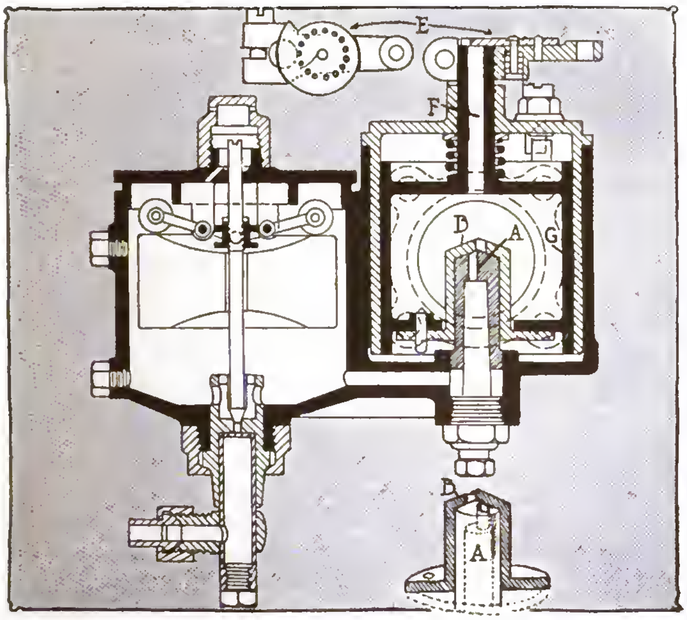


Fig. 24—White-Poppe is an eccentric carbureter with a variable adjustable jet

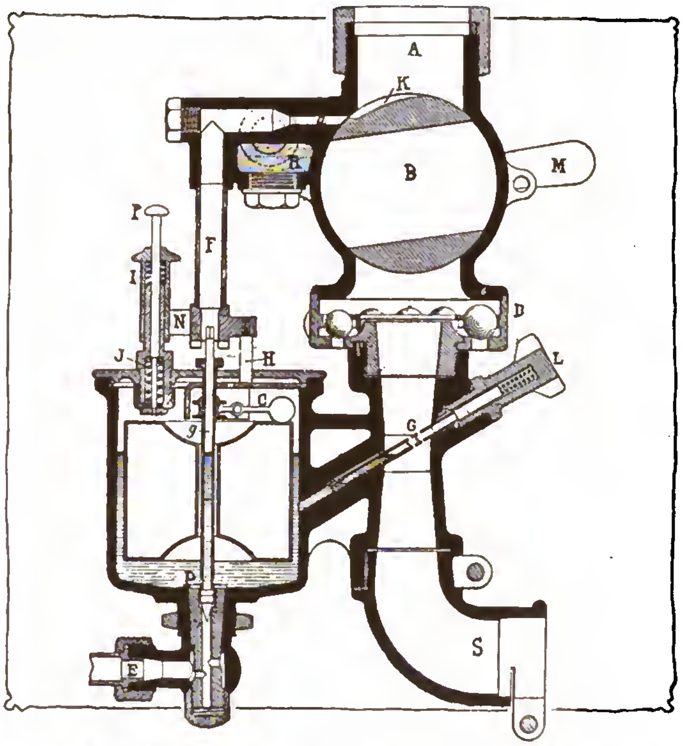


Fig. 25—G & A carbureter now has secondary jet above float chamber

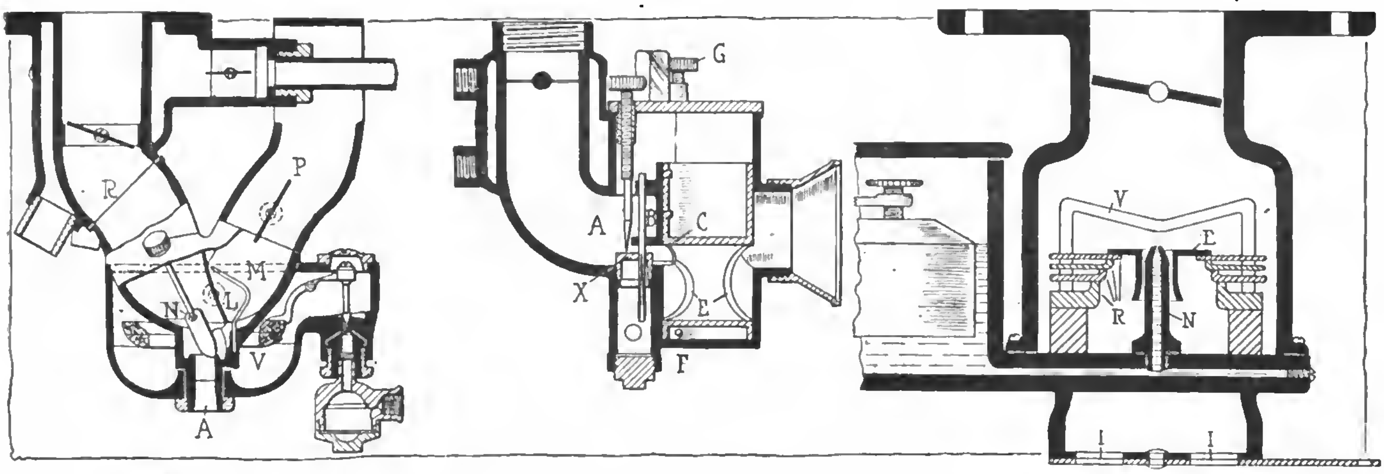


Fig. 26—Left, Marvel H with diagonal needle controlled jet; center, Hoyt metering pin control; right, Krause variable venturi eccentric carbureter

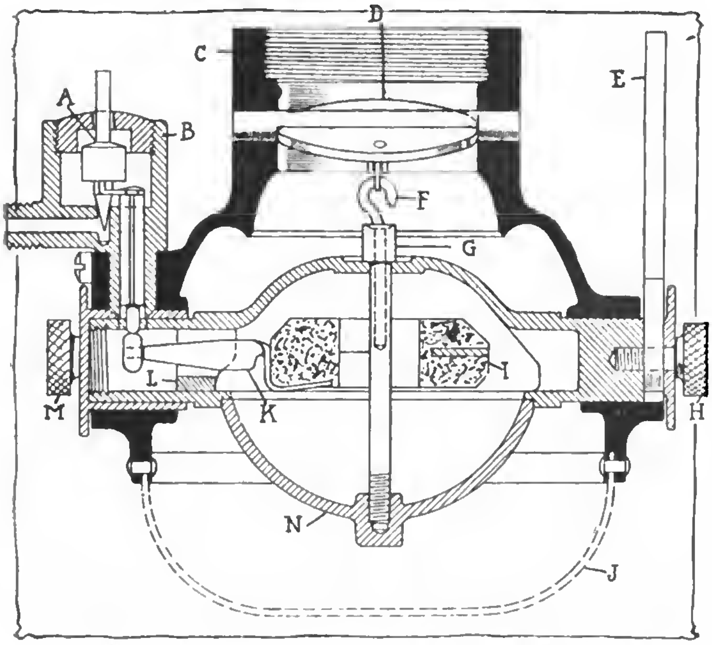


Fig. 27—A B C carbureter contains six jets in rotating float-chamber

is little tendency for this ball to be drawn upward toward the manifold connection. The tube becomes larger in section as it nears the manifold and is of the least diameter where the ball is shown. With increased vacuum, it floats in a higher position, as indicated by the dotted lines at C. In some such position as this, there is a wide passage for the air around the ball. Thus, the greater is the suction, the greater becomes the air clearance.

G & A—Adds a Two-Jet Model

The new Grouvelle and Arquembourg, or as it is generally called, G & A carbureter, Fig. 25, is of the eccentric-float, double-jet type. An unusual feature is that the auxiliary jet is concentric with the float while the main jet is set in a long venturi passage concentric with and below the intake manifold connection.

The normal air intake is located at S below the venturi and the jet is located at G at the narrowest part of this passage. As may be noted, the jet enters the venturi passage at 45 degrees. Additional air is obtained at greater engine speeds through the passages at D, closed by twelve metal balls of different sizes. This gives the required leaner mixture for intermediate speeds. At low speeds the auxiliary jet acts alone. The groove K in the throttle B allows the gasoline to be drawn up through the passage F. At the bottom of this passage the small auxiliary jet is located. It is indicated by G. Around this jet is an annular open passage through which air is drawn. The priming device is shown at P, I and J. When the throttle is open wide enough for the main jet to come into operation the air is first taken through and then by lifting one ball after the other as the motor increases its speed. The course of the gasoline is through E, and though the usual form of float chamber P. The carbureter is hot-water jacketed at R.

A B C—Tilting Float Chamber

In the A B C carbureter a pivoted float chamber which rotates about a horizontal axis in conjunction with the throttle-valve action is the feature of the A B C carbureter. The latter is of concentric design. The float chamber is a flattened sphere suspended in the air passage; above the float chamber and situated in the intake passage in the butterfly throttle. The float chamber and throttle are linked together in such a manner that when the float chamber is tilted about its axis the throttle is opened. Piercing the wall of the float chamber above its equatorial line on one side is a series of five jets of different capacities and arranged at different heights; on the other side of the float chamber a single jet for low-speed and compensating work is located. When the float chamber is tilted, gasoline fills the jets one after another as the tilt increases; incidentally the throttle opening grows wider and wider. The more jets are opened the greater becomes the cross area of the air entrance around the float chamber.

C R G—Uses Three Venturis

The C R G carbureter is unique in that it contains three separate and independent venturi tubes in one casing, their relative location being such that if connected by lines, an equilateral triangle would be formed in the carbureter. Three jets or nozzles are used, each being located centrally in one of these venturi tubes. The concentric float chamber surrounds the three venturis. When running slowly, the smallest of the three venturis is in action and operates at speeds of from 4 to 12 miles an hour on level roads. Above the latter speed and up to 35 miles an hour the second venturi comes into action and works in conjunction with the first up to a car speed of 35 miles an hour. Above this speed all three jets operate. The air inlets for each of these venturis is separate and in order to get the gasoline started through the nozzle before the air comes into play a priming disk is fitted over each air passage.

White & Poppe—Eccentric Jet Control

The White & Poppe carbureter is of the single, variable-jet type and has a rotary throttle B working in conjunction with the jet-regulating device. The latest addition to the carbureter is a corrugated copper device for silencing the noise of the ingoing air. Fig. 24 shows a section in which A is the single jet having a hole drilled out of center into its main passageway. Fitting gasoline-tight over the upright jet is a regulator cap B which has a hole of corresponding size and eccentrically drilled in its upper end. A rotary movement of the cap obviously has the effect of altering the effective opening of the jet. The regulation cap has a flange at its base by which it is attached to a cylindrical throttle valve S, which latter is operated when desired by the lever. The correct proportions of air to gasoline openings is in the neighborhood of 500 to 1, and the respective openings of the air throttle and regulation cap are arranged in such manner that their proportions are maintained at all positions of the throttle lever.

In the later type of carbureter an ingenious arrangement is furnished for varying the amount of constant air supply to the instrument. A hole F situated immediately over the jet is partially closed by a cam-shaped plate E. This plate can be lifted out of engagement with a small peg on the throttle lever and partially rotated so that the edge of the plate covers more or less of the constant air port F. In this manner an extremely fine adjustment is obtained. A small stop is provided close to the air inlet, known as the slow-running stop, for making it possible to instantly bring the throttle lever to the best position for slow running.

Krause—Maco—Marvel—Shain

Although conventional in most respects the Krause carbureter, Fig. 26, utilizes a method of controlling the air supply in proportion to the suction. The air enters through the bottom of the device through the adjustable air inlets I, and passes upward by the nozzle N. As the motor suction increases, the air controlling ring valves R are successively raised from their seats and slide on the guides V. Thus the air passing through is in proportion as the opening is made larger by the raising of these rings. When the engine is cranked, air enters only through the automatic priming valve E close around the nozzle, serving to draw enough gasoline for starting. The operation of this carbureter is a constant-suction type with what is in reality a variable air gap.

Extreme simplicity marks the Maco carbureter. It is of the concentric-float, fixed-venturi type. The air passes in through the bottom of the carbureter, up through the venturi and around the spray nozzle. A spring-regulated auxiliary air valve takes care of the mixture at increased suction due to higher engine speeds. There are two adjustments: The needle valve in the venturi jet may be regulated by turning the knurled screw above the carbureter and the tension on the auxiliary air valve may be regulated causing this valve to open earlier or later according as to whether the pressure is made higher or lower.

The use of more than one jet in an instrument assumes several forms; an unique adaptation being that shown in Fig. 26, which is a sectional view of the Marvel. This device is provided with a primary nozzle N which extends into the mixing chamber diagonally and which is controlled conventionally by a needle valve; and with an auxiliary or high-speed nozzle M which extends to the upper part of the mixing chamber and back of a butterfly valve L. This latter is held in a closed position by an adjustable tension spring. When the engine is running at high speed, the suction overcomes the tension in the spring and the valve L is opened admitting air through P in proportion to the opening and drawing auxiliary fuel through nozzle M which connects with the fuel chamber through the tube V. When the nozzle N only is in use, air enters through the fixed tube A only. The passage to the motor is at R. Float feed arrangements are in accord with American practice.

The Shain carbureter, Fig. 29, is distinguished by the fact that it has no float regulation but a ball B rests upon the gasoline supply pipe opening and is lifted from its seat by the pressure of the gasoline below and the suction of the motor above. Air is supplied through the ten open air ports surrounding the ball. The greater the suction of the motor the higher the ball will be lifted and the greater the amount of air drawn through the air ports. The ball revolves, owing to the suction above and the pressure below, giving a spraying action to gasoline.

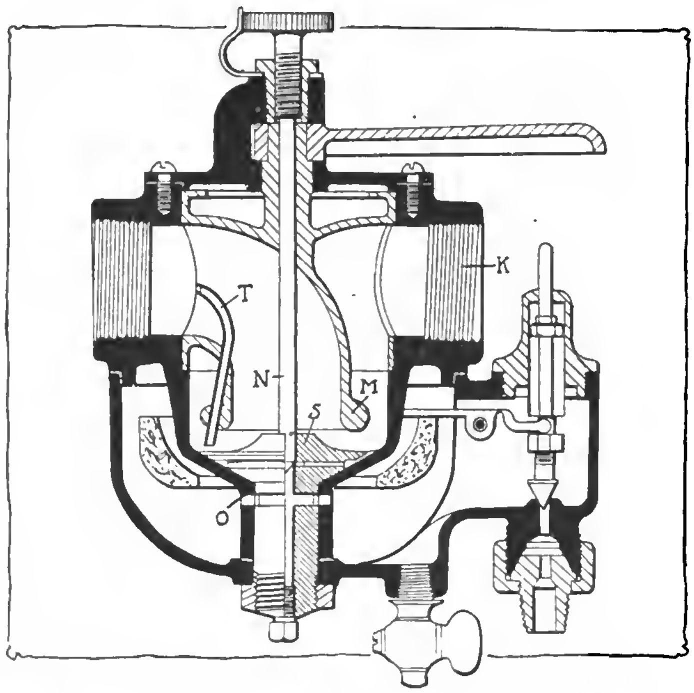


Fig. 28—Krice carbureter has no needle valve, but annular gasoline passage

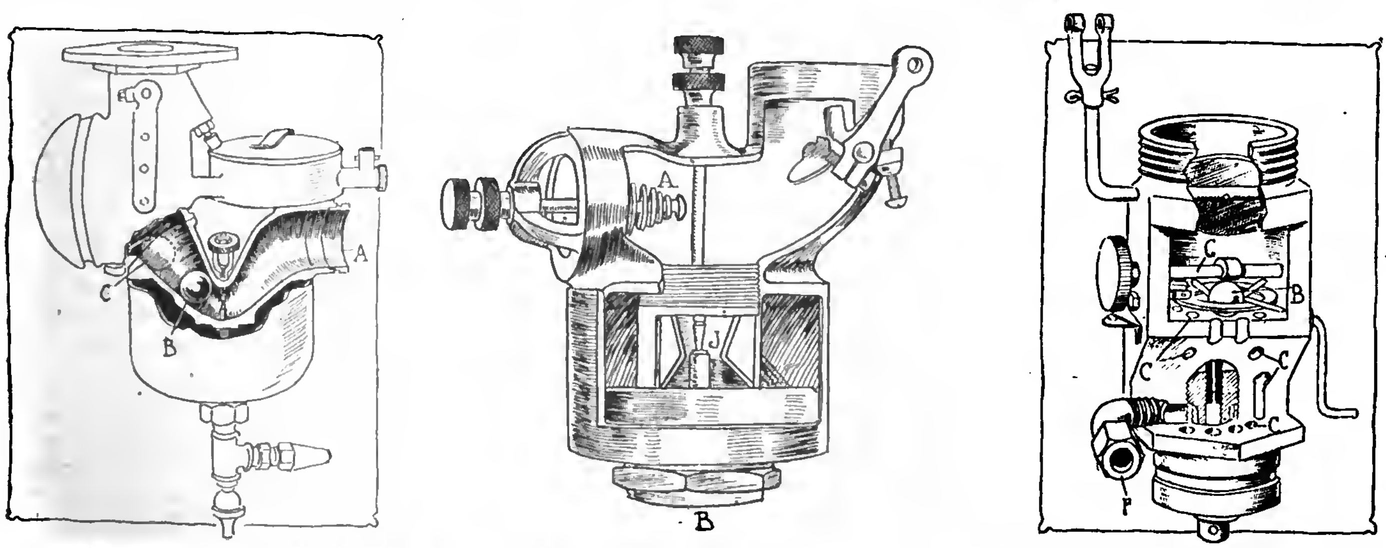


Fig. 29—Excelsior, left, ball regulating suction; Maco, center, concentric float, spring auxiliary air; Shain, right, uses no float control

Sudden Expiration of French Patents a Constant Danger to Some Non-French Holders—Odometer and Revolution-Counter of Interesting Design—Keeping Cars Young—Cheap Protection for Grade Crossings—Improvement of Road Tar

LAPSING of French Patents.—A recent decision in a patent case of the Thomson-Houston company against the street car company of Lille, France, rendered on appeal to the Court of Cassation by the latter calls attention to the risk of having their French patents declared invalid which confronts some non-French patentees and assignees.

The French patent law of 1844 says in article 29: "The author of an invention or discovery already patented abroad can obtain a patent in France, but the duration of this patent shall not exceed that of the patents previously taken abroad."

This paragraph is subject to varying interpretations. It is admitted that by virtue of this article the French patent granted for the same term as the foreign (non-French) patents is affected not only by the normal expiration but also by any accidental lapse of these patents, even if the cause of the voidance is not recognized in French laws. The Court of Paris found differently in a decree of May 16, 1863, in a case where a patent had become void in Belgium through failure to pay the required annual tax, but this decree was reversed by the Court of Cassation, January 14, 1864. It is held to be the purpose of the article to protect French industry and therefore not to permit a monopoly in France on something which can be manufactured freely abroad.

But what is to be understood by "abroad"? To cause the French patent to continue in force, is it sufficient that the invention is protected in any one foreign country? Or, on the other hand, is it sufficient, in order to cause its lapse in France, that its manufacture has become free in a single foreign country?

The natural sense of the article may be invoked in favor of the first opinion. Otherwise an inventor might find himself punished for his excess of precaution in taking out patents in all the countries of the world. Suppose, for example, that he takes out patents in the principal countries and also in Bulgaria. But after a year or two he abandons the idea of exploiting the Bulgarian patent and lets it go by default of payment. Should he then be deprived of his French rights, though he would have remained protected if he never had taken out a Bulgarian patent?

This consideration inspired the Court of Douay when on November 19, 1907, it rendered a decision in favor of the Thomson-Houston company.

The Thomson-Houston company had bought from Knight and Potter, the inventors, the French patent relating to a method for adjusting electric machinery. The method had already been patented in Sweden and in Belgium, but in 1907 the Swedish patent lapsed in default of the annual payment, and the street car company of Lille assumed that for this reason the patent had fallen into the public domain. In this the Court of Douay did not uphold it. Now, however, the Court of Cassation by its decree of November 5, last, has reversed the decision of the Court of Douay, maintaining that it follows absolutely from the purpose of the law that the French patent must lapse when any previously obtained foreign patent lapses for any cause.

This decree may be criticised for not interpreting the text of the law but the intent of the legislator and even for interpreting the latter incorrectly. The member who introduced the law of 1844 said in the Chamber of Deputies with regard to article 29: "We should not chain to a monopoly in France something which may be produced free of all restrictions everywhere else (*Il ne faut pas enchaîner en France par le monopole ce qui, partout ailleurs, serait libre de toute entrave*)." The words "everywhere else" conflict with the decree of the Court of Cassation.

At all events the applicability of this decree is now much restricted through the convention of December 14, 1900, in which there is found the following clause: "The patents demanded in the different contracting states by persons admitted to the benefits of this convention shall be independent of the patents obtained for the same invention in other states, whether these are or are not members of the union (*dans les états adhérant ou non a l'union*)." In accordance herewith, citizens of the countries which took part in this convention are no longer subject to seeing their French patents [or patents granted in any of the other countries interested.—Ed.] suffer from the reaction of accidents befalling one of their other foreign patents. These privileged countries are numerous, including Belgium, Brazil, Denmark, Spain, the United States, Great Britain, Italy, Japan, the Netherlands, Portugal, Servia, Sweden, Switzerland and Tunis.

In the Thomson-Houston case the Court of Cassation disregarded this convention, although Sweden and Belgium are among the parties to it, because the facts of the case existed before the convention went into effect, which was in 1902. This shows the slowness of French legal procedure, since an action for infringement filed in 1903 and referring to facts antedating 1902, does not reach the Court of Cassation until 1912. It may be noted, by the way, that the case is not yet finished, as the Court of Cassation has remanded it back to the Court of Amiens. This, it may be hoped, will prove to be only a simple formality.—From *Le Génie Civil*, December 14.

[On the basis of facts presented in the foregoing it still seems possible that the American assignee of a French patent obtained from a Russian, a Norwegian, a Greek, an Austrian or a German patentee would forfeit his rights in France if any other patents secured by the inventor lapsed.—Ed.]

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NEW Odometer Principle Described.—The makers of the Gnome motors in France bring to the attention of the French industry an odometer which they have found very reliable in practice despite its apparently complicated mechanism in which the parts are small and delicate. The idea of the maker of this instrument seems to have been to avoid the use of a centrifugal governor in direct connection with the index hand which tells the speed variations and to measure the latter by bringing a roller which follows all the speed variations in a measurable and slowly self-adjustable relation to a disk revolving at a constant speed not too far removed from the average motor speed. The principle is explained as follows with reference to the accompanying diagrams, Figs. 1, 2 and 3:

The Behrens odometer is composed of two distinct mechanical movements whose interaction gives the number of revolutions per minute for any vehicle or motor. Where the driving shaft enters the device it transmits motion to both movements through a small train of gears, the ratio of which may be changed to suit the requirements in each case.

The first movement is shown in diagrammatic elevation in Fig. 1, and is intended to secure the rotation at constant speed of the disk D. The spindle of this disk is actuated by the driving shaft through a friction clutch T, which consists of a spiral spring whose free end expands against the interior of a drum, so as to permit small relative speed variations without slip. At the other end the shaft of D is geared to a small plate P, which turns with its spindle while capable of sliding in or out on it under the influence of a ball-governor which, at increasing speed, tends to draw the plate against the brake-screw B, which is mounted on a small leaf spring. The plate P is thus constantly in contact with the brake-screw, and the brake effect may be sufficient to make the clutch T slip. The disk D is hereby made to turn at constant speed.

The second movement, Fig. 2, comprises a metallic roller G, which is in frictional contact with disk D of the first movement and of an ingenious gear connection by which the roller is rotated from the main driving shaft of the device while yet permitted to take different positions in relation to disk D. It is this position which in each case is taken as the measurement of the motor speed. The roller gets into this position automatically by following the lines of smallest resistance in its frictional contact with the rotating disk D. The mechanism by which this result is obtained is as follows: The gear wheel R, driven from the main shaft of the device, actuates the wheel R_1, which is guided by the radial arm V, and the latter can turn around the center O_1. R_1 meshes with R_2, which controls the roller G. The arm V is connected by joints, not shown, with the sliding piece E, which is shaped somewhat as a tuning-fork and rides upon the spindle O of disk D. It is upon the unforked portion of this sliding piece that the roller G and wheel R_2 are mounted.

Being thus free to move radially upon disk D, the roller will take the position in which its circumferential speed is the same as the linear speed of the contact point on disk D, in which position there is only rolling friction to impede its movement.

The position of the sliding piece is finally brought in relation to the index hand of the device by means of an arm with a toothed sector, on the plan shown in Fig. 3, the center C of this arm being chosen arbitrarily somewhere near the middle of the curve described upon the disk D by roller G.—From *Bulletin Officiel,* November.

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DEVELOPMENT of the Schoop Method.—With a view to keeping automobiles and motor trucks, and perhaps especially taxicabs, constantly in commission, looking trim and new in spite of hard service, any process which holds out a promise of serving to keeping vehicles out of the paint shop engages the attention of the public at large as well as of the manufacturer. Among such processes that invented by Mr. Schoop of Zurich, Switzerland, for imparting a metallic surface to objects and substances of the most varied nature by blowing molten metal—especially tin, zinc or lead—upon them, holds a notable place, as it has already been employed in the manufacture of radiators, taking the place of soldering, and has been proposed for other uses to take the place of the electroplating bath, such as for forming water jackets, for coating gear blanks which are to be case-hardened in part and for producing a more substantial nickeling than is usually obtainable by electrolysis (owing to the development of hydrogen at the negative terminal). By the Schoop method as heretofore practiced the object to be coated was placed before a large funnel in which an exhaust fan caused a strong suction, and a spray of the molten metal was blown against the object, being carried in strong current of air or nitrogen taken from a reservoir under high pressure. The excess of metal was drawn in through the funnel and deposited in filters from which it was recovered. Similar methods have been used, at least experimentally, for plastering walls with cement or mortar.

Recently the same inventor has created a very light and portable apparatus which permits operating on any object at any place and without a complicated plant. It is in the nature of an oxy-acetylene gas torch and roughly resembles in appearance a Browning revolver connected by air and gas tubes with small compressor tanks. The flame of the gas torch is projected against the end of a stick of the metal with which the object is to be coated and, instantly melting this metal, carries it into the air, or nitrogen, current which carries it further onto the object, where it immediately cools and solidifies. Nitrogen takes the place of air in the case of metals which oxidize readily. As the cooling is mostly due to the rapid passage of the spray through the atmosphere the tool should be passed before the object at a certain distance from the latter in order to get the best results in each case. A small compressed-air transmission device advances the stick of metal in proportion as the end of it is consumed. Wood, cardboard, plastering, glass and metal can be coated in this manner, and the coating is at once hard and smooth. Its thickness can be varied at will, as the adhesion is perfect.—From *Génie Civil,* December 21.

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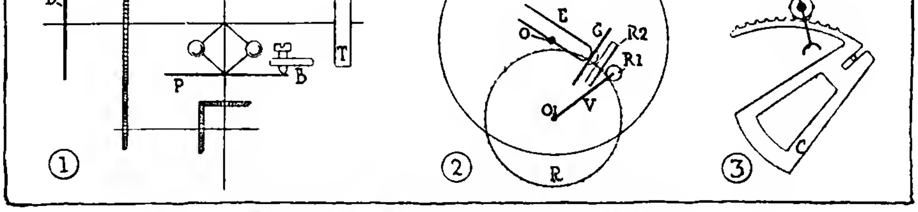
IMPROVED Dustless Road Material.—Coal tar gets soft at high temperatures and brittle at low ones; also slippery. It is therefore not well adapted for replacing the more expensive natural asphalt for road improvements, unless its properties may be changed by some suitable and inexpensive process. By subjecting it to the chemical action of sulphur, imitations of asphalt have been produced from it, but they cost as much as the natural asphalt. Other processes consist in the addition of mineral substances, but the mixture is usually uneven and defective because the mineral substances by reason of their higher specific gravity have a tendency to clutter at the bottom of the mass. Admixtures of organic substances, such as pulverized charcoal, cork powder and sawdust, have resulted indifferently. But it has now been found at the Lindenhof Chemical Works that the tendency to segregation of mineral admixtures can be obviated if a vegetable and a mineral admixture are incorporated in the mass simultaneously. The physical action obtained by this means is that the organic substances coated with the tar resin hold the heavier mineral matter in suspension, and a chemical action is also effected, as the cellulose of the organic ingredients forms viscous compounds with the tar at the temperature at which the mixing is done.

The following is mentioned as a suitable method of proceeding: In a vat with a stirring mechanism 1,000 parts of tar are heated to 150 to 180 deg. C. To this there are added 200 to 300 parts of fine sawdust and 400 to 500 parts of ground chalk. Stirring is continued, without exceeding the temperature of 180 degrees, until the mass is homogeneous. Wood chips or shav-



Figs. 1, 2 and 3—Illustrating principle of Behrens odometer ings may be used instead of the sawdust and marl or ashes instead of the chalk.

The viscous mass obtained can be run into molds and used like paving blocks or can be used directly in road construction. Like natural asphaltum it can be rolled, either cold or hot, into a uniform, coherent and elastic layer, if a firm foundation is provided and heated rollers are employed. The new composition is said to resist wear, heat and cold, undergoing no contraction in cold weather and being always impermeable to water, heat and sound.—From *Revue des Produits Chimiques*, December.

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FLASHLIGHT for Grade Crossings.—With the increasing amount of automobile traffic the old method of guarding the grade crossings of railways by means of a bar which is lowered at the approach of trains and from which a lantern is hung at night has proved inadequate; largely, so far as the night traffic is concerned, because the light of the lantern may be confused with other lights which are visible in the line of the street or road further on. Lights flashing 60 to 100 times per minute have lately come into extensive use in the railway signal service, and an adaptation of the same principle is now proposed for grade crossings. The light source in the apparatus offered for this purpose by the well-known Julius Pintsch company (originators of Pintsch gas) is acetylene gas dissolved in acetone and confined in steel bottles. The connection from this bottle, which is at the heavy end of the barrier, to the flashlight lamp, which is at the middle of the bar, as indicated in the accompanying illustration, Fig. 4, is by a single metallic tube, in which the maximum pressure from within the bottle, amounting to 15 atmospheres, is reduced to one-hundredth part of an atmosphere by a reduction valve system rendering the gas pressure uniform in the tube and at a small jet which burns only four-tenths of one liter of gas per hour. This jet is always lit, or may be lighted in the evening and turned off in the daytime, but the light from it is not visible. It serves only to ignite the flashlights, which are produced the moment the barrier is turned around its pivotal bearing to be let down, this movement opening a stopcock sending surplus gas to an intermittent-pressure valve in the lamp which the usual flow of gas to the lighter-flame is insufficient to operate.

Each bottle holds 650 liters of gas which, at the price of 3.50 mark per cubic meter, costs 2.275 mark for each filling. With flashes lasting one-quarter of a second and intervals of one-half second, the daily consumption of the flashes and the lighter is found to average 16.6 liters, at which rate one filling lasts 39 days. This brings the daily cost to 5.82 pfennig or about 1½ cents. Considering this low cost of maintenance, the device may be used both day and night, so as to save the much higher expense which would be incurred by providing for the lighting and extinguishing of the lighter flame. The main objection to the introduction of the device is of course that the railway companies would object to it because if—once introduced—it went out of order and an accident occurred, a suit for damage would be liable to go against them.—From Z. d. M. M. V., Dec. 15.

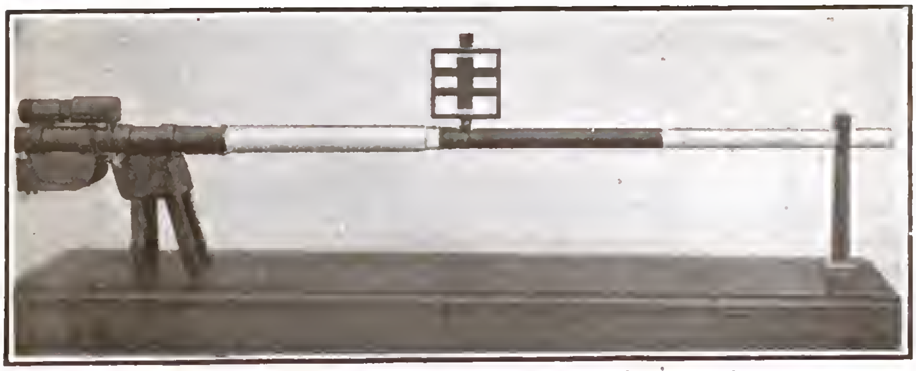

Fig. 4—Sample of flashlight barrier for grade crossings

STEAM Trucks in France.—Among the industrial motor vehicles shown at the Paris Salon last month there were two steam vehicle constructions which surprised many visitors, it being quite generally supposed that the gasoline vehicle had completely downed all competition. These were the Purrey and the Fodens. The Purrey steam trucks are very numerous in France and the power plant used in them, for which coke is the fuel, is the same that is used for the steam street cars in Paris. Their operating and maintenance cost per ton-mile is said to be interestingly low.

The Fodens steam trucks are of a very different type and are made for loads from 5 to 7 tons. They have fire-tube boilers and their engine actuates a flywheel from the shaft of which the power is taken to a differential on the rear axle by means of a reducing gear and a single chain. The low speed gear gives a maximum speed of 5 kilometers per hour and the high gives 11 kilometers. Either of them can be in mesh for starting, owing to the flexibility of the motor power. These trucks are equipped with sheet steel wheels.—From *Omnia*, December 14.

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Commercial Cost of Radical Change.—The net profits recorded for the firm of A. Darracq et Cie. at the last public accounting were only 18,300 francs, as against 1,824,225 francs the previous year. In order to pay dividends on privileged obligations, 3¾ per cent. on the common stock and the income tax of 500,000 francs imposed in accordance with the new decision of the tax commissioners, the company was compelled to take 1,250,000 francs from the reserve funds. While this unfavorable result of the year's business is in some quarters ascribed in part to the severance of A. Darracq from the company's affairs, the functionaries of the company ascribe it to the expenses incurred in manufacturing its new valveless motor, and they count upon recouping themselves through its success in the future.—From *La Vie Automobile*, December 21.

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American Engineers to Inspect German Plants.—The American Society of Mechanical Engineers will hold its next summer session in Leipsic, Germany, in common with the Society of German Engineers. About 200 American visitors are expected. It is the plan to inspect the industrial establishments of Hamburg, Leipsic, Dresden, Berlin, Dusseldorf, Krupp, Frankfurt, Munich and Nuremburg. Preparations are already under way for a festive reception.—From *Die Turbine*, December 20.

[The Society of German Engineers is very influential and counts more than 24,000 members. It has a large number of local branches which usually hold their business and social meetings at the most popular local hostelry, frequently under the eyes of the public.—Ed.]

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Vibrations of Buildings.—With regard to the vibrations of floors, which interfere with the precision of machine work and in some instances with the health of workmen, it has been established through experiments with a seismograph that the operation of a motor in a building constructed entirely of reinforced concrete caused arcs of vibration in two contiguous brick buildings much larger than those observed in the building where the motor was installed.—From *Génie Civil*, December 21.

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Foreign Car Specifications.—The seventh annual edition of the Catalogue des Catalogues has appeared containing specifications and prices of 2,000 motor vehicles, comprising motorcycles, sidecars, cycle-cars, automobiles, motor trucks and aeroplanes. Lefevre & Baron, No. 1 Avenue Félix-Faure, Paris, send it postpaid for 1.30 francs (26 cents).

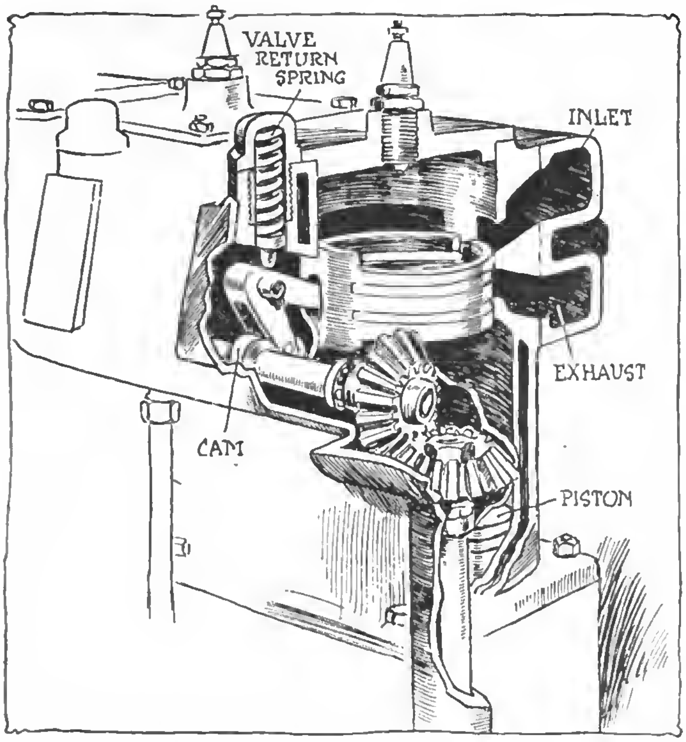

Fig. 18—Sphinx cam-operated sliding-valve motor

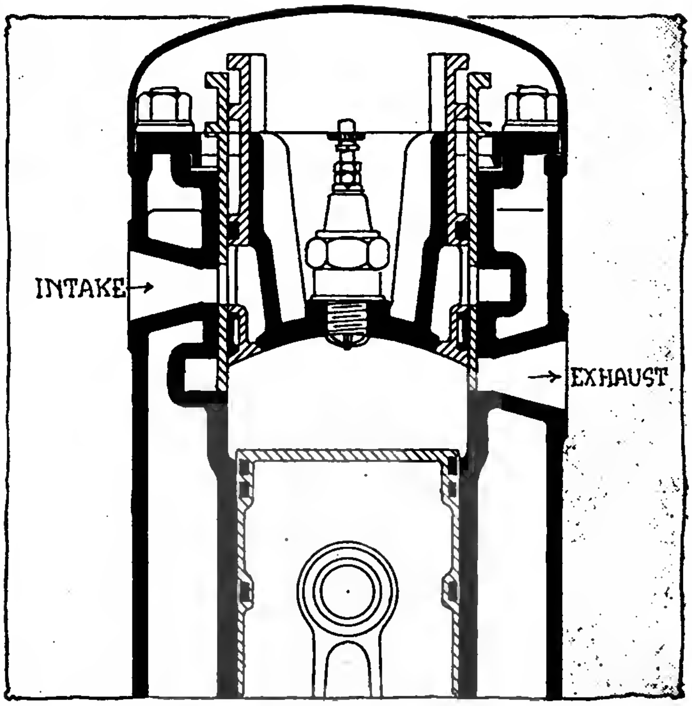

Fig. 19—Overhead sleeve-valve design by Crossley Motors

Criticisms of Non-Poppet Valves To-Date

Cam-Operated Sleeve Valves Have Harmful Effect on Valve-Tappets and Cams, Owing to Strong Return Springs—Laycock Motor Shows Good Scavenging Properties, Resulting in Strong Mixture

Complete Scavenging Produces Quicker Ignition and Combustion—Increase in Thermal Efficiency Over That Obtained with Incomplete Scavenging Should Amount to 25 Per Cent.

By Eugene P. Batzell Installment IV

SOME uncertainty of practical nature is attached to the motor, Fig. 21, in its cam-operated valve. The rest of the design deserves credit, being quite simple in its cylinder and valve construction. The overhead valve operation, permitting a short sleeve for the valve, removes the objections caused by the long sleeves of the type employed in the Knight motor, which objections refer to their manufacture, permanency of shape, lubrication, cooling, etc. The Diehl motor has a sleeve well separated from the cylinder interior, well balanced in regard to pressure and cooled all around. That being the case, the strain on the valve-operating mechanism ought to be small, much smaller than in an overhead poppet-valve arrangement, and therefore there is every reason for expecting a good performance by this motor in practice.

Other designers and inventors also have taken recourse to overhead sliding-sleeve valves with varying success. The Sphinx, Fig. 18, is one of these. This is its second improved form, the first being found unsatisfactory. Even this newer construction leaves much to be desired and in its idea it is inferior to that of the motor, Fig. 21. The slotted-sleeve valve of the Sphinx motor is exposed to the full pressure and temperature of the explosion chamber, the combination of which make sticking very likely, which must have been the makers' experience, because they have discarded the positive means of valve operation, adopting instead a cam and return spring arrangement as used with the conventional poppet valves. The principal advantages of a non-poppet-valve system is its positive valve operation, resulting in always equal valve motion regardless of the motor speed and in the general elimination of the noise, when the mechanism joints are tight. The Sphinx valve being exposed to sticking and also possessing much greater friction in its motion than the conventional poppet valve would necessarily require a very strong return spring if anything like high motor speed is expected with proper valve functioning. The poppet-valve spring must overcome merely the inertia of the valve and the slight friction resistance of the valve stem in its guide. The motion of the Sphinx valve is such that the exhaust port is opened by the cam action overcoming the resistance of the return spring and the friction of the valve against the cylinder walls, which is considerable, due to the valve being split. The return spring is determined also by the inertia and friction of the valve mechanism. The Sphinx valve weight is not less, but rather greater than the weight of the reciprocating valve parts in a poppet-valve motor; besides its valve travel is longer than the lift of a poppet valve. As a result a much stronger return spring is necessary in the Sphinx motor than is used on the ordinary poppet-valve motor, and a more harmful effect on the valve tappets and cams would necessarily follow.

An example of valve design which differs in type from those already dealt with is a recent design by Crossley Motors, Limited, Fig. 19. The principle of the valves should be clear from the drawing, but their actuating mechanism is not shown so that it is impossible to say whether the valve motion is positive or actuating mechanism is not shown because it would permit to state if the valve motion is positive. Another departure from the usual type is the Brasier motor, Fig. 20, which has a main sleeve valve in its cylinder, which directly operates the exhaust, and in connection with a piston valve at the side of the cylinder operates the inlet. These two motors are merely referred to as examples, and as no practical results have been published in connection with either it is only possible to estimate their value from the drawings.

A motor with piston valves has some advantage over the rotary or sleeve-valve type inasmuch as its manufacturing is not rendered more complicated or uncertain on account of the valve system. On the contrary, the piston valve action being identical with that of the main piston there is no reason why equally simple machinery operations should not be proper for both places. Thus the valve mechanism here would be relieved of all the extra precision work which so far has been found indispensable in connection with the sleeve or rotary-valve manufacturing. The tight action of the piston valves being secured with the use of expansion rings no accurate fitting of the valves into their cylinders is necessary, which removes the main item causing trouble in non-poppet-valve systems, that is, heating and change of shape when a permanent good fit is essential. Of course, the piston-valve systems are executed with a great deal of complications in their operating mechanism, losing here in favor of the rotary-valve type. But, all things considered, they could easily prove some advantage over the sliding-sleeve valves, especially in engines where consistency of reliable service is the principal aim. This is apparently proven by the use of piston valves for some aviation motors. Both of these systems are identical in their operating mechanism, but the piston valves have a smaller surface requiring lubrication, they are generally lighter than the sleeves of the Knight type which would reduce vibration and wear in the operating links due to the inertia of moving reciprocating parts; their action is less liable to be affected by the conditions of motor functioning and temperature, etc., all of which tend to make them more reliable than the sleeve valves of the unprotected type as in the Knight motor. The above is not said with the intention of explaining my attitude for or against certain systems; it is based merely on technical comparison between them, and the Knight motor has been mentioned here frequently in drawing comparison merely because it is the most widely known of all the non-poppet-valve systems.

A most promising novelty in valve arrangement is offered in the shape of the piston-valve Laycock motor, Fig. 22. This motor, besides having valves of the variety which are balanced against the cylinder pressure in respect to their driving mechanism, incorporates a feature very little used or advanced in the field of internal-combustion motors, but which nevertheless deserves much attention. This is scavenging of the cylinders from the spent gases remaining there after completion of the exhaust stroke, which gases being mixed with the entering fresh mixture weaken it to a very great extent. There are a few other systems in existence which provide for scavenging, but they do not offer it in a combination of features as in the Laycock, the construction of which is practically not influenced by the added scavenging means and it can be carried out to suit the requirements of every case. Other scavenging systems impose some restrictions in this respect. In the Laycock motor the main cylinder has but a small clearance space at the piston top and the combustion chamber is divided into two parts formed by the space between the two connected pistons of each of the separate inlet and exhaust valves, individual ones for each cylinder. During the upward motion of the valves they draw into the space below their lower piston either fresh air from the outside or mixture though a by-pass to the inlet manifold and carbureter. When the main piston reaches the position, Fig.

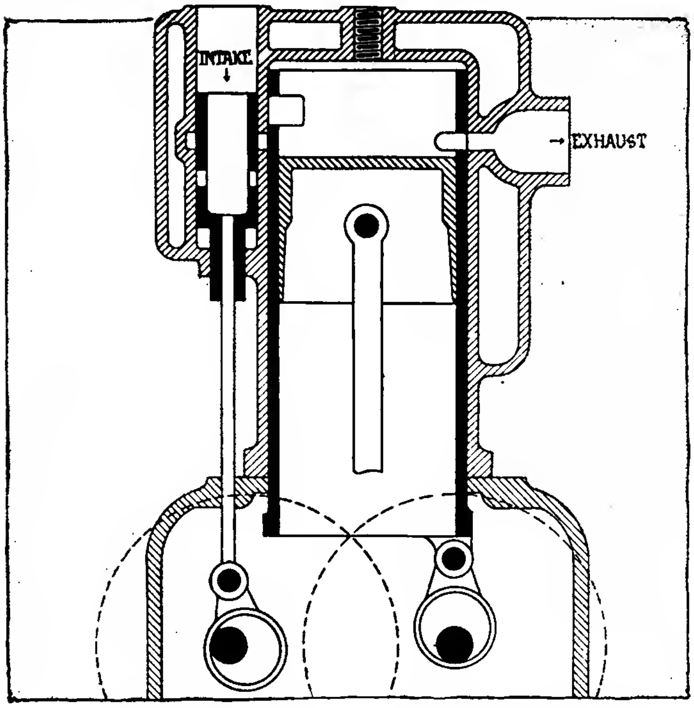

Fig. 20—Brazier motor using sleeve and piston valves

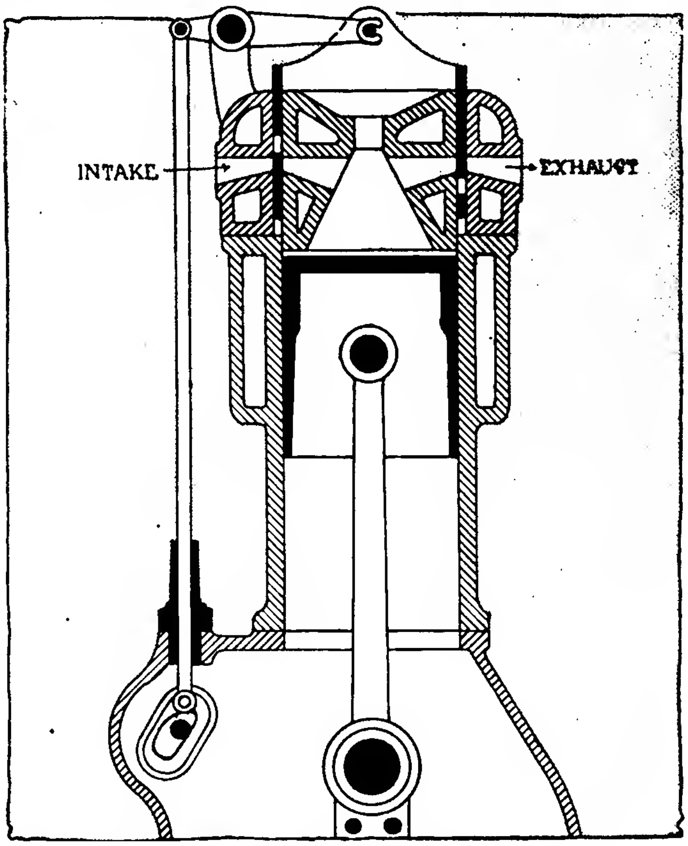

Fig. 21—Cam-operated overhead sleeve-valve of Diehl motor

22, that is, at the end of the exhaust stroke, the inlet valve is about to open the port leading into the cylinder to admit fresh charge from the manifold over the top of the upper valve piston. At the same time the space between its two valve pistons communicates through a by-pass with the compartment below the lower valve piston, the air or gas mixture in which was somewhat compressed during the downward motion of the valve. This air or mixture now rushes into the space between the two valve pistons expelling the spent gases from there into a passage leading outside. The action of the valve and the scavenging of the dividing combustion chambers is identical with that used in two-cycle engines for filling their main cylinder space, and consequently equal results should be anticipated. However, as in this motor only the volume of combustion space is cleared of spent gases the total rate of scavenging, considering also the piston displacement volume, is more nearly complete.

The exhaust valve acts similarly to the inlet valve only in advanced phase according to the timing. The exhaust gases from the main cylinder escape above the top of the upper valve piston, which piston overlaps the cylinder port just before the exhaust begins, thus separating the main cylinder from the space between the two valve pistons. The main cylinder space is cleared of gases by the returning main piston and the spent gases remaining between the valve pistons are expelled similarly as in the intake valves. The ignition of the charge takes place either by a spark-plug located in the main cylinder top or by plugs located in the two parts of the combustion space.

The section of the motor being very simple and identical with that found in other existing and well-proven types there should be little doubt as to its practicability. There are some points, however, about its construction which could be criticized and which would seem to require attention. The separated explosion chambers have an unfavorably large cooling surface through which part of the gain effected by scavenging will be lost. The burning of the charge between each pair of moving valve pistons will necessitate extra requirements for their lubrication because the oil film on the walls of this chamber are liable to burn out. The valve pistons should have lubrication rather from the inside than from oil which is supposed to cover the walls of their chambers. I cannot refrain from approving it in its combination of a simple non-poppet-valve scavenging motor.

Access with a scavenging motor inevitably would mark a big progress in the whole gas-engine field towards greater efficiency of their action. One could obtain high economy without excessive pressures on the working parts and without a mass of complication, which would be inevitable, for instance, when using an engine of the Diesel type to reduce engine of the fuel consumption, obtainable economy by scavenging is considerable and worth much attention. This way to reduce operative expenses of a motor deserves at least as much attention as trials to adopt the motors for cheaper fuel, especially because it can have beneficial influence on the motor action regardless of the fuel used. In my little experience with partially scavenging motors I was surprised to note the results witnessed in respect to the ratio between the explosion and the compression pressures; whereas a ratio of 3 to 1 is considered good in ordinary automobile practice when about 25 to 30 per cent. of the mixture volume is composed of spent gases, reduction of this latter content to about 18 to 20 per cent., but retaining the same rate of compression, was followed by an increase of the ratio between the mentioned pressures to about 4 to 1 and a little over.

The purer charge has much quicker ignition and quicker combustion properties. The absence of late burning results in a steeper expansion curve of the pressure diagram, which approaches the diabatic shape with a pressure volume exponent close to 1.4 instead of 1.3 as ordinarily. Thus relatively lower final pressure and temperature are reached when the exhaust starts. The relation between the higher initial temperature of expression and its lower final value indicate towards an increase of the thermal cycle efficiency amounting to 15 to 20 per cent. for the incomplete rate of cylinder scavenging as observed. Judging from this and as well from statements by recognized authorities a 25 per cent. gain of thermal cycle efficiency can be expected with complete scavenging. Accounting for some losses this theoretical figure might be reduced in practice to show a saving of about 15 per cent. in fuel consumption per power developed. In other words, it could also convey the meaning that with the same cylinder dimensions the scavenging motor would show some 15 per cent. greater developed power. These figures are well worth noticing and they should attract more attention to the scavenging high-efficiency engines than is now given them.

THE END.

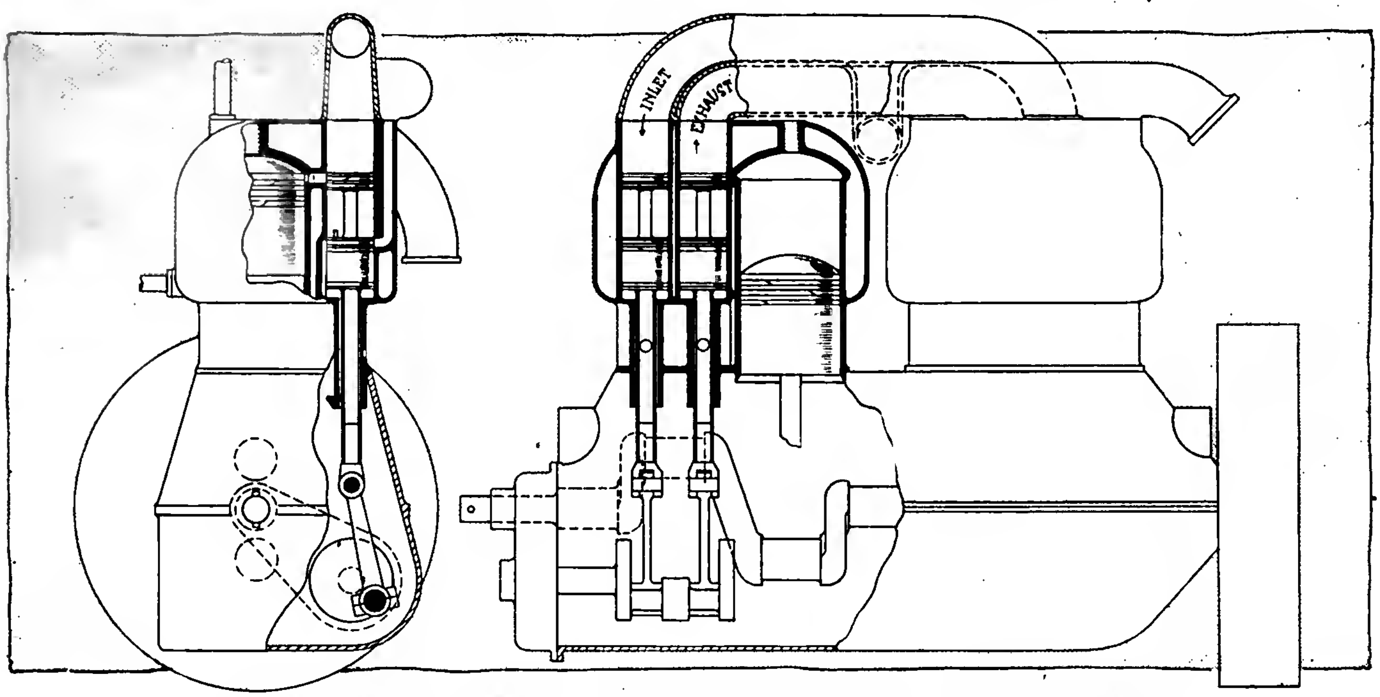

Fig. 22—Sectional views of Laycock piston-valve motor in which provision is made for scavenging

Carburetion

Part V

by Robert W. A. Brewer

Subject Digest

The principal difference between American and European carbureter design at the present time is that the majority of American makers are apparently partial toward the use of moving parts, whereas these are eliminated as far as possible in European practice. The American designer relies upon a suction-operated valve to control the supply of air, while the European pins his faith upon the system of compensating jets.

Controlling factors in the rate of discharge of the fuel from the orifice are the coefficient of discharge from the orifice, the pressure acting upon the orifice and viscosity of the fuel, which varies with the temperature.

Experiments have demonstrated that an increase of the water head above the normal 10 inches slightly increases the fuel discharge up to 16 inches of water head when the discharge increases rapidly.

The type of instrument which has a floating element supported in the air stream and actuated on the one hand by the engine suction and on the other hand by a spring or by gravity has come to the fore very much during the past few years.

CONSIDERING the modern carbureter designs in a broad sense we come to the conclusion that one of **the principal differences between the American and European carbureter consists in the almost general adoption of moving parts in the American design as distinct from their elimination in the European design. What the American carbureter manufacturer relies upon is some manipulation of the air supply by means of a suction-operated valve, whereas the European designer has a leaning towards the system of compensating jets.**

This generalization must only be considered in a broad sense because there are numerous exceptions on both sides of the Atlantic. Taking, for instance, the Holley instrument; this from the writer's point of view shows progress in the European line of thought as moving parts are eliminated and the jet orifice is so designed that under certain working conditions the air is allowed to pass through the jet orifice together with the fuel, thus retarding the flow of fuel when high suction is present in the body of the instrument. Of course, in the American design we have the school of thought which concentrated upon the development of a constant-suction instrument in which naturally a moving part has a very large rôle to play.

Moving parts, in addition to their having a spring-actuated or spring-balanced air valve working against a difference of pressure between the inside and the outside of the instrument, and, as an alternative, the weight of the part itself may be relied upon alone.

Consider for a few moments the controlling factors in the rate of fuel discharge from an orifice, and you find that these amount to the co-efficient of discharge of the orifice and the effective head or pressure acting upon the orifice. The viscosity of the liquid also must be considered, and this also varies with the temperature.

With regard to the question of moving parts, there is only one of these factors which requires our attention, namely, the co-efficient of discharge or jet friction, and we will proceed to consider how this behaves under working conditions with a needle type of control. First—Any orifice must be considered from the point of view of the relation between its area and its length.

Second—With regard to its shape: When the length of the orifice is great with respect to its area we naturally expect to find that the jet friction is greater, or, in other words, the co-efficient of discharge is less than would be the case when the area is greater or when the length is shorter. This we find to be most pronounced in actual practice, as will be shown in the table of figures following, from which it is evident that when the area of the orifice increases beyond a certain amount the characteristic curve of discharge droops, or practically ceases to rise with increments of area of orifice. At the origin end of the curve, that is, where the orifice gets very small with regard to its length, we again find another characteristic of the fuel discharge curve, which shows that when the suction is constant very small increments of area produce very small increase of this fuel flow. However, after a certain critical area is reached the fuel flow for a time increases in a straight line proportionately as the area of the orifice increases.

My experiments on various shapes of metering pins having a straight taper invariably show a characteristic curve of this nature which is somewhat curious. I have, however, found that when the active head has been increased above the normal 10 inches of water for which many instruments are designed, a fuel discharge of a different character takes place. Under these conditions almost the opposite effect has been obtained, namely, when the area of the orifice remains the same, the increase of head has slightly increased the fuel discharge up to a certain value, namely, 16 inches of water head, and after that the fuel discharge rapidly increases in the manner observed with a single round hole.

It will be useful, therefore, for us to consider a few values of flow of fuel in English gallons per hour per square millimeter of orifice with annular orifices of a major diameter of 3.96 millimeters operated on by a pin 24 millimeters in length when this pin is inserted to its full extent in the jet orifice.

Fuel Discharge Through Orifice Under 10-Inch Water Head			Flow of Fuel Through Brewer's Patent Orifice Under 10-Inch Water Head	
Area of Orifice Sq. Mms.	Flow of Fuel in Gals. per Hr. per Sq. Mm	Coefficient of Discharge of the Orifice	Area of Orifice Sq. Mms.	Flow of Fuel in Gals. per Hr. per Sq. Mm.
0.55	1.60	0.924	2.3	0.52
0.86	1.58	0.912	3.1	0.53
1.10	1.40	0.810	3.9	0.55
1.33	1.20	0.693	4.6	0.57
1.74	1.02	0.590	5.3	0.59
2.04	0.95	0.548	5.7	0.57
2.44	0.91	0.525		
3.22	0.88	0.507		
3.90	0.65	0.375		
6.20	0.60	0.346		

Furthermore, in this particular connection, we have the variation which can be caused by a choke tube either altering in its size or in its position with regard to the jet orifice. Taking, therefore, the most usually adopted moving part in American practice, viz., the air valve, we will consider the difficulties in connection with a device of this nature when one attempts to carry out a theoretically perfect carburetion by means of this adjunct.

In the first place, there is the inertia of the valve itself to be considered, and, secondly, there is the spring-error, which is of necessity a feature of all spring-actuated devices, where it is practically impossible to obtain springs of the same nature which can be relied upon throughout their active life.

Springs which are used in connection with air valves are, as a rule, misused, and the more accessible they become the more they are liable to misuse in the hands of the driver or the owner of the car. Furthermore, it is practically impossible on the road to give an accurate adjustment of any spring-actuated device of this sort, although where the cost of gasoline is immaterial, a sufficiently satisfactory result can be, and is, obtained, in ordinary practice. There is, however, a certain period in the working of an instrument, viz., when the extra air valve begins to lift, where carburetion is bound to be momentarily upset due to the very great difference of prevailing conditions when the said valve operates or not, the effect of its lifting being a reduction in the vacuum within the mixing chamber.

It is probably owing to this reason that in carbureters where two springs of different strength are employed, the lighter comes into operation at the initial stage of the valve movement, and its resistance is supplemented by that of a stronger spring as the valve lifts from its seat as the suction of the engine becomes greater.

Now we come to the type of instrument characterized by a floating element supported in the air stream and actuated on the one hand by the engine suction and on the other hand by either a spring or gravity. Such a type of instrument has come very much to the fore during recent years, and it depends for its correct and satisfactory working to a very great extent upon accuracy of manufacture.

When quantity production is carried out, very great care must be taken with the accuracy of any instrument of this type, particularly with regard to the dashpot. Many of these instruments have given unsatisfactory results owing to the dashpot action not being as it should, and the immediate effect of any inaccuracy is that the floating element flutters to such an extent that the instrument absolutely refuses to work.

An instrument of this type in which the action of gravity comes into play has the following characteristics:

1—The inertia of the moving part due to the necessary weight which must be put into it, particularly with the larger sizes of instrument;

2—The effect of this inertia upon the working of this instrument as the car passes along rough or bumpy roads;

3—The liability to leakage of the air, or the effect of air leakage through the joints will naturally alter the depression within the mixing chamber for which it has been calculated; and

4—The leakage of fuel at the stem of the moving part where it is also assisting the dashpot action.

As an instance of the effect of an automatic moving part upon the depression in the mixing chamber of a certain instrument, the following observed values will be of interest: Weight of moving part, 1.5 pounds. Net area of part upon which suction acts, 4.1 square inches. Calculated depression, 0.365 pounds or 9.5 inches waterhead. Engine, four cylinders, 3 9-16 inches by 4¾ inches.

Engine R.P.M.	B.H.P. Developed	Vacuum Inches of Water	Lift of Part in Millimeters
500	8.25	11.0	2.3
1,000	19.5	9.5	4.
1,200	23.4	10.0	5.
1,400	25.9	10.3	6.
1,600	27.2	10.75	6.5
1,800	23.8	11.0	7.5

It will thus be seen that the moving valve regulates the depression with very fair accuracy, at any rate sufficient for all practical purposes.

Harking Back a Decade

FROM THE AUTOMOBILE, January 10, 1902:

A private speedway is being built through the pine woods about a mile north of Lakewood, N. J. It will be 1 1-4 mile long and will be for the exclusive use of members of the association although it is expected that it will be thrown open to the Automobile Club of America. The speedway is to be 80 feet wide. The team to represent America in the international cup race will probably be selected after a series of trials on the course.

Gasoline is now selling in Germany at 40 cents a gallon and lubricant brings $1.24 a gallon.

Methods of timing races used up to the present are inadequate. The famous error in the timing at Deauville last summer and the more recent disputes over times made in the Eagle Rock climb show that 1-5 second may measure the distance between the first and the last in a class of competitors. At 80 miles an hour a car covers 23.5 feet in 1-5 second and as the variation between two stop watches in any given event is rarely less than 1-5 second, the possibilities for error are apparent.

Tests to determine the personnel of the team to represent America in the Gordon Bennett race will be held April 11. The entries are as follows: Alexander Winton, H. S. Harkness, Percy Owen, L. P. Mooers, and C. W. Matheson. Albert C. Bostwick, Windsor T. White and Rollin H. White are prospective entries.

With 140 exhibitors, the third annual automobile show will be held at Madison Square Garden, January 17-24.

A new company to make gasoline engines, headed by Harold O. Smith and capitalized at $50,000 has been started at Indianapolis.

From Last Week's Issue

DEVOTED to the electric vehicle. Wholly electrified up to page 43 inclusive. Mainly descriptive of *status quo* 1912. Fine for reference. Keep it on file.

Did you notice that the power for electric vehicles, including self-starting facilities and lighting, inside and out, does not really cost anything worth mentioning—or at least would not in a socialistic state where only production cost counts—since it is only an off-hour by-product, wanted for no other purpose at the present writing, of the central light and power plant?

Did you notice—on page 23, for example—how boldly electric vehicle makers now place the batteries directly over the rear and front axles, where these supposedly tender mechanisms get just twice as much of a shaking every time a road obstacle is bumped as would be theirs if they were placed midway between the axles? Some argument in this for that silent advancement in battery robustness which distinguishes the vehicle of 1913 from that which scorched its brand onto public opinion way back in 1900—an advancement whose fault has been its silence.

And did you notice the bold and plausible claim made by nearly all contributors from the electric vehicle business, to the effect that no chauffeur is needed for an electric limousine? Quite a saving, if one would otherwise want a chauffeur. But we wonder a little if customers for electric vehicles will subscribe to it; whether it is a water-proof argument or one which will shrink and crock in the wash. The driving and the cleaning of any vehicle is in the long run a prosaic job. while there is poetry in a complete understanding of wonderful mechanism, as well as in several more utilitarian privileges of the owner.

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The Car of 1913

THE pendulum is swinging backward. It is swinging backward to lower horsepower; it is swinging backward to fewer models, and it is swinging backward to fewer manufacturers. An accurate survey of the cars listed for 1913 points unmistakably to these facts.

The average horsepower of the various four and six-cylinder models is lower than it was last year, part of which is accounted for by the longer strokes and reduced cylinder bore, which strokes are not considered in calculating horsepower. But if horsepower is neglected and piston displacement taken as the criterion then, too, there is shown a certain reduction, which is chiefly so where new designs are brought out.

But our motors are still large, when contrasted with the European product. Some say we need the extra power because of the bad roads; but granting this there yet remains room for a reduction. When viewed in the horsepower scale the average American car is over 50 per cent. higher than the average European car, these figures being averages of all the listed models, regardless of the output. But we are coming down the scale and if the price of fuel continues to advance there will be some very perceptible reductions in the 1914 models. With the added efficiency that is being obtained from motors by changing valve timing, precluding dust from valve actuating parts, better balancing of crankshafts and reciprocating parts, improved lubrication and lighter-weight moving parts the maker is able to reduce the piston displacement and yet have more power or as much as he had with the larger cylinders.

We are slowly moving to the longer-stroke type. A retrospect over 1911, 1912 and 1913 models shows that the ratio of stroke to bore has been steadily climbing. The steps have been gradual. They are: 1911, 1.14 to 1; 1912, 1.16 to 1, and 1913, 1.22 to 1. This is slow but certain progress. But at this rate we are lagging behind continental practice, and while the average stroke-bore ratio for American cars for this year is 1.23 to 1 the average of the European models is 1.70 to 1. This year has witnessed a big gain and next year will record a still greater one. The square motor is now almost obsolete; it is approximately 5 per cent. of the entire models listed, and those motors under the square are but 2 per cent. of the total.

Nineteen-thirteen models listed record some forward steps that it is difficult to realize. One is the giant stature that the six-cylinder car has attained. There are not fewer than thirty concerns building only sixes. True some of these are obscure ones with small products, but their presence shows the country-wide ramification of the six-cylinder wave of popularity. All told, there are 120 different six-cylinder models.

It is but natural that at the inception of the six-cylinder car the motors should be larger than necessary, but there is a commendable reduction in sizes as compared with last year. There is an average horsepower reduction of nearly 6 horsepower in the average six of this year as compared with that of last year. When we measure the average horsepower of the American six with the average European six we find ourselves 16 per cent. greater, which is a better showing than in the four-cylinder field.

On every hand there are indications of myriads of engineering activities in the present models. Chain-driven camshafts are used by thirteen different companies, and it is certain that next season will witness a landslide to this method of drive, as has occurred across the water. Worm drive has inserted the thin edge of the wedge. Wire wheels are being clamored for by manufacturers, but the difficulty of obtaining them has restricted the listing of them as stock equipment to anything like the extent it is done in England and France. The block casting of motors has progressed by leaps and bounds.

Bodies have profited materially by the activity of the past 12 months. They are a little larger, for the sake of comfort, and the upholstery has been carried to its zenith. Doors are slightly wider.

Left-hand steering has increased to a 25 per cent. following. Larger tires are more general. And last, but not least, while the prices seem to be higher and are from $200 to $400 on the majority of the models, it is due to added equipment, so that the buyer is getting more for his money than he did last year.

Letters Answered and Discussed has been omitted from this issue, the space having been given over to the illustrated review of the year. This popular department of THE AUTOMOBILE will be continued next week.

Parcels Post Opens New Field for Trucks

House Delivery of Packages May Eventually Be Handled by Motor Vehicles—On R. F. D. Routes Efficiency Practically Demands Their Use

CHICAGO, Jan. 6—With the success of the new parcels post assured by the events of the first few days of its use, a new transportation has been born, destined to become a vast system of delivery covering the entire country, handling tons of merchandise a day, delivering house to house in every city and to rural communities, and employing for the work a large number of motor vehicles.

At the present stage of the parcels post the public seems to take it as a new kind of amusement, but with the passing of the novelty will come the serious aspect of increased business facility and a more efficient delivery of medium-sized parcels. It is a possibility that the parcels post system will more than double the amount of matter handled by the government in its mailing systems.

Tests made by the Chicago *Tribune* show that in the majority of cases the mails are quicker than the express companies. The *Tribune* posted twenty packages at 1 minute after 12 o'clock New Year's morning, the moment of the inauguration of the system, these being of various sizes and one to every zone of the parcels post system. At the same moment twenty similar parcels were given to the express companies for delivery to the same addresses. In each package was the request for a wire immediately on receipt of the package.

Out of all the packages heard from seventeen arrived first by parcels post and but three by express.

The list below gives the cities to which the packages were sent, the postal rate and the express rate, these figures giving a good idea of the relative cost of the two systems. Though figured from Chicago, the cost comparison is a fair average.

	Zone.	Express Rate.	P. P. Rate.
Buffalo, N. Y.	4	$0.25	$0.14
Fort Worth, Tex.	5	.25	.09
Milwaukee, Wis.	2	.25	.10
Boston, Mass.	5	.25	.09
St. Louis, Mo.	3	.25	.07
Minneapolis	4	.25	.08
Tampa, Fla.	5	.80	.09
Toledo, O.	8	.25	.07
Fort Dodge, Ia.	4	.25	.08
San Francisco	8	.80	.12
Cincinnati, O.	3	.25	.07
Des Moines, Ia.	3	.80	.12
Washington, D. C.	4	.25	.08
Washington, D. C.	4	.25	.26
Cleveland, O.	8	.25	.17
San Antonio, Tex.	6	.85	.19
Seattle, Wash.	7	.60	.21
Atlanta, Ga.	4	.85	.14
Kansas City, Mo.	4	.55	.14
New Canaan, Conn.	5	.25	.09
Emporia, Kan.	4	.25	.08
		$6.25	$2.48

A test conducted in the East gave the express a slight advantage. A package sent from Washington to the New York *World* by express arrived 27 minutes before a similar bundle sent by parcels post.

A number of enterprising firms used the new delivery for unique purposes, while many took advantage of the new possibilities to play jokes on their friends.

A Gary, Indiana, brick manufacturer deposited 6,000 bricks in the mails, and thereby obtained publicity enough through newspaper comment to pay for many more thousands of bricks.

The first parcel post package was received by President-elect Wilson. A local political club mailed a package of apples to Governor Wilson at midnight. By previous arrangement the regular letter carrier to the Wilson home was on hand and immediately carried the package to his destination by speedy motor car, delivering it to the President-elect at just 12:04.

A nameless brindle bulldog had the distinction of being the first canine that every traveled by post in America. He was delivered by post to a resident of Yonkers.

The first package received at Omaha contained two dozen eggs—nicely scrambled. A coffin was sent through the mails from the Zanesville, Ohio, post office, the cover forming a separate package. It is reported that nearly all of the downtown department stores of San Francisco delivered by parcels post the day of its inauguration.

A horned owl made its appearance at the Chicago post office January 2 en route by parcels post.

It will thus be seen that the possibilities of the new system are wonderful as allowing almost any kind of package under 11 pounds to be delivered. Books are excluded, however. In response to the new system, express rates on many classes have been more than cut in half to meet the government competition.

Packages cannot be deposited in the corner mailbox from now on as formerly. To prevent confusion tags were attached to Chicago package boxes reading as follows:

> **This Box for Printed Matter Only. All Merchandise Requires Parcels Post Stamps and Must Be Mailed at Postoffice or Carrier Station.**

It is probable that the house delivery of parcels will eventually be handled by motor vehicles entirely delivering even on rural free delivery routes.

Program of Business and Social Meetings to Be Held During the New York Show

Association Activities

Monday, January 13.—Meeting of the Executive Board of the American Automobile Association, luncheon 2 o'clock p. m., Belmont.

Jannary 14.—Annual meeting Automobile Board of Trade, 10:30 o'clock a. m., headquarters.

Motor and Accessory Manufacturers, executive committee, 10 o'clock, headquarters.

Motor and Accessory Manufacturers, directors, 3 o'clock, headquarters.

Motor Boosters' Annual Beeksteak Dinner, Murray's Lyceum, 11 o'clock p. m.

January 15.—Society of Automobile Engineers, Standards Committee, 9:30 o'clock a. m., headquarters.

Motor and Accessory Manufacturers. Tenth Annual Meeting, 5:30 o'clock p. m.. Waldorf.

Motor and Accessory Manufacturers, Fifth Annual Banquet, 8 o'clock p. m., Waldorf.

January 16.—Society of Automobile Engineers, Annual Meeting, 9:30 o'clock a. m., 2 o'clock p. m. and 8 o'clock p. m., hallroom, Hotel McAlpin.

Motor and Accessory Manufacturers, directors, 2:30 o'clock p. m., headquarters.

January 16.—Electric Vehicle Association of America, dinner in honor of W. H. Blood, Jr., retiring president, Delmonico's.

January 17.—Society of Automobile Engineers, professional session at hallroom, Hotel McAlpin, 9:30 and 2 o'clock and reception and annual hanquet in Louis XIV dining-room at 8 and 8:30 o'clock.

January 18.—Society of Automobile Engineers, professional session, 9:30 o'clock, at McAlpin.

Social Features

Moon Motor Car Company, January 15, dinner to agents and guests at the Aherdeen.

Cadillac Motor Car Company, January 16, Hotel Astor, dinner to old guard.

Lozier Motor Company, customary dinner, Saturday, January 18.

Overland Company will keep open house throughout the week at the St. George.

Special entertainment will he given for the agents every evening.

Garford Company will maintain headquarters at the Breslin.

The New York Trade Association will hold meetings with the Boston Automobile Dealers' Association and a committee from the association will confer with the National Association of Automobile Manufacturers with regard to the second-hand car prohlem. A luncheon will he given in honor of the Boston dealers, date and place to he announced later.

Locomohile Company of America will exhibit its show cars in the local hranch up to the time of installation at Madison Square Garden.

Packard Motor Car Company has not completed its plans for entertainment hut a rather extensive program will he carried out.

The Peerless Motor Car Company will have headquarters at the Astor throughout the week and will show a chassis in the lohhy. At the Waldorf the Peerless will show an inclosed car.

The Rauch & Lang Company will show a closed car in the lohhy of the Waldorf.

The Winton Motor Carriage Company will give its regular family dinner during the show season, place and date to he announced later.

The Colt-Stratton Company will entertain the Cole agents as usual hut the details of the program have not yet heen framed.

View of the Importers' Salon as the display appears on entering the ballroom of the Hotel Astor from the corridor

Body Work Is Feature at Importers' Salon

Many European Developments in the Coach Builder's Art Shown—Nine Exhibitors Show Fifty-Three Cars and Chassis

THE thirteenth annual exhibition of imported cars now being held in the grand ballroom of Hotel Astor, opened on January 2 and will continue until January 11, the date of opening of the national automobile shows in Madison Square Garden and Grand Central Palace. The exhibit this year is made up of nine European makers, one Canadian and several American body builders. While in number of exhibitors the salon of this year falls somewhat behind that of a year ago, the models shown are representative of the European art and are 1913 productions in practically every case.

The concerns exhibiting are Renault, Panhard, De Dion, Mercedes, Isotta, Minerva, Metallurgique, Lancia and Austrian Daimler from across the ocean and the Keeton from Canada. The body building art is represented by Quinby & Company, Locke & Company, Healey & Company, and the Holbrook Company.

Fifty-three complete cars and chassis are on exhibition, the division being as follows: Limousines, 24; touring cars, 14; runabouts, 2; coupés, 2; landaulets, 7 and chassis, 4.

THE AUTOMOBILE has in its reports of the Olympia and Paris shows, written by its special representatives at these shows, described nearly all of the new models seen as well as illustrated them, and the repetition of another description is unnecessary, excepting where important features of design have been omitted.

The Importers' Salon is always welcomed by the American as it invariably gives new inspiration in body creations, and in this respect the present salon is not disappointing. Two interesting creations are one-passenger cars of the coupé class or the type intended for milady who prefers to go alone when shopping or calling. These vehicles of De Dion and Minerva make are very narrow, the seat being from 42 to 44 inches wide, not possibly allowing room enough for two. The interiors are lavishly finished, the Minerva interior being in hand-carved wood panels, with corresponding luxuries.

There is much versatility in body arrangements for touring cars, one of the leaders being a Metallurgique for seven passengers. The type is a stream-line torpedo. The driver sits in an individual-arm-chair seat, the seat to his left folds against the side of the body and has unusually heavy arm rests for comfort. There are two other folding seats, of the same type. The car has but one door at each side, which is nearly 50 per cent. wider than the conventional ones. There are not a few other examples of the very wide doors for touring-car models. The foreigner has made every effort to keep the rear of the chassis as low as possible and consequently the underslung springs are much more common. Electric lights are nearly general and a special lamp novelty is an Isotta model, in which the fenders are carried on the axles instead of on the frame and each front fender carries an electric bull's-eye. The fenders are very small and the general appearance of the car is considerably changed because of this.

One of the most novel body ideas is the Kellner convertible landaulet on a Panhard-Levassor chassis, which may be used either as a landaulet or as a five-passenger touring car.

The Metallurgique is also distinguished by its efforts in the line of body development. The leader In this respect is the above-mentioned seven-passenger touring car in which there is no partition between the driver's compartment and the tonneau. On this car, the bonnet is shaped with a noticeable convergent flare toward the front, ending in the V-shaped radiator.

The De Dion-Bouton has obtained a novel and pleasing effect by the use of a body border, similar to that introduced by the Alco company, but using instead of a white paint, wicker work along the top edge of the touring body.

One car shown for the first time in New York is the Austro-Daimler. The four motors made by the Austrian company are shown in the several leaders of its line, these being the Prince Henry, Alpine, 1911, and Alpine, 1912 touring body, mounted on 27, 32 and 80 horsepower chassis respectively. Another car on a 60-horsepower chassis completes the line. The Prince Henry type is undoubtedly the most striking representative of Austro-Daimler practice, being fashioned as a stream-line body and with a Metallurgique type of radiator. The other types of body are equipped with straight radiators. All of them are equipped with Bosch two-point ignition, force-feed lubrication and double-bevel shaft drive to the live rear axles. Two sets of brakes are used, the service brakes acting on the transmission shaft and the emergency brakes on the wheel drums. Four speed selective transmissions are used throughout the line of Austro-Daimler cars, and wooden or wire wheels are furnished at the option of the purchaser.

The Mercedes people have made few changes for the 1913 products. The old chassis are being continued, with such minor improvements as a double cone-clutch, a ring-sleeve air valve for varying the air admitted to the carbureter for a given throttle opening and a closer arrangement of the double sets of spark-plugs in their cylinders than has been used heretofore. Furthermore, an air-pressure regulating valve which formerly was carried on the front of the dashboard, is now in place between the latter and the radiator, being thereby made more accessible than before.

The Canadian Keeton car is practically identical with the product built in the United States under the same name. A six-cylinder motor, rated at 48 horsepower but delivering 61 in the dynamometer test and well nigh 70 at the brake, is used in both the seven-passenger touring and the roadster model. The wheelbase is 136 inches with 37-inch wheels in the rear and 36-in wheels in front. A Renault type of hood is used and no starting crank is attached to the front of the car, due to the application of a Jesco electric starter.

Panhard & Levassor exhibit 20 and 30-horsepower cars of the Knight type. In all other respects valveless and poppet-valve motors are alike for both sizes of chassis. The Knight lubrication system has been improved upon by the use of an automatic circulating, non-mechanical oiler working as follows: The oiler consists of a reservoir the outlet of which is governed by a needle valve regulating the passage to the highest crankchamber trough, from which the overflow passes into the next trough and so forth. The oil splashed up by the scoops of the connecting-rod end in the fourth trough returns to the reservoir by its momentum and after being strained is recirculated

Four De Dion chassis, the 10-16, 30, 50 and 100, are shown. The De Dion-Bouton product having been described in a recent issue of The Atomobile, only the chief new features are mentioned here. These are the use of a worm drive between shaft and differential, the standard wire-wheel equipment, Vesta lighting dynamo, set-spark ignition and the carrying under the dash cowl of the gas tank on the 10-16 model. The clean dashboard is a special feature this year.

Renault automobiles for 1913 are built on nine chassis, ranging from 9 to 60 horsepower and equipped with a variety of body styles, including touring cars, limousines and landaulets. Two chassis are also shown. The mechanical developments incorporated in the Renault cars are as follows: The cylinders are offset and the valves are mounted at an angle to the cylinder axes. A Bosch automatically timed magneto is used. The suspension has been developed to an underslung, semi-elliptic system in the rear, instead of the former three-quarter elliptic springs. Renault detachable wooden wheels are standard.

Minerva cars, made in Belgium like the foregoing product, are made in four chassis sizes, namely, 14, 18, 26 and 38 horsepower. The Knight motor has been continued in these cars without changes, and the use of a large bevel gear in driving the differential is the principal mechanical feature. Only the small model uses the worm drive.

The Isotta-Fraschini company is represented by two chassis and several complete cars, every type made by the company being shown. There are six types altogether: the 14-18, 18-25, 25-35, 70-80, 35-45 and 120 horsepower motor chassis, the last two of which have the cylinders cast in pairs, while the others are block castings. The mechanical features of 1912 have been retained for this year.

Two Lancia models, the 20 and 30 horsepower cars, are shown at the Salon. The motors are 3.14 by 5.11 inches and 3.93 by 5.11 inches, respectively. These motors are operated at higher speeds than former models and are cooled by larger radiators. The motor compartment is closed up against the dashboard by an aluminum plate which protects the wooden board from the heat.

Arrangement of the cars at the Importers' Salon in the ballroom of the Hotel Astor, looking toward the entrance

Savannah Gets Big Races

Vanderbilt Cup and Grand Prize To Be Held on Last Year's Course Shortened to 14 Miles

Milwaukee, Determined Not To Be Outdone, Will Make the Pabst Trophy an International Event

SAVANNAH was awarded the running of the next Vanderbilt Cup and Grand Prize races at a meeting of the Motor Cups Holding Company this week. The races will be staged on approximately the same course as in 1911. It is likely that it will be slightly shortened but will be about 14 miles in length.

The races will be run some time between November 1, 1913, and February 23, 1914, but according to Henry Sanderson of the Contest Board of the Automobile Club, of America, it is likely that they will be staged about Thanksgiving Day as usual.

No other applications for the races were formally considered although it was stated that the New York dealers and the Milwaukee Automobile Dealers Association sought to secure the races.

A large delegation from Savannah, representing the local automobile club and various civic organizations waited upon the cup committee and presented the claims of the southern city. Harvey Granger, president of the Savannah Automobile Club was spokesman.

All the details of the Grand Prize race have to be submitted to the Automobile Club, of America while the American Automobile Association has the sanctioning power with reference to the Vanderbilt Cup.

Mr. Granger reported to the committee that the old course is in excellent condition and could be put in shape for the races in 48 hours.

Milwaukee to Run Pabst Anyway

MILWAUKEE, WIS., Jan. 8—Failure of Milwaukee to secure the Vanderbilt Cup and Grand Prize race has led the local automobile enthusiasts to the determination to make the Pabst Trophy race an international event with large cash prizes to be offered. Already negotiations have been opened with the Elgin authorities looking to two race carnivals for August and September.

Tetzlaff Falls Under Official Ban

LOS ANGELES, CAL., Jan. 6—The race meeting just held here will prove of much more interest than the running of the events seemed to warrant because it means the suspension of Teddy Tetzlaff by the American Automobile Association; Barney Oldfield may be permanently barred and a new association known as the Western Automobile Association is in a state of active insurgency against the A. A. A. The Western Automobile Association is at present confined to Los Angeles and vicinity as San Francisco and San Diego so far have refused to affiliate with it.

Tetzlaff's suspension was automatic under the rule that prohibits exhibition and participation in unsanctioned events.

Fiat Wins San Diego Road Race

SAN DIEGO, CAL., Jan. 1—The first San Diego road race, two laps around a course extending through the hills and along the coast, for a distance of 190 miles was won today by Walter Hill in a 120-horsepower Fiat at an average of 57.1 miles per hour.

The finish was at Pacific Beach and Hill finished 10 minutes ahead of Smith in a Mercer. Considering the mountain grades and the winding road, Hill's time of 3 hours 59 minutes and 36 seconds was very fast.

Hardly less remarkable was the showing of W. H. Smith and his little Mercer. W. H. Carlson, Jr., driving the Stutz No. 20, after he had been given up as out of the money, came to the front and won third place. Smith's time was 4 hours, 12 minutes, 12 seconds; Carlson's time was 4 hours, 16 minutes, 15 seconds and Louis Nikrent, Buick, who came in fourth, made it in 4:48:09.

Broken springs and radius rods were mainly responsible for Bob Burman's failure to place. Spider Campbell had engine troubles and quit at the finish of the first lap. C. A. Conant's National went into the ditch at Encinitas on the first lap and broke a wheel. Al Lambis, in a Columbia, was thrown out of the running after finishing the first lap. The steering gear gave out on Torrey Pines grade.

More than 100,000 people lined the sides of the road on which the machines traveled.

Galveston to Offer $25,000 for Races

GALVESTON, TEX., Jan. 6—Plans for what is already assured of being the biggest automobile race meet ever held in the south, with cash prizes totaling $25,000, are well under way under the leadership of Captain J. W. Munn, chairman of the Beach Course Race committee of the Fifth Annual Cotton Carnival. The plans which have been set in motion are sanctioned by the Galveston Commercial Association and have also been indorsed by the most prominent business and professional men of the city.

The big race meet will be held in August during the Cotton Carnival days, tentatively set for August 7 to 16 inclusive, during the 10 days of which there will be 5 devoted almost exclusively to the automobile races, the races being held every alternate day of the 10, as it is thought the best results and attendance can be secured in this manner.

Now that everything is in readiness for announcing the dates and events of the race, Captain Munn has inaugurated a movement which should result in the establishment of a permanent fund for automobile races at Galveston. He with his committee secured enough money to erect a long string of permanent grandstands and seats, also have fenced off the 5-mile straightaway race course and have prepared 5 additional miles so that 10 miles straightaway may be run if desired.

Two Stutz Cars in 500-Mile Race

INDIANAPOLIS, IND., Jan. 6—To the Ideal Motor Car Company, of this city, belongs the honor of making the first entries for the 500-mile sweepstake to be held on the Indianapolis Motor Speedway, Memorial Day. Two Stutz cars have been entered and Charles Merz and Gil Anderson nominated to drive them. Anderson and Merz are two of the most consistent drivers in the racing game and have made an excellent showing with Stutz cars wherever they have driven.

The Speedway management has announced that the prizes for the 500-mile event will aggregate $50,000, the same as last year, but that they will be divided among ten drivers instead of among twelve drivers as in 1912. The prizes will be as follows: First, $20,000; second, $10,000; third, $5,000; fourth, $3,500; fifth, $3,000; sixth, $2,200; seventh, $1,800; eighth, $1,600; ninth, $1,500, and tenth, $1,400.

Paul R. Martin has been appointed general press director of the Indianapolis Motor Speedway and of the Ocean-to-Ocean highway movement. He succeeds Homer McKee. Mr. Martin came to Indianapolis 5 years ago.

A Correction—In the description on page 113 of the Correja car it should be stated that this company will make only sixes. The bore and stroke of the motor described should be 4 by 6 inches. An Eisemann magneto, electric lighting and starting and full equipment are among the prominent features.

Gotham Raises Limit

Aldermen Pass Ordinance Increasing Maximum Speed Permissible in the City to 15 Miles An Hour

Penalties Provided Are Severe, Being Graduated as to Number of Offenses—Owners Responsible

INCREASING the speed limit for automobiles to 15 miles an hour and increasing the penalties for violation, the aldermen of New York have passed an ordinance doing away with the ancient law that made 8 miles an hour the speed limit in New York. On certain much used automobile thoroughfares of Harlem and the Bronx, the limit is set at 18 miles an hour. In certain highways in Brooklyn and Queens 20 miles and in outlying sections 28 miles. The old law has been a dead letter almost from the time of its enactment and much uncertainty existed in the minds of the general public as well as automobilists as to traffic rights.

Offenders are to be punished on a graduated scale. For first offense the penalty is a fine of $25 to $100 or 15 days in jail, or both; second offenders within a year, fine $50 to $100. or 30 days or both and for third and subsequent offenses, $100 fine or 60 days or both.

Owners riding in automobiles at the time of breaking the speed law, are deemed liable to punishment provided for misdemeanors.

The law goes into effect March 1. The vote upon it was unanimous.

Fire and police automobiles, United States mail vehicles and ambulances are excepted from its operation.

Gramm Output to Be Increased

LIMA, O.. Jan. 6—At the annual stockholders' meeting of the Gramm Motor Car Company, of Lima, Ohio, which was held recently after being postponed from September 10. steps were taken toward increasing the output of the plant to a large degree. It is planned to build 5,000 trucks during the coming year and to bring about that change it will be necessary to employ 700 men instead of 275 as at present. Additional space will be secured.

The announcement has been made that Thomas M. Conroy, of Elmira, N. Y., has been made superintendent in the place of Michael Coakley, resigned.

Officers elected were: John N. Willys, president; G. W. Bennett. vice-president; J. E. Kepperly, secretary; Walter Stewart. treasurer; J. N. Garver and H. K. Hocke, general managers.

W. A. Redding Signally Honored

William A. Redding, chief patent counsel of the Automobile Board of Trade has just been elected president of the General Alumni Association of the University of Pennsylvania which has a membership of about 20,000. The university ranks as third in the United States. The new president has announced that he is in favor of forming a cohesive body, including all graduates of the institution, to exert a powerful influence for progress throughout the world.

Marvin Explains Purpose of Branch

DETROIT, MICH., Jan. 6—That the branch office established in the Ford building. Detroit, by the traffic department of the National Association of Automobile Manufacturers will aid automobile manufacturers to get cars through to their destination promptly and secure their return, is the statement of J. S. Marvin, of New York, general traffic manager for the N. A. A. M.

"When a manufacturer sends a car out on one road and the car must be turned over to another road before reaching its destination, we will beat the car and notify the second road that it is coming and to be ready for it," said Mr. Marvin. "We intend to keep after roads in the matter of rates the same as we have been doing for years. It is hard to get special automobile cars, although there are 45,000 or 50,000 of them in service. The reason is that automobile cars are used by manufacturers in other lines.

"It is rather queer, but it seems only a few days ago we were asking the railroads for special automobile cars, and now there are nearly 50,000 of them. At that we could use more. The Detroit office will have very little, if anything, to do with Detroit traffic congestion. We will leave that to the board of commerce, whose traffic department is handling the matter. We needed a branch office in the West and Detroit was the logical place."

Mr. Marvin announces that he will divide his time between the New York and Detroit offices. R. A. Gardner has assumed charge of the Detroit branch, coming from the Stoddard-Dayton company.

Lion Assets Bring $12,500 at Sale

DETROIT, MICH., Jan. 6—Referee in Bankruptcy Joslyn has effected the sale of the factory equipment of the Lion Motor Car Company, of Adrian, after the sale had been postponed twice on account of low bids.

The property goes to Samuel Winternitz & Company, of Chicago, for $13,000. At the first sale the highest bid was $7,000, and the second time it was offered Winternitz & Co., bid $12,500, raising their own bid the last time the property was offered. Attorney Charles L. Robertson was named as trustee in the proceedings.

The tangible property was appraised at $33,401.73. The various claims presented against the company when business was suspended amounted to $108,000. The actual amount of liabilities outstanding are estimated by Attorney Robertson at about $75,000.

Engler Heads G. M. T. Engineers

DETROIT, MICH., Jan. 6—W. B. Engler, for the last 3 years head of the engineering department of the General Motors heavy-duty gasoline truck plant at Owosso and previously with the Olds Gas Power Company, of Lansing, Mich., has been promoted to the post of chief engineer of the General Motors Truck Company, with entire charge of experimental and development work. The announcement is made by W. L. Day, vice-president of the company.

Mr. Engler has spent the last 3 months abroad in preparation for his new position, most of the time being spent in England, Switzerland, Italy and France.

Ricker Enters Broader Field

INDIANAPOLIS, Jan. 6—Chester S. Ricker, chief engineer of the Henderson Motor Company, has resigned to enter the field as a consulting engineer. He has been retained by the Henderson company in an advisory capacity. Mr. Ricker designed the six-cylinder model put out by the company and has recently completed an electric starter.

Castle Out of Lamp Company

CINCINNATI, Jan. 6—Fred E. Castle, who resigned the presidency of the Castle Lamp Company recently, has announced that he is not connected with the company in any way. Mr. Castle stated that his plans for the future have not been definitely formed.

$7,000,000 For U. S. M.

Reorganization Committee Bids That Sum For Assets of the Company and Court Will Rule by Friday on Offer

Flanders To Head Standard Motor Company, Which Will Take Over and Enlarge Old Concern

TWO bids, one for about $7,000,000 and the other to pay a percentage of the indebtednesses of the United States Motor Company and its subsidiaries, were made in the United States District Court on Wednesday. Judge Charles M. Hough received the bids and announced that he would rule which, if either, of them would be accepted by Friday.

The bidders were Henry C. Holt and William McAlister, acting for the reorganization committee. If one of the bids is accepted the property will be transferred to the Standard Motor Company, a Delaware corporation of which Walter E. Flanders will be president and W. J. McGuire, vice-president.

The receivers reported that the losses incurred in manufacturing since they took hold were $308,000 and that all the factories are closed as far as new work is concerned except the Briscoe Manufacturing Company. The Atlas Engine Works gave notice that appeal would be taken from any order of sale, but this will not serve as a stay to the proceedings.

INDIANAPOLIS, IND., Jan. 6—There was a new turn in the affairs of the Maxwell-Briscoe Motor Company, and the United States Motor Company last Friday when the Indiana creditors of the Maxwell company asked that that concern be adjudged bankrupt, the petition being filed in the federal court in this city. These same creditors filed a petition in the superior court here recently asking that the Newcastle plant be sold separately from the other Maxwell plants.

Franklin Raises Its Capitalization

SYRACUSE, N. Y., Jan. 6—The capital stock of the H. H. Franklin Manufacturing Company was raised from $300,000 to $1,500,000 at a meeting of the stockholders held Friday, January 3. The new stock consists of 9,000 shares of common stock of par value of $100 each and 6,000 shares of preferred stock, 7 per cent. accumulative, of par value of $100 each.

The increase in the common stock is made by a 200 per cent. stock dividend upon the present capital stock.

American-La France Refinancing

Additional capitalization for the American-La France Fire Engine Company has just been announced. The old company was capitalized at $2,900,000, divided into $900,000 bonds; $1,000,000 preferred stock and $1,000,000 common. It was found that the company required more working capital and a new issue of $2,000,000 of 7 per cent. cumulative preferred and $1,450,000 common was authorized to take up the old issues. The bonds will be retired from the proceeds of the sale and the floating indebtedness has already been liquidated from earnings.

Bill Heads Rambler Sales and Plant

KENOSHA, WIS., Jan. 6—(*Special Telegram*)—Important addition to the executive staff of Thomas B. Jeffrey Company, manufacturers of the Rambler, and promotions among prominent employees were given out today by President Charles T. Jeffrey.

Louis H. Bill, who for many years has had charge of the Pacific coast business, has been appointed assistant general manager in charge of both factory and sales. Mr. Bill was prominent in the bicycle industry and for the past 10 years has been actively identified with the automobile business on the coast. Harry E. Field, who formerly had in his charge the business of the company in New York and adjacent territory, becomes general sales manager with George H. Cox as his assistant. Field was formerly vice-president and general sales manager for the Hartford Rubber Works.

J. W. DeCou, is factory manager, while John Bjorn has been made assistant factory manager and general superintendent.

Two assistant superintendents have been appointed, including George N. Bliss, and M. Mattson.

Three general foremen have been named: William Martinson, C. P. Heide and H. Luthi.

The new officers of the company include president, Charles T. Jeffrey; vice-president, Harold W. Jeffrey; second vice-president and treasurer, George H. Barry; secretary, Edward S. Jordan and assistant secretary, Edward S. Haddock. The Jeffrey Company is the outgrowth of the old Gormully & Jeffrey Company

New Manager for Herreshoff Plant

DETROIT, MICH., Jan. 6—C. Stuart Somervell, until recently manager of the Lycoming Foundry & Machine Company, of Williamsport, Pa., manufacturers of automobile motors, has become general manager of the Herreshoff Motor Company, of Detroit. Mr. Somervell will perform a part of the duties hitherto falling to Charles F. Herreshoff, chief engineer and vice-president, the office of general manager being a new one.

Rubber Steadily Lower in 1912

During 1912 the price of the highest grade of crude Para rubber ranged between $1.22 and $1.01, the final quotation of the year was $1.09. Since 1909 something over 1,000,000 acres of rubber has been planted in the mid-East. Only a small propor-

Automobile Securities Quotations

Prices yielded slightly during the past week, due largely to the fact that the eyes of investors were turned toward the general market. A few of the specialties were higher but trade was small in volume. The feature of the trading was the strength displayed by Goodrich and the firmness of General Motors, Alco and Pope. Otherwise the market was pretty soft in spots. The automobile specialists were waiting for the sale of United States Motors and the developments to be announced following the sale.

	1911		1912	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	170	200
Ajax-Grieb Rubber Co., pfd	..	..	96	102
American Locomotive Co., com	36	37	43	43½
American Locomotive Co., pfd	105	106	104	106
Chalmers Motor Company	..	..	130	145
Consolidated Rubber Tire Co., com	5	12	13	14
Consolidated Rubber Tire Co., pfd	10	20	50	60
Firestone Tire & Rubber Co., com	178	180	320	326
Firestone Tire & Rubber Co., pfd	108	110	104	106
Garford Company, preferred	..	..	100	102
General Motors Company, com	34	36	32½	34½
General Motors Company, pfd	77	78	78	79
B. F. Goodrich Company, com	..	..	67	68
B. F. Goodrich Company, pfd	..	..	104½	105½
Goodyear Tire & Rubber Co., com	330	335	440	446
Goodyear Tire & Rubber Co., pfd	104	106	104	105
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	10	20
International Motor Co., pfd	..	..	40	60
Lozier Motor Company	..	..	..	35
Miller Rubber Company	..	..	160	170
Packard Motor Company, pfd	105	107	103	106
Peerless Motor Company	..	..	115	118
Pope Manufacturing Co., com	38	40	35½	36½
Pope Manufacturing Co., pfd	68	70	79	80½
Reo Motor Truck Company	8	10	9	11
Reo Motor Car Company	23	25	19	21
Studebaker Company, com	..	..	33½	35½
Studebaker Company, pfd	..	..	92	94½
Swinehart Tire Company	..	..	100	105
Rubber Goods Mfg. Co., pfd	100	105	104	108
U. S. Motor Company, com	..	..	..	..
U. S. Motor Company, pfd	..	..	..	..
White Company, preferred	..	..	104	107
Willys-Overland Co., com	..	..	71½	72
Willys-Overland Co., pfd	..	..	99	100

tion of this tremendous cultivated acreage is in the productive stage at the present time.

The plantations turned out 28,000 tons of rubber during 1912, approximately double the yield of 1911. Taking the natural percentage of trees that will come into bearing in 1913 and the natural increase of yield in the plantations already producing, it has been estimated that the cultivated rubber yield of the present year will not be far from 55,000 tons.

Automobile tire requirements for this year represent about the total rubber production of the world 15 years ago.

Col. Samuel P. Colt, president of the United States Rubber Company, states that the past year has been generally favorable for the tire makers. The spring business was poor on account of bad weather and a backward season, but the fine weather conditions of the fall evened the score.

Gasoline Still Making High Records

Wholesale prices of gasoline have been steadily advanced during the past year. Starting with the wholesale rate at 9 cents, the first few days of 1912 saw the price pushed up to 11 cents. Since that time the price has been advanced cent by cent until now a new high mark of 17 cents has been established.

This makes the retail price at least 20 cents, and from that level it ranges as high as 30 cents. Much irregularity was noted during the year as between various sections of the country. This is accounted for by the fact that quite a large number of contracts covering portions of the year had been made between wholesalers and the oil companies. With a very few exceptions these contracts have now expired and a more uniform, if less agreeable, condition obtains.

The oil companies declare that the law of supply and demand is working in the gasoline field, while the enormous advance in the price of oil securities and the tremendous dividends paid on these stocks is viewed with much interest by the consumers.

Market Changes for the Week

There was a pressure for steel in all sections, consequently there were freer offerings in the metal markets. Tin was heavy, weak and lower in the domestic market on Tuesday, with freer offerings at concessions of 15 to 20 points early in the day. Tin suffered a loss of $.45. Copper electric and lake declined $.00 1-8. Cottonseed oil rose $.06. In the chemical market, gasoline rose $.01 1-4, petroleum $.05, and lard oil $.02. Tire scrap, antimony, Bessemer steel, open-hearth steel, sulphuric acid, cyanide potash, fish oil, and Kansas petroleum remained constant throughout the week.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, per lb..	.09	.08¾	.08¾	.08¾	.08¾	.09¼	....
Beams and Channels, 100 lbs....	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, Pittsburg, ton...	27.50	27.50	27.50	27.50	27.50	27.50	....
Copper, Elec., lb.	.17 5/11	.17 5/11	.17 5/11	.17½	.17½	.17½	—.00⅛
Copper, Lake, lb..	.17⅝	.17⅝	.17⅝	.17⅝	.17⅜	.17⅜	—.00½
Cottonseed Oil, Jan., bbl........	6.12	6.15	6.15	6.15	6.17	6.18	+.06
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil (Menhaden), brown..	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 bbls. @.....	.21	.21	.21	.22¼	.22¼	.22¼	+.01¼
Lard Oil, prime...	.92	.92	.92	.92	.90	.90	+.05
Lead, 100 lb......	4.25	4.30	4.30	4.30	4.32½	4.30	+.05
Linseed Oil, prime	.46	.46	.46	.46	.46	.46	....
Open-Hearth Steel, per ton........	28.00	28.00	28.00	28.00	28.00	28.00	....
Petroleum, bbl., Kansas crude....	.83	.83	.83	.83	.83	.83	....
Petroleum, bbl., Pa. crude.......	2.00	2.00	2.00	2.00	2.00	2.05	+.05
Rapeseed Oil, Refined	.69	.69	.69	.69	.69	.69	....
Silk, raw Italy....	....	....	....	....	4.35	4.35	....
Silk, raw Japan....	....	....	....	....	3.67½	3.72½	+.05
Sulphuric Acid, 60 Beaume.....	.90	.90	.90	.90	.90	.90	....
Tin, per 100 lb...	50.75	50.70	50.65	50.60	50.50	50.30	—.45
Tire Scrap........	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	....

U. S. Exports $2,107,721

Thirty-One Commercial Cars to a Value of $56,176—1,658 Passenger Cars to a Value of $1,750,890

Imports from the United States Have Steadily Risen During the Past Few Years

WASHINGTON, Jan. 6—During November, 1912, domestic exports of automobiles and automobile parts, not including engines and tires, from the United States amounted to a total value of $2,107,721. The exports were divided as follows:

Thirty-one commercial cars of a value of $56,176; 1,658 passenger cars of a value of $1,750,890, and parts of, $300,655.

Consular and trade reports received by the Department of Commerce and Labor continue to discuss the excellent field abroad for the American made motor machine. The American consul at Johannesburg says an especially good market for motor cars will be found at and around that city.

"While England still continues to sell most of the motor machines in that district," says the consul, "the imports of automobiles from the United States have steadily risen during the past few years and would, in the opinion of many, be much greater but for the fact that the prices charged the local agents by certain American firms having the exclusive handling of the machines in this country have been considerably in excess of the manufacturers' prices."

The consul continues:

"The imports of motor cars and parts into the Union of South Africa in 1911 amounted to $1,800,495 in value. Of these the United Kingdom furnished machines to the value of $1,172,549; United States, $208,000; France, $166,997; Germany, $147,784; Canada, $81,600, and Belgium, $15,878. The total from all countries is an increase of $400,000 over 1910, and the 1911 imports from the United States show an increase over 1910 of more than $50,000. The 1911 imports from the United Kingdom were $358,803 in excess of 1910. Both Germany and France show substantial decreases, while Canada increased its sales from $6,389 in 1910 to $81,600 in 1911. These Canadian sales are of a well-known American car (Ford) manufactured at and shipped from a branch factory in Canada."

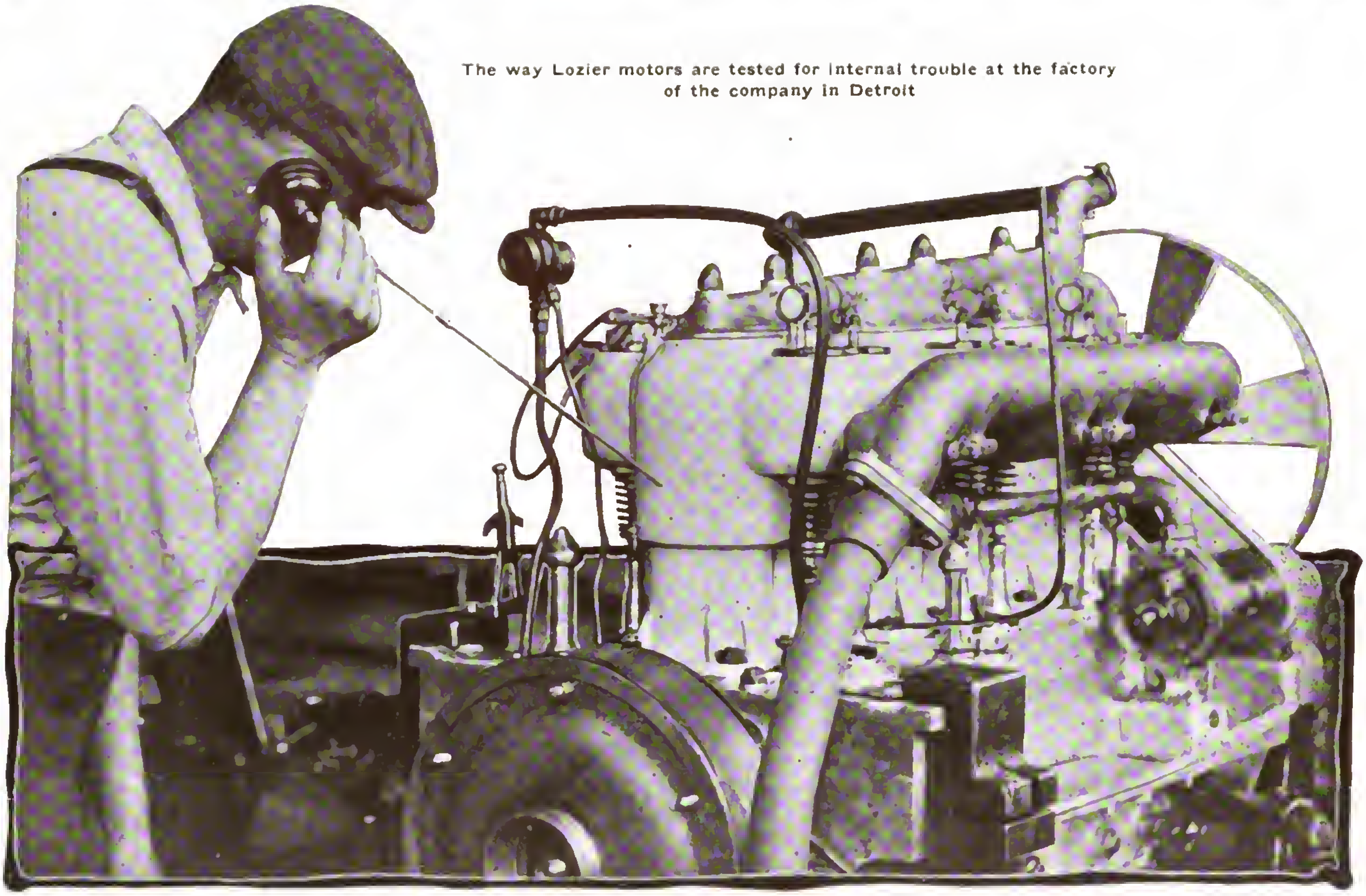
The American Consul at Sheffield says the use of the automobile is becoming more general in that city, and there is no reason why American manufacturers should not secure a share of the growing trade. He says there are a number of American

The American consul at Huddersfield says:

"The sale of American motor cars is rapidly increasing and the outlook for the future is good. The total registered motor cars in Huddersfield at the beginning of 1912 was 663. Of these 595 were pleasure cars and 68 were used for commercial purposes. The retail prices of the different grades selling range from about $730 to $4,150. The retail prices of cars most largely sold range from $2,430 to $2,675, complete. The horsepower employed is generally 12 to 20. The four-cylinder car, 14 horsepower, is popular. It is estimated that about 150 cars are sold in this district annually. Of this number probably 50 per cent. are French. A few of these are imported direct by way of the ports of Hull and Goole, but as this trade is chiefly carried on through general agencies the bulk of imported cars reaches this district indirectly.

"An effective method for advertising American goods and the efficiency of modern American manuacturing methods was a series of lectures, accompanied by motion-picture illustrations showing the various processes in motor-car production, given by a representative of a Michigan establishment. The lectures were held in one of the principal halls of the town."

Factory Miscellany



The way Lozier motors are tested for internal trouble at the factory of the company in Detroit

THERE is no marked similarity between the physician's office of a life insurance company and the block testing room of a motor car factory, yet they have points in common. Among the tests given in each place is that of the stethoscope. The physician uses it to detect irregularities of the heart, and the mechanic to discover any uneveness of operation in the motor.

While it serves the same purpose as the stethoscope, the instrument used in the high grade motor car factories is slightly different in appearance. It consists of a steel rod made of three separate pieces combined with a regulation telephone receiver. By placing the end of the rod against the side of a motor it is possible to locate the source of the smallest disturbance. The lightest of "valve slaps" or knocks in the engine are thus noted, allowing the correction of any fault before mounting the motor on a chassis. The road testers carry similar instruments as an extra precaution against the possibility of car being turned over to the sales department with a faulty motor.

The accompanying photograph taken in the Detroit plant of the Lozier Motor Company, shows a workman testing the exterior of a six-cylinder motor for interior trouble. In the same manner the entire car and running gear can be examined.

TIMKEN'S Glass House—The Timken Roller Bearing Company, Detroit, Mich., is building a new factory for the grinding of the cups, cones and rollers. The dimensions of the new Timken plant are 64 feet by 240 feet. It is of the latest saw tooth skylight roof construction and $100,000 of new machinery will be installed. The accompanying photograph conveys the impression it is a conservatory for tender young plants but in this instance it is, in truth, the half-clothed skeleton of that plant.

Fitzsimmons Erecting Factory—An automobile factory costing $12,000 is being erected in Lindsay, Ont., for J. A. Fitzsimmons.

Summers Establishes Factory—Summers Brothers, Glasgow, Ky., will establish a factory in Indianapolis, Ind., to manufacture a hydraulic transmission for automobiles.

Factory at Louisville—The Speedway Tire Company, incorporated under the laws of Kentucky, with a capital of $250,000, will build a factory in Louisville in the near future.

Scharf Gearless Builds—The Scharf Gearless Motor Company, Richmond, O., incorporated for $10,000, by G. W. Worden and others, will erect a plant to make a new gearless motor.

Brass Works on Fire—The Port Washington Brass Works, Port Washington, Wis., owned by John Meyer, sustained a total loss by fire due to defective wiring. The works will be rebuilt without delay.

Walloff Factory in Redcliff—It is stated that the Walloff Motor Company, of Minneapolis, Minn., has decided to establish a factory in Redcliff, Alta, and will commence work on the erection of a plant immediately.

Another Franklin Meeting.—A conference of the Franklin Automobile Company, Syracuse, N. Y., dealers of the Pacific Coast, Cleveland and Cincinnati, O., districts, will be held at the Franklin factory on January 10.

Wolverine Accessories Plans Factory—The Wolverine Motor Supplies Company, Detroit, Mich., manufacturer of automobile accessories, has had plans prepared for a two-story brick addtion to its plant, to be 74 by 84 feet.

Oldsmobile Factory Inspected—During the holidays the branch managers of the Olds Motor Works, Lansing, Mich., throughout the United States were invited to attend a meeting at the factory for an exchange of opinions on the past policies of the company and to assist in forming new features in the conduct of the business for the coming season. The most noteworthy event of the meeting was the concerted inspection and criticism of the new light Oldsmobile Six.

The Automobile Calendar

Shows, Conventions, Etc.

Jan. 2-10..........New York City, Importers' Salon, Hotel Astor, Importers' Automobile Alliance.
Jan. 4-11..........Cleveland, O., Annual Automobile Show.
Jan. 4-11..........Montreal, Que., Montreal Motor Show, Drill Hall and 65th Regiment Armory.
Jan. 11-18..........Milwaukee, Wis., Annual Show, Auditorium, Milwaukee Automobile Dealers' Association.
Jan. 11-25..........New York City, Thirteenth Annual Show, Madison Square Garden and Grand Central Palace, Automobile Board of Trade.
Jan. 18-25..........Philadelphia, Pa., Annual Automobile Show.
Jan. 21-26..........Toledo, O., Annual Show, Exposition Building, Toledo Automobile Shows Company.
Jan. 25-Feb. 1.....Montreal, Que., Montreal Automobile and Truck Show, R. M. Jaffray, Manager.
Jan. 25-Feb. 1.....Providence, R. I., Annual Show, State Armory, Rhode Island Automobile Dealers' Association, Inc.
Jan. 27-Feb. 1.....Philadelphia, Pa., Truck Show.
Jan. 27-Feb. 1.....Buffalo, N. Y., Annual Automobile Show.
Jan. 27-Feb. 1.....Detroit, Mich., Annual Automobile Show.
Jan. 27-Feb. 1.....Ottawa, Ont., Ottawa Motor Show, Howick Hall, Louis Blumenstein.
Jan. 27-Feb. 1.....Rochester, N. Y., Annual Show, Exposition Park, Dealers' Association.
Jan. 27-Feb. 1.....Scranton, Pa., Annual Automobile Show, Hugh B. Andrews.
Jan. 27-Feb. 13....Troy, N. Y., Annual Show, State Armory, Troy Automobile Club.
Feb. 1-8..........Chicago, Ill., Annual Automobile Show, Coliseum and 7th Regiment Armory.
Feb. 3-8..........Washington, D. C., Annual Show.
Feb. 8-15..........Hartford, Conn., Annual Show, State Armory, Hartford Automobile Dealers' Association.
Feb. 8-15..........Minneapolis, Minn., Annual Automobile Show.
Feb. 10-15..........Chicago, Ill., Truck Show.
Feb. 10-15..........Winnipeg, Man., Show, A. C. Emmett.
Feb. 11-15..........Binghamton, N. Y., Annual Show, State Armory, Dealers' Association, R. W. Whipple.
Feb. 15-22..........Albany, N. Y., Annual Show, State Armory, Dealers' Association.
Feb. 15-22..........Newark, N. J., Annual Automobile Show, First Regiment Armory, New Jersey Automobile Exhibition Company.
Feb. 16-23..........Richmond, Va., Annual Show.
Feb. 17-22..........Kansas City, Kan., Annual Automobile Show.
Feb. 18-19..........Madison, Wis., Annual Show, City Market Building, Dealers' Association.
Feb. 18-21..........Grand Forks, N. D., Annual Show, Auditorium, Dealers' Association.
Feb. 18-22..........Baltimore, Md., Annual Show, B. A. D. A.
Feb. 19-22..........Bloomington, Ill., Annual Show, Coliseum, McLean County Automobile Club.
Feb. 19-22..........Geneva, N. Y., Automobile Show, Armory, Louis Blumenstein.
Feb. 19-23..........New Orleans, La., Annual Show.
Feb. 19-27..........Topeka, Kan., Annual Show.
Feb. 20-22..........Canadaigua, N. Y., Automobile Show, Louis Blumenstein.
Feb. 22-Mar. 1.....Brooklyn, N. Y., Annual Show, 23rd Regiment Armory.
Feb. 24-27..........Kansas City, Mo., Truck Show.
Feb. 24-Mar. 1.....St. Louis, Mo., Annual Show.
Feb. 24-Mar. 1.....Memphis, Tenn., Annual Show.
Feb. 24-Mar. 1.....Omaha, Neb., Annual Automobile Show.
Feb. 24-Mar. 1.....Paterson, N. J., Annual Show, Paterson Automobile Trade Association.
Feb. 24-Mar. 5.....Cincinnati, O., Annual Show, Music Hall, Cincinnati Automobile Dealers' Association.
Feb. 26-Mar. 1.....Fort Dodge, Ia., Annual Show.
Feb. 26-Mar. 1.....Glen Falls, N. Y., Automobile Show, Louis Blumenstein, Manager.
Feb. 27-Mar. 1.....Toronto, Ont., Annual Show, Toronto Automobile Trade Association.
March 3-8..........Pittsburgh, Pa., Annual Automobile Show.
March 3-18..........Des Moines, Ia., Annual Show, Pleasure Car Section, Coliseum, Dealers' Association.
March 5-8..........Tiffin, O., Annual Show, Tiffin *Daily Advertiser.*
March 8-15..........Boston, Mass., Annual Automobile Show.
March 12-15..........Ogdensburg, N. Y., Automobile Show, Louis Blumenstein, Manager.
March 12-15..........Louisville, Ky., Annual Show, Dealers' Association.
March 18..........Syracuse, N. Y., Annual Show, Syracuse A. A.
March 19-26..........Boston, Mass., Annual Truck Show.
March 20-24..........New Orleans, La., Annual Show, N. O. A. D. A.
March 24-29..........Indianapolis, Ind., Annual Automobile Show.
Jan. 6..........New York City, Meeting Motor Dealers' Contest Association.
Jan. 14..........New York, Beefsteak Dinner, Big Village Motor Boosters.
Jan. 15..........New York City, Banquet, Waldorf-Astoria, Motor and Accessory Manufacturers.
Jan. 16..........New York City, Meeting, Hotel McAlpin, Society of Automobile Engineers.
Jan. 16..........New York City, Dinner in Honor of W. H. Blood, Jr., Retiring President, Electric Vehicle Association of America, Delmonico's.
Jan. 17..........New York City, Banquet, Hotel McAlpin, Society of Automobile Engineers.

Race Meets, Runs, Hill Climbs, Etc.

May 30..........Indianapolis, Ind., 500-Mile Race, Speedway.

Building $100,000 Plant—The Canadian Standard Automobile & Traction Company, with a capital of $250,000, is calling for tenders for the erection of a factory at Moose Jaw, Ont. The factory is to be 250 feet by 50 feet, its value with the machinery and plant being $100,000.

Moon Installs New Machinery—The Moon Motor Car Company, St. Louis, Mo., recently installed a considerable amount of costly new machinery in its rear axle department. The Moon rear axle department is now equipped to turn out a new rear axle evrey 20 minutes.

Palmer-Moore Leases Plant—The Palmer-Moore Company, Syracuse, N. Y., has started the manufacture of a truck with a 2-cycle motor with throttle control and with a capacity of 1,600 pounds, has leased the plant formerly occupied by the Syracuse Stove Works in North Geddes street, and will move in the early part of January.

McNaul Tire Moves—The McNaul Auto Tire Company, Toledo, O., has moved into a three-story brick building on Superior street, formerly occupied by the Merrill Company. The place is being remodeled and redecorated. The McNaul company manufactures a tire which is practically puncture-less and has outgrown the old quarters on Cherry street.

To Build Wizard Plant—P. S. Florea, O. C. Forbes and E. H. Habig, Indianapolis, Ind., have organized the Wizard Motor Company, which has been incorporated with an authorized capitalization of $50,000. A factory is to be leased immediately, and motors adaptable to cycle cars will be manufactured. J. L. Yarian has been engaged as factory superintendent, engineer and designer.

Plan Automobile Factory—A project which is now on foot, in which some Coshocton, O., people are interested, may result in the establishment of an automobile factory in that city within the near future. It is planned to use the old Premium Manufacturing Company building and there to assemble cars, the parts of which will be made at other points. Indiana parties are interested in the deal and J. C. Baughman of that city is taking care of the local end of the planning. The company expects to make cars valued at $2,000 and $2,500, and to assemble them.

How Moon Tests Motors—Whenever an engine is put on the testing block in the Moon Motor Car Company's factory, St. Louis, Mo., it is directly connected by means of coupling to another engine which is running under its own fire; the engine under fire drives the engine which is being worn in until the latter is in position to work under its own fire when dynamometer tests are made and the engine which passes the inspection test goes to the chassis assembly room, while the other engine, which is just beginning to work under its own fire, in turn now wears in a fresh engine, just out of the assembly room.

Reo Plant Completed—The new three-story, 252 feet by 252 feet, shipping and assembling plant of the Reo Motor Car Company, Lansing, Mich., was completed on December 2. This increases the floor space 190,512 square feet and provides shipping and assembly accommodation for 1,600 automobiles. Its floors are cement. It is equipped throughout with the latest improved automatic sprinkling system. An overhead runway connects it with the main factory buildings, thus providing a convenient easement to and fro for all traffic. Its covered shipping platform cares for twenty 40-foot box cars at one time, giving a loading capacity of 120 cars per day. The incoming freight is cared for on a separate track, which runs direct to the main factory buildings. From present indications the 1913 Reo output will far exceed 30,000 cars.

New factory addition of the Timken Roller Bearing Company, Detroit, Mich., to be used for the grinding of cups, cones and roller

Dinner of the Importers' Automobile Alliance held in the grand ballroom of the Hotel Astor, New York City, to celebrate the opening of the Thirteenth Annual Importers' Salon

IMPORTERS' Alliance Dines—The Importers' Automobile Alliance celebrated the opening of the Thirteenth Annual Salon in the grand ballroom of the Hotel Astor, New York City, last Thursday evening. The table was spread in the midst of the cars on exhibition and was decorated with the Vanderbilt Cup and the Elgin Trophy. Besides the importers and other automobile men, the automobile editors of the Metropolitan dailies and the editors of the national motor journals were present.

Paris with Reo—R. E. Paris has joined the Reo Truck Company, Lansing, Mich.

York Has 540 Automobiles—According to a recent count made by the York, Pa., police department there are 540 persons in that city owning automobiles.

Atlanta Buick Branch Moving—The Southern branch of the Buick Motor Company, Flint, Mich., is moving into its new Peachtree street building, Atlanta, Ga.

Scharlach Sternberg Manager—H. L. Scharlach has been appointed manager of sales for the Sternberg Manufacturing Company, makers of commercial vehicles, Milwaukee, Wis.

West Chester's Fire Engines—The Borough Council of West Chester, Pa., has decided to purchase three motor-driven chemical engines, one for each of the fire companies there.

Universal Adds Worm-Drive—F. K. Parke, general manager of the Universal Company, recently announced the addition of a one-ton worm-drive truck to the company's 1913 line.

Wilmington Banquet Date Changed—The Delaware Automobile Association has changed the date of its annual banquet from January 23 to 27. It will be held at the new Hotel Dupont.

Motz Factory Branch Opened—A factory branch house of the Motz Tire & Rubber Company, of Akron, O., was opened in St. Louis, Mo., recently. It is located at 4378 Olive street. E. G. Deibel is in charge.

New Automobile Bus Line—An automobile line from Lancaster, Ky., to Lexington will be started within the next fortnight. The promoter is the same company which has been running a line from the Madison capital to Lexington.

Studebaker Discontinues Louisville Branch—The Studebaker Corporation, Detroit, Mich., has discontinued its Louisville, Ky., branch. No wholesale business will be transacted hereafter and the retail end of the Studebaker concern will be handled by the Rommel Motor Car Company.

Mills on World Trip—D. B. Mills, president of the Rajah Auto-Supply Company, Bloomfield, N. J., and Mrs. Mills, are in California. On February 6, they will leave San Francisco for a trip around the world, returning home about June 1.

Doering Sales Manager Gramm—H. H. Doering has become a member of the executive staff of the John N. Willys industries, as sales manager of the Gramm Motor Truck Company, Lima, O. He will make his headquarters at the plant.

Galvin Resigns—H. J. Galvin has resigned from the Remy Electric Company, Anderson, Ind., to become president and general manager of the Galvin Specialty Company, also of that city. This company will manufacture and market gasoline machines for heating garment-pressing and laundry machinery.

Louisville Show March 12—At a recent meeting of the Louisville, Ky., Automobile Dealers' Association it was decided to hold the sixth annual exhibition of the organization March 12 to 15. The show will be held in the First Regiment Armory. Mr. P. S. Longest, secretary of the association, will handle all applications for space.

Important to Garage Owners—Garage owners in Cincinnati, O., will be vitally interested in the recent decision by high courts that where a machine is left in their care, and proper watch is not bestowed thereon, to the result that such car may be stolen or damaged, the proprietor of the garage is himself financially liable.

Pennsylvania Issues 59,365 Licenses—During 1912 the automobile division of the Pennsylvania State Highway Department issued 59,365 licenses, the highest number known since the establishment of the bureau. The licenses represent an income of $598,000. In 1911, 44,272 cars were licensed. The 24,000 mark in 1913 licenses was reached recently.

Wilmington Helps Visiting Automobilists—For the benefit of visiting automobilists who are passing through Wilmington, Del., the street and sewer department, which has control of the streets, has erected large signs on lamp posts in different sections of that city giving directions to the next towns and showing the streets and roads to follow. The signs, which are of sheet iron, are painted black, with silver lettering, making the words and finger marks very clear.

New Agencies Established During the Week

PLEASURE CARS.

Place.	Car.	Agent.
Boston, Mass.	Brown	F. E. Wentworth.
Bayfield, Wis.	Studebaker	William Bassett.
Canton, O.	Moon	Auto Service Co.
Cleveland, O.	Rambler	W. H. Barger Co.
Columbus, O.	Winton	Winton Sales & Repair Company.
Correctionville, Iowa	Cole	A. M. Rogers.
Dows, Iowa	Cole	C. W. Broeffle.
Hanford, Cal.	Paige Detroit	H. R. Cousins.
Harrisburg, Ill.	Moon	Chas. V. Parker.
Humboldt, Tenn.	Cole	Lannon & Johnson.
Joplin, Mo.	Moon	Joplin Supply Co.
Los Angeles, Cal.	Speedwell	Dwight Holmes.
Louisville, Ky.	Cole	Geo. Dunham & C. L. Anderson.
Macon, Mo.	Moon	Macon Garage Co.
Manhattan, Kans.	Cole	Gordon Belt Auto Company.
Marcus, Iowa	Moon	Johnson, Petty and Johnson.
Melbourne, Australia	Tudhope	W. B. Veirs.
Milwaukee, Wis.	Flanders Six	Hughes-McDonald Motor Car Co.
Milwaukee, Wis.	Garford	Hughes-McDonald Motor Car Co.
Mitchell, S. Dak.	Moon	Central Auto Supply Co.
Nashville, Tenn.	Lozier	Union Motor Car Company.
New Orleans, La.	Lozier	Automobile Maintenance Company.
Oakland, Cal.	Paige Detroit	Osen & Hunter Auto Co.
Oakland, Cal.	R-C-H	C. C. Eichelberger.
Ozona, Tex.	Cole	Ozona Auto Company.
Pasadena, Cal.	Cole	Lieher-Coryall Motor Car Company.
Passaic, N. J.	Lozier	Nathaniel Finch.
Phillips, Wis.	Cutting	Hunt Auto Sales Co.
Phillips, Wis.	Chevrolet	Hunt Auto Sales Co.
Phillips, Wis.	Ford	Hunt Auto Sales Co.
Phillips, Wis.	Herreshoff	Hunt Auto Sales Co.
Phillips, Wis.	Little	Hunt Auto Sales Co.
Phillips, Wis.	National	Hunt Auto Sales Co.
Quincy, Ill.	Cole	Machinery & Motor Company.
Sacramento, Cal.	Paige Detroit	Skinner & Elliott.
San Angelo, Tex.	Cole	Wm. R. Ede Company.
San Francisco, Cal.	Paige Detroit	A. E. Hunter Auto Co.
San Jose, Cal.	Flanders Six	William J. Benson.
Sherman, Tex.	Cole	Roberts Electric Company.
Stockton, Cal.	Paige Detroit	J. C. Skinner.
Texarkana, Tex.-Ark.	Moon	Paul Jones.
Union Hill, N. J.	Lozier	Union Automobile Company.
Vancouver, B. C.	Detroiter	H. W. Chambers.
Washington, Mo.	Moon	C. A. Krumsick.
Webster City, Ia.	Lozier	Hansen & Tyler Automobile Co.
Winnipeg, Ont.	Cutting	The Palace Garage.

COMMERCIAL VEHICLES.

Place.	Car.	Agent.
Los Angeles, Cal.	Speedwell	Dwight Holmes.
Milwaukee, Wis.	Garford Truck	Hughes-McDonald Motor Car Co.
Montreal, Can.	Mack	Canadian Fairbanks Morse Co.

ELECTRIC VEHICLES.

Place.	Car.	Agent.
Milwaukee, Wis.	Ohio Elec.	Hughes-McDonald Motor Car Co.

Vancouver Receives Glide—South Vancouver, B. C., recently received a 45-horsepower Glide, to be used as a combination police patrol and ambulance.

Schwartz Joins New Company—S. A. Schwartz has joined forces with Edward McKelvey and H. Walling, in organizing the S. A. Schwartz Oil Company with headquarters in Columbus, O.

Ziegler Goodyear Manager—H. P. Ziegler was promoted on January 1 to the position of general manager of the Chicago, Ill., district of the Goodyear Tire & Rubber Company, Akron, O.

Burnside in Insurance Field—F. H. Burnside, of San Francisco, Cal., has been appointed special agent and adjuster for the Firemen's Fund Insurance Company in the Pacific northwest.

Newark Concern Changes Hands—The C. W. Thompson Manufacturing Company, of Newark, O., has been taken over by W. A. Tungs and will be rehabilitated and extended. The concern produces a patent automobile tire clamp.

Tampa's Flying Automobile Squadron—Tampa, Fla., recently purchased a 6-cylinder Hudson, which is being used by W. M. Mathews, chief of the fire department. The car is equipped with chemical extinguishers and other apparatus for fighting fires.

Aldrich Resigns—Owing to a nervous breakdown, G. B. Aldrich, who has been general manager of the Dayton Automobile Truck Company, Dayton, O., has tendered his resignation to become effective at once. He still retains his holdings in that company.

Martin Tractor in Ottowa—Representatives of the Martin Tractor Company, Indianapolis, Ind., were in Ottawa, Can., recently with a view of making their Canadian headquarters in that city. This company manufactures motor tractors for pulling fire engines and other vehicles.

Eagal Resigns—J. H. Eagal has resigned his position as district manager of the Oldsmobile Company, Tacoma, Wash., and has accepted a position with the Consolidated Motor Car Company of San Francisco, Cal. Mr. Eagal will have charge of the commercial department.

Hughes and McDonald Join—O. R. Hughes, Marshfield, Wis., and John McDonald, Jr., Milwaukee, Wis., have joined forces and organized the Hughes-McDonald Motor Car Company, Milwaukee, Wis., to represent the following lines: Garford, Flanders Six, Ohio electric and Garford truck.

Colorado's New Road—Preliminary surveys for the new automobile road from Colorado Springs to Cripple Creek, Colo., have been completed and work will start next spring. The road is to be built along the Colorado Springs stage line through Cheyenne Canon. The government has appropriated $2,000.

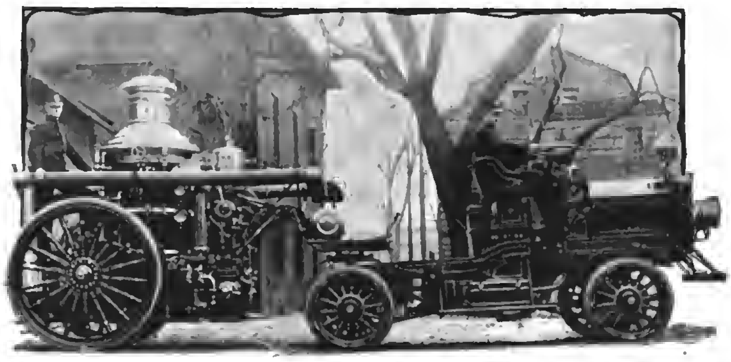
Toronto's Show February 20—The Toronto, Ont., Automobile Trade Association's show will be held from February 20 to March 1, 1913. Three buildings—the new Dominion Government, the Transportation and the Horticultural—will probably be utilized, and their combined floor area will provide all the space that is likely to be required.

Victoria Show Postponed—Owing to its inability to secure suitable quarters close in or to get the only ones at all available, except in the rainy season, the Victoria Automobile Dealers' Association recently postponed the automobile show at Victoria, B. C., until autumn, when it will join forces with the agricultural exhibition in a building of its own.

Road Building Delayed—Nearly 100 road petitions asking for in the neighborhood of 300 miles of water-bound pike in Ohio have been found invalid by the Circuit Court through a recent decision of the State Supreme Court declaring the Garret road law invalid. This decision will mean that the building of new roads in the country will be delayed for some time.

Change in Tacoma's Course—Plans are now on foot to make a decided change in the Tacoma, Wash., automobile race course which will mean the shortening of the track from its present length to approximately 5 miles to 3 miles to 3 1-2 miles. There are two dangerous curves near Lakeview and it is planned to cut off the road altogether through the town of Lakeview.

Regal in France—R. M. Lockwood, representative of the Regal Motor Car Company, Detroit, Mich., in France, has completed a deal in Paris which will place the sale of his product and all other American made cars in all the provinces of France. He has established a garage which is a formidable appearing structure with a capacity for 400 automobiles. Its management is backed with a capital of 1,250,000 francs.

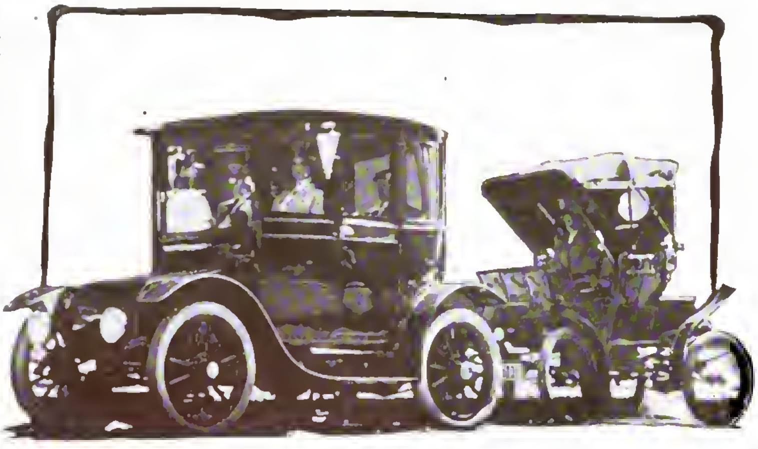


Gasoline-electric tractor and steam fire engine combination recently installed in the service of the Hartford, Conn., fire department. The gas engine used is of the T-head type with 5.5-inch bore and 6-inch stroke and is direct coupled to a 125-volt generator. Drive is from four motors, one for each wheel, of 88 volts. The current is controlled through a street car type of controller

Steinhauer General Manager—F. P. Steinhauer has been employed by the Colby Motor Company, Mason City, Ia., as general sales manager.

Seibel to Manage Motz—A branch factory of the Motz Tire & Rubber Company, Akron, O., has been established in St. Louis, Mo., with E. G. Seibel as manager.

Stone with Landman-Griffith—M. Stone, formerly with the Gamble Motor Car Company, Toledo, O., has accepted a position with the Landman-Griffith Company, of that city.



Another meeting of the new and the old, bringing forth strikingly the advance in electric car construction during the past decade. The car in the foreground is a 1913 Baker brougham, while that in the background is a Baker stanhope built 12 years ago

Portland Club Increasing Membership—The Portland, Ore., Automobile Club is making strenuous efforts to increase its membership to 1,000 before 1913. The membership fee is now but $10 but will be raised to $25 on that date.

Carnahan Resigns from Swinehart—F. G. Carnahan will sever his connection on January 15, 1913, from the Swinehart Tire & Rubber Company, Cleveland, O., to assume a position with F. G. Carnahan & Company, Akron, O., dealers in rubber stock.

South Bend Forbids Speed—The board of public safety of South Bend, Ind., has adopted resolutions forbidding the drivers of automobiles of the police and fire departments from driving their machines at a rate of speed greater than 30 miles an hour.

McGiehan Resigns—T. H. McGiehan has resigned his position of manager of the New Orleans, La., branch of the Goodyear Tire and Rubber Company, Akron, O., to accept the position of general manager of the Motz Tire and Rubber Company, Akron, O.

Eagal Resigns—J. H. Eagal has resigned his position as district manager of the Oldsmobile Company, Tacoma, Wash., and has accepted a position with the Consolidated Motor Car Company of San Francisco, Cal. Mr. Eagal will have charge of the commercial department.

Frisco's Truck Club.—The San Francisco, Cal., Motor Truck Association is the name of an organization of motor truck men of that city recently organized. At the meeting there was considerable enthusiasm displayed, and it was the general belief that there was a very wide field for the activities of such an association. Its immediate formation was the result.

Pennsylvania Improves Roads—Since the Pennsylvania highway department took over 8,000 miles of highways in the state on June 1, the department has improved 4,700 miles of roads. This total includes those that have been rebuilt under the seventy-nine contracts so far let under the Sproul act and those that have been repaired by the road superintendents, forty-seven of which have been named out of fifty the law calls for.

Canada Has 21,290 Automobiles.—The popularity of the automobile in Canada, and incidentally the prosperity of the Canadian farmer, is shown in the latest statistics. According to the figures there are at present 21,920 automobiles in Canada, or about one car for every 323 inhabitants. The rate varies considerably in the different provinces, Nova Scotia having only one automobile per 851 people, while in Alberta there is a car to every 125 inhabitants. British Columbia ranks next as a motoring province.

Incorporations of Automobile Companies During the Week

AUTOMOBILES AND PARTS.

ALBANY, N. Y.—Electric Coach Corporation of New York City; capital, $500,000; to manufacture and engage in the motor vehicle business. Incorporators:

BOSTON, MASS.—Norwalk Motor Car Company; capital, $75,000. Incorporators: Charlea C. Smith, James W. Briggs, M. A. Beaudet.

BOSTON, MASS.—Lozier Motor Car Company; capital, $1,000. Incorporators: Ralph B. Nettleton, Stanley G. Barker, Robert S. Barlow.

CHICAGO, ILL.—A. W. Goeiner Auto Sales Company; capital, $25,000; to manufacture automobiles and accessories. Incorporators: A. W. Goeiner, Michael Feinberg, C. E. Becker.

CINCINNATI, O.—Hermes Motor Car Company; capital, $30,000: to manufacture automobiles, trucks and accessories. Incorporators: Albert Kloybolte, Powel Croslet, Jr., Charles Eissen, Slater H. Aiken, John C. Rogers.

DOVER, DEL.—Standard Motor Company; capital, $31,000,000; to manufscture, construct, maintain and operate automobiles, wagon trucks, motor cycles, flying machines. Incorporators: Donald Muhleman, Wm. J. Maloney, Herbert E. Latter.

JERSEY CITY, N. J.—The Wheel of Fortune Corporation; capitsl, $600,000; to conduct a general automobile business. Incorporators: L. H. Gunther, H. A. Black, J. R. Truner.

LOUISVILLE, KY.—Miller, White & Company; capital, $5,000; to deal in automobiles. Incorporators: R. W. Miller, A. W. White, William Atix.

MORGANTOWN, W. VA.—Chaplin-Dille Motor Car Co.; capital, $25,000; to manufacture and deal in automobiles, trucks, aeroplanes, etc. Incorporators: B. M. Chaplin, M. C. Wildman and Jas. E. Dille.

MORRISTOWN, N. J.—Morristown Automobile Company; capital, $25,000: to conduct a general automobile business. Incorporators: J. J. Lyons, L. Van Gansbeck, Alex. Newmark.

NEWARK, N. J.—Universal Motor Truck Company of New Jersey; capital, $50,000; to deal in motor trucks, etc. Incorporators: John Kramer, Grace Cleveland, Pasquale Mauan.

NEW YORK CITY, N. Y.—Drouet & Page Company; capital, $10,000; to manufacture motors of all kinds. Incorporators: Conrad Milliken, Ingrid E. Larsen, Martin B. Rofman.

NEW YORK CITY, N. Y.—Electro Coach Corporation; capital, $500,000; to manufacture automobiles. Incorporators: John Larkin, Alexander Andrews, Richard J. Lynch.

NAW YORK CITY, N. Y.—Standard Motor Company; capital, $31,000,000: to manufacture, construct, maintain, store, care for, sell and deal in and with automobiles, etc. Incorporators: Donald Muhleman, W. J. Maloney, Herbert E. Latter.

NEW YOAK CITY, N. Y.—E. J. Sullivan Corporation; capital, $5,000: to conduct an automobile business. Incorporators: Robert C. Ballantine, Eugene J. Sullivan, Walter F. Hopper.

PORT CLINTON, O.—Holmes Tractor Company; capital, $50,000; to manufacture farm tractors of all kinds. Incorporators: George H. Holmes, George W. Sloan, R. S. Galleher, A. R. Laschinger, F. S. Dennernberg.

ROCHASTEA, N. Y.—Ball-Washhurne Motor Company; capital, $25,000; to manufacture and sell motors. Incorporators: Ward H. Ball, Charles H. Washburne, Asa R. Ball.

WASHINGTON, D. C.—American Motor Traffic Company; to operate and manufacture motor vehicles for all uses. Incorporators: E. S. Alford, S. J. McFarren, W. J. Moore, A. L. Kley, J. C. Muncaster, J. C. Menoher.

GARAGES AND ACCESSORIES.

ALBANY, N. Y.—New York Motor Speedway Association; capital, $1,000,000; to hold aeroplane, auto and motor vehicle races, displays and contests. Incorporators: William B. Allen, Herbert J. Carter and Alfred B. Casner.

BUFFALO, N. Y.—United States Rubber Reclaiming Company; capital, $2,400,000; to manufacture and deal in rubber goods, tires, etc. Incorporators: Theodore W. Bassett, Rudolph A. Lowenthal, Cornelia Beebe.

JAMESTOWN, N. Y.—Eagle Garage Company, of Jamestown; capital, $25,000. Incorporators: Samuel B. Robbins, Olive M. Spencer, George Rappole.

NEW YORK CITY, N. Y.—New York Motor Speedway Association; capital, $1,000,000; to construct a motor speedway for racing. Incorporators: William B. Allen, Herbert J. Carter, Alfred B. Casner.

NEW YORK CITY, N. Y.—Stewart-Warner Speedometer Corporation; capital, $25,000; to manufacture speedometers. Incorporators: Elmer E. Holmes, J. K. Stewart, C. B. Smith.

PORTLAND, ME.—Portland Automobile Dealers' Association; capital, $10,000. Incorporators: Fred A. Nickerson, Albert M. Spear, Jr., Ernest E. Brewer, Luther C. Gilson.

SAN ANTONIO, TEX.—Motor Car Supply Company; capital, $5,000. Incorporators; C. P. Guthrie, H. B. Wyne, James Harrison and Will Harrison.

WEST SENECA, N. Y.—The George Schuster Garage & Sales Company; capital, $5,000; to conduct a general garage business. Incorporators: Jacob F. Berner, Sr., Reinhold C. Berner, George Schuster.

WILLIAMSON, N. Y.—Williamson Garage Company; capital, $20,000; to manufacture and repair automobiles. Incorporators: Robert Carr, Charles DeZutter and Alfred F. Raymer.

WINNIPEG, CAN.—Dominion Garage; capital, $250,000; to conduct a general garage business.

CHANGES OF NAME AND CAPITAL.

CARROLTON, O.—L. & M. Rubber Company; increase of capital from $120,000 to $500,000.

CLEVELAND, O.—Cleveland Auto Livery Company; increase of capital from $10,000 to $25,000.

HARTFORD, CONN.—Universal Auto Company; capital increased from $3,000 to $30,000.

SYRACUSE, N. Y.—H. H. Franklin Manufacturing Company; increase of capital from $300,000 to $1,500,000.

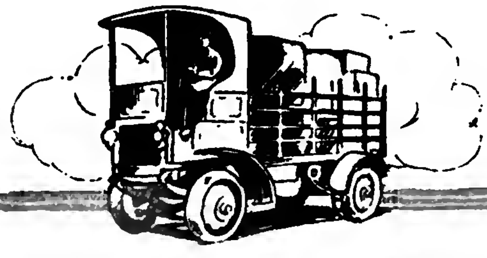
YOUNGSTOWN, O.—Auto Rubber & Cycle Company; change of name to Auto Rubber and Mill Supply Company.

Vol. XXVIII — New York—Thursday, January 16, 1913—Chicago — No. 3

The Automobile
Commercial Vehicle Issue

Addition of Models Features Gasoline Truck Development

Radical Changes in Design Are Few—Stronger Construction Distinguishes the Models for 1913



NUMBERS OF VARIOUS CAPACITIES

1000	1500	2000	3000	4000	5000
34	45	60	41	48	5

6000	7000	8000	10000	over 10000
55	12	20	45	14

IGNITION

Single—110 Dual—215 Double—51

IGNITION CONTROL

Fixed—65 Hand—248 Automatic—56

COOLING

Water-Pump—270 Water-Syphon—84 Air—30

CLUTCHES

Cone—161 Disk—195 Band—7

GEAR-BOX LOCATION

Amidships—222 Unit Motor—78 Unit Jackshafts—75 Unit Axle—4

STEERING WHEEL

Right—257 Left—118

REAR AXLE BEARINGS

Roller—245 Ball—98 Ball and Roller—25 Plain—4

METHOD OF DRIVE

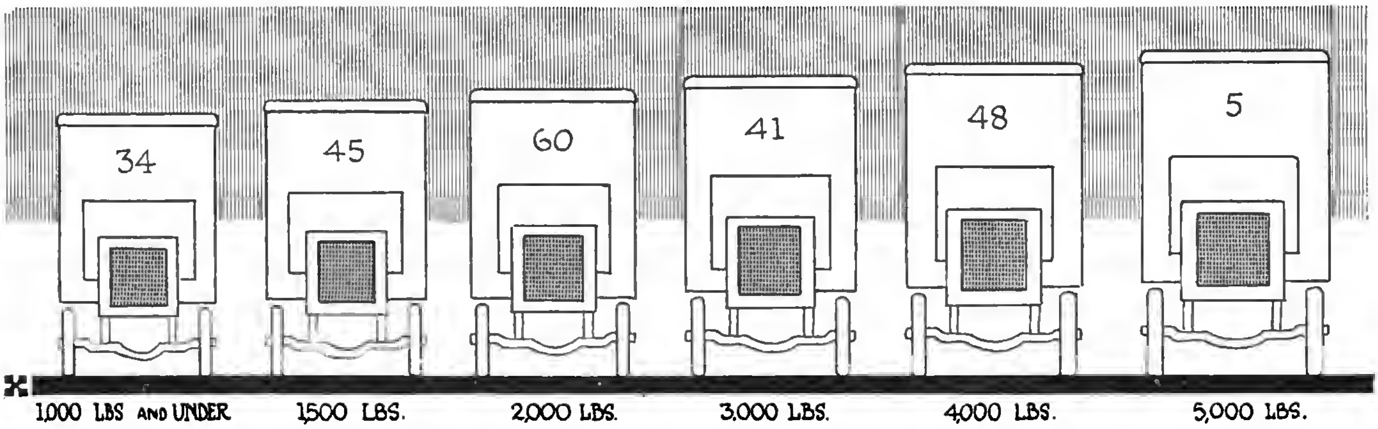
Chain—317 Worm—7 Bevel—53 Internal Gear—10

A Full Account of the Opening of New York's Thirteenth Annual Show Given on Pages 218 to 230

THE forthcoming annual New York truck show which will open its doors to the public on January 20 will be the most representative that has ever been held. The exhibits will be staged in Madison Square Garden and the Grand Central Palace laying bare to an expectant public the offerings for the ensuing season. There have been numerous refinements made in body construction during the last year, as well as improvements in the methods of expeditiously dumping heavy loads. According to present indications this is a year of refinements rather than changes.

Comparing the statistics that have been furnished by makers of gasoline commercial vehicles for the coming season with those of last year there is a decided tendency on the part of a good proportion to increase the number of models manufactured. In cases where a small model was manufactured last year one or more chassis of heavier carrying capacity have been added to the line, and in not a few cases the makers of heavy duty trucks having found that they were losing business with concerns to whom they had sold the large trucks when these customers came to buy trucks of smaller capacity which they did not make. A competitor by this means obtained the footing in some cases equally as strong as the pioneer manufacturer. Besides the question of additional models the subject of overload has been met by many of the manufacturers in the following manner: Without directly stating or guaranteeing that their trucks will withstand any specific overload over and above the rated capacity they nevertheless appreciate the fact that at times the trucks may be inadvertently overloaded or undue strain may be caused by circumstances beyond the control of the owner or his driver. Consequently, the chassis frames, axles and steering gears, have in many cases been strengthened to take care of additional strain.

It is somewhat confusing to consider trucks as built according to yearly models; as far as the truck business is concerned this never was the case; improvements may have been added during the preceding year that have not been announced prior to the show time, and, again, certain types of models have been purposely withheld until the event of the show in order to present



Showing the numbers of truck models of different capacities up to 5,000 pounds

them to the buying public when its mind is in a receptive mood. The date of manufacture of the truck and its designating model title are the only points that manufacturers consider. Such things as modes and fancies do not enter the commercial field and so cause to be discarded what otherwise might be good.

The much-debated question of motor under the bonnet or motor under the seat has not materially changed in aspect during the last 12 months. Between thirty and forty vehicles have remained unchanged except perhaps insofar as relates to minor details.

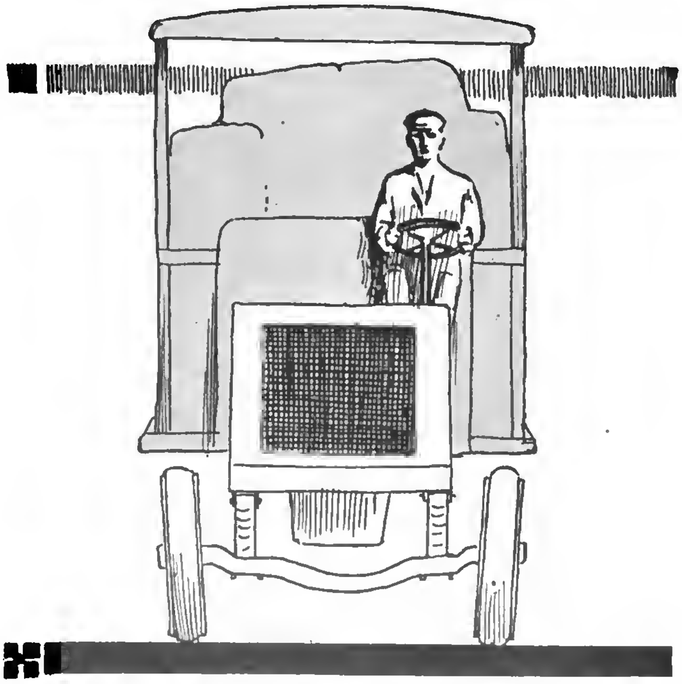
One hundred and sixty-four commercial vehicle makers of gasoline trucks responded to calls for specifications, and out of this number there was a total muster of 409 chassis models. This shows a growth of eighteen new makers listed as compared with 1912 and an addition of eighty-eight chassis models. When it is taken into consideration that such concerns as the Franklin, Mitchell, Cartercar, Case, Lozier, Interstate, Premier, Hudson and Ohio, as well as a few others, have discontinued the manufacture of commercial vehicles, the list of new makers must be correspondingly increased in order to make up the sum total given above. Some of the concerns who have entered the commercial vehicle field during the last year are: Stewart Corporation, Stewart Iron Works, National Motor Truck Company, Nordyke & Marmon, Motor Car Manufacturing Company, Standard Motor Truck Company, Gramm-Bernstein Motor Truck Company, Krebs Commercial Car Company, KaDix Newark Motor Truck Company, White Star Motor & Engineering Company, Driggs Seabury Ordinance Corporation.

The general characteristic features of truck design have undergone very little change during the last year. There has been a general cleaning up on the part of the majority of manufacturers and it is safe to say that the year that has passed besides being a good one for the truck business in general has been extremely educational as several of the trucks that are in operation have passed from the stage of new toys to everyday necessities and have shown themselves in their true light. If the result was a good one the manufacturers have themselves to congratulate upon their success, but if real dissatisfaction or even indifferent results were met with in certain quarters, lessons learned will act as a guide to prevent the recurrence of such mistakes.

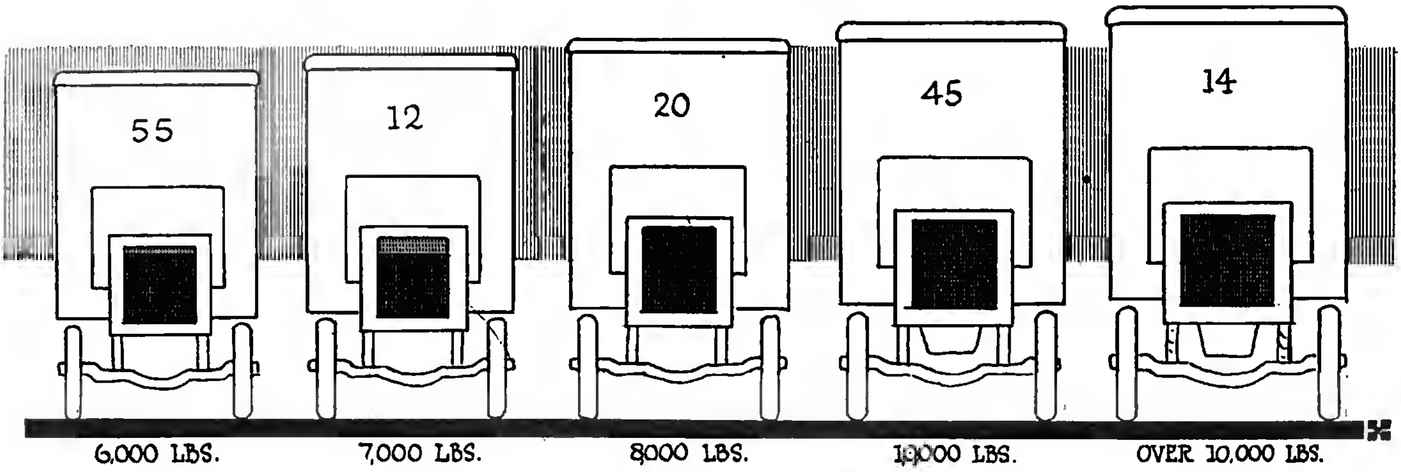
Reference has already been made to the position of the motor and the same remarks apply to the general mechanical features of the motor as well. Very little has been done along the lines of changes and in another part of this issue of The Automobile a series of curves is given, showing the S. A. E. horsepower, the bore and stroke, as well as the piston displacement for the various makes. In order to arrive at a common basis of comparison, the useful load capacity in pounds has been divided by the piston displacement in cubic inches, thereby giving the ratio of useful load in pounds per cubic inch of piston displacement. It would be impossible to attempt to closely analyze the figures that this calculation affords, as the question of the efficiency of the engine is entirely disregarded as well as the engine speed and a number of other considerations which are not to be neglected.

The clutch has received very little alteration at the hands of designers of trucks; in figures compiled of percentages of this and last year's models there is a slight tendency towards an increase of favor of the leather-faced cone-type clutch in preference to the disk or band types. Provided the area of the contacting surfaces is sufficient and the degree of the angle of the male member suitable there is no reason why the cone type of clutch will not give most excellent results. Its co-efficient of friction is in many cases increased by the addition of cork inserts. Its great feature is its simplicity.

Gear-box location seems to be a point upon which the different makers have various opinions as is indicated by the number of concerns building the various types. Out of the total number who have responded 222 chassis are fitted with the transmission gearset amidships, the power being delivered from the clutch to the gear-box and thence to the differential, usually by universal-jointed shafts, leaving the transmission an entirely independent unit. In seventy-eight chassis the transmission is attached to the rear end of the crankcase housing, thereby forming a unit of the motor and transmission. In seventy-five chassis the transmission and differential form a unit with the jackshaft housings in the case where chain drive is employed. The number of trucks using rear axle and transmission unit combination is extremely small.



Out of a total of 375 truck models there are 118 with the steering on the left

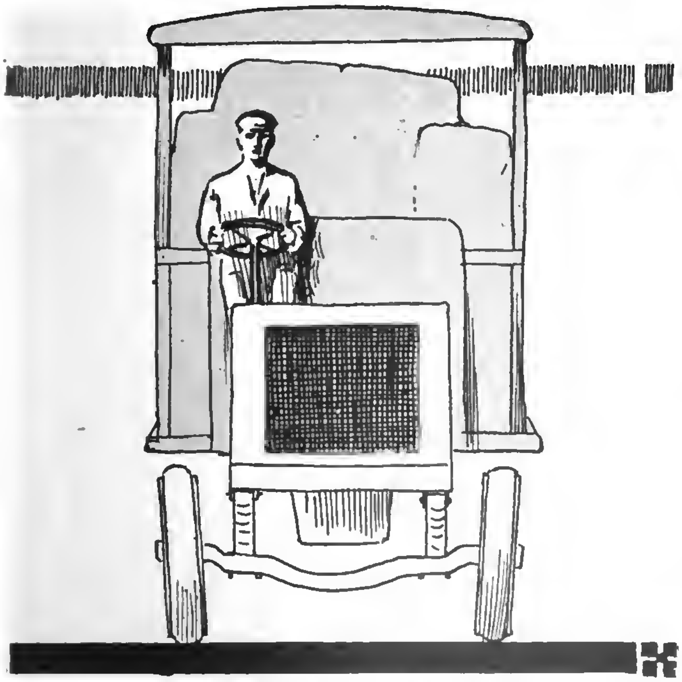


Showing the number of truck models of different capacities from 6,000 pounds upwards

One of the principal features of truck design that has been carefully watched by both manufacturer and purchaser has been the question of worm drive. Credit must be given to the pioneer of this class of drive in this country, namely the Pierce-Arrow, and this coming season will see more converts among whom may be mentioned the Smith, Diamond T, Universal, Blair, Schacht and Wolverine. The Smith trucks, of 3.5 and 6-ton capacities, both use worm drive, the Schacht has worm drive fitted to its 1-ton model, the Blair is being built in three models, of 1.5, 2.5 and 3.5-ton capacity with worm drive as well as the Universal Motor Truck in its recently announced 1-ton model. The Wolverine Detroit, a 1,000-pound wagon, is also fitting worm drive to this season's models.

The question of the suitability of steel wheels has not been much debated in America and it is somewhat surprising that this type of construction has not gained more headway. Three prominent concerns, namely the White, Smith and Locomobile, are using steel wheels as a standard in all their models for the coming season.

The chain still claims the premier position as the means of final drive in all carrying capacity models. Out of the total number 317 chassis are fitted with chain, fifty-three with bevel drive, seven with worm drive and ten models with internal or external gear drive. A new type that is making its appearance this year may be mentioned, namely, the Walters, built along



Out of a total of 375 truck models there are 257 with the steering on the right

the lines of the French Avant-train Latil, which opens up a means of utilizing existing horse wagons, thereby saving considerable loss when these have to be sold for what they will fetch to make room for conventional gasoline or electric truck.

There is a preponderating majority in favor of roller bearings for use in the rear wheels, there being 245 chassis fitted with roller bearings as compared with ninety-eight chassis fitted with ball bearings. Ball and roller bearings are fitted to twenty-five chassis and four chassis are fitted with plain bearings. These latter are in most cases of small carrying capacity. While it is possible to make heavy trucks with plain wheel bearings, the problem of lubrication and the damage that may be caused by want of lubrication have seriously retarded any decided efforts in this direction. Ball bearings of the annular type alone without any provision for end thrust do not give satisfaction after a certain load has been reached, despite the fact that the balls are large enough and proportionate to the load. The adaptability of the roller bearing to carry the load and take end thrust makes it particularly adaptable for truck work as is indicated by the number of manufacturers using it.

Dealing closer with details of design, the method of cooling claims the premier position. There are 270 models using a pump to circulate the water, which shows a 5 per cent. increase over last year's figures, eighty-four models using the thermo-syphon system, and thirty models who rely solely upon air. The majority of these latter have two-cycle motors.

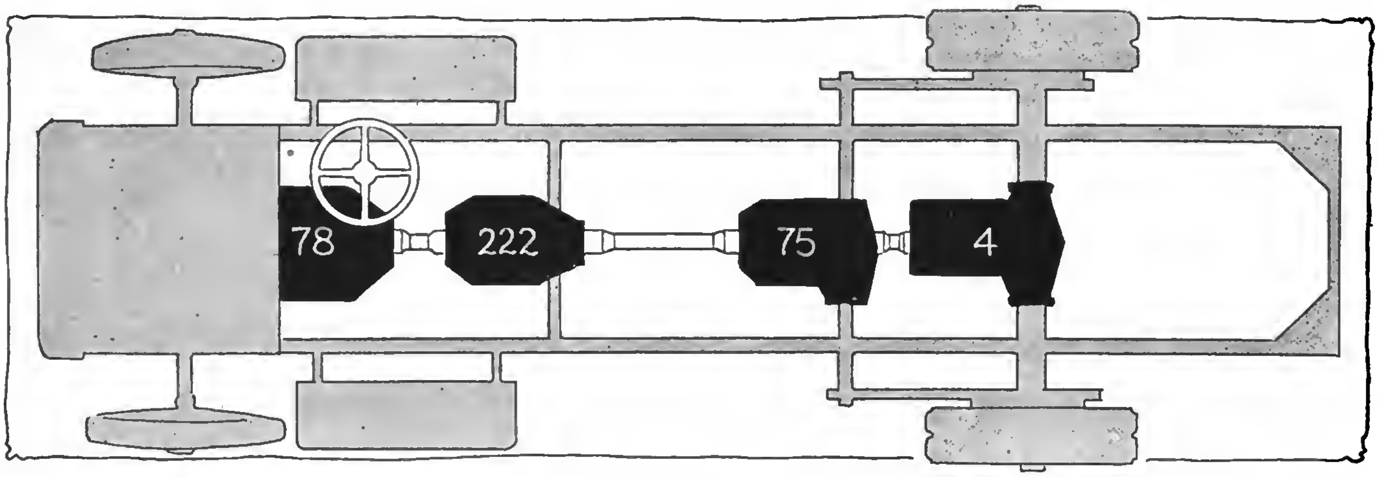
Approximately five-eighths of the total number of chassis listed employ dual ignition, there being 246 of this type. The remaining three-eighths are divided into 110 models, using single ignition and fifty-one models employing two independent sets of ignition classified under the heading of double ignition.

Governors are being fitted to an increasing number of chassis. The point at which these are set to operate being largely dependent upon the carrying capacity of the vehicle.

The 3,000-pound wagon has its speed restricted when a governor is fitted, in many cases to 15 miles per hour. The 6,000-pound wagon has its speed regulated to 12 miles per hour, and the 5-ton truck between 8 and 10 miles per hour. There is no doubt that there is an increasing tendency toward the fitting of some means of controlling the speed of trucks, the unanimous opinion being that a governor will satisfactorily control the maximum speed while traveling along the level of high gear. When it is necessary, however, to increase the engine speed on the lower gears in order to extricate a truck from bad ground or heavy sand, the restriction with the governor sometimes acts in a detrimental manner.

While the left-hand drive type of vehicle is gaining favor there is still a considerable number of right-hand driven vehicles in excess of the first mentioned type. Out of 375 chassis there are 257 which have the steering wheel placed on the right hand side of the vehicle, and 118 with the steering wheel on the left.

As an indication of the enormous growth of the truck busi-



Showing the trend of gearbox location in the various models of trucks for the coming season, showing the numbers with various locations

ness the plans for next year in most cases show that the number of vehicles manufactured will be two or three times that of 1912. It is a well-known fact that the sales of 1912 were at least 100 per cent. more than 1911.

Among the changes and additions that have been made recently may be mentioned the following:

ADAMS—In addition to the 1 and 1.5 models a 2-ton vehicle known as model E has been added, following the general lines of last year's models. The new models will be equipped with a 30-horsepower motor and a change has been made to a multiple-disk clutch. The wheelbase of the new model is 140 inches and springs 50 inches in length will be used at the rear.

ALCO—No new models will be brought out by the American Locomotive Company during 1913. Most of the improvements in the 1913 models were incorporated in the 1912, including a new steel quick-acting service brake lined with a high-friction lining in place of the locomotive type brake; the driving sprockets have been made removable. A specially designed drive plate clutch and a new carbureter with an adjustment on the dash have been incorporated as well as an alteration to the driver's cab, square section spokes for the rear wheels and a strengthening of the bumper.

ATTERBURY—The Atterbury Motor Car Company has increased the number of models, having added a 1,500-pound wagon with internal gear drive, and a 1.5-ton truck to its existing line of 1, 2, 3 and 5-ton trucks.

AVERY—A 1 and a 5-ton truck have been added to the previous models manufactured. The entire line being fitted with governors. One of the features of the 5-ton truck is that the seat and foot boards over the motor can be tipped forward, thus offering easy accessibility. The disk clutch has been modified, twelve pins being used instead of six as heretofore.

BESSEMER—In addition to the 2,000-pound capacity chassis manufactured last year, 2 new models have been added, namely 1.000 and 3,000-pound capacities. Some minor changes have been made.

CHASE—The most recent addition to this line is the 500-pound wagon. The difference between this model and the 1,000, 2,000, 3,000 and 4,000-pound chassis is that it is left-hand driven instead of right hand, as is the case in the larger models.

DART—Two entirely new models are being placed on the market this year, one of 1,500-pound capacity and the other of 2,000 to 3,000-pound capacity. These trucks will both be four-cylinder left-hand drive and center control. The former will have a cone clutch and the later multiple disk clutch.

FEDERAL—No changes have been made in the design of the Federal 1.5-ton truck. One of the features of this car is that it is fitted with a governor restricting the speed to 15 miles per hour.

GARFORD—In the near future a new 2-ton truck will be added to the existing line ef vehicles which consist of 1.5, 3 and 5-ton trucks manufactured at present. The 1913 line includes 2, 3, 4, 5 and 6-ton trucks, but the details of the 2-tonner are not yet available.

GRAMM—Three new models of the motor-between-the-seats type of 1, 2 and 3.5-ton capacities are being placed on the market for 1913. A feature of these trucks will be the Gray & Davis electric starter. The motor is attached to a subframe which is mounted on four coil springs, a governor being provided to restrict the engine speed to 1,000 R. P. M. The four-speed gearset is composed of individual dog clutches, the gears remaining in constant mesh. The specifications of the 1-ton truck differ from the other two in several points. A selective gearset is employed on the 1-ton truck, and the governor cuts out at 1,200 R. P. M.

B. A. GRAMM'S—These trucks are built in two sizes, namely of 2 and 3.5-ton carrying capacities. Both models are fitted with the same size motor, multiple-disk clutch, individual clutch type transmission, final chain drive.

GENERAL MOTORS—1,500-pound, 1.5 and 2-ton trucks have been added to the existing line for the coming season. Regarding mechanical improvements, the high speed is now direct instead of indirect, and a change has been made from multiple-disk clutch to cone clutch.

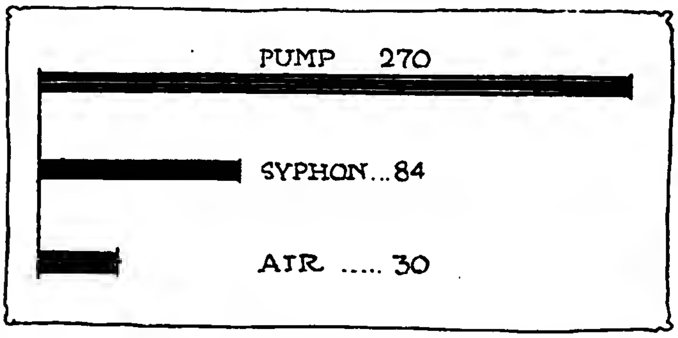
IDEAL—Manufactured by the Ideal Commercial Company, of Akron, O., the 1,500-pound capacity truck will be under the name of Akron. New mechanical features and improvements are mostly in the transmission. The clutch is automatically thrown out when the gears are shifted from one speed to another. This forms a foolproof mechanism.

INTERNATIONAL—The Mack, Hewett and Saurer trucks remain practically unchanged, except for some minor details. In addition to the other Mack models, a new 1,500-pound chain-drive model will be added. The specifications for this machine, however, are not yet available.

KADIX—This is a new make of truck and is being manufactured in four sizes. Namely, 2, 3, 5 and 6-ton capacities. The first two models have the motor under the bonnet and the second two have the motor under the seat. Spring suspension is employed in connection with the motor subframe and a straight-line driveshaft is used. There are several novel features in this truck, including the jackshaft housing, radiator suspension and brake mechanism.

KELLY-SPRINGFIELD—These trucks have changed air-cooled motors under the seat to water-cooled motors placed under a sloping bonnet. Two models at present manufactured are of 1 and 3-ton capacities, respectively. The steering is placed on the left and the control in the center. The motors are governed to 1,200 R. P. M. in the case of the 1-ton and 900 R. P. M. in 3-ton trucks.

KNICKERBOCKER—A 1-ton truck with a four-cylinder motor placed forward under a hood, selective gearset, and final chain drive has been added to last year's line which consisted of two models of 3 and 5-ton capacities, which will be continued this year practically unchanged.



Showing how the truck motors are cooled, comparing water-pump, water-centrifugal and air types

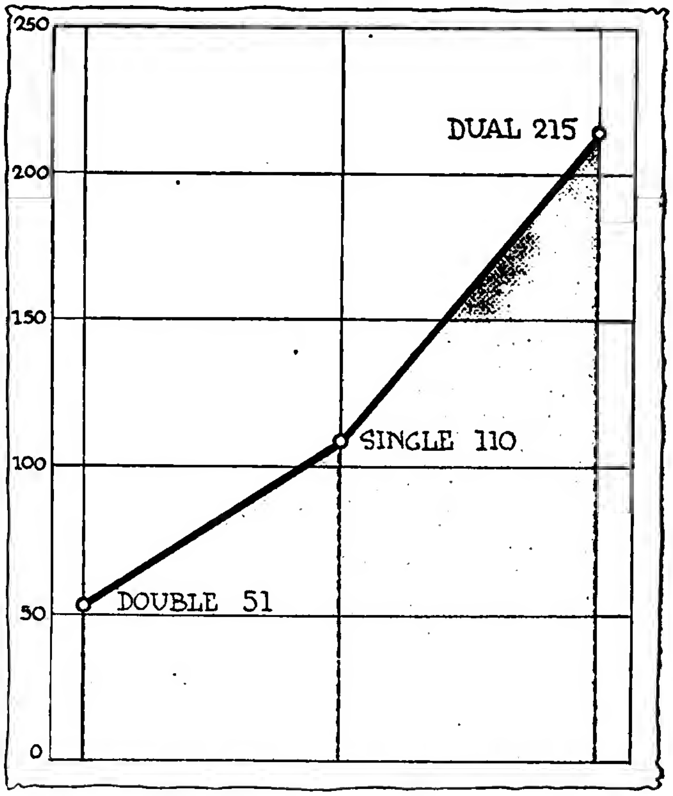
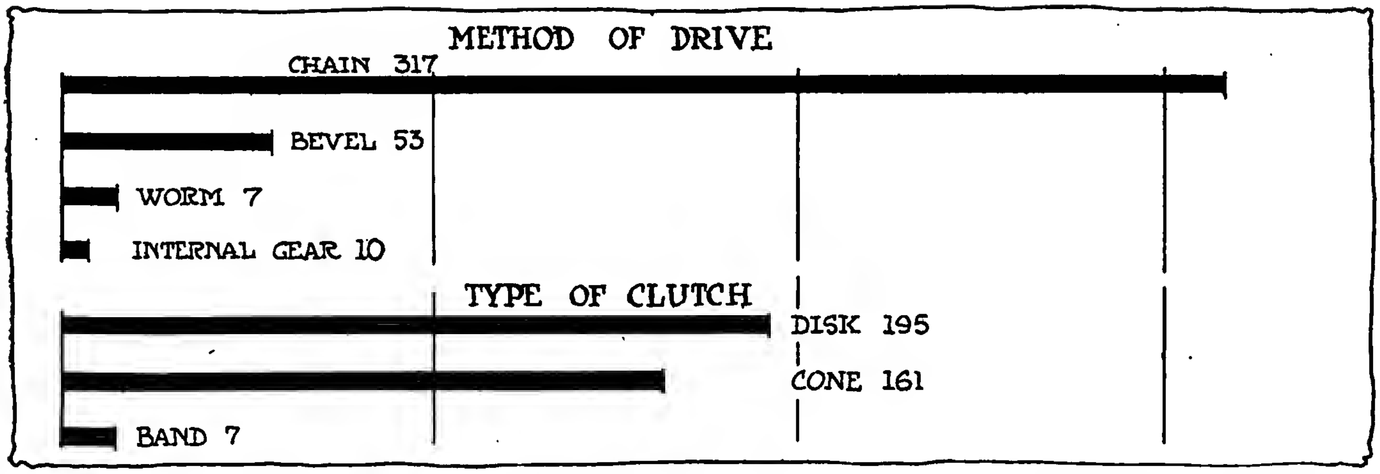


Chart showing the numbers of trucks using single, dual and double ignition respectively



Upper—Comparing the numbers of cars and the methods of drive. Lower—Comparison of the different types of clutches

KNOX—In addition to the Knox Martin tractor, only two models of conventional trucks will he manufactured next year. These being of 2 and 3-ton sizes. The chief mechanical changes over last year's vehicles consist of stronger steering gears and front axles, springs with flatter arch and sundry minor details.

LAUTH-JUERGENS—The latest addition to this line is the 5-ton truck. In order to take care of frame wearing self-aligning hearings are used in the jackshift housing. Coil springs have been incorporated, acting as shock-absorbers and relieving the main springs under full load. The hubs of the wheels are so constructed that a choice of four or five different bearings may he had, such as double row annular, parallel roller, taper roller aod ordinary angular.

LIPPARD-STEWART—Quite a few changes have been made in the 1913 Lippard-Stewart, among which are the following: A 30-horsepower motor takes the place of a 22-horsepower motor hitherto fitted, a leather face cone clutch is used instead of a multiple disk. This is a separate unit, oot being incorporated with the transmission. A new transmission has been fitted and the length of the rear springs has been increased hy 5 ioches. Full elliptic springs have given way to semi-elliptic springs, and, besides the length of the frame heing made greater, the size of section has been increased. Steering gear, tires and gasoline tank have all heen increased in size.

LOCOMOBILE—The 5-ton Locomobile which was placed on the market last year will he continued without any alterations.

McINTYRE—The design and construction of commercial vehicles of this make have been entirely changed. The line comprises a 1,000-pound chassis with a two-cylinder motor and 1,000, 1,500, 3,000, 6,000 and 10,000 capacity vehicles. Governors are fitted to all models and the design of motor, clutch and gearset of the 3,000 and 6,000 pound chassis is the same.

MAIS.—The principal change to be noted in the construction of these chassis is that all models now use pressed steel frames. Other changes are unimportant, heing of a minor nature.

PACKARD—The latest addition to this line is the 5-ton model, which made its appearance during last season, shipments of which commenced about December 1. The only mechaoical change from last year is in the ignition apparatus. An automatic magneto is now fitted.

PEERLESS—The 1913 trucks will not he different in any way from the 1912 product. These trucks are made in 3, 4, 5 and 6-ton capacities.

PIERCE-ARROW—The 5-ton model Pierce-Arrow continues to he the only model marketed by this concern. It is fitted with worm drive. The general design has not been changed.

PIGGINS—The Piggins is made in 3 capacities of 1, 2 and 3 tons. With the exception of a change of motor, the 1913 models are the same as 1912.

PLYMOUTH—Two new models of 2 and 3-ton carrying capacities, both equipped with a six-cylinder engine, are heing placed on the market this year. The power is transmitted through friction drive.

REO—A four-cylinder model of 1.5 to 2-ton capacity has been placed on the market in addition to the single cylinder 1,500-pound truck. The motor is placed forward under a hood, aod the final drive is hy chain.

SERVICE—Two heavier models have been added to this line of trucks. Previously, carrying capacities were only 1,500 pounds and 2,000 pounds. The new models have carrying capacities of 3,000 pounds and 6,000 pounds, respectively. The mechanical improvements in the trucks include double spring suspended radiator, heavier axle construction and Grant roller bearings in transmission and rear axles, as well as S. K. F. self-aligning bearings in the jackshafts.

SMITH—There will he no mechanical changes over 1912. The principal features will he retained, including worm gear drive, herringbone gear transmission, cast steel wheels with hollow spokes, old mechanical parts pack of the motor and clutch, inclosed in dustproof cases and run in an oil bath. A three-plate dry disk clutch will he used, constituting the only mechanical change, except that the motor of the 3.5-ton vehicle is larger.

STEGEMAN—A new 1,500-pound delivery wagon will make its appearance this year, in which hevel gear drive takes the place of inclosed chains used on the large models.

SCHACHT—The 1912 models are heing continued in practically the same form for 1913 aod in addition to these there will he added a new 1-ton worm drive truck, also a 1.5 to 2-ton worm drive truck.

SPEEDWELL—To the line of 4 and 6-ton trucks, a 2-ton vehicle has been recently added, the same general design being carried out. Mechanical changes include a diagonal cross-member at the rear of the chassis frame and a new style jackshaft hanger which carries the forward extremity of the radius rods. Now the motor and transmission are hung from a subframe cushioned at the two forward points between double coil springs and is pivoted at two points in the rear. The front end of the frame is protected by a wood humper and the starting-crank is made to fold. A new centrifugal governor has been added to all models.

UNIVERSAL—Announcement has been made of a new 1-ton model in which a Wallwork worm drive is incorporated. The motor in this chassis is placed under a hood in contrast to the larger types in which the motor is placed under the seat. A power hoist driven hy a chain from an extension of the sprocket shaft is a useful innovation.

VELIE—A new 1-ton model has heen added to this line and, instead of chain as is used on the larger models, shaft drive is employed. A governor is fitted on the 2 and 3-ton models, restricting the speed to 15 and 12 miles per hour, respectively. The previous chassis are unchanged.

WILLYS-OVERLAND—The 800-pound chassis has an increased wheel hase, three-quarters floating axle, larger hrakes and increased equipment, which includes a self-starter.

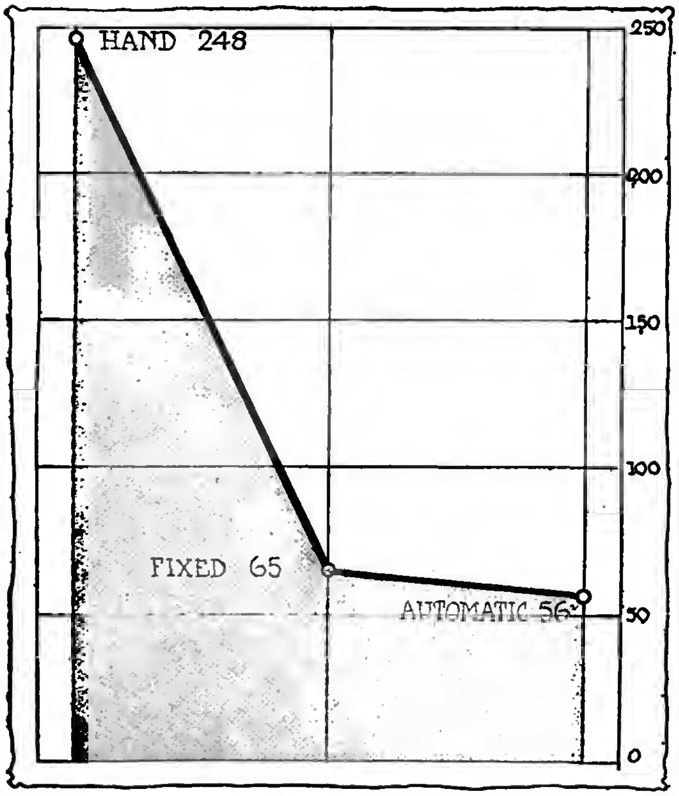
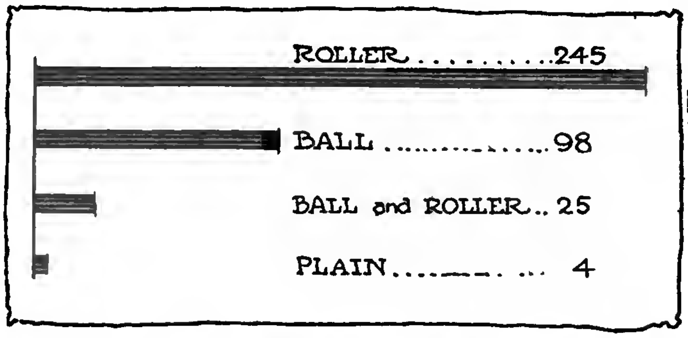


Chart showing the number of trucks and the methods of ignition control



Showing the numbers of trucks and the types of bearings used in the rear wheels

Directory of Motor Truck Manufacturers

Giving the Names and Business Addresses of the Various Companies, the Name of the Truck Manufactured and the Number of Models of Each Load Capacity from 500 Pounds to 14,000 Pounds Included in the Line of Each Maker

COMPANY	ADDRESS	TRUCK	500	800	1000	1500	2000	3000	4000	5000	6000	7000	8000	9000	10,000	12,000	14,000
Abendroth & Root Mfg. Co.	Newburgh, N. Y.	A & R									1		1		1		
Adams Bros. Co., The	Findlay, O.	Adams					1	1	1								
American Locomotive Co.	Providence, R. I.	Alco							1			1			1		1*
Anglaize Motor Car Co.	New Bremen, O.	Anglaize				1	1										
Armleder Co., The O.	Cincinnati, O.	Armleder				1	1										
Atterbury Motor Car Co.	Buffalo, N. Y.	Atterbury				1	1		1		1				1		
Autocar Co., The	Ardmore, Pa.	Autocar						1									
Auburn Motor Chassis Co.	Auburn, Ind.	Handy Wagon	1	1													
Available Truck Co.	Chicago, Ill.	Available				1	1										
Avery Company	Peoria, Ill.	Avery							1		1				1		
American La-France Fire Engine Co.	Elmira, N. Y.	La-France														1	
Bergdoll Motor Co., Louis J.	Philadelphia, Pa.	Bergdoll				1											
Bessemer Motor Truck Co.	Grove City, Pa.	Bessemer			1		1	1									
Blair Mfg. Co.	Newark, O.	Blair						1		1		1					
Brooks Mfg. Co.	Saginaw, Mich.	Brooks		1													
Brown Commercial Car Co.	Peru, Ind.	Brown				1											
Babcock Co., H. H.	Watertown, N. Y.	Babcock				1											
Buick Motor Co.	Flint, Mich.	Buick			1												
Buckeye Mfg. Co.	Anderson, Ind.	Lambert				1	1		1								
Bowling Green Motor Car Co.	Bowling Green, O.	Modern			1	1											
Barker Mfg. Co.	Norwalk, Conn.	Barker									1				1		
		Beck					1		1		1						
Best Mfg.	San Leandro, Cal.	Best			1		1										
Brockway Motor Wagon Co.	Homer, N. Y.	Brockway			1		1	1*	1								
Bucklen Motor Truck Co.	Elkhart, Ind.	Bucklen				1		1			1						
Cass Motor Truck Co.	Port Huron, Mich.	Cass						1*		1							
Chase Motor Truck Co.	Syracuse, N. Y.	Chase	1		1		1	1	1								
Coleman Motor Truck Co.	Ilion, N. Y.	Coleman					1		1								
Couple Gear Freight Wheel Co.	Grand Rapids, Mich.	Couple Gear										1			1		
Crawford Automobile Co.	Hagerstown, N. Y.	Crawford				1*											
Crown Commercial Car Co.	No. Milwaukee, Wis.	Crown				1	1	1									
Chicago Pneumatic Tool Co.	Chicago, Ill.	Little Giant					1										
Cleburne Motor Car Mfg. Co.	Cleburne, Tex.	Luck Utility			1												
Clark Delivery Car Co.	Chicago, Ill.	Clark						1									
Continental Truck Mfg. Co.	Superior, Wis.	Continental					1	1									
Croxton Motor Co.	Washington, Pa.	Croxton															
Clark Co., F. G.	Lansing, Mich.	Superior					1										
Dart Mfg. Co.	Waterloo, Iowa	Dart						1									
Dayton Auto Truck Co., The	Dayton, O.	Dayton							1		1				1		
Dorris Motor Car Co.	St. Louis, Mo.	Dorris				1			1								
Driggs Seabury Ordinance Corp.	Sharon, Pa.	Vulcan									1		1	1	1	1	1
Durrant Dort Carriage Co.	Flint, Mich.	Durrant Dort					1*										
		Day Utility															
Diamond T. Motor Car Co.	Chicago, Ill.	Diamond T.						1			1				1		
Dispatch Motor Car Co.	Minneapolis, Minn.	Dispatch			2												
Elk Motor Truck Co.	Charleston, W. Va.	Elk							2		2				2		
Eclipse Motor Truck Co.	Franklin, Pa.	Eclipse					1				1						
		Erving						1									
Federal Motor Truck Co.	Detroit, Mich.	Federal					1										
Ford Motor Co.	Detroit, Mich.	Ford		1*													
Four Wheel Drive Auto Co.	Clintonville, Wis.	Four Wheel Drive						1			1						
Flanders Motor Co.	Detroit, Mich.	Hercules					1										
Grand Rapids Motor Truck Co.	Grand Rapids, Mich.	Decatur						1									
Gabriel Auto Co.	Cleveland, O.	Gabriel															
Geneva Wagon Co.	Geneva, N. Y.	Geneva			1	1*											
General Motors Truck Co.	Pontiac, Mich.	G. M. C.						2	2			2			2		
Gramm Motor Truck Co.	Lima, O.	Gramm					1		1		1				1		
Garford Co.	Elyria, O.	Garford							1		1				1		
		Gleason			1												
Gramm-Bernstein Co.	Lima, O.	B. A. Gramms							1			1					
		Great Eagle															
Grabowsky Power Wagon Co.	Detroit, Mich.	Grabowski					1	1	1		1						
Hart-Kraft Motor Co.	York, Pa.	Hart-Kraft			1	2	1	1	1	1							
Harwood-Bailey Mfg. Co.	Marion, Ind.	Indiana						1	1		1						
Haberer & Co.	Cincinnati, O.	Cino				1											
Hatfield Auto Truck Co.	Elmira, N. Y.	Hatfield			1												
Hupp Motor Co.	Detroit, Mich.	Hupmobile		1													
Ice Mfg. Co.	1170 Broadway, N. Y.	A. I. C.													1		
Ideal Auto Co.	Fort Wayne, Ind.	Ideal				1	1	1	1								
International Harvester Co.	Chicago, Ill.	I. H. C.			2												
Ideal Commercial Car Co.	Akron, O.	Akron				1											
International Motors Co.	Broadway & 57th St.	Mack					1	1	1		1		1		1		1
	New York City	Hewitt					1		1			1			1		1*
		Saurer													1		1*
Joliet Auto Tire Co.	Joliet, Ill.	Jatco				1											
Jarvis Huntington Automobile Co.	Huntington, W. Va.	Jarvis							1			1			1		
Johnson Service Co.	Milwaukee, Wis.	Johnson				1	1		1				1				
Ka Dix Newark Motor Truck Co.	Newark, N. J.	Ka Dix									2		2		2		
Kearns Motor Co.	Beavertown, Pa.	Kearns				1											
Kelly-Springfield Motor Truck	Springfield, Mass.	Kelly						1				1					
King Mfg. Co.	Kingston, N. Y.	King										1					

Directory of Motor Truck Manufacturers

COMPANY	ADDRESS	TRUCK	500	800	1000	1500	2000	3000	4000	5000	6000	7000	8000	9000	10,000	12,000	14,000
Kissel Motor Car Co	Hartford, Wis.	Kisselkar				1	1		1		1		1		1		
Kline Motor Car Corporation	Richmond, W. Va.	Kline Kar				1*											
Knickerbocker Motor Truck Mfg. Co	New York City, N. Y.	Knickerbocker									2				2		
Knox Automobile Co	Springfield, Mass.	Knox							1		1						
Koehler, H. J., Co	Newark, N. J.	Koehler					1*										
Kopp Motor Truck Co	Buffalo, N. Y.	Kopp						1			1				1		
Krebs Commercial Car Co	Clyde, O.	Krebs															
Kelsey Mfg. Co., C. W.	Hartford, Conn.	Motorette	1*–1														
		Kato															
Lange Motor Truck Co	Pittsburg, Pa.	Lange					1	1	1								
Lauth Juergens Motor Car Co	Fremont, O.	Lauth Juergens					1		1		1						
Lewis Motor Truck Co	San Francisco, Cal.	Lewis								1					2		
Lippart-Stewart Motor Car Co	Buffalo, N. Y.	Lippart-Stewart				1											
Locomobile Company of America	Bridgeport, Conn.	Locomobile													1		
Longest Bros. Co	Louisville, Ky.	Longest						1					1				
Lord Baltimore Motor Car Co	Baltimore, Md.	Lord Baltimore					1		1		1		1		1		
Lincoln Motor Car Wks	Chicago, Ill.	Lincoln		1													
		Lambert															
Mais Motor Truck Co	Indianapolis, Ind.	Mais						1	1		1						
Mason Motor Co	Waterloo, Iowa	Mason				1	1										
McIntyre Co	Auburn, Ind.	McIntyre				1		2			2						
Mercury Mfg. Co	Chicago, Ill.	Mercury			1												
Mogul Motor Truck Co	Chicago, Ill.	Mogul							1				1		1		
Monitor Motor Works	Janesville, Wis.	Monitor					2	1									
Mora Power Wagon Co	Cleveland, O.	Mora				1											
Moreland Motor Truck Co	Los Angeles, Cal.	Moreland					1		1		1						
Minneapolis Motor Co	Minneapolis, Minn.	Minneapolis															
		Tricar	1*														
Motor Car Mfg. Co	Indianapolis, Ind.	Pathfinder				1											
Nordyke & Marmon	Indianapolis, Ind.	Marmon Delivery				1											
National Motor Truck Co	Bay City, Mich.	Natco					1										
Nelson & LeMoon	Chicago, Ill.	LeMoon						1		1		1					
Nyberg Automobile Works	Anderson, Ind.	Nyberg						1									
Old Reliable Motor Truck Co	Chicago, Ill.	Old Reliable									1				1		
Oliver Motor Truck Co	Detroit, Mich.	Oliver				1		1									
Packard Motor Car Co	Detroit, Mich.	Packard							2		1				1		
Packers Motor Truck Co	Wheeling, W. Va.	Packers							1				1				
Palmer Mayer Motor Car Co	St. Louis, Mo.	Palmer				1											
Peerless Motor Car Co	Cleveland, O.	Peerless									1		1		1	1	
Pierce-Arrow Motor Car Co	Buffalo, N. Y.	Pierce-Arrow													1		
Piggins Motor Truck Co	Racine, Wis.	Practical Piggins					1										
Plymouth Motor Truck Co	Plymouth, O.	Plymouth					1		1								
Pope Mfg. Co	Hartford, Conn.	Pope Hartford									1				1		
Poyer & Co., D. F.	Menominee, Mich.	Menominee				1	1										
Pratt, Carter, Sigsbee & Co	Detroit, Mich.	Wolverine-Detroit			1												
Randolph Motor Car Co	Flint, Mich.	Randolph					1		1				1		1	1	
Reo Motor Truck Co	Lansing, Mich.	Reo				1			1								
Robinson Motor Truck Co	Minneapolis, Minn.	Minneapolis						1	1								
Rowe Motor Mfg. Co	Coatesville, Pa.	Rowe				1	1	1	1		1				1		
Sayers & Scovill Co	Cincinnati, O.	S & S				1											
Sampson Mfg. Co., Alden	Detroit, Mich.	Sampson						1			1				1		
Sandusky Auto Parts & Motor Truck Co.	Sandusky, O.	Sandusky				1		1									
Sanford Motor Truck Co	Syracuse, N. Y.	Sanford					2										
Schleicher Motor Vehicle Co	Ossining, N. Y.	Schleicher									1				1		
Seagrave Co	Columbus, O.	Seagrave							1		1						
Schmidt Bros. Co	Chicago, Ill.	Schmidt				1	1										
Selden Motor Vehicle Co	Rochester, N. Y.	Selden															
Service Motor Car Co	Wabash, Ind.	Service				1	1	1									
Smith Company, A. O.	Milwaukee, Wis.	Smith-Milwaukee										1				1	
Speedwell Motor Car Co	Dayton, O.	Speedwell							1				1			1	
Standard Motor Truck Co	Detroit, Mich.	Standard									4						
Stearns Co., The F. B.	Cleveland, O.	Stearns													2		
Schacht Motor Car Co	Cincinnati, O.	Schacht				1	1		1		1		1				
Stegeman Motor Car Co	Milwaukee, Wis.	Stegeman				1	1		1		1		1			1	
Sternberg Mfg. Co	Milwaukee, Wis.	Sternberg							3		2		1			1	
Seitz Automobile & Transmission Co.	Wyandotte, Mich.	Seitz				1	1		1		1				1		
		Schacher			1		1		1		1		1				
Stewart Motor Corporation	Buffalo, N. Y.	Stewart				1											
Stewart Iron Works Co	Cincinnati, O.	Stewart					1										
Studebaker Automobile Co	South Bend, Ind.	Studebaker						1*					1				
Sullivan Motor Car Co	Rochester, N. Y.	Sullivan			1	1											
Staver Carriage Co	Chicago, Ill.	Staver				1											
Schlotterback Mfg. Co	Newark, N. J.	Koehler					1*										
Toledo Motor Truck Co	Toledo, O.	Toledo					2		1								
Transit Motor Truck Co	Louisville, Ky.	Transit							1			1			1		
Triumph Motor Car Co	Chicago, Ill.	Triumph						1									
Tulsa Automobile & Mfg. Co	Tulsa, Okla.	Tulsa				1	1	2									
Universal Motor Truck Co	Detroit, Mich.	Universal					1		1		1					1	
United States Motor Truck Co	Cincinnati, O.	U. S.							1		1						
Union Motor Truck Co	San Francisco, Cal.	Union							1								
Universal Machinery Co	Milwaukee, Wis.	Progress						1									
Veerac Motor Co	Anoka, Minn.	Veerac					1										
Velie Motor Vehicle Co	Moline, Ill.	Velie							1		1						
Walter Auto Truck Co	New York City, N. Y.	Walters							1		1	1			1		
Ware Motor Vehicle Co	St. Paul, Minn.	Ware															
Warren Motor Car Co	Detroit, Mich.	Warren							1						1		
White Co	Cleveland, O.	White				1		1			1				2		
Wichita Falls Motor Co	Wichita Falls, Tex.	Wichita					1		1								
Wilcox Motor Car Co., H. E	Minneapolis, Minn.	Wilcox					1	1			1						
Willet Engine & Carbureter Co	Buffalo, N. Y.	Willet							1								
Willys-Overland Co	Toledo, O.	Overland		1													
Wyckoff Church & Partridge	Kingston, N. Y.	Commer													1		1
Wagenhalls Commercial Motor Car Co	St. Louis, Mo.	Wagenhalls	1	1													
Zimmerman Mfg. Co	Auburn, Ind	Zimmerman		1													

Contrast The Motor and

Oval—The motor trucks sailed majestically along the snow-swept streets
Right—Extra horses were necessary to pull heavy loads after the storm
Upper Left—The wagon crew often had to put their shoulders to the wheel
Bottom—Deep in the drifts, the driver had to help the horse turn

Delivery in the

WHEN the avalanche of snow descended upon New York City Christmas Eve, it found the holiday delivery business just passing the peak of the load. When the storm was at its height, the volume of deliveries was on a lessening scale and the crux of the storm was too late to do any serious harm to the delivery systems at large. Nevertheless, the managers of most of the delivery departments of the big department stores declared that the motor trucks in their service were of primary importance in clearing up the holiday rush. On the slippery pavements the horses were unable to keep their feet and strained in vain to draw the heavy loads, while the trucks majestically sailed on their way, unhampered by the drifting snow and the treacherous traction.

But, from the beginning of the snowfall until the last of the Christmas Eve deliveries was made, something over 1,000,000 packages were carried from retail stores to consumers within the delivery districts. It is estimated by the delivery chiefs of the department stores that the packages averaged 5.5 pounds, and thus the total amount of Christmas busi-

Pictures the Horse —

Christmas Storm

ness done by the delivery systems during the storm was 5,500,000 pounds or 2,750 tons.

Throughout the storm these motor vehicles did yeoman service. Some of them were used continuously for full 24 hours, though the average service of the whole battery of trucks in use has been estimated at 18 hours

Only one complaint was made on account of the truck service. Traction in the falling snow was uncertain and the demand for chains exhausted the supply in 2 hours. This led to some astonishing makeshifts to prevent skidding and to obtain traction. Bits of carpets were bound upon tire treads; impromptu chains were hastily forged at blacksmith shops; ropes were pressed into service pretty generally and the business was moved.

The use of non-skid devices on trucks is a subject that has caused a large amount of debate in the automobile industry. Advocates of chains state that they are necessary in light snow and others hold that a very large truck under load does not require chains under any conditions.

They also declare that a good driver does not need chains to the

Oval—The way the motor trucks bowled merrily along in spite of ice and snow
Left—It took as many men as horses to deliver a load of coal in the storm
Upper Right—Every few moments traffic would be blocked by a fallen horse
Bottom—Even when the wagon was empty the horse could not keep his feet

Fixing up a strained trace at Columbus Circle

The panel of three pictures shown above gives an idea of the difficulties which the drivers of horse-drawn wagons had to conquer in order to make deliveries

same extent that the novice or careless driver requires them. Nevertheless, the rush for chains was a concerted movement when the snow began to fall. Not only that, but the reports of stalled automobile trucks fails to include any mention of one which was equipped with chains that fitted the tires.

With the horses there was a very different story to tell. During the hours when the snow was unpacked, those that were smooth-shod floundered and fell in all parts of the city, as shown in the accompanying illustrations, and where the streets are paved with granite or other unyielding surface matêrial, it did not matter whether they were rough-shod or not. After the snow packed, the horses which had calks in their shoes did better but the service was considerably delayed in spots.

Systems of transportation in New York are divided into three classes on an equipment basis. First, the fully motorized systems; second, the mixed systems and third, the exclusive horse systems.

There was no trouble to speak of with the first named class; a small amount of difficulty, mostly due to temporary delays in the second and a considerable amount with the last.

From noon of December 24 guaranteed delivery was not universal among the New York stores as it usually is on that day. No formal notification was published for the guidance of salesmen not to promise deliveries within the day, but the word was passed around in some of the stores that rash promises of delivery should be avoided and that the word confident should be substituted for the word guaranteed in all delivery promises.

Fortunately weather conditions so shaped themselves that the deliveries were actually made, although in some outlying districts Santa Claus arrived after midnight.

Some of the leading houses had the following to say about the Christmas deliveries in relation to the storm conditions:

Greenhut-Siegel Cooper Company: Deliveries slowed up after the storm was over, but not sufficiently to cause disappointment to our patrons in the matter of Christmas deliveries. We retain the horse as motive power for our deliveries in large proportion, although the department includes a large number of automobiles. We were obliged to double our horse equipment during the snow, but fortunately we were in position to do so with little disturbance of the system. Everybody met with some delays during the day and night.

Macy's: The delivery chief said: We use 450 horses and 55 automobiles of various types. The horses are used for central work and to distribute from our suburban depots

The big motor busses covered their route with no trouble

and the automobiles for the heavy long-haul work. We had no trouble as the storm broke too late to catch us at the height of the holiday deliveries.

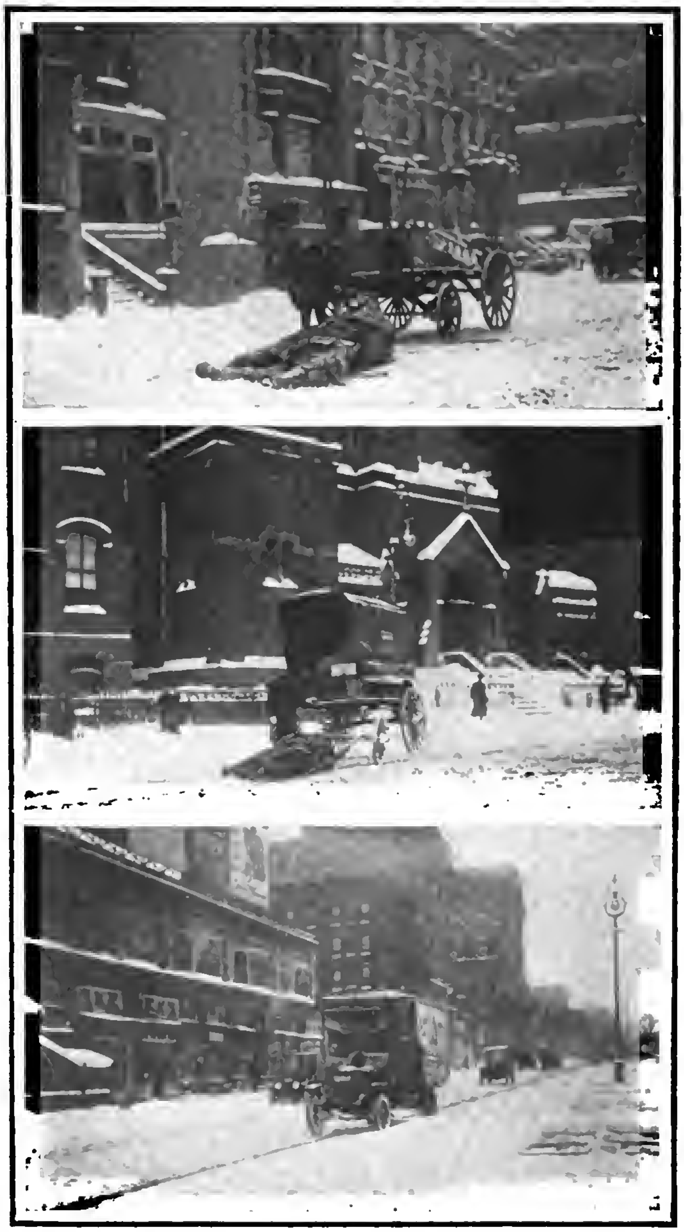
Gimbel's: Captain Mabie, chief of transportation, said: Gimbel's is completely motorized and our equipment proved adequate although it was worked to its full capacity. We had some trouble, but nothing out of the ordinary. Working out from the store, warehouses and depots under full load the drivers reported no delays, but in certain cases where chains were lacking the empty cars had some trouble in returning on schedule. Compared with other storms where mixed equipment was used, the showing Christmas Eve was excellent.

W. & J. Sloane: Our battery of eighteen Whites and five General Vehicles performed splendidly under the heavy business and weather conditions of Christmas Eve. It would be foolish to say that the business was handled under the storm conditions as any ordinary day's business could be handled, but our patrons have made no complaint, which is the real measure of the situation.

Wanamaker's: If the storm had come along 24 hours before it did, deliveries generally would have been delayed to a greater extent, but it was withheld long enough to remove its sting. Under ideal weather conditions, Christmas business must be slower in delivery than ordinary business, because of its volume. When a storm intervenes there must be some delay. Luckily we had no more than our share, which was little.

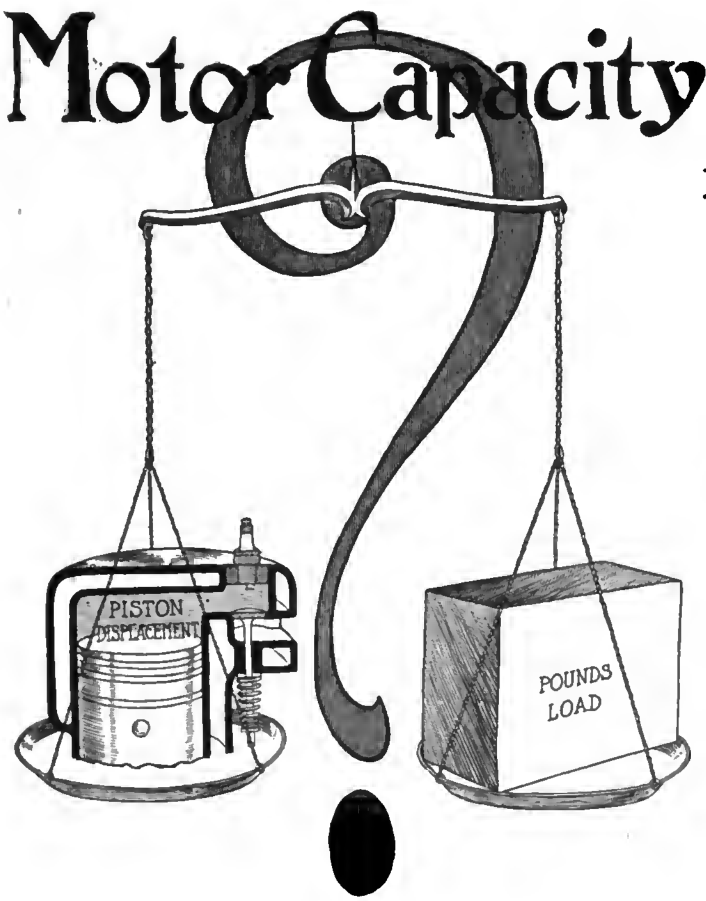
Burns Brothers: During the height of the storm an order was received for the immediate delivery of 54 tons of coal from one of our North River pockets to a customer on the east side of town. Three of our 10-ton Hewitts were available for the job and three three-horse teams hauling 8-ton wagons were standing in the shed. The six vehicles were loaded and each automobile was assigned to a wagon as a helper. The six started out, but before they had gone far the drivers of the horses signalled for help and the fleet went through Forty-second street with the automobiles towing the horse trucks. During the run the horses had all they could do to keep their footing, but the heavily loaded automobiles did not require chains.

John E. Morrell & Co.: We used electric trucks in our delivery service on Christmas Eve, and while we experienced some delays as the traction was very bad, the power wagons handled the business. Compared with former years and storms where we used horses, the showing during the holidays was excellent.



When the horses fell, exhausted by their struggle on the precarious foothold afforded by the icy pavements, it was often a hard task to get them to their feet

Motor Capacity—Load Ratios



Describing by Charts and Tables How Different Makers of Trucks Have Met the Situation, Showing Considerable Diversity of Opinion

OWING to the varying conditions under which trucks operate, there is bound to be a wide difference of opinion as to the proper relation of horsepower to useful load. The rated horsepower is no criterion to form a basis of calculation, as the accepted formula in use at present does not take the stroke or revolutions per minute directly into consideration. This being the case, the next best method is to take some common unit as piston displacement in cubic inches and compare it to the useful load capacity of the vehicle. In fairness to the makers it may be well to state at the outset that motors are not fitted to trucks without any regard to general economy. Economy and efficiency are the two desiderata of the truck user. The question of the size of the engine as compared with the useful load has been a much-debated one for some time past and the following tables and charts have been prepared, from data furnished by individual makers, for the readers of THE AUTOMOBILE, to show the present trend of affairs rather than to show directly or by inference what the best ratio should be. It would be necessary to know many things in order to attempt to criticize, and even then, any conjecture might fall short of the actual conditions.

While the truck business generally has grown by leaps and bounds in the last few years, there have not been enough data for engineers to go upon to determine what the best ratio should be. On the one hand there is the maker who fits a large engine and claims greater all-round efficiency despite increased running costs due to a larger consumption of oil and gasoline, but the mere fact that the engine is large is not a proof that the consumption will be high. The maker who fits a comparatively small engine with a high ratio of useful load to piston displacement probably has a better showing upon consumption than his larger competitor. But how high should this ratio be so as to insure the motor from being overloaded or, in other words, breaking its back endeavoring to carry the load?

In this connection conditions of service are the main factors to determine the question. It would be safe to assume that it would take less power to drive a pneumatic-tired truck than one

Load Capacity and Piston Displacement of Trucks Under 2000 Pounds

NAME	Load Capacity in Pounds	Society Automobile Engineers Horsepower	Number of Cylinders	Bore and Stroke	Piston Displacement in Cubic Inches	Ratio of Load in Pounds per Cubic Inch of Piston Displacement
Available	1500	22.10	2	5¼x4	173.1	8.6:1
Akron	1500	22.5	4	3¾x5	220.9	6.8:1
Armleder	1500	16.92	4	3¼x4	132.7	11.2:1
Atterbury	1500	22.5	4	3¾x4½	198.8	7:1
Anglaize	1200	22.10	2	5¼x4	173.1	6.9:1
Bergdoll	1500	25.6	4	4 x4½	226.2	6.7:1
Brown	1500	22.5	4	3¾x5¼	231.9	6.4:1
Bessemer	1000	19.61	4	3½x4½	173.2	5.8:1
Babcock	1500	22.10	2	5¼x4	173.1	8.6:1
Brooks	1800	11.25	2	3¾x3¾	82.8	9.3:1
Buick	1000	9.82	2	3½x5	96.2	10.4:1
Crawford	1200	29.0	4	4¼x4½	255.3	4.9:1
Durant Dort	1600	22.5	4	3¾x4½	198.8	8:1
Dorris	1500	30.65	4	4⅜x5	300.7	5:1
Geneva	1000	21.00	2	5⅛x4½	185.6	5.4:1
I. H. C. Commercial	1000	16.20	2	4½x5	157.2	6.3:1
Jatco	1500	22.10	2	5¼x4	173.1	8.6:1
KisselKar	1500	29.	4	4⅛x4½	211.1	6.2:1
Koehler	1600	22.10	2	5¼x4	173.1	9.2:1
Koehler	750	22.10	2	5¼x4	173.1	4.3:1
Lippard Stewart	1500	22.5	4	3¾x5¼	231.9	6.4:1
Mason	1500	20.	2	5 x5	196.3	8.5:1
Modern	1000	22.5	4	3¾x4½	198.8	5:1
Modern	1500	22.5	4	3¾x5¼	231.9	6.4:1
Oliver	1500	40.	4	5 x5	392.7	3.8:1
Overland	800	25.60	4	4 x4½	226.2	3.5:1
Palmer	1500	22.5	4	3¾x5	220.9	6.8:1
Reo	1500	9.05	1	4¾x6	106.3	14.1:1
Schmidt	1500	20.	2	5 x4¾	186.5	8:1
Stewart	1500	22.50	4	3¾x5¼	231.9	6.4:1
Service	1500	22.5	4	3¾x5½	242.9	6:1
Stegeman	1500	22.5	4	3¾x5¼	231.9	6.4:1
Sandusky	1500	22.5	4	3¾x5	220.9	6.8:1
S & S	1500	27.20	4	4⅛x5¼	280.6	5.4:1
Sullivan	1000	32.4	4	4½x4½	286.3	3.5:1
Sullivan	1500	32.4	4	4½x4½	286.3	5.2:1
Schacht	1500	29.0	4	4¼x5½	312.	4.8:1
Tulsa	1500	22.5	4	3¾x4½	198.8	7:1
Wolverine	1000	8.10	1	4½x5½	88.5	11.3:1
White	1500	22.5	4	3¾x5⅛	226.4	6.7:1

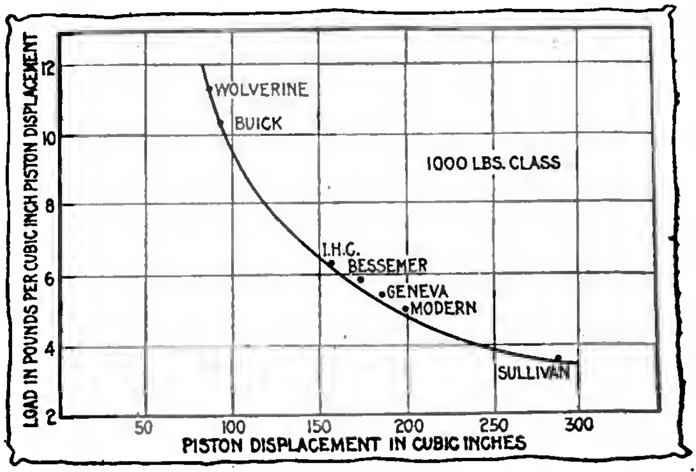


Fig. 1—Chart showing ratio of load to piston displacement for trucks of 1000 pounds capacity and under

fitted with solid tires; also that a truck running on level roads would perform better with a comparatively small engine than with one of more power that it was necessary to keep throttled down the best part of the time. Truck users have themselves to blame in some cases for apparent lack of efficiency. There has been a desire on the part of some to make a 2-ton truck do the work of a 3 or even a 4-tonner, and with the overload expect the same maximum speed that was intended for the rated capacity. Truck makers are entirely at the mercy of their customers in this respect and with a better understanding of the overload and overspeeding situation there is a possibility of a reduction of the power at present existing to a conservative average that will bring with it a more economical vehicle.

Under 2,000-Pound Class

¶ The chart for this class, Fig. 1, shows the ratio of useful load in pounds per cubic inch of piston displacement of seven vehicles. The first two vehicles have one and two-cylinder engines respectively, which fact naturally gives them a small piston displacement. The largest truck, the Sullivan, has a small ratio in the 1,000-pound class, but by referring to the table for vehicles under 1 ton it will be found that the same size engine is used in the 1,500-pound chassis as well. Its relative position is also shown on the 1,500-pound chart, Fig. 2. This chart has been plotted from the figures of twenty-five vehicles and while the ratio stretches from the 14-pound to the 5-pound line nevertheless the greater proportion lies in between the 6 to 8-pound lines. In other words, the general average ratio is 6 to 8 pounds useful load per cubic inch piston displacement. All vehicles above the 8-pound line, with the exception of the Available, which has a four-cylinder motor, are fitted with one or two-cylinder engines. No doubt the motor capacity of this class has in a measure been influenced by pleasure car practice, the available data being sufficient to form a foundation to work upon.

2,000-Pound Class

¶ The average horsepower for this class is approximately 25, according to S. A. E. rating, and the average ratio is 8.47 pounds load per cubic inch of piston displacement. The elongation of the curve for this category, Fig. 3, is caused by the fact that several makers who cater to this class fit the same engine in the next heavier class that they do in this case. When the reason for this is inquired into it will be apparent to any one that the 1-ton truck is expected to go faster than the 2-ton, consequently the gear ratio will be higher and therefore requiring more power to drive it. The concentration of effort upon one motor also is cheaper for the maker and in the case where a truck user has several vehicles of one make, for example, some of the 1-ton and some of the 2-ton types, parts for one will fit the other, which is quite an item when the repair question is taken into consideration.

The general average ratio above stated can be realized by referring to the chart, Fig. 3, which shows that a number of makers use the same size engine, with a piston displacement of 231.9 cubic inches, while several more use an engine with 226.2 cubic inches piston displacement. The two largest, namely, the Mack and the KisselKar, have the same rated horsepower, the bore in each case being the same, but the stroke of the Mack is .5-inch longer, giving the motor 16 cubic inches more displacement, and .3 pound load less per cubic inch displacement.

3,000 to 4,000-Pound Class

¶ These classes are so inter-connected that it may be well to deal with the two capacities as a whole from the point of view of averages. Reference to the table will show that several makers fit the same size of engine to the 3,000-pound chassis that others use in the 4,000-pound. In order to differentiate between the classes two separate curves have been plotted.

Taking the two classes as a whole, there are fifty-three makes represented, which is by far the greatest number for any class.

Load Capacity and Piston Displacement of Trucks of 2000 Pounds

NAME	Load Capacity in Pounds	Society Automobile Engineers Horsepower	Number of Cylinders	Bore and Stroke	Piston Displacement in Cubic Inches	Ratio of Load in Pounds Per Cubic Inch of Piston Displacement
Available	2000	22.5	4	3¾x4½	198.8	10:1
Adams	2000	24.22	4	3⅞x5	235.8	8.5:1
Armleder	2000	25.60	4	4 x4½	226.2	8.8:1
Atterbury	2000	25.60	4	4 x4½	226.2	8.8:1
Anglaise	2000	22.5	4	3¾x5¼	231.9	8.6:1
Bessemer	2000	22.5	4	3¾x5¼	231.9	8.6:1
Cass	2500	25.6	4	4 x4½	226.2	11:1
Crown	2000	25.6	4	4 x4½	226.2	8.8:1
Federal	2000	29.0	4	4¼x4½	255.3	7.8:1
Gramm	2000	29.0	4	4¼x4½	255.3	7.8:1
Hercules	2000	22.5	4	3¾x5¼	231.9	8.6:1
Ideal	2000	22.5	4	3¾x5¼	231.9	8.6:1
KisselKar	2000	32.40	4	4½x5¼	334.	6:1
Kelly	2000	22.5	4	3¾x5¼	231.9	8.6:1
Lord Baltimore	2000	22.5	4	3¾x5	220.9	9:1
Lange	2000	22.5	4	3¾x5¼	231.7	8.6:1
Mack	2000	32.40	4	4½x5½	349.9	5.7:1
Mason	2000	20	2	5 x5	196.3	10.2:1
Natco	2000	19.61	4	3½x5	192.4	10.4:1
Practical Piggins	2000	29.00	4	4¼x4¾	269.4	7.4:1
Superior	2000	22.5	4	3¾x5¼	231.9	8.6:1
Sanford	2000	25.60	4	4 x4½	226.2	8.8:1
Selden	2000	22.5	4	3¾x5¼	231.9	8.6:1
Stegeman	2000	22.5	4	3¾x5¼	231.0	8.6:1
Schacht	2000	29.0	4	4¼x5½	312.0	6.4:1
Toledo	2000	27.2	4	4⅛x5¼	280.6	7.1:1
Tulsa	2000	27.2	4	4⅛x5¼	280.6	7.1:1
Universal	2000	22.5	4	3¾x5¼	231.9	8.6:1
Ware	2000	29.0	4	4¼x5½	312.	6.4:1
Wichita	2000	16.92	4	3¼x5	165.9	12.1:1

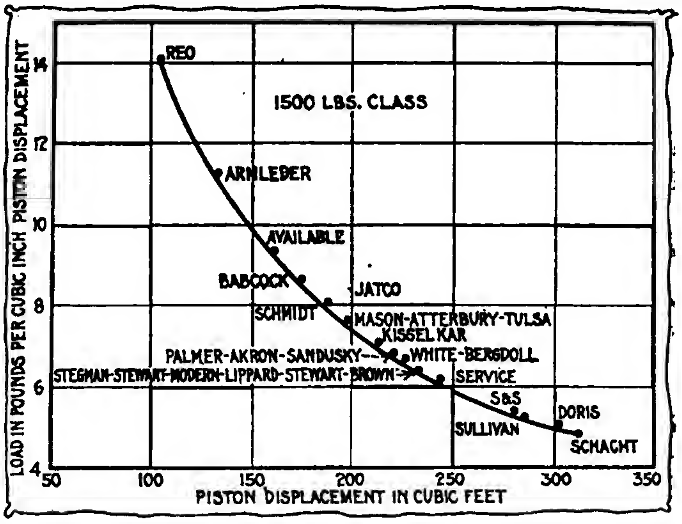


Fig. 2—Chart of the 1500-pound class, showing a decided tendency in load displacement between 6 and 8 pounds per cubic inch

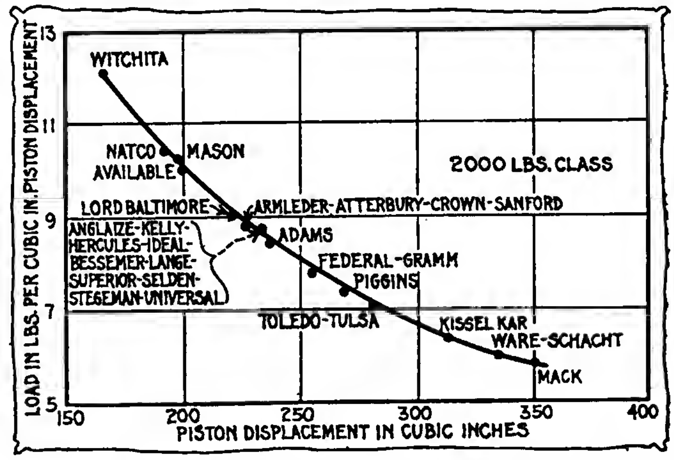


Fig. 3—Chart of the 2000-pounds class, a feature being that 10 makes of trucks are fitted with the same size engines

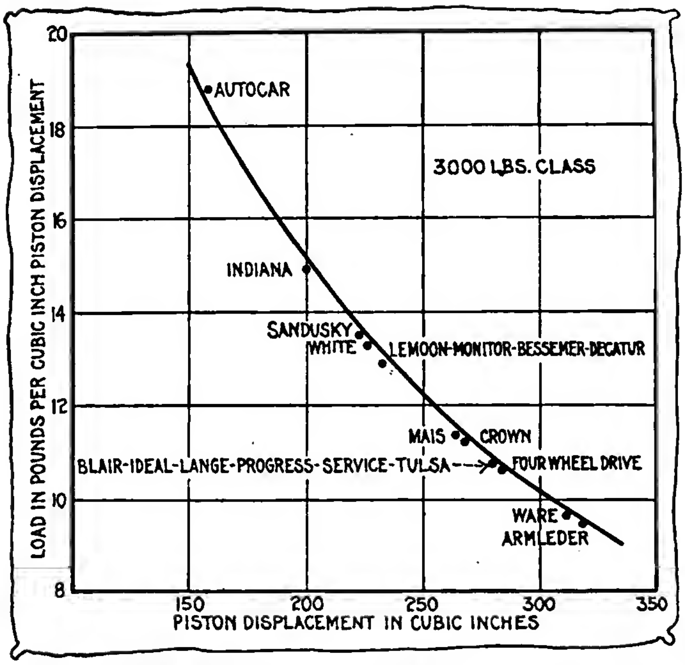


Fig. 4—The chart of the 3000-pound class shows two distinct tendencies

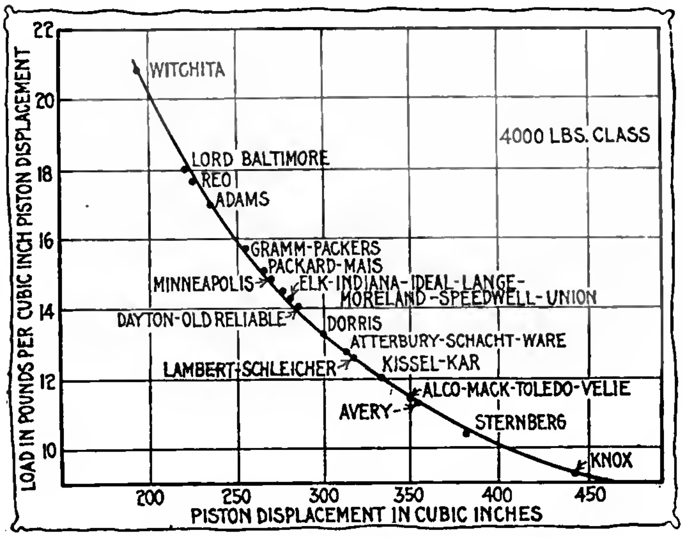


Fig. 5—The chart shows that the 4000-pound class is well represented

Of this there are thirty-four 2-ton models. The average horsepower is 28.8 and the average ratio of useful load in pounds per cubic inch of piston displacement is 13.16.

The Knox is fitted with the largest engine, having a piston displacement of 431.9 cubic inches, the ratio of which is 9.3 pounds useful load per cubic inch. This same size of engine is used in the Knox 3-ton chassis.

The average bores of the engines of this class range from 4 to 4.5 inches, the strokes varying from 5 to 5.5 inches.

5,000 to 6,000-Pound Class

¶ This class is represented in the tabulation by thirty-three models, four of which are 5,000-pound capacity and the rest 6,000-pound trucks. The horsepowers and load displacement ratios differ considerably, as can be seen by the length of the curve in Fig. 6, so the average horsepower is the best criterion for the class, this being 32.69, and the average ratio 17.76 pounds useful load per cubic inch of piston displacement. The chart, Fig. 6, shows that the piston displacement of the majority of the trucks is between 350 and 400 cubic inches and the ratio

Load Capacity and Piston Displacement of Trucks of 3000 and 4000 Pounds

NAME	Load Capacity in Pounds	Society Automobile Engineers, Horsepower	Number of Cylinders	Bore and Stroke	Piston Displacement in Cubic Inches	Ratio of Load in Pounds per Cubic Inch of Piston Displacement
Avery	4000	36.15	4	4¾x5	354.4	11.3:1
Adams	4000	24.22	4	3⅞x5	235.8	17:1
Armleder	3000	32.4	4	4½x5	318.1	9.4:1
Atterbury	4000	29.0	4	4¼x5½	312.	12.8:1
Alco	4000	32.4	4	4½x5½	349.9	11.4:1
Autocar	3000	18.10	2	4¾x4½	159.5	18.7:1
Bessemer	3000	22.5	4	3¾x5¼	231.0	12.9:1
Blair	3000	27.20	4	4⅛x5¼	280.6	10.7:1
Crown	3000	27.20	4	4⅛x5	267.3	11.2:1
Decatur	3000	22.5	4	3¾x5¼	231.9	12.9:1
Dorris	4000	30.65	4	4⅜x5	300.7	13.3:1
Durable Dayton	4000	29.0	4	4¼x5	283.6	14.1:1
Elk	4000	27.20	4	4⅛x5¼	280.6	14.3:1
Four-Wheel Drive	3000	29.0	4	4¼x5	283.6	10.6:1
Gramm	4000	29.	4	4¼x4½	255.3	15.7:1
Indiana	3000	25.60	4	4 x4	201.1	14.9:1
Indiana	4000	27.20	4	4⅛x5¼	280.6	14.3:1
Ideal	3000	27.2	4	4⅛x5¼	280.6	10.7:1
Ideal	4000	27.2	4	4⅛x5¼	280.6	14.3:1
KisselKar	4000	32.40	4	4½x5¼	334.	12:1
Knox	4000	40.	4	5 x5½	431.9	9.2:1
Lambert	4000	32.4	4	4½x5	318.1	12.6:1
Lord Baltimore	4000	36.15	4	3¾x5	220.9	18:1
Lange	3000	27.2	4	4⅛x5¼	280.6	10.7:1
Lange	4000	27.2	4	4⅛x5¼	280.6	14.3:1
LeMoon	3000	22.5	4	3¾x5¼	231.9	12.9:1
Moreland	4000	27.2	4	4⅛x5¼	280.6	14.3:1
Mack	4000	32.40	4	4½x5½	349.9	11.4:1
Mais	3000	25.60	4	4 x5¼	263.9	11.3:1
Mais	4000	25.60	4	4 x5¼	263.9	15.1:1
Minneapolis	4000	29.0	4	4¼x4¾	269.4	14.8:1
Monitor	3000	22.5	4	3¾x5¼	231.9	12.9:1
Old Reliable	4000	29.00	4	4¼x5	283.6	14.1:1
Packers	4000	29.00	4	4¼x4½	255.3	15.7:1
Packard	4000	26.4	4	4 1/16x5⅛	265.7	15.1:1
Plymouth	4000	36.15	4	4¾x5	354.4	11.3:1
Progress	3000	27.20	4	4⅛x5¼	280.6	10.7:1
Reo	4000	25.6	4	4 x4½	226.2	17.7:1
Speedwell	4000	27.20	4	4⅛x5¼	280.6	14.3:1
Sternberg	4000	29.0	4	4½x6	383.0	10.4:1
Service	3000	27.20	4	4⅛x5¼	280.6	10.7:1
Sandusky	3000	22.5	4	3¾x5	220.9	13.5:1
Schleicher	4000	32.4	4	4½x5	318.1	12.6:1
Schacht	4000	29.0	4	4¼x5½	312.1	12.8:1
Toledo	4000	32.40	4	4½x5½	349.9	11.4:1
Tulsa	3000	29.20	4	4⅛x5¼	280.6	10.7:1
Union	4000	27.2	4	4⅛x5¼	280.6	14.3:1
Universal	4000	25.6	4	4 x5½	276.5	14.5:1
Velie	4000	32.4	4	4½x5½	349.9	11.4:1
Ware	3000	29	4	4¼x5½	312.	9.6:1
Ware	4000	29	4	4¼x5½	312.	12.8:1
Wichita	4000	19.61	4	3½x5	192.4	20.8:1
White	3000	22.5	4	3¾x5⅛	226.4	13.3:1

of load lies between 14.5 and 17 pounds useful load per cubic inch piston displacement.

The largest engine in this class, the Mack, is another example of the same size engine used in several classes. The 3-ton chassis does not have to be built extremely heavy and, while so many makers have not catered to it as the 1.5 to 2-ton type, or even the 2-ton type alone, nevertheless the size is one that is popular, it being the happy medium between the light and the heavy class. It is adapted to the long-distance haul, wherein lightness is an advantage and the motor has a better opportunity of turning over at a more even speed than in city work where traffic stops necessitate considerable fluctuations in the revolutions per minute and constant speed changing. The average horsepower for this class is 32.5, there being ten makers out of the thirty-three herewith scheduled who fit larger engines than the average.

7,000 to 8,000-Pound Class

¶ This class has not attracted as many makers as the one below it, namely, the 6,000-pound nor as many as the next larger, the 5-ton class. Eighteen models are represented in the tabulation, eleven belong to the 8,000-pound and seven to the 7,000-pound classes. With few exceptions the piston displacement of this class lies between 320 and 420 cubic inches. In order to strike a general average the class has been taken as a whole, the average horsepower being 34.4 and the average ratio of useful load is 20.55 pounds per cubic inch of piston displacement. The chart, Fig. 7, shows two curves, one for the 7,000-pound and one for the 8,000-pound chassis. In the 7,000-pound class the Alco has the largest piston displacement with a ratio of 14.3 pounds useful load per cubic inch displacement and the smallest, the De Dion Bouton, with a ratio of 23.3 pounds per cubic inch. One point that has not been mentioned so far is the question of engine speed and gear ratio. Quite aside from the question of piston displacement these two features have a direct bearing one upon the other, as well as upon the cylinder contents.

8,000 to 10,000 Class

¶ From the 8,000-pound chassis upwards the power of the motor is influenced, not only by the load to be carried, but also by the total weight of the chassis as well, the work to be performed and the nature of the country in which the vehicle is to operate. There would not be any advantage in fitting a motor larger than the average for this class, namely, 35, if the truck were intended for level roads, but this rated power might prove entirely inadequate, as it has in some cases, in very hilly districts. A more powerful motor would not only be advisable under certain circumstances, but sometimes imperative.

10,000 Pound Class

¶ This class covers twenty-three makes of trucks in the tabulation, all rated at 10,000-pound carrying capacity. The 5-ton truck has attracted many of the most prominent concerns in this country, and while it may be said that the greater number favor a motor with a piston displacement of between 400 and 500 cubic inches, yet there are ten makers who fit smaller motors and four who fit larger ones than this average. The average rated horsepower is 37.44, but this is below the horsepower actually developed. For an example of this one only has to look at the upper end of the curve and compare the four smallest engines. The White and the De Dion are rated the same but there is a difference of 14 cubic inches in displacement, as the De Dion has a longer stroke. The piston velocity in feet per minute might show an entirely different aspect as also would the gear ratios. The Vulcan is rated at 30.65 horsepower, while the Knicker-

Load Capacity and Piston Displacement of Trucks of 5000 and 6000 Pounds

NAME	Load Capacity in Pounds	Society Automobile Engineers Horsepower	Number of Cylinders	Bore and Stroke	Piston Displacement in Cubic Inches	Ratio of Load in Pounds per Cubic Inch of Piston Displacement
A & R	6000	40.0	4	5 x5¾	451.6	13.3:1
Avery	6000	36.15	4	4¾x5	354.4	17:1
Atterbury	6000	38.25	4	4⅞x5½	410.6	14.8:1
Blair	5000	32.4	4	4½x5½	349.9	14.3:1
Croxton	6000	27.20	4	4⅛x5½	294.	20.4:1
De Dion Bouton	5000	14.40	4	3 x4¾	134.3	36.5:1
Durable Dayton	6000	36.15	4	4¾x5½	389.9	15.3:1
Four-Wheel Drive	6000	36.15	4	4¾x5½	389.9	15.3:1
Gramm	6000	40.	4	5 x5	392.7	15.3:1
Indiana	6000	36.15	4	4¾x5	354.4	17:1
KisselKar	6000	38.25	4	4⅞x5	373.3	16.1:1
Knickerbocker	6000	32.40	4	4½x5	318.1	19:1
Knox	6000	40.00	4	5 x5½	431.9	13.9:1
Kadix	6000	32.40	4	4½x5½	349.9	17.1:1
Lewis	5000	29.00	4	4¼x5	283.6	17.6:1
Lord Baltimore	6000	36.15	4	4¾x5½	389.9	15.3:1
LeMoon	5000	27.20	4	4⅛x5¼	280.6	17.8:1
LeMoon	6000	32.40	4	4½x5½	349.9	17.1:1
Mais	6000	25.60	4	4 x5¼	263.9	22.3:1
Mack	6000	48.48	4	5½x6	570.2	10.5:1
Packard	6000	32.40	4	4½x5½	349.9	17.1:1
Pope Hartford	6000	.....	...	.....	.....	....
Peerless	6000	32.40	4	4½x6½	413.5	14.5:1
Progress	6000	32.40	4	4½x5½	349.9	17.1:1
Speedwell	6000	29.0	4	4¼x6¾	383.0	15.6:1
Standard	6000	32.4	4	4½x5½	349.9	17.1:1
Schleicher	6000	40.	4	5 x5	392.7	15:1
Schacht	6000	29.0	4	4¼x5½	312.	19.2:1
Universal	6000	25.60	4	4 x5½	276.5	21.7:1
U. S.	6000	32.4	4	4½x5½	349.9	17.1:1
Velie	6000	32.4	4	4½x5½	349.9	17.1:1
Vulcan	6000	30.65	4	4⅜x5½	330.7	18.1:1
Ware	6000	29.0	4	4¼x5½	312.	19.2:1
White	6000	22.5	4	3¾x5⅛	226.4	26.5:1

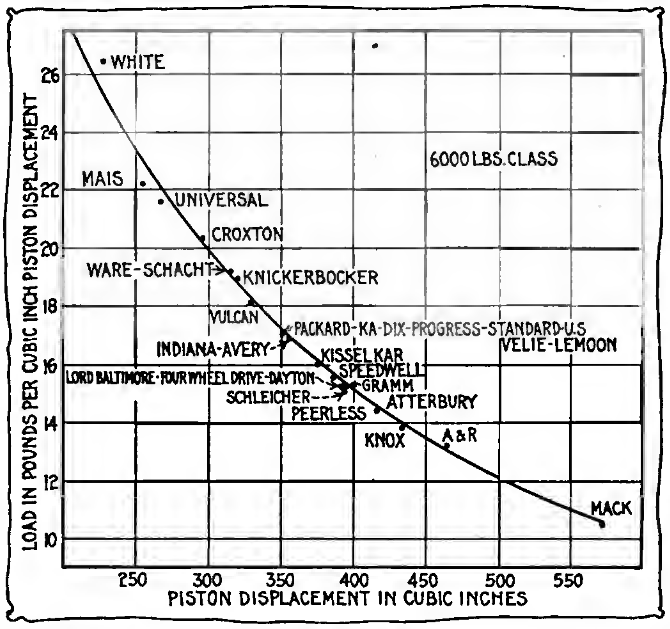


Fig. 6—The 6000-pound class is popular, but shows considerable diversity in ratio

Load Capacity and Piston Displacement of Trucks of 7000 and 8000 Pounds

NAME	Load Capacity in Pounds	Society Automobile Engineers Horsepower	Number of Cylinders	Bore and Stroke	Piston Displacement in Cubic Inches	Ratio of Load in Pounds per Cubic Inch of Piston Displacement
Alco	7000	40.	4	5 x6	481	14.5:1
Blair	7000	32.4	4	4½x5½	349.9	20:1
De Dion Bouton	7000	25.60	4	4 x 6	301.6	23.3:1
Elk	7000	32.4	4	4½x5½	349.9	20:1
KisselKar	8000	38.25	4	4⅞x5	373.3	21.1:1
Knickerbocker	8000	32.40	4	4½x5	318.1	25.1:1
Kadix	8000	32.40	4	4½x5½	349.9	22.8:1
King	7000	32.40	4	4½x5½	349.9	20:1
Kelly	7000	32.40	4	4½x6½	413.5	16.9:1
Longest	8000	40.00	4	5 x5½	431.9	18.7:1
Lord Baltimore	8000	36.15	4	4¾x5½	389.9	20.5:1
Packers	8000	44.20	4	5¼x6	519.5	15.4:1
Peerless	8000	32.40	4	4½x6½	413.5	19.3:1
Speedwell	8000	40.	4	5 x5	392.7	20.3:1
Sternberg	8000	36.15	4	4¾x5½	389.9	20.5:1
Schacht	8000	29.00	4	4¼x5½	312.	25.6:1
Transit	7000	32.40	4	4½x5	318.1	22:1
Vulcan	8000	30.65	4	4⅜x5½	330.7	24.2:1

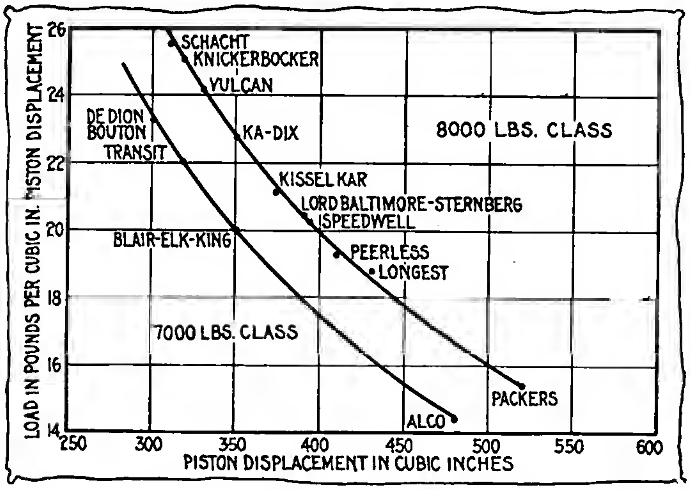


Fig. 7—The 7000 and 8000-pound classes, charted together, showing a slight variation in load-displacement ratio

bocker is rated at 32.4, and, when piston displacement is considered, the Vulcan shows 14 cubic inches more.

The curve, Fig. 8, is a very interesting one as it shows the differences of opinion of the designers of the various makers therein represented. It must be admitted that a variation between 32 pounds and 14 pounds useful load per cubic inch of piston displacement is a very wide range, but on carefully analyzing the chart it will be seen that there are only four makers who run below 21 pounds, so that in point of fact the range is nearer 20 to 30 pounds.

11,000 Pounds and Upwards

¶ Trucks with a load capacity of 10,000 and upwards must necessarily be made heavy to carry the weight of the load and when the weight of the body and chassis are added it is no uncommon occurrence to find that the combined weights total 20,000 pounds and over. Engines with 5-inch bore seem to be the general average for this class, and as the speed of these vehicles must necessarily be restricted if the tires are to last any length of time irrespective of the excessive vibration that is engendered above a certain speed which is most detrimental to the entire mechanism, this size of motor should seem to be ample for most conditions. The solution of the load displacement ratio problem in the case of this class seems to lie in the degree of efficiency of the motor and the correct speed reduction ratios, be they in the gearbox or the final reduction at the sprockets. The initial effort to move this weight from rest must involve a great strain upon the entire mechanism and as speed is not the main factor, general efficiency is more to be sought. This class of truck is primarily intended for the short to medium haul and its handling must be understood in order to obtain satisfactory results.

In order to show at a glance the variations in motor capacity as compared with load ratio in the various classes of trucks Fig. 9 has been prepared. It will be noticed that the curves representing the different capacities are more or less the true arcs of circles and in many cases these have a common radius.

While it is true that a small motor may be more efficient than one considerably larger or a large motor may be more economical than a smaller one of a different make, nevertheless, in order to understand the question of motor capacity as compared with load ratio, it will perhaps be better to strike a general average. It cannot be stated too emphatically that piston displacement *per se* is not the most important factor in engine analysis, as by it alone very little can be determined. It must be presumed that other conditions are equal, such as engine speed, compression, valve area, carburetion, ignition and transmission efficiency. With this clearly in mind, the accompanying tables have been analyzed and the following figures obtained showing the average S. A. E. rated horsepower and the average ratio of load in pounds per cubic inch piston displacement for the various classes of trucks for 1913.

Load Capacity and Piston Displacement of Trucks of 10,000 Pounds and Over

NAME	Load Capacity in Pounds	Society Automobile Engineers Horsepower	Number of Cylinders	Bore and Stroke	Piston Displacement in Cubic Inches	Ratio of Load in Pounds per Cubic Inch of Piston Displacement
A. I. C.	10000	29.0	4	4⅜x6⅜	383.0	26.1:1
Atterbury	10000	38.25	4	4¾x5¾	410.6	24.4:1
Alco	10000	40.	4	5 x6	481.	20.8:1
De Dion Bouton	10000	29.	4	4¼x6	340.4	29.3:1
Durable Dayton	10000	44.20	4	5¼x7	606.1	16.5:1
Elk	10000	32.4	4	4½x5½	349.9	28.8:1
Gramm	10000	40.	4	5 x5	392.7	25.4:1
KisselKar	10000	38.25	4	4⅞x5	373.3	26.5:1
Knickerbocker	10000	32.40	4	4½x5	318.1	31.4:1
Kadix	10000	32.40	4	4½x5½	349.9	28.8:1
Lewis	10000	36.15	4	4¾x5½	389.9	25.6:1
Locomobile	10000	40.	4	5 x6	471.2	21.2:1
Lord Baltimore	10000	44.20	4	5¼x7	606.1	16.5:1
Mack	10000	48.48	4	5½x6	570.2	17.5:1
Old Reliable	10000	36.15	4	4¾x5½	389.9	25.6:1
Packard	10000	40.00	4	5 x5½	431.9	23.1:1
Pierce Arrow	10000	38.25	4	4⅞x6	448.0	20.1:1
Peerless	10000	32.40	4	4⅝x6	413.5	24.2:1
Sternberg	10000	36.15	4	4¾x5½	389.9	25.6:1
Stearns	10000	36.15	4	4⅝x6	414.2	24.1:1
Schleicher	10000	57.70	4	6 x6½	735.1	13.6:1
Vulcan	10000	30.65	4	4⅜x5½	330.7	30.2:1
White	10000	29.0	4	4½x5⅛	326.3	30.7:1
Aries	14000	40.0	4	5 x5¾	451.6	31:1
Alco	13000	40.0	4	5 x6	481.	27:1
Mack	15000	48.48	4	5½x6	570.2	26.3:1
Speedwell	12000	40.	4	5 x5	392.7	30.5:1
Vulcan	12000	36.15	4	4¾x5½	389.9	30.7:1

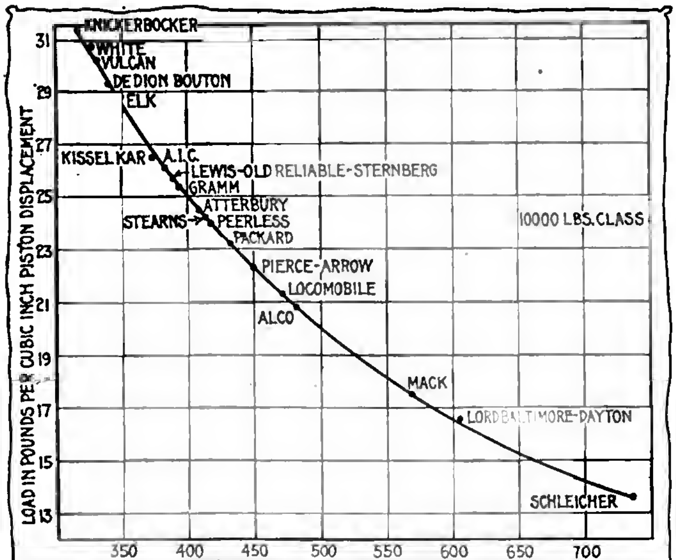


Fig. 8—The 10,000-pound class is represented by twenty-one makers, the ratio varying from 31 to 14 pounds per cubic inch piston displacement

Average Horsepower of 200 Truck Motors

Load in Pounds	Average Horsepower	Average ratio in pounds useful load per cubic inch piston displacement
1500 and under	22.5	6.96:1
2000	25.	8.47:1
3000—4000	28.8	13.16:1
5000—6000	32.7	17.76:1
7000—8000	34.4	20.55:1
10,000	37.4	24.17:1
11,000—15,000	40.9	29.06:1

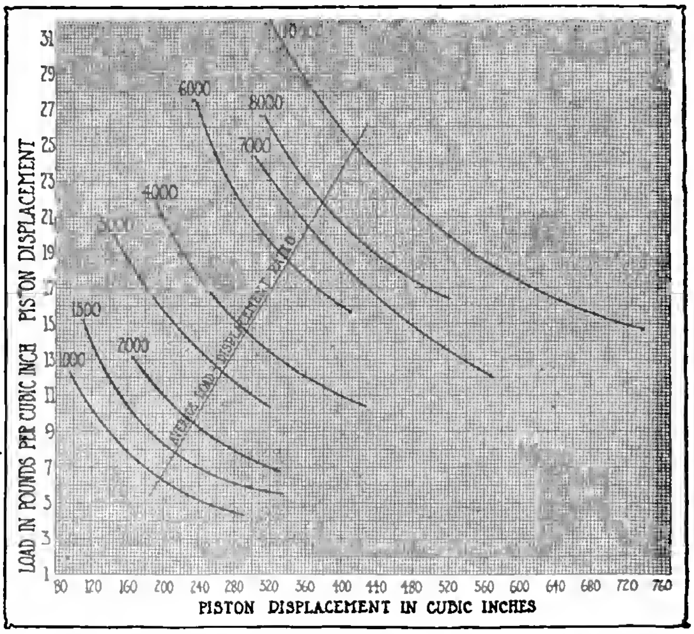


Fig. 9—Composite chart showing the different load-capacity ratio curves of various makes of trucks as well as the average load-displacement ratio

The Gasoline Truck

Trucks and Delivery Vehicles Classified According to Load Capacity; Price and Body Sizes

Facts for the Buyer

THE field of commercial vehicles has considerably broadened during the last year and at present the buyer has a greater variety of offerings than heretofore. Despite the fact that several makers have abandoned truck manufacture there are, in round figures, twenty more makers listed herein this year than last. The number of models has also materially increased by about 100.

The 1-ton class finds the largest number of adherents, next to which in point of numbers comes the 3-ton class. The 2-ton class, with forty-eight models, ranks third. The 5-ton category shows a total of forty-five models, the same number being true of the 1,500-pound class. There are thirty-four types of chassis offered in the 1,000-pound class, ranging anywhere from the 400-pound utility wagon to the 1,000-pound inclosed panel body style.

There seems to be considerable diversity of opinion upon the matter of price, and owing to the considerable variations that will be found by a careful scrutiny of the tabulations the buyer's choice will largely depend upon the peculiar conditions met within his business as to his requirements.

The general average price for the 1,000-pound wagon is anywhere between \$750 to \$850. The 1,500-pound wagon, however, does not seem to offer any happy medium, as one make of car lists around \$800 whereas another with the same capacity lists at \$2,500. The general average of prices runs between \$1,400 and \$1,700, naturally with some above and some below these figures.

The 1-ton capacity class which has already been mentioned offers the buyer the greatest choice from the point of view of number of models. The prices range from \$1,000 to \$2,250 with perhaps a mean average of \$1,750 to \$1,800, for the chassis.

The 3,000-pound class is not so important from the point of view of numbers as the 1-ton. The prices range from \$1,750 to \$3,000 with a mean average of \$2,400. The 2 to 2.5-ton class ranges between \$1,800 and \$3,500 with an average of \$2,800 to \$3,000. The 3 to 3.5-ton class ranges between \$2,700 and \$4,000 with an average of \$3,400 to \$3,500. The 4-ton class ranges in price from \$3,200 to \$4,500, averaging slightly less than \$4,000. The 5-ton contingent range between \$4,000 and \$5,000 in price, with a few selling for less than \$4,000.

Vehicles Under 1-Ton Capacity

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	LOAD SPACE Width	LOAD SPACE H'ght	LOAD SPACE Length	Over-all Length
Akron, A	1500	\$1350	Panel	\$1500	4' 6"	4' 6"	6'	13'8"
Akron, A	1500	1350	Express	1475	4'	......	6'	13'8"
Akron, A	1500	1350	Open Ex.	1460	4'	......	6'	13'8"
Akron, A	1500	1350	Stake	1475	4'	......	6'	14'9"
Anglaize, B	1500	1000	Express	1050	3'10"	......	7'11"	8'1"
Armleder, C	1500	1250	Open Ex.	1375	4'	......	7'	16'
Armleder, C	1500	1250	Express	1400	4'	5' 4"	7'	16'
Armleder, C	1500	1250	Panel	1500	3' 6"	5' 2"	5' 2"	13'
Armleder, C	1500	1250	Stake	1325	4'	3'10"	7'	16'
Atterbury, A	1500	......	Optional	......	3' 6"	5'	6' 6"	14'
Available, 15	1500	800	Express	875	3 8"	1'	7'	10'6"
Available, 15	1500	800	Closed	925	3' 8"	4' 6"	7'	10'6"
Available, 15	1500	800	Panel	1000	3' 8"	4' 6"	7'	10'6"
Available, 15	1500	800	Stake	875	3' 8"	4' 6"	7'	10'6"
Bessemer, K	1000	1150	Open Ex.	1250	3'10"	......	7'	13'
Bessemer, K	1000	1150	Stake	1225	5'	......	7' 6"	13'6"
Bessemer, K	1000	1350	Panel	1350	3' 8"	......	7'	13'
Bessemer, K	1000	1150	Furnit	1250	5'	......	7' 6"	13'6"
Best, A and B	1000	......	......	......	......	......	......	10'
Brockway, A	1000	......	Express	950	3' 8"	10"	6' 2"	9'6"
Brockway, A	1000	......	Panel	1100	3' 8"	5'	5' 6"	9'
Brooks, A	800	600	......	625	3'	......	5' 6"	10'
Brooks, B	800	600	......	650	3'	4' 6"	5'	10'
Brooks, C	800	600	......	675	3'	4' 6"	5'	10'
Brown	1500	1600	Open Ex.	......	3' 8"	2' 8"	7' 6"	14'7"
Brown	1500	1600	Panel	......	3' 8"	2' 8"	7' 6"	14'7"
Brown	1500	1600	Stake	......	4' 6"	3' 8"	7' 6"	14'7"
Brown	1500	1600	Screen	......	3 8"	2' 8"	7' 6"	14'7"
Bucklen, A	1500	1400	Op. Ex.	1450	3' 9"	......	9' 2"	9'3"
Bucklen, A	1500	1400	Stake	1490	5' 5"	......	10'	10'
Bucklen, A	1500	1400	Delivery	1490	3' 9"	5'	7' 6"	7'9"
Cameron	800	......	Express	725	3'	4' 7"	4' 8"	12'
Cameron	800	......	Van	775	3'5½"	4' 7"	6' 3"	12'
Chase, M	500	......	Express	500	4' 4"	......	4'10"	10'5"
Chase, M	500	500	Panel	600	4' 4"	2' 9"	4'10"	10'5"
Chase, D	1000	855	Express	900	3' 6"	......	5' 6"	12'6"
Chase, D	1000	855	Stake	950	Opt...	......	Opt...	12'6"
Chase, D	1000	855	Panel	1050	3' 8"	5'	5'	12'6"
Cino, 440-D	1500	1300	......	1600	3'10"	4'10"	5'	1?'8"
Crawford, 13-30	1200	1300	Delivery	1450	3' 8"	5'	6'	13'
Crawford, 13-30	1200	1300	Delivery	1400	3' 8"	5' 2"	6'	13'
Crown, A	\$1500	\$1250	......	\$1350	3' 8"	4' 2"	6'	13'6"
Dart	......	950	Optional	......	Opt...	Opt...	Opt...	Opt...
Day-Utility, D	......	......	Combi	1500	Opt...	Opt...	Opt...	Opt...
Detroit, 111	1000	900	Open Ex.	950	3' 8"	......	5' 6"	12'
Detroit, 111	1000	900	Stake	950	3' 9"	......	5' 6"	12'
Detroit, 111	1000	900	Panel	975	3' 8"	......	5' 6"	12'
Detroit, 111	1000	900	Panel	985	3' 8"	......	5' 6"	12'
Dispatch, L	1000	800	Panel	900	3'	4' 9"	7'	14'6"
Dispatch, L	1000	800	Delivery	850	3'	......	7'	14'6"
Dispatch, L	1000	800	Furnit	850	3'	......	7'	14'6"
Dispatch, L	1000	800	Laund'y	900	3'	......	7'	14'6"
Dispatch, N	1000	800	Grocer	850	3'	......	6'	14'6"
Dorris H	1500	2100	Optional	......	Opt.	Opt.	Opt...	Opt...
Ford, T	1000	750	Optional	......	Opt...	Opt...	Opt...	Opt...
Gabriel, G	......	900	Optional	......	......	......	......	......
Geneva, B	1200	1250	Open Ex.	1300	3' 9"	......	5' 3"	12'
Geneva, C	1000	1250	Panel	1350	3' 9"	4' 8"	4'10"	12'
Gleason, 10	1000	......	Open Ex.	1050	3' 6"	......	6'	14'
Gleason, 10	1000	......	Canopy	1100	3' 6"	6'	6'	14'
Gleason, 10	1000	......	Panel	1150	3' 6"	6'	6'	14'
Handy Wagon	500	390	Optional	......	2' 7"	......	2' 8"	8'6"
Handy Wagon	800	487	Optional	......	2' 3"	......	3'10"	8'6"
Hart-Kraft, B	1000	......	Optional	825	......	......	......	......
Hart-Kraft, BX	1500	......	Optional	900	......	......	......	......
Hart-Kraft, G	1500	1800	Express	1950	......	......	......	......
Hart-Kraft, G	1500	1800	Panel	250	......	......	......	......
Hatfield, J	1000	850	Express	950	3' 8"	......	6' 6"	10'6"
Hatfield, J	1000	850	Stake	950	4'	......	7' 6"	11'6"
Hatfield, K	......	......	Optional	Opt...	Opt...	Opt...	Opt...	Opt...
Hupmobile, HT	800	850	Panel	950	3' 4"	4'10"	4' 4"	6'
Ideal, I	1500	1500	Optional	......	Opt...	Opt...	Opt...	Opt...
I. H. C., A	1000	......	Open Ex.	......	3' 6"	10'	6' 4"	......
I. H. C., M	......	......	Optional	......	Opt...	Opt...	Opt...	Opt...
Kearns, A	1000	850	Laund'y	1150	Opt...	Opt...	Opt...	Opt...
Kearns, A	1225	850	Optional	......	3' 5"	4' 7"	5'	......
Kearns, A	1075	850	Optional	1150	Opt...	Opt...	Opt...	Opt...
KisselKar	1500	1500	Stake	1625	3' 8"	......	6' 9"	......
KisselKar	1500	1500	Express	1625	3' 8"	......	6' 9"	......

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	LOAD SPACE			Over-all Length
					Width	H'ght	Length	
Klinekar, 2-16	1250	$1250	Optional	......	Opt...	Opt...	Opt...	Opt..
Koehler	1600	725	Open Ex.	$750	3' 8"	4' 8"	7'	12'
Koehler	1600	725	Can. Top	790	3' 8"	4' 8"	7'	12'
Koehler, A	1600	725	Closed...	800	3' 8"	4' 8"	6' 6"	12'
Koehler	1600	725	Panel....	900	3' 8"	4' 8"	7'	12'
Koehler, B	1000	725	Panel....	825	3' 8"	4' 8"	7'	12'
Koehler	1600	725	Stake....	775	3' 8"	4' 8"	7'	12'
Krebs, A	1500	1375	Express..	1510	3' 9"	......	8'	8'6"
Krebs, A	1500	1375	Screen...	1550	3' 9"	4' 6"	8'	8'6"
Krebs, A	1500	1375	Stake....	1510	3' 6"	......	8'	8'6"
Lambert	1500	1125	Panel....	1300	3' 8"	......	6'	......
Lambert	1500	1125	Stake....	1200	3' 8"	......	6'	......
Lambert	1500	1125	Express..	1200	3' 8"	......	6'	......
Lincoln, 27	800	625	Panel....	785	......	......	......	......
Lincoln, 29	800	625	Open Ex	685	......	......	......	......
Lipp.-Stewart, B	1500	1650	Panel....	......	3' 9"	4'10"	7'	15'
Lipp.-Stewart, B	1500	1650	Stake....	......	4'10"	......	7'	16'
Lipp.-Stewart, B	1500	1650	Express.	......	3' 9"	4'10"	7'	15'1½"
Luck Utility	1000	......	Delivery.	......	......	......	......	......
Marmon	1500	2500	Optional	......	Opt...	Opt..	Opt ..	Opt...
Mason, 12	1000	......	Delivery.	800	3' 6"	4'	3' 7"	12'
Mason, 12	1200	......	Open Del.	800	3' 6"	......	5' 5"	12'
Mason, 10	1600	......	Delivery.	1000	3' 6"	......	7' 2"	13'
Menominee, A	1500	1125	Express..	1200	3' 6"	......	6' 6"	13'6"
Menominee, A	1500	1125	Stake....	1200	5'	......	7'	14'6"
Menominee, A	1500	1125	Panel....	1300	3' 6"	......	6' 6"	13'6"
Mercury, P	1000	......	Panel ...	875	3' 3"	5'	7' 2"	9'
Mercury, P	1000	......	Open Ex.	750	3' 3"	......	7' 2"	9'
Mercury, P	1000	......	Panel...	900	3' 3"	5'	7' 2"	9'
Modern, B	1000	1200	Optional	......	3' 8"	1'	6'	14'
Modern, BX	1000	1350	Optional	......	......	......	......	......
Modern, BR	1000	1225	Optional	......	3' 8"	1'	8'	14'
Modern, A	1500	......	Open Ex.	1750	3' 9"	1'	7' 6"	15'8"
Modern, AX	1500	......	Open Ex.	1750	3' 9"	1'	10'	15'8"
Mora, 20	1500	950	Open Ex.	1000	3' 0"	......	6' 8"	12'9"
Mora, 20	1500	950	Open Ex.	1064	3' 9"	......	8'	14'2"
Mora, 20	1500	950	Open Ex.	1178	5' 9"	5'	8'	14'2"
Mora, 20	1500	950	Grocery..	1200	3' 9"	5'	6' 8"	12'9"
McIntyre, E	1500	1500	Optional	......	5'	......	8' 3"	15'4"
Moore, C	1500	1350	Optional	......	3' 8"	......	6' 8"	13'1"
Motorette, L1	400	......	Delivery.	400	2' 7"	1'11"	3' 3"	9'4"
Motorette N1†	500	......	Delivery.	500	2' 7"	2' 3"	4'	9'
Oliver, A	1500	1250	Express..	1350	3' 8"	......	6'	12'
Oliver, A	1500	1250	Screen...	1400	3' 8"	4' 6"	6'	12'
Oliver, A	1500	1250	Panel....	1450	3' 8"	4' 6"	6'	12'
Oliver, A	1500	1250	Brew'y..	1400	4' 1"	4' 6"	6'	12'
Oliver, B	1500	......	Optional	2200	Opt...	Opt...	Opt...	Opt...
Reo, H	1500	700	Express..	750	4'	......	6'	11'
Reo, H	1500	700	Stake....	750	4'	......	7'	12'
Rowe, A	1500	......	......	......	......	......	......	......
Sandusky, B	1500	1650	Express..	1750	3'10"	1' 3"	7' 6"	......
Sandusky, B	1500	1650	Panel....	1800	3'10"	5' 6"	6' 6"	......
Sandusky, B	1500	1650	Stake....	1750	3'10"	......	7' 6"	......
Schacht, MB4	1800	......	Delivery.	......	......	......	......	......
Schmidt	1000	975	Open Ex.	......	Opt...	Opt...	Opt...	Opt...
Schmidt	1500	1025	Optional	......	Opt...	Opt...	Opt...	Opt...
Seitz	1500	1500	Optional	......	Opt...	Opt...	Opt...	Opt...
Service, J	1500	......	Open Ex.	......	4'	......	8'	15'6"
Service, J	1500	......	Panel....	......	3' 6"	4' 6"	8'	15'6"
Service, J	1500	......	Stake....	......	5' 6"	......	8'	15'6"
Stegeman	1500	1600	Panel....	......	4'	......	8'	13'
Stewart	1500	1650	Panel....	1800	3' 9"	5'	7'	14'6"
Stewart	1500	1650	Express..	1775	3' 9"	5'	7'	14'6"
Stewart	1500	1650	Stake....	1775	5'	......	7'	14'6"
Stewart	1500	1650	Open Ex.	1775	3' 9"	......	7'	14'6"
Sullivan, 20	1000	925	Optional	1050	3' 2"	4' 9"	5' 1"	8'6"
Sullivan, 51	1500	950	Furnit...	1125	3'10"	......	9'	......
Sullivan, 51	1500	950	Coal.....	1125	3'10"	......	7' 6"	......
Sullivan, 51	1500	950	Plumb'r.	1075	3'10"	......	7' 6"	......
Sullivan, 51	1500	950	Stake....	1090	4'	......	7' 6"	......
Tulsa, 10	1500	1500	Express..	1650	Opt...	11'	8'	15'
Wagenhals	800	......	Open Ex.	600	3' 4"	2' 6"	5'10"	12'6"
Wagenhals	800	......	Cl. Ex...	600	3' 4"	2' 6"	5'10"	12'6"
Warren, 12-30	1000	......	Express..	1325	......	......	......	......
White, GBE	1500	2100	Express..	2250	3' 7"	5'	6'10"	14'10"
White, GBE	1500	2100	Platf'm..	2250	5'	2'	6'10"	14'10"
Wolverine, C	1000	800	Express .	850	3' 6"	1'	6'	11'3"
Wolverine, C	1000	800	Panel....	900	3' 6"	3' 6"	6'	11'3"
Wolverine, C	1000	$800	Stake....	$875	4'	......	6'	11'[illegible]
Zimmerman, T	800	450	Open Ex.	700	3'	2' 6"	5' 6"	8'6"

Vehicles of 1-Ton Capacity

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	LOAD SPACE			Over-all Length
					Width	H'ght	Length	
Adams, A	3000	......	Optional	$2100	3'10"	......	8'10"	......
Angiaize, D	2000	$1850	Optional	1900	......	......	......	......
Armleder, B	2000	2200	Express .	2300	4' 4"	......	8'	18'
Armleder, B	2000	2200	Express .	2350	4' 4"	6'	8'	18'
Armleder, B	2000	2200	Screen...	2400	4' 4"	6'	8'	18'
Armleder, B	2000	2200	Panel....	2450	4' 4"	6'	7'	18'
Armleder, B	2000	2200	Stake....	2300	4' 4"	6'	8'	18'
Atterbury, B	2000	......	Optional	......	4'	5' 6"	8'	16'
Available, 24	2000	1250	Express..	1350	3' 8"	1' 2"	7' 6"	11'6"
Available, 24	2000	1250	Stake....	1350	3' 8"	1' 2"	7' 6"	11'6"
Available, 24	2000	1250	Grocery..	1400	3' 8"	4' 6"	7' 6"	11'6"
Available, 24	2000	1250	Panel....	1500	3' 8"	4' 6"	7' 6"	11'6"
Autocar, 21	3000	2150	Optional	......	Opt...	Opt...	Opt...	Opt...
Beck	2000	......	Platf'm..	1250	4' 6"	4'	9' 6"	16'
Bergdoll, C-30	2600	......	Ex-Del..	1600	......	......	......	......
Bessemer, B	2000	1800	Express..	1900	4'	5'	8' 6"	14'6"
Bessemer, B	2000	1800	Stake....	1880	5'	......	9'	15'
Bessemer, B	2000	1800	Panel....	2000	3' 9"	4'	8'	14'
Bessemer, C	3000	1800	Express.	2250	4'	4'	10'	15'6"
Bessemer, C	3000	1800	Stake....	2175	5'	......	10' 6"	15'6"
Bessemer, C	3000	1800	Panel....	2300	3' 9"	3' 5"	9' 6"	15'6"
Best	Opt.	......	Optional	......	Opt...	Opt ..	Opt...	Opt...
Blair, C	3000	3000	Express..	3150	4' 6"	1'	10'	15'6"
Brockway, B	2000	......	Express..	1250	3' 8"	1' 2"	4' 6"	10'6"
Brockway, B	2000	......	Panel....	1450	3' 4"	5'	6' 6"	10'
Brockwey, C	2500	2500	Express..	1400	3' 8"	1' 2"	7' 6"	10'6"
Brockway, C	2500	......	Panel....	1600	3' 4"	4'10"	6' 6"	10'2"
Bucklan, B	3000	1700	Open Ex.	1795	3' 9"	......	9'	17'6"
Bucklen, B	3000	1700	Stake....	1825	5' 5"	......	10'	17'6"
Cameron	2000	1300	Express..	1400	3' 7"	1' 4"	8' 2"	......
Cameron	2000	1300	Stake. ..	1400	4'	1' 3"	8' 6"	13'
Cameron	2000	1300	Express..	1400	3' 7"	1' 3"	8' 2"	13'
Cass	2500	1850	Optional	2000	Opt...	Opt...	Opt...	Opt...
Chase, H	2000	1200	Express..	1250	3' 9"	......	6' 6"	13'3"
Chase, H	2000	1200	Stake....	1300	3' 9"	......	6' 4"	13'3"
Chase, H	2000	1200	Panel....	1450	3' 9"	4'10"	6'	13'3"
Chase, K	2000	1350	Express..	1400	3' 9"	......	6' 6"	13'3"
Chase, K	2000	1350	Stake....	1450	3' 9"	......	6' 4"	13'3"
Chase, K	2000	1350	Panel....	1600	3' 9"	4'10"	6'	13'3"
Chase, L	3000	1675	Express..	1750	4'	......	7' 6"	[illegible]
Chase, L	3000	1675	Stake....	1825	4'	......	7' 6"	[illegible]
Chase, L	3000	1657	Panel....	1950	Opt...	Opt...	Opt...	14'
Clark, C	Opt...	2000	Optional	......	......	......	......	14'
Clark, D	......	2000	......	......	......	......	......	14'
Clark, E	Opt...	2150	......	......	......	......	......	16'
Colemen	2000	1800	Open Ex.	1900	3' 8"	......	8' 4"	14'2"
Coleman	2000	1800	Express..	2000	3' 8"	......	8' 4"	14'2"
Coleman	2000	1800	Stake....	1900	3'10"	......	10'	14'10"
Continental, AE	3000	1850	Optional	1950	4'	6'	11'	15'
Continental, AE	2000	1850	Optional	2000	4'	1'	12'	10'
Crescent	2000	......	Optional	......	......	......	......	......
Crown, B	2000	1450	....	1550	3' 8"	1' 2"	7'	14'6"
Crown, C	3000	2000	....	2125	Opt...	1' 2"	Opt..	16'
Dart	3000	1800	Box....	......	4'	......	8' 4"	......
Decatur, B	3000	2500	Stand...	......	Opt...	Opt...	Opt ..	Opt...
Diamond, T-J	3000	2250	Optional	Opt...	Opt...	Opt..	Opt...	Opt...
Eclipse, B-2	2000	1900	Stake ...	2000	Opt...	Opt...	Opt...	Opt ..
Eclipse, B-2	2000	1900	Express..	2000	Opt..	Opt...	Opt...	Opt...
Eclipse, B-2	2000	1900	Express..	2030	Opt...	Opt..	Opt...	Opt ..
Eclipse, B-2	2000	1900	Panel....	2100	Opt..	Opt...	Opt..	Opt .
Eclipse, B-2	2000	1900	Stake....	2000	Opt...	Opt...	Opt...	Opt .
Erving	3000	......	Optional	......	......	......	......	......
Federal, C	2000	1800	Optional	......	Opt...	Opt...	Opt...	Opt...
Federal, D	2000	1800	Optional	Opt...	Opt...	Opt...	Opt...	Opt...
Four-Wheel Drive, G	3000	3600	Stake....	3750	5'	3'	11'	11'4"
Gabriel, H	......	1350	Optional	......	......	......	......	......

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	Load Space Width	Load Space H'ght	Load Space Length	Over-all Length
Gabriel, J		$2200	Optional					
G. M. C., VC	2500		Optional		Opt...	Opt...	Opt...	Opt...
Gramm, 1	2000	1750	Optional		Opt...	Opt...	Opt...	Opt...
Hart-Kraft, E	2000							
Hart-Kraft, C	3000							
Hercules, E	2000		Express	$1775	4' 6"	1'	9' 6"	15'
Hercules, E			Stake					
Ideal, H	2000	1750	Optional		Opt...	Opt...	Opt...	Opt...
Ideal, H-2	2000	2000	Optional		Opt...	Opt...	Opt...	Opt...
Ideal, G	3000	2250	Optional		Opt...	Opt...	Opt...	Opt...
Indiana, H	3000	2000	Optional		Opt...	Opt...	Opt...	Opt...
Johnson, A	2000		Express	2000				
Johnson, A	2000		Stake	2000				
KisselKar	2000	2000	Optional	2125	3' 8"		8'	
Kelly, K-30	3000	2100	Optional	2250	4' 5"		9'	
Kopp, H	3000		Platf'm.	2500				
Lambert	2000	1700	Stake	1800				
Lambert	2000	1700	Express	1800				
Lange, C	2000	2250	Optional		3' 8"	Opt...	7' 6"	13'6"
Lange, D	3000	2600	Optional		4' 2"	Opt...	8' 6"	14'6"
Lauth-Juerg., K	2000	2100	Optional		Opt...	Opt...	Opt.	Opt.
Little Giant, D	2000	1050	Open Ex.	1100	3' 8"	1' 1"	7' 6"	12'7"
Little Giant, D	2000	1050	Optional	1150	3' 8"	4'10"	7' 6"	12'7"
Little Giant, D	2000	1050	Optional	1200	3' 4"	4'10"	6' 6"	11'11"
Lord Balti., C	2000	2100	Stake		Opt...		9' 6"	17'6"
Mack, 1 ton	2000	2500	Optional		Opt...	Opt...	9' 6"	17'6"
Mack, 1½ ton	3000	2750	Optional		Opt...	Opt...	Opt...	Opt...
Mais	3000	2750	Optional					
McIntyre, A	3000	2300	Express	2450	5'		Opt...	Opt...
Menominee, B	2000	1400	Express	1500	3' 8"		8' 6"	15'7"
Menominee, B	2000	1400	Stake	1500	5'		8' 6"	15'7"
Monitor, D	2000	1700	Express	1750	4'		8'	11'
Monitor, C	2000	1600	Stake	1650	4'		8'	11'
Monitor, E	3000	1850	Express	1950	4'		9'	13'
Moreland, B	2000		Optional		Opt.	Opt.	Opt...	Opt...
Natco, 15		1925	Optional				9' 6"	Opt..
Nelson & Le-Moon, D-1	2000	2000	Optional		Opt...	Opt...	Opt...	Opt...
Nyberg	3000							
Piggins	2000	1750	Optional	1875	3'10"	3'	9' 8"	14'
Plymouth, D-2	2000	1750	Van		4'	5' 6"	8'	13'
Progress, A	3000		Brewery	2900	5'	3'	10'	14'7"
Progress, A	3000		Express	2850	5'	1'	10'	14'7"
Progress, A	3000		Platf'm	2800	5'	4"	10'	14'7"
Randolph, 1 ton	2000		Optional	1750	Opt...	Opt...	Opt...	Opt...
Robinson, B	3000		Express		4'6"		10'	
Rowe, B	2000		Optional			2'11"		10'
Rowe, C	3000		Optional			2'11"		10'
Schmidt, C	2000	1375	Optional		Opt...	Opt...	Opt...	Opt...
Sampson	3000	2500	Platf'm	2600	5'	2' 7"	9'	14'
Sampson	3000	2500	Delivery	2650	5'	5' 7"	9'	14'
Sampson	3000	2500	Open Ex.	2600	5'	1'10"	9'	14'
Sampson	3000	2500	Panel	2850	4'	5'10"	8'	13'
Sandusky, C	3000	2500	Express	2625		1' 3"	9' 6"	
Sandusky, C	3000	2500	Stake	2600			9' 6"	
Sanford, J	2000	1400	Optional	1500	3' 9"	1' 4"	Opt...	Opt...
Sanford, K	2000	1660	Optional	1750	3' 9"	1' 4"	Opt...	Opt...
Schacht, 16	2000		Delivery		4'	5' 8"	9'	17'2"
Selden, J	2000	2000	Furnit		5' 6"		10'	
Selden, J	2000	2000	Stake		5' 6"		10'	
Selden, J	2000	2000	Box		3'10"		9'	
Service, K	2000		Express		4'	4' 6"	8'	15'6"
Service, K	2000		Panel		3' 6"	4' 6"	8'	15'6"
Service, K	2000		Stake		5' 6"		9'	16'6"
Service, M	3000		Express		5' 5"	5'	9'	17'
Service, M	3000		Stake		5' 6"		9'	17'
Service, M	3000		Panel		3' 6"	4' 8"	8'	16'
Service, M	3000		Express		5' 5"		9'	17'
Stegeman	2000	2250	Optional				Opt...	
Studebaker, 75T	2500		Optional					
Superior, A	2000	1700	Express		3'10"		8' 8"	
Toledo A	2000	$1700	Optional	$1850	4'	3' 2"	Opt...	
Wilcox, I	2000	2300	Optional		Opt...	Opt...	Opt...	Opt..
Wilcox, K	3000	2500	Optional		Opt...	Opt...	Opt...	Opt...
Transport, A	3000	2300	Express	2450	5'	Opt...	Opt...	Opt...
Triumph	3000	1800	Optional	Opt...	Opt...	Opt...	Opt...	Opt...
Tulsa, 1 ton	2000	2000	Stake	2150	Opt...	4'	9'10"	17'10"
Tulsa, 1½ ton	3000	2200	Stake	2350	Opt...	4' 9"	9'10"	17'10"
Universal, C	2000	1950	Optional		5'	Opt...	10'	17'
V.C., B	3000	2350						
Veerac, B	2000	1100	Open Ex.	1150	3' 6"	9' 6"	7' 4"	11' 4"
Veerac, B	2000	1100	Stake	1175	3'11"		7' 4"	11' 4"
Veerac, B	2000	1100	Express	1250	3' 6"	4' 4"	7' 4"	11' 4"
White, GTB	3000	3000	Express	3150	4' 4"	4' 7"	9' 2"	17' 3"
White, GTB	3000	3000	Platf'm	3150	5' 4"	1'11"	9½'	17' 5"
White, Star, C	3000	2250	Optional	Opt...	Opt...	Opt...	Opt...	Opt...
White, Star, B	3000	1750	Optional	Opt...	Opt...	Opt...	Opt...	Opt...
Wichita, A	2000	1650	Stake	1760	4½'		8'	
Wichita, A	2000	1650	Express	1780	3' 9"		8'	
Wichita, A	2000	1650	Express	1750	3' 9"		8'	
Wichita, A	2000	1650	Panel	1800	3' 7"	4' 8"	6'10"	

Vehicles of 2-Ton Capacity

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	Load Space Width	Load Space H'ght	Load Space Length	Over-all Length
Adams, D	4000		Optional		Opt...	Opt...	Opt...	Opt...
Alco	4000	$2950	Optional		Opt...	Opt...	Opt...	Opt...
Armleder, D	4000	2400	Optional		Opt...	Opt...	Opt...	Opt ..
Atterbury, C	4000		Optional		4' 6"	5' 6"	10'	18'
Avery, A	4000	2700						
Blair, D	5000	3250	Stake	$3400	5' 2"	2' 6"	Opt...	Opt...
Beck	4000		Truck	1500	4' 6"	5'	10'	16'
Cass	5000	2650	Optional		Opt...	Opt...	Opt..	Opt...
Chase, J	4000	2100	Express	2200	4'		9'10"	15'3"
Chase, J	4000	2100	Stake	2300	4' 4"		9'11"	15'3"
Chase, J	4000	2100	Panel	2500	4'	6'	9' 8"	15'3"
Colman	4000	2300	Stake	2400	Opt...	Opt...	Opt...	Opt...
Colman	4000	2300	Express	2500	Opt...	Opt...	Opt...	Opt...
Colman	4000	2300	Open Ex.	2400	Opt...	Opt...	Opt...	Opt...
Crescent	4000		Optional		Opt ..	Opt .	Opt...	Opt...
Dur. Dayton, H	4000	2650	Stake	2800	4' 5½"	3'	10' 8"	15'10"
Dur. Dayton, H	4000	2650	Express	2800	4' 3"	1'10"	10' 9½"	15'10"
Elk, C	4000	2600	Stake		4' 6"	Opt...	Opt...	Opt...
G.M C., SC	4000		Optional		Opt...	Opt...	Opt..	Opt ..
Gramm, 2	4000	2600	Optional		Opt...	Opt...	Opt..	Opt...
Gramm's B.A.	4000							
Hart-Kraft, H	4000		Optional		Opt...	Opt...	Opt...	Opt...
Hart-Kraft, D	5000		Optional		Opt...	Opt...	Opt...	Opt...
Indiana	4000	2500						
Jarvis-Hunting'n.	4000	2750	Panel	3200	Opt...		10'	
Jarvis-Hunting'n.	4000	2750	Delivery	3050	Opt...		10'	
Jarvis-Hunting'n.	4000	2750	Delivery	2900	Opt...		10'	
Jarvis-Hunting'n.	4000	2750	Furnit	3000	Opt...		10'	
Jarvis-Hunting'n.		2750	Stand	3050				
Jarvis-Hunting'n.	4000	2750	Stake	2900	Opt...		10'	
Johnson, B	4000	2000	Express					
Johnson, B	4000	2000	Stake					
Kissel-Kar	4000	2750	Optional	2900	5'		10'	
Knox, R-3	4000	3000	Wagon	3275	5'		11'	15'9"
Knox, R-3	4000	3000	Platf'm	3325	5'		11'	15'9"
Knox, R-3	4000	3000	Van	3450	5'	6' 6"	11'	15'9"
Knox, R-3	4000	3000	Panel	3450	5'	6' 6"	11'	15'9"
Lambert	4000	2100	Stake	2200	3' 6"			
Lambert	4000	2100	Express	2200	3' 6"			
Lange, B	4000	3000	Optional		4' 6"	Opt...	10'	16'6"
Lauth-Juerg's, L	4000	2800	Optional		Opt.	Opt...	Opt ..	Opt.

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	Load Space Width	Load Space H'ght	Load Space Length	Overall Length
Lewis, 21	5000	$3250	Express	$3500	5'	1' 6"	11'	19'6"
Lewis, 21	5000	3250	Platf'm	3400	5'	1' 6"	11'	19'6"
Lewis, 21	5000	3250	Brewery	3500	5'	1' 6"	11'	19'6"
Lewis, 21	5000	3250	Dump	3500	4' 6"	1'10"	10'	19'6"
Lewis, 21	5000	3250	Dump	3600	6'	1' 6"	9'	19'6"
Lewis, 21	5000	3250	Furnit	3600	5'	5'	11'	19'6"
Lewis, 21	5000	3250	Lumber	3400	6'		11'	19'6"
Lord Baltimore	4000	2500	Stake		6'		10'	18'
Mack, 2 ton	4000	3000	Optional		Opt...	Opt...	Opt...	Opt...
Mais	4000	2950	Optional		Opt...	Opt...	Opt...	Opt...
Mogul, G	4000	2800	Optional		Opt...	Opt...	Opt...	18'4"
Moreland, E								
Nelson LeMoon D	4000	2500	Optional	Opt...	Opt...	Opt...	Opt...	Opt...
Packard	4000	2800	Optional		Opt...	Opt...	Opt...	Opt...
Plymouth, G-2	4000	2600	Express		4' 6"	5' 8"	10'	15'
Randolph, N	4000	2250	Express					
Reo, J	4000	1800	Optional		5' 2"	9' 7"	1'	6'6"
Robinson, D	4000	2500	Optional		Opt...	Opt...	Opt...	Opt...
Rowe, D	4000		Optional			3' 9"		12'
Schacht, 13	4000		Panel		4' 8"		10'	16'10"
Speedwell, Y	4000	2850	Optional	2950	Opt...	Opt...	Opt...	Opt...
Stegeman	4000	2950	Optional		Opt...	Opt...	Opt...	10'8"
Sternberg	4000	2850	Optional		5'	Opt...	Opt...	Opt...
Toledo, B	4000	2400	Optional	2600	4' 2"	3' 6"	Opt...	
Transit, F	4000	2850	Optional	3000	5'		14'	20'
U.S., E	4000	2800	Optional		5'	Opt...	10'	16'6"
Velie, Y	5000		Stake		5' 6"		10'	19'
Ware, A	4000	3500		3700	5' 5"	3' 6"	9'	17'
White Star, D	4000	2750	Optional	Opt...	Opt...	Opt...	Opt...	Opt..
Wichita, B	4000	2100	Stake	2250	5' 6"		10'	
Wichita, B	4000	2100	Express	2275	3 9"		9'	
Wichita, B	4000	2100	Open Ex.	2225	3' 9"		9'	
Wichita, B	4000	2100	Panel	2300	3' 9"		8'	
Willet	4000	2850			5'		12'	

Vehicles of 3-Ton Capacity

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	Load Space Width	Load Space H'ght	Load Space Length	Overall Length
A. & R	6000	$3500	Express		Opt..	Opt...	Opt...	Opt...
A. & R		3500	Brewery		Opt...	Opt...	Opt...	Opt...
A. & R		3500	Coal		Opt...	Opt...	Opt...	Opt...
A. & R		3500	Furnit		Opt...	Opt...	Opt...	Opt...
Alco, 3½ ton	7000	3650	Optional		Opt...	Opt...	Opt...	Opt...
Atterbury, D	6000		Optional		6'	6'	12'	19'
Avery, A	6000		Farm T.		4' 4"		10' 4"	
Avery, B	6000		Stand		6' 4"		12'	12'6"
Barker, B	6000	3100	Stake	$3200	6'		14'	14'
Barker, B	6000	3100	Express	3200	6'		14'	14'
Barker, B	6000	3100	Van	3500	6'		14'	14'
Beck	6000			1800	4' 6"	5'	10' 6"	18'
Blair, E	7000	3750	Stake	3900	5' 6"	2' 6"	Opt...	Opt...
Buckien, C	6000	2400	Stake	2575	5' 5"		16'	22'
Bucklen, C	6000	2400	Open Ex.	2525	3' 9"		15'	21'6"
Couple Gear, HC	7000	4850	Stake	5000	5' 6"	6'	14'	18'6"
Crescent	6000		Optional		Opt...	Opt...	Opt...	Opt...
Diamond T, G	6000	3400	Optional		Opt..	Opt...	Opt...	Opt...
Dur. Dayton, K	6000	3400	Stake	3600	5' 7"	3' 3"	12' 1"	17'7"
Dur. Dayton, K	6000	3400	Express	3600	5' 4"	2'	12' 1"	17'7"
Eclipse, D	6000	3000	Stake	3200	Opt...	Opt...	Opt...	Opt...
Eclipse, D	6000	3000	Express	3200	Opt...	Opt...	Opt...	Opt...
Elk, B	6000	$3400	Optional		Opt...		Opt...	Opt...
Elk, B	6000	3400	Dump					14'8"
Four-Wheel Drive B	6000	4000	Stake	$4150	5'	4'	11'	11'4"
Freighton, G	6000	3200	Platf'm		6'		12'	19'
Freighton, G	6000	3200	Stake		6'		15'	21'
G.M.C., H	7000		Optional		4' 5"	Opt...	Opt...	Opt...
G.M.C., HL	7000		Optional		4' 5"	Opt...	Opt...	Opt...
G.M.C., HM	7000		Optional		4' 5"	Opt...	Opt...	Opt...
Gramm, 3	6000	3500	Optional		Opt...	Opt...	Opt...	Opt...
Gramm's, B. A.	7000		Optional		Opt...	Opt...	Opt...	Opt...
Indiana	6000	3200	Express		4' 4"		12'	
Indiana	6000	3200	Stake		6'		12'	
Jarvis, 3½ ton	7000	3500	Delivery	3875	Opt...	Opt...	12'	
Jarvis, 3½ ton	7000	3500	Open Ex.	3675	Opt...		12'	
Jarvis, 3½ ton	7000	3500	Furnit	3800	Opt...		12'	
Jarvis, 3½ ton	7000	3500	Oil tank	4000	Opt...		12'	
Jarvis, 3½ ton	7000	3500	Stake	3700	Opt...		12'	
KaDix, C	6000	3500	Optional		6' 6"		12'	19'3"
KaDix, C	6000	3500	Optional		6' 6"		14'	19'3"
KaDix, C	6000	3500	Optional		6' 6"		15'	19'3"
KaDix, C	6000	3500	Optional		6' 6"		17'	19'3"
Kato, H	6000		Stake	3500	6'		12'	15'6"
King, 3	7000	3350	Optional		6'		13'	17'6"
Kisselkar, 3 ton	6000	3350	Optional	3500	6		12' 4"	
Kelly, K-40	7000	3500	Optional	3650	4'10"		12' 4"	12'4"
Knickerbocker, 12-3	6000	3500	Optional		Opt...	Opt...	Opt...	Opt...
Knox, R-15	6000	3700	Platf'm	4050	6'		12'	
Knox, R-15	6000	3700	Express	4050	6'		12'	
Kopp, L	6000		Optional		Opt...	Opt...	Opt...	Opt...
Lauth-Juerg., M	6000	3450	Optional		Opt...	Opt...	Opt...	Opt...
Lord Baltimore, A	6000	3250	Stake		6'		13'	17'4"
Mack, 3 ton	6000	4000	Optional		Opt...	Opt...	Opt...	Opt...
Mais	6000	3400	Optional		Opt...	Opt...	Opt...	Opt...
Moreland, 13-F	6000		Optional		Opt...	Opt...	Opt...	Opt...
Nelson LeMoon, D-3	6000	3000	Optional		Opt...	Opt...	Opt...	Opt...
Old Reliable, 2	6000	2750	Optional		Opt...	Opt...	Opt...	17'
Packard	6000	3400	Optional		Opt...	Opt...	Opt..	Opt..
Peerless, TC	6000	3700	Optional		6'	Opt...	12'	19'6"
Peerless, TC	6000	3700	Optional		6'	Opt...	14'	21'6"
Pope-Hartford	6000	3350	Optional	3550	6' 6"		14'	18'1½"
Pope-Hartford	6000		Optional	3675	6' 6"		16'	20'1½"
Pope-Hartford	6000	3350	Cab Top.	3600				
Progress, B	6000	3500	Brewery	3700	6'	3' 6"	12'	16'11"
Progress, B	6000	3500	Trunk	3600	6'		12'	16'11½
Progress, B	6000	3500	Package	3700	6'	3' 6"	12'	16'11½
Progress, B	6000	3500	Bottle	3800	5' 9"		14' 3"	17'11½
Rowe, E	6000		Optional			4'		12'
Sampson	6000	3400	Platf'm	3550	5' 6"	3' 3"	12'	17'
Sampson	6000	3400	Open Ex.	3600	5' 6"	1'10"	12'	17'
Sampson	6000	3400	Delivery	3650	5' 6"	7'	12'	17'
Seagrave, F	6000				4' 2"		8'	20'
Schacht	6000		Barrels		5' 6"		11' 6"	18'8"
Schacht	6000		Furnit		5' 8"	6'10"	12' 6"	15'8"
Schacht	6000		Ice		5'	3' 8"	12'	19'2"
Schacht	6000		Coal D'p		5' 6"		10'	18'2"
Schleicher	6000	4000	Optional		Opt...	Opt...	Opt...	Opt...
Standard	6000	2750	Optional		Opt...	Opt...	10' 3"	17'4"
Standard	6000	2750	Optional		Opt...	Opt...	12' 3"	19'4"
Standard	6000	2750	Optional		Opt...	Opt...	15 3"	22'4"
Standard	6000	2750	Optional		Opt...	Opt...	20'3"	27'4"
Stegeman	6000	3500	Optional		Opt...	Opt...	Opt...	Opt...
Sternberg	6000	3400	Optional		5' 6"		12'	
Sternberg	6000	3400	Optional		5' 6"		15'	
Transit, T	7000	3500	Express	3700	5' 6"		14'	20'
Transit, T	7000	3500	Stake	3650	5' 6"		14'	20'
Transit, T	7000	3500	Comb.	3700	5' 6"		14'	20'
Transit, T	7000	3500	Rear D'p	4000	5' 4"		12'	18'
Universal, A	6000		Platf'm	3525	6'		12' 4"	17'
U.S., D	6000	3500	Optional		6'		12'	19'6"

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	LOAD SPACE			Overall Length
					Width	H'ght	Length	
Velie, Z	7000	$3350	Stake	$3500	6' 6"		14'	21'
Velie, Z	7000	3350	Optional		Opt.	Opt.	Opt.	Opt.
Victor	6000	2750	Optional		Opt.	Opt.	Opt.	Opt.
Vulcan	6000	3600	Optional		Opt.	Opt.	Opt.	Opt.
White, GTA	6000	3700	Platf'm.	3850	6' 6"	2' 5"	3' 3"	20'7½"
Wilcox, J	6000	3250	Optional		Opt.	Opt.	Opt.	Opt.

Vehicles of 4-Ton Capacity

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	LOAD SPACE			Overall Length
					Width	H'ght	Length	
A. & R., 4-ton	8000	$3700	Optional		Opt.	Opt.	Opt.	Opt.
Johnson, C.	8000	3200	Optional		Opt.	Opt.	Opt.	Opt.
KaDix, D	8000	4000	Optional		Opt.	Opt.	Opt.	Opt.
KisselKar	8000	3650	Stake	$3800	6'		13'	
KisselKar	8000	3650	Express	3800	6'		13'	
Longest, 2A	8000	4000	Optional		Opt.	Opt.	Opt.	Opt.
Lord Baltimore, E	8000	3750	Stake		6'		14'	18'4"
Mack, 4-ton	8000	4250	Optional		Opt.	Opt.	Opt.	Opt.
Mogul, O		3800	Optional					18'2"
Packers, E	8000		Express		6'		12'	19'2"
Packers, E	8000		Express		5' 6"	5' 6"	12'	19'2"
Peerless, TC	8000	4000	Optional		6'	Opt.	Opt.	Opt.
Randolph, A	8000		Optional	3600		2'11"	13'	
Schacht, 21	8000		Brewery		5' 6"		11' 6"	18'8"
Schacht, 21	8000		Furnit.		5' 8"	6'10"	12' 6"	19'8"
Schacht, 21	8000		Ice		5'	3' 8"	12'	19'2"
Schacht, 21	8000		Stake		6' 6"	4'10"	12'	19'2"
Schacht, 21	8000		Coal		5' 6"		10'	18'2"
Speedwell, Z	8000	3750	Optional	3850	Opt.	Opt.	Opt.	Opt.
Stegeman	8000		Optional		Opt.	Opt.	Opt.	Opt.
Sternberg	8000	4000	Optional		6'		15'	
Studebaker, TTT	8000		Optional		Opt.	Opt.	Opt.	Opt.
Vulcan	9000	4500	Optional		Opt.	Opt.	Opt.	Opt.
Vulcan	8000	4000	Optional		Opt.	Opt.	Opt.	Opt.

Vehicles of 5-Ton Capacity

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	LOAD SPACE			Overall Length
					Width	H'ght	Length	
A. & R.	10000	$4350	Optional					
A.I.C., B.	10000	3500	Ice	$3750	6'	4'	12'	17'
Alco	10000	4750	Optional					
Atterbury, E.	10000				6'	6'	12'	19'
Avery, B.	10000		Standard		6' 4"		14'	14'8"
Barker, B	10000	3100	Express	3700	6'		14'	14'
Barker, B	10000	3100	Stake	3700	6'		14'	14'
Barker, B	10000	3100	Van	4000	6'		14'	14'
Couple Gear AC	10000	5400	Stake	5600	6'	6'	14'	18'6"
Diamond T, G	10000	3600	Optional		Opt.	Opt.	Opt.	Opt.
Dayton, M.	10000	4500	Stake	4700	5'9½"	3' 3"	13' 1"	18'7"
Dayton, M.	10000	4500	Express	4700	5' 7"	2' 1"	13' 3"	18'7"
Elk, E.	10000	4100	Standard				14' 2"	18'8"
Elk, E.	10000	4100	Short				12' 7"	17'1"
Elk, E.	10000	4100	Dumb.				13' 2"	17'8"
G.M.C., K.	10000		Optional		4' 5"		Opt.	Opt.
G.M.C., K1	10000		Optional		4' 5"		16'	21'
Gramm	10000	$4500	Optional		Opt.	Opt.	Opt.	Opt.
Jarvis-Hunting'n.	10000	4400	Delivery.	$4825	Opt.		14'	
Jarvis-Hunting'n.	10000	4400	Delivery.	4600	Opt.		14'	
Jarvis-Hunting'n.	10000	4400	Furniture	4775	Opt.		14'	
Jarvis-Hunting'n.	10000	4400	Oil tank.	5050	Opt.		14'	
Jarvis-Hunting'n.	10000	4400	Stake	4650	Opt.		14'	
KaDix, E.	10000	4500			6' 6"		Opt.	19'3"
KisselKar	10000	4350	Optional	4500	6'		14'	
Knickerbocker, 12-5	10000	4500	Optional		Opt.	Opt.	Opt.	Opt.
Kopp, M.	10000							
Lewis, 51	10000	4750	Platf'm.	5000	6' 6"	4'	14'	19'6"
Lewis, 51	10000	4750	Side D'p.	5100	6'	1' 6"	12'	19'6"
Lewis, 51	10000	4750	End D'p.	5000	5' 6"	1'10"	12'	19'6"
Lewis, 51L	10000	4750	Lumber	5000	7'		14'	19'6"
Locomobile, A	10000	4800						
Lord Baltimore, F	10000	4250	Stake		6'		15'	19'4"
Mack, 5 ton	10000	4800	Optional		Opt.	Opt.	Opt.	Opt.
Mogul, M.	10000	4400	Optional					20'6"
Mogul, V.	10000	4400	Lumber					20'6"
Old Reliable, V.	10000	4500	Optional		Opt.	Opt.	Opt.	18'4"
Packard	10000	4500						
Peerless, TC	10000	4500	Optional					
Pierce-Arrow	10000	4500	Optional		Opt.	Opt.	Opt.	Opt.
Pope-Hartford	10000	4350	Platf'm.	4550	6' 6"	3' 5"	14'	19'2"
Pope-Hartford	10000	4350	Stake	4550	6' 6"	3' 5"	14'	19'2"
Pope-Hartford	10000	4350	Tab Top.	4600	6' 6"	3' 5"	14'	19'2"
Pope-Hartford	10000	4350	Platf'm.	4675	6' 6"	3' 5"	16'	19'2"
Pope-Hartford	10000	4350	Stake	4675	6' 6"	3' 5"	16'	19'2"
Rowe, F.	10000	3150	Optional		Opt.	Opt.	Opt.	Opt.
Sampson	10000	4750	Platf'm.	5000	6'	3' 3"	14'	20'
Saurer	10000	5000	Optional		Opt.	Opt.	Opt.	Opt.
Schleicher	10000	6000	Optional	Opt.	Opt.	Opt.	Opt.	Opt.
Stearns	10000	3800	Stake	3950	6'		12' 6"	19'6"
Stearns	10000	3900	Stake	4050	6'		15' 6"	22'6"
Transit, V.	10000	4500	Express	4700	6'		14'	20'
Transit, V.	10000	4500	Stake	4650	6'		14'	20'
Transit, V.	10000	4500	Comb.	4700	6'		14'	20'
Transit, V.	10000	4500	Dump	5000	5' 8"		12'	18'
Vulcan	10000		Optional.		Opt.	Opt.	Opt.	Opt.
White, TC	10000	4500	St. Plat.	4700	6' 6"	2' 5"	13' 3"	20'7½"
White, TKA	10000		Dump	5200	6'	Opt.	11' 2"	19'8"

Vehicles Over 5-Ton Capacity

Name and Model	Capacity, Lbs.	Chassis Price	Body Style	Price With Body	LOAD SPACE			Overall Length
					Width	H'ght	Length	
Alco, 6½-ton	13000	$5200	Optional		Opt.	Opt.	Opt.	Opt.
Hewitt	20000	5500	Optional		Opt.	Opt.	Opt.	Opt.
LaFrance, 6-ton	12500	5500	Platf'm.	$5500	Opt.		Opt.	Opt.
Mack, 7-ton	14000	5300	Optional		Opt.	Opt.	Opt.	Opt.
Peerless	12000	5000	Optional					
Randolph, R.	12000	4500	Optional		Opt.	Opt.	13' 3"	Opt.
Saurer	13000	6000	Optional		Opt.	Opt.	Opt.	Opt.
Speedwell, X.	12000	4400	Optional	4500	Opt.	Opt.	Opt.	Opt.
Stegeman	12000		Optional		Opt.	Opt.	Opt.	Opt.
Sternberg, 6-ton	12000	4750	Optional		6'	Opt.	15'	Opt.
Universal Truck	12000							
Victor	10000	3650	Optional		Opt.	Opt.	Opt.	Opt.
Vulcan	12000		Optional		Opt.	Opt.	Opt.	Opt.
Vulcan	15000		Optional		Opt.	Opt.	Opt.	Opt.

Educating the Freight Automobile Driver

Drivers Must Be Taught Operation and Care of the Automobile Mechanism as Well as Delivery Business—Factory and Private Schools and Traveling Demonstrators Instruct the Former Horse Drivers

TO GET the best possible service out of a freight automobile two things are necessary, namely, a truck as perfectly as possible adapted to the specific requirements of the owner's business and a driver equally qualified. The motor truck driver, his selection and his education arc the subject of the following article.

The situation has three angles, the selection of the man best fitted for the position for which he is chosen, the education wich must be given to the man to suitably prepare him for his driving and delivery work and, finally, the best method of imparting his education to him. These three points of view may again be subdivided as follows:

1. **Selection of best men:**
   a. Ability and general qualification.
   b. Character.
   c. Age, physical constitution, etc.
2. **Subjects of education:**
   a. Knowledge of the truck, its construction, troubles and repair.
   b. Care of truck, operating speed, etc.
   c. Correct way of loading the truck.
   d. Delivery work.
   e. Economical training.
   f. Moral training.
3. **Methods of education:**
   a. Schools conducted by truck makers.
   b. Work of companies' instructors and demonstrators.
   c. Instruction by experienced truck drivers in owners' employ.
   d. Specially organized schools.

The selection of the men who are to serve as truck drivers must be in the hands of a person fully familiar not only with the construction and nature of automobile trucks, but also of the business in which the machines and their drivers are to be used. A general inquiry among men of this nature has brought out the astonishing fact that the most important quality which makes for a good driver is industriousness coupled with common sense, rather than years of experience with automobile mechanisms.

The majority of men who have had vast experience with truck drivers are unanimous in stating that the best type of truck driver comes from the ranks of the former horse vehicle drivers taught to handle a freight automobile.

The reason for this fact is that a horse driver who is familiar with the delivery business of a certain company will be much easicr educated to a truck driver and familiarized with the requirements of an automobile than a chauffeur will learn the delivery business, as this business requires a long and steady training and a good man must have a high degree of responsibility to be worth his wages. This brings us to the critical point of the situation. Chauffeurs of pleasure cars are liberally paid, and often command much higher incomes than truck drivers, although the work of the former is in many cases easier and more pleasant than that of the latter. Consequently there is no inducement for a good chauffeur to come down to the pay of truck driver.

Another point upon which great stress is laid by men who know is the fact that pleasure car chauffeurs are, as a rule, not such hard-working men as truck drivers must be in order to be efficient. The hours of the averagc chauffeur who drives a pleasure car are short when compared with thc working time of a motor truck driver and such an occupation as that of the former does not tend to make a man ambitious and hard working. A man who has worked as a pleasure car chauffeur for any length of time generally begins to consider himself an aristocrat among his fellows and would deem himself degraded if he had to step down to the harder work of the delivery driver, which is not even paid as well. Add all the little pleasures that go with the profession, so-called, of a pleasure car chauffeur, such as a neat livery, the occasional use of the car for his own devices and the consequent social successes, there remains little or no incentive for a chauffeur to join the ranks of his truck brothers. Furthermore, the chauffeurs' profession has occasionally been a goal for capable but morally irresponsible characters whose influence has made itself known at least by the general desire for private gain, which sort of egotism cannot be satisfied if a man works as truck driver. The little niceties which count in the person of a pleasure car driver, such as an attractive exterior and gentlemanly bearing, are likewise superfluous in a truck driver and therefore not paid for by a truck owner and operator.

A former horse driver, on the other hand, improves himself, however slightly, when he advances to the ranks of a truck chauffeur. The improvement is financial as well as moral, since most people's self-consciousness is elated upon changing from the operation of a quadruped to that of a mechanism which does so much more work in a shorter time and, once known in its habits, may be easily governed by the man who knows. The knowledge of the truck mechanism opens, furthermore, to the ambitious man the road to the chauffeurs' profession, to the position of a delivery superintendent or the like, all being factors which tend to make a good man put his best efforts into his work.

It goes without saying that a certain physical ability is requisite for a man's being eligible to the truck drivers' ranks. As a rule, a man who is capable of handling a pair of horses will be physically able to cope with the freight automobile after having been taught the mechanical requirements of the latter. In this connection the age of the man is frequently among the principal factors considered. One of the largest express companies of this country, for instance, only uses men ranging from twenty-one to forty-five years of age, for either the work of the driver or the worker. Men above forty-five after twenty years or so of this sort of work are naturally not quite as quick as when they took it up; nevertheless in a great many cases their accumulated experience and grown brain capacity makes up for this defect, and it is doubtful whether such a hard and fast rule is a better course to adopt than a decision from case to case.

Coming to the second division, the subjects of the driver's education, the knowledge of the automobile and an understanding of its construction and needs seems to stand foremost. It stands to reason that it would be a very expensive process to let a driver take out his truck and if he meets with an accident or slight misadjustment of some part or other of his truck, 20 miles away from the garage, to telephone for a mechanic, merely to have the latter go over the spark-plugs or to locate a short-circuit in the ignition wiring. It is ever so much cheaper to instruct a driver before entrusting him with a truck how such minor troubles may be remedied without calling on the aid of an expert. A phase of the education which goes hand in hand with this is to make the driver familiar with the proper care of the freight automobile. The driver should know at what speed he may safely operate his truck over various kinds of road. He should also know the details of lubrication, of keeping the cooling system well filled with water, and so forth.

One point of the education which is half mechanical and half of a delivery-business nature is the proper method of loading a truck. The driver when being instructed should be informed how much weight should be loaded on the various portions of the body and how this should be done to permit of efficient and rapid unloading and delivery. Whatever information is necessary to bring out the points upon which depends the high or low cost of truck operation should be imparted to the driver. He ought to be taught to avoid tire abuse, to properly use and not strain his brakes, to use the motor as a brake in coasting down a hill, to use the top gear whenever possible and to apply every known process to get as much work as possible out of the given quantity of fuel. To complete his education the owner or his representative should instill some definite moral ideas into the men which would tend to make them good workers and to which they would live up if the lessons are brought home in the right manner and spirit; the latter, of course, requires deft work, but the success of various firms operating on modern principles has shown that moral education of the driver pays.

The practice of a truck maker conducting a gratis course for the men who are to drive the trucks manufactured by them is making headway, although not as rapidly as might be expected. It has been proven, however, that the companies who introduced such a school for the benefit of their customers have been amply repaid for their efforts by the reduced measure of trouble encountered with their product later on. In these schools men who are to drive the trucks and are sent in by the buyers of the latter are given a sufficient knowledge of the mechanical side of the truck and the various requirements of the latter, this instruction work taking place in the shop. A little later the men are generally taken out on the road and shown how to drive and how to make repairs in case of trouble.

Other companies, instead of conducting a central school system, send their demonstrators with a newly sold truck, who also serve as instructors to the drivers with whom the handling of the truck is to rest. Some of these companies make also a practice of a periodical inspection of every truck sold and of instructing the drivers on this occasion.

One of the best methods conceivable is the following which, however, can only be used where a number of motor trucks have been in service before a new lot is introduced and a new set of drivers must be educated. **This system is used by some of the largest express companies in New York. It consists in using the most experienced of the companies' drivers as teachers for the recruits, who in this way not only become acquainted with the mechanical side of truck driving, but also get a good idea of the delivery work, the loading problem, etc.**

Finally there are especially organized private schools who teach the men all the things mentioned above.

Following are a few excerpts from letters received by THE AUTOMOBILE in reply to an inquiry as to the stand they are taking with regard to the question of automobile instruction for truck drivers.

What Truck Makers Think of the Education of the Truck Driver

ARDMORE, PA.—The system that the Autocar Company uses in instructing drivers allows for taking a horse driver off from a wagon, putting him through the Autocar course, and turning out a very capable driver. As a matter of fact, we have turned out in Philadelphia alone 1,400 drivers in the past 2 years. It is an earnest desire of the Autocar Company to co-operate at all times with the users of Autocars, who are invited to send their drivers to school in Philadelphia, New York and Boston, where free instruction is given on the care of the cars.—THE AUTOCAR COMPANY.

MOLINE, ILL.—Men are placed on the assembly floor of the Velie factory that they may notice the location of every part, grease cup, etc., and instructed in theory as to the operation of trucks; as a result we find their efficiency much increased and at the same time making better their operation of the truck and its decreased depreciation. The idea has been confined largely to the adjacent factory territory.

We think that idea of training schools in various cities for the education of truck drivers is fine. We believe that all truck manufacturers would be interested in such a proposition.—VELIE MOTOR VEHICLE COMPANY.

SPRINGFIELD, MASS.—The Knox Automobile Company has done a great deal of work of this sort in connection with handling our fire apparatus particularly. Firemen as a rule know very little about automobile motors, to say nothing about the requirements in handling fire trucks, so it is necessary to give them a very thorough course. They are generally men picked for some slight mechanical intelligence.

We start them generally on the motor assembly, where they learn how the motors are put together, as well as the major adjustments. They then go on to the chassis assembly, and finally to the testing department. Here they learn the handling and control of the car and the minor adjustments, thus following their own cars right through the shop.

We believe it would be the height of foolishness to put expensive machines of this sort into the hands of untrained men, or even to risk having them operated by local drivers who might have had driving experience on certain cars but not on ours. This particular arrangement is expensive to our factory and is a source of considerable hindrance to our employees at times, but we find it pays in the long run, and it enables these green men to become much more proficient in handling and taking care of our cars.—KNOX AUTOMOBILE COMPANY.

NEW YORK CITY—The Alco company always has experts available to instruct a driver employed by any of our owners in the operation and care of Alco trucks. This form of service is supplemented by service in the way of sending experts along on the trucks with the new drivers until they become proficient. Furthermore, our inspection system aids the drivers, as we keep in touch with them. Traveling inspectors make the rounds and give drivers the benefit of their advice in such matters as operating economically, proper distribution of loads and general care of the vehicles.—AMERICAN LOCOMTIVE COMPANY.

MINNEAPOLIS, MINN.—The former horse driver makes the best truck driver, but it takes some time to get him properly trained so that he can take care of the mechanical parts. We believe the best method for training this kind of driver is to bring him into the shop and train him for 2 or 3 months until he gets acquainted with the operation of the truck. He then makes a most efficient driver.—H. E. WILCOX MOTOR CAR COMPANY.

FREMONT, O.—The Lauth-Juergens Company believes that it would be a splendid idea if schools were established, providing those attending the schools could get the proper training, not only as to driving of the truck, which is a very small matter, but the detection of trouble, and the ability to repair it, to get that proper training which will overcome his helplessness in case of an accident.—THE LAUTH-JUERGENS MOTOR CAR COMPANY.

NEW YORK CITY—We know of nothing that would help the industry to a greater extent than the establishment of training schools for drivers in fifty or seventy-five of the largest cities in the country. The local auto training schools are not adequate for the purpose, as they have neither equipment in machines nor men to carry out the course of instruction that is of any benefit whatever to the motor truck driver. This is an opportunity for a man of broad mental perspective to further the industry as a whole and himself individually as has never existed in any branch of the motor truck industry. To be of any value, these schools should not only teach the technique of truck driving but they must go into the problem of transportation from the method of handling the goods on the inside of the establishment as well as the inefficiencies of loading and unloading now existing with horse equipment and to a great extent motor truck equipment also.—INTERNATIONAL MOTOR COMPANY.

BUFFALO, N. Y.—As to whether a school for teaching delivery systems would be successful is very problematical. Every line of business has its own peculiarities and details, and it would seem as though it would be extremely difficult to teach a general proposition that would apply to the various lines.—PIERCE-ARROW MOTOR CAR COMPANY.

ELYRIA, O.—The Garford Company has never conducted a class at its factory for educating truck drivers, and we doubt that it will. We have found, however, that the best drivers for motor trucks are found in the ranks of the present drivers of horse-drawn vehicles, and are preferably taken from the force which is to be displaced by the installation of trucks. The reasons for this are many, among which we might say that the most important to the purchaser of the truck is the fact that the driver knows his routes, most of the people to whom he is expected to deliver goods, and is familiar with the methods of doing business.—THE GARFORD COMPANY.

DETROIT, MICH.—The Packard Company in 1907 organized at the factory a school for the instruction of truck drivers in the proper care and operation of Packard machines. The course is 1 month and the class is held from 7.30 a.m. to 4.30 p.m., each day of the week, with 1 hour for lunch. The instructor lectures before the class; then part of the class is taken out by a second instructor for a driving lesson, while the others are examined on the subject taught during the morning.—PACKARD MOTOR CAR COMPANY.

MILWAUKEE, WIS.—We have not to date inaugurated any school for drivers, but have made it a practice to have the drivers of Stegeman trucks come to the factory and give them a thorough instruction in the construction of the chassis, so that they will realize its component parts, their relations to one another and what the operation of different levers actually means. We have found this method very beneficial and is one that should be adopted or followed by every manufacturer.

As regards a training school for truck drivers, this might look good on the face of it, but we are rather inclined to believe that a school of this character cannot long remain independent—that is to say, certain manufacturers will control the instructors and instill into the schools the advantages of certain construction, or in other words, of certain makes of machines.—STEGEMAN MOTOR CAR COMPANY.

Motor Truck Chassis on the 1913 Market

THE AUTOMOBILE Publishes Herewith Its Annual Table of Commercial Vehicles, Covering the Details of Practically Every Gasoline Truck Chassis Produced by Manufacturers of the United States at the Present Time

ON these and the following pages appear the leading mechanical specifications of the various commercial vehicles listed for 1913. These specification tables are based on chassis and not body types. To explain: some of the concerns herein listed with but one, two or three different chassis models may have ten or twelve different bodies, which list of the various body styles of each concern appears in other pages of this issue.

There are a few concerns which do not appear in these specifications solely because it has been impossible to get from them the necessary information on their models. In some cases this has been due to the fact that they are bringing out new ones which they hope to announce immediately after the shows. There are a few concerns which are in more or less uncertain financial conditions and they are not in a position at present to make definite announcements concerning 1913 plans.

This information has all been obtained direct from manufacturers and in places where it is incomplete it has been due to such points not being decided upon. The various columns call for little, if any, explanation. Where optional wheelbases are listed it means that the concerns do this to accommodate the chassis to different body types which call for greatly varying loading platforms.

It is to be regretted that more complete information was not obtainable for the column headed Turning Radius in Feet, as this column refers to the amount of space required to make a complete circle with the vehicle.

I

NAME AND MODEL	Load Capacity Pounds	Chassis Weight Pounds	Turning Radius Feet	Wheelbase	TIRES			No. Cylinders	Bore and Stroke	S. A. E. H. P.	CYLINDERS		Valve Location	Camshaft Drive	COOLING	
					Kind	Front	Rear				Shape	How Cast			Circulation	Radiator Suspension
A & R, 3 ton	6,000	Opt	Opt	Opt	Opt	Opt	Opt	4	5.0x5.8	40.0	L Head	Pairs	Left	Gear	Pump	Springs
A & R, 4 ton	8,000	Opt	Opt	Opt	Opt	Opt	Opt	4	5.0x5.8	40.0	L Head	Pairs	Left	Gear	Pump	Springs
A & R, 5 ton	10,000	Opt	Opt	Opt	Opt	Opt	Opt	4	5.0x5.8	40.0	L Head	Pairs	Left	Gear	Pump	Springs
Adams, D	3,000	3,900		140	Solid*	36x3½	36x3	4	3.9x5.0	24.0	L Head	Block	Right	Gear	Pump	Rubber
Adams, A		3,200	41½	121	Solid*	36x3½	36x4	4	3.9x5.0	24.0	L Head	Block	Right	Gear	Pump	Rubber
A. I. C., B	10,000	8,000		136	Solid*	36x6	40x5	4	4.3x6.8	28.9	L Head	Pairs	Left	Hel'l	Pump	Springs
Akron, A	1,500	2,300	27	118	Solid*	34x4	34x4	4	3.8x5.0	24.0	L Head	Block	Right	Hel'l	Pump	Brackets
Alco, 2 ton	4,000							4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Trunnions
Alco, 3½ ton	7,000							4	5.0x6.0	40.0	L Head	Pairs	Left	Gear	Pump	Trunnions
Alco, 5 ton	10,000							4	5.0x6.0	40.0	L Head	Pairs	Left	Gear	Pump	Trunnions
Alco, 6½ ton	13,000							4	5.0x6.0	40.0	L Head	Pairs	Left	Gear	Pump	Trunnions
Angaize, B	1,500	2,000		100	Solid*	36x2	38x2	2	5.3x4.0	22.1	Straight	Sep'rt	Head	Gear	Thermo	
Angaize, D	2,000	3,700	20		Solid	36x3½	40x4	4	3.8x5.3	22.5	L Head	Block	Right	Gear	Pump	
Armleder, C	1,500	2,000	28	114	Pneu.	34x4	34x4	4	3.3x4.0	16.9	L Head	Block	Right	Gear	Pump	Springs
Armleder, B	2,000	3,100	34	136	Opt	40x4	40x5	4	4.0x4.5	25.6	L Head	Block	Left	Gear	Thermo	Springs
Armleder, D								4	4.5x5.0	32.4	L Head	Block	Right	Gear	Pump	Springs
Armleder, F		3,000	37	142	Solid	39x6	39x6	6	4.1x5.3	40.9	L Head	Pairs	Right	Gear	Pump	Springs
Atterbury, A	1,500	3,200	13½	116	Solid	34x3	34x3	4	3.8x4.5	22.5	L Head	Pairs	Left	Gear	Pump	Springs
Atterbury, B	2.000	3,600	15	128	Solid	36x3½	36x4	4	4.0x5.5	25.6	L Head	Pairs	Left	Gear	Pump	Springs
Atterbury, C	4,000	4,300	17½	143	Solid*	36x3½	36x3½	4	4.3x5.5	28.9	L Head	Pairs	Left	Gear	Pump	Springs
Atterbury, D	6,000	5,600	20	153	Solid*	36x4	36x4	4	4.9x5.5	38.0	T Head	Pairs	Opp	Gear	Pump	Springs
Atterbury, E	10,000	6,000	20	153	Solid*	36x5	42x5	4	4.9x5.5	38.0	T Head	Pairs	Opp	Gear	Pump	Springs
Autocar, 21††	3,000	3,300	38	97	Opt	Opt	Opt	2	4.8x4.5	18.1	L Head	Sep'rt	Head	Gear	Pump	Springs
Available, 15	1,500	1,900	34	100	Solid	34x2	34x2	2	5.3x4.0	22.1	L Head	Sep'rt	Left	Gear	Thermo	Springs
Available, 24	2,000	2,250	34	102	Solid	34x2½	34x3	4	3.8x4.5	22.5	L Head	Block	Right	Gear	Thermo	Springs
Avery, B	6,000	6,250		128	Solid*	38x5	38x4	4	4.8x5.0	36.1	L Head	Sep'rt	Left	Gear	Pump	Springs
Avery, A	6,000	5,700		140	Wood			4	4.8x5.0	36.1	L Head	Sep'rt	Left	Gear	Pump	Springs
Avery, 5 ton	10,000	7,250		140	Solid*	38x6	38x5	4	4.8x6.8	36.1	L Head	Pairs	R & H	Gear	Pump	Springs
Barker, 3 ton	6,000	5,650		150	Solid*	36x3½	36x4	4	5.0x4.8	40.0	L Head	Pairs	Right	Gear	Pump	Springs
Barker, 5 ton	10,000	6,350		150	Solid*	36x4	36x5	4	5.0x4.8	40.0	L Head	Pairs	Right	Gear	Pump	Springs
Beck, 2 ton	4,000	2,400	22	130	Solid	36x4	36x5	4	4.0x4.5	25.6	T Head	Sep'rt	Opp	Gear	Pump	Springs
Beck, 3 ton	6,000	2,800	25	130	Solid	36x4	36x6	4	5.0x6.0	40.0	T Head	Sep'rt	Opp	Gear	Pump	Springs
Beck, 1 ton	2,000	2,000	25	128	Solid	34x3½	38x4	4	4.0x4.5	25.6	T Head	Sep'rt	Opp	Gear	Pump	Springs
Bergdoll, C-30		2,600		115	Solid	34x4	34x4	4	4.0x5.0	25.6		Block			Pump	
Bessemer, K	1,000	2,075	28	102	Solid	34x2	34x2½	4	3.5x4.5	19.6	L Head	Block	Left	Gear	Thermo	Springs
Bessemer, B	2,000	2,900	33	120	Solid	34x3	34x3½	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Thermo	Springs
Bessemer, C	3,000	3,000	33	136	Solid	34x3½	34x4	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Thermo	Springs
Best, A & B††	1,000	2,100	30	79				2	4.5x4.5	16 2	L Head	Sep'rt	Top	Gear	Thermo	Springs
Best, 1 ton	2,000							4	3.8x4.5	22.5	L Head	Block	Right	Gear	Thermo	Springs
Blair, C	3,000	4,200		114	Solid	34x4	34x3	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	Springs
Blair, D	5,000	5,100		121	Solid	34x4	34x3½	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Blair, E	7,000	6,600		144	Solid	36x5	36x4	4	4.5x5.5	32.4	L Head	Pairs	Right	Gear	Pump	Springs

†Three wheels. ††Two-cylinder opposed. *Drives on four wheels. †††Gas-electric power plant.

ABBREVIATIONS:—Tires: Solid*, solid dual tires in rear. **Cylinders:** Sep'rt, separate. **Valves:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling:** Thermo, thermo-syphon. **Radiator Suspension:** S & T, springs and trunnions. **Ignition:** Sing, single; Doub, double; Gov, governor; Auto, automatic. **Magneto or Generator:** Atw K, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Lubrication:** Spl-Pres, splash and pressure; In Fuel, oil fed with gasoline. **Bore and Stroke:** In decimals to nearest 1-10 inch, as 4.3=4¼ etc., .2=3/16, .1=⅛, .3=¼, .4=⅜, .5=½, .6=9/16, .7=11/16, .8=¾, .9=⅞.

Load Capacity and Complete Specifications

In Calculating the Horsepower of the Motors Given in the Table the S. A. E. Formula Was Followed—That Is, Horsepower Equals the Cylinder Bore Squared, Multiplied by the Number of Cylinders Divided by 2.5

The horsepower given is not necessarily that listed by the manufacturer, but the rating computed by the formula of the Society of Automobile Engineers, which formula is based on cylinder bore and the number of cylinders and only indirectly takes the piston stroke into consideration.

In view of the many requests for gear ratios between the motor and rear wheels it is to be regretted that complete information on this subject was not available because the manufacturers offer such a variety of ratios. The ratio that will suit Chicago is not satisfactory for the same service in hilly cities, such as Cincinnati or San Francisco. Because of this situation wide options are permitted which it would be impossible to list herein.

An interesting column under the head Transmission is that of location, which refers to the position at which the gearbox is mounted in the chassis. Midship means, of course, located by itself at a point approximately midway between the front and rear axle. The other locations are unit with the motor, unit with the jackshaft in chain-driven cars and unit with the rear axle in shaft-driven vehicles.

Under the main heading Running Gear the sub-head Control has reference to whether the steering wheel is placed on the right or left side of the chassis and whether the gear shift lever is on the right side, in the center or on the left side. This also applies to the location and manner of mounting of the emergency brake lever.

Ignition			Carburetor	Motor Lubrication	Transmission						Running Gear					Bearings	1
					Clutch Type	Gearset			Gear Ratio	Final Drive	Springs		Control				
System	Magneto or Generator	Control				Type	Location	No. Forw'd Speeds			Front	Rear	Steering Wheel	Gear-shift	Emergency Brake	Gearset	Rear Axle
Dual		Hand	Stromberg	Spl-Pres	Cone	Sel	Amid	3	4.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	B & R	Roll
Dual		Hand	Stromberg	Spl-Pres	Cone	Sel.	Amid	3	2.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	B & R	Roll
Dual		Hand	Stromberg	Spl-Pres	Cone	Sel.	Amid	3	11.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	B & R	Roil
			Schebler	Splash	Disk	Sel	Amid	3	7.5-1	Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Ball
			Schebler	Splash	Disk	Sel	Amid	3	7.5-1	Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Ball
Sing	Simms	Fixed	Schebler	Spl-Pres	Cone	Sel	Amid	3	10.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Remy	Hand	Schebler	Splash	Disk	Sel	Unit M	3	4.0-1	Bevel	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Newcomb	Spl-Pres	Disk	Sel	Amid	3	6.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Newcomb	Spl-Pres	Disk	Sel	Amid	3	7.6-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Newcomb	Spl-Pres	Disk	Sel	Amid	3	13.9-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Newcomb	Spl-Pres	Disk	Sel.	Amid	3	13.9-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Spld'rf	Hand	Schebler	Spl-Pres		Plan	Amid	2		Chain	Ell	Ell	Right		Pedal	Plain	Ball
Opt	Remy	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	2	8.1-1	Chain	½ Ell	Plat	Right	Right	Left	Plain	Opt
Sing	Bosch	Hand	Schebler	Splash		Fric	Unit M			Chain	½ Ell	½ Fll	Left	Center	Left	Ball	Ball
Sing	Bosch	Hand	Schebler	Spl-Pres	Disk	Sel	Unit M	3		Bevel	½ Ell	½ Ell	Left	Pedal		Ball	Ball
Sing	Bosch	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Plain
Dual	Bosch	Hand	Schebler	Spl-Pres	Disk	Sel	Unit M	4		Bevel	½ Ell	Ell	Left	Center		Ball	Ball
Dual	Bosch	Hand	Stromberg	Spl-Pres	Disk	Sel	Unit M	3		Bevel	½ Ell	½ Ell	Right	Center	Center	Ball	B & R
Doub	Opt	Fixed	Stromberg	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Right	Center	Center	Ball	Roll
Doub	Opt	Fixed	Stromberg	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Right	Center	Center	Ball	Roll
Doub	Opt	Fixed	Stromberg	Spl-Pres	Disk	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Doub	Opt	Fixed	Stromberg	Spl-Pres	Disk	Sel.	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Sing	Bosch	Fixed	Stromberg	Splash	Disk	Pro	Amid	3	6.0-1	Bevel	½ Ell	Plat	Right	Right	Right	Roll	Roll
Dual	Briggs	Hand	Schebler	Pressure	Disk	Plan	Unit J	2	5.7-1	Chain	Ell	Ell	Right	Right	Right	B & P.	Ball
Dual	Briggs	Hand	Rayfield	Splash	Cone	Sel	Unit J	3	5.3-1	Chain	Ell	Ell	Right			Ball	Ball
Dual	Eisemann	Auto	Schebler	Splash	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Center	Center	Roll	Roll
Dual	Eisemann	Auto	Schebler	Splash	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right			Plain	Roll
Dual	Eisemann	Auto	Schebler	Spl-Pres	Disk	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Center	Center	Ball	Roll
Dual	Remy	Hand	Optional	Splash	Disk	Sel	Unit J	3	9.0-1	Chain			Right	Right	Right	Ball	Ball
Dual	Remy	Hand	Optional	Splash	Disk	Sel	Unit J	3	9.0-1	Chain			Right	Right	Right	Ball	Ball
Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Unit M	3	8.0-1	Chain	½ Ell	½ Ell	Right	Center	Right	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Unit M	3	8.0-1	Chain	½ Ell	½ Ell	Right	Center	Right	Rell	Roll
Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Unit M	3	8.0-1	Chain	½ Ell	½ Ell	Right	Center	Right	Roll	Roll
Dual	Bosch	Hand	Mayer	Splash	Disk	Sel	Unit M	3		Bevel	½ Ell	¾ Ell				Ball	Ball
Sing	Briggs	Hand	Rayfield	Spl-Pres	Cone	Sel	Unit J	3		Chain	½ Ell	Plat	Left	Center	Center	Ball	Ball
Dual	Briggs	Hand	Rayfield	Spl-Pres	Cone	Sel	Unit J	3		Chain	½ Ell	Plat	Left	Center	Center	Ball	Roll
Dual	Briggs	Hand	Rayfield	Spl-Pres	Cone	Sel	Unit J	3		Chain	½ Ell	Plat	Left	Center	Center	Ball	Roll
Doub		Gov	Marvel	Splash		Fric	Amid		6.1-1	Chain	½ Ell	Ell	Left	Left	Left	Roll	Roll
Dual	Remy	Hand	Marvel	Splash	Cone	Sel	Amid	3		Bevel	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Dual	Bosch	Fixed	Schebler	Spl-Pres	Cone	Sel	Amid	3		Bevel	½ Ell	½ Ell	Right			Plain	B & R
Dual		Fixed	Schebler	Spl-Pres	Cone	Sel	Amid	3		Bevel	½ Ell	½ Ell	Right			Plain	B & R
Dual		Fixed	Schebler	Spl-Pres	Cone	Sel.	Amid	3		Bevel	½ Ell	½ Ell	Right			Plain	B & R

ABBREVIATIONS:—Clutch: Exp B, expanding band; Con B, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; I. C., individual clutches. **Gearset Location:** Amid, amidships; Unit M, unit with the motor; Unit J, unit with the jackshaft; Unit X, unit with the rear axle. **Drive:** Bevel, shaft with bevel gears at rear axle; Worm, shaft with worm gears at rear axle; Ext G, external gear; Int G, internal gear. **Springs:** ½ Ell, semi-elliptic; Ell, ellipitc; ¾ Ell, ¾ elliptic; Plat, platform. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball roller and plain.

Motor Truck Chassis on the 1913 Market

2

NAME AND MODEL	Load Capacity Pounds	Chassis Weight Pounds	Turning Radius Feet	Wheelbase	TIRES Kind	TIRES Front	TIRES Rear	No. Cylinders	Bore and Stroke	S. A. E. H. P.	CYLINDERS Shape	CYLINDERS How Cast	Valve Location	Camshaft Drive	COOLING Circulation	COOLING Radiator Suspension
Brockway, A	1,000	1,575	30	100	Solid	36x2	38x2½	3	4.0x5.0		2 Cycle	Sep'rt			Air	
Brockway, B	2,000	2,500	30	106	Solid	36x2½	38x3	3	4.0x5.0		2 Cycle	Sep'rt			Air	
Brockway, C	2,500	2,500	30	106	Solid	36x2½	38x3	3	4.0x5.0		2 Cycle	Sep'rt			Air	
Brockway, D	4,000	3,800	30	112	Solid	36x3	38x4	3	4.5x5.0		2 Cycle	Sep'rt			Air	
Brooks, A, B, C	800	900	22	87	Solid	38x1¾	40x1¾	2	3.7x3.7		2 Cycle	Sep'rt			Air	
Brown, 1,500 lb	1,500			122	Opt	Opt	Opt	4	3.7x5.2	22.5	L Head	Block	Left	Gear	Pump	Springs
Bucklen, A	1,500	2,500[1]		120	Solid	32x4	32x4	4	4.5x5.0	32.4	L Head	Pairs	Left	Spiral	Thermo	Springs
Bucklen, B	3,000	3,600		145	Solid	36x3½	37x5	4	4.5x5.0	32.4	L Head	Pairs	Left	Spiral	Thermo	Springs
Bucklen, C	6,000	4,500		160	Solid	36x5	37x7	4	4.5x5.0	32.4	L Head	Pairs	Left	Spiral	Thermo	Springs
Cameron, 1 ton	2,000	2,725	19	108	Solid	36x2½	36x2½	4	3.8x3.7	24.0	Straight	Sep'rt	Head	Gear	Air	
Cameron, 1 ton	2,000	2,725	19	103	Solid	36x2½	36x2½	4	3.8x3.7	24.0	Straight	Sep'rt	Head	Gear	Air	
Cameron	800	1,318	17½	104	Solid	30x3½	30x3½	4	3.8x3.7	24.0	Straight	Sep'rt	Head	Gear	Air	
Cass, 1 ton	2,500	3,200		119	Solid	35x3½	35x4	4	4.0x4.5	25.6	L Head	Block	Right	Gear	Thermo	Trunnions
Cass, 2 ton	5,000	5,000		137	Solid	35x3½	39x3½	4	4.2x5.0	28.9	Straight	Sep'rt	Head	Gear	Pump	Trunnions
Chase, M†	500	1,400	25	84	Solid	34x2	36x2	2	4.1x4.0		2 Cycle	Sep'rt			Air	
Chase, D†	1,000	1,920	32	100	Solid	34x2	36x2	3	4.1x4.0		2 Cycle	Sep'rt			Air	
Chase, H†	2,000	2,300	45	106	Solid	34x2½	36x3	3	4.1x4.0		2 Cycle	Sep'rt			Air	
Chase, K†	2,000	2,600	45	106	Solid	34x2½	36x3	3	4.1x4.0		2 Cycle	Sep'rt			Air	
Chase, L†	3,000	3,200	50	112	Solid	36x3	36x3½	3	4.5x5.0		2 Cycle	Sep'rt			Air	
Chase, J†	4,000	3,900	52	120	Solid	36x3½	36x4	3	4.5x5.0		2 Cycle	Sep'rt			Air	
Cino, 440-D	1,500	2,300		120	Solid	35x4½	35x4½	4	4.5x5.0	32.4	T Head	Block	Opp	Gear	Pump	Springs
Clark, C	3,000	3,000	25	100	Solid	36x3½	36x4	4	3.7x5.0	22.5	L Head	Block	Left	Gear	Thermo	Springs
Clark, D	3,000	3,400	25	100	Solid	36x3½	36x4	4	3.7x5.0	22.5	L Head	Block	Left	Gear	Thermo	Springs
Clark, E	3,000	3,400	25	120	Solid	36x3½	36x4	4	3.7x5.0	22.5	L Head	Block	Left	Gear	Thermo	Springs
Clark, E	3,000	3,400	25	140	Solid	36x3½	36x4	4	3.7x5.0	22.5	L Head	Block	Left	Gear	Thermo	Springs
Coleman, 1 ton	2,000	3,400		110½	Solid	36x3	36x4	4	3.6x5.3	20.3	L Head	Block	Left	Hel'l	Thermo	Springs
Coleman, 2 ton	4,000	4,000		110½	Solid	36x3½	36x5	4	3.6x5.3	20.3	L Head	Block	Left	Hel'l	Thermo	Springs
Continental, AE	3,000	3,000	31		Solid			4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	
Continental, AE	2,000	3,000		120	Solid			4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	
Couple Gear, HC*	7,000	7,500	28	144	Solid*	36x4	36x4	4	5.3x6.0	44.1	T Head	Sep'rt	Opp	Gear	Pump	Springs
Couple Gear, AC*	10,000	8,000	28	144	Solid*	36x5	36x5	4	5.8x6.0	53.0	T Head	Sep'rt	Opp	Gear	Pump	Springs
Crawford, 18-30	1,200	2,400	25	112	Solid	32x3	33x4	4	4.3x4.5	28.9	L Head	Pairs	Right	Spi'l	Pump	
Crescent, 1 ton	2,000	3,600		108	Solid	34x3½	34x3½	4	4.1x4.3	27.3	L Head	Sep'rt	Left		Pump	Springs
Crescent, 2 ton	4,000	4,000		126	Solid*	34x4	34x3½	4	4.5x5.0	32.4	L Head	Sep'rt	Left		Pump	Springs
Crescent, 3 ton	6,000	5,000		136	Solid*	36x5	36x4	4	4.8x5.0	36.1	L Head	Sep'rt	Left		Pump	Springs
Crown, A	1,500	2,400		104	Solid	36x2½	36x2½	4	3.8x4.5	22.5	T Head	Sep'rt	Opp	Gear	Thermo	Trunnions
Crown, B	2,000	2,600		116	Solid	36x3	36x3½	4	4.0x4.5	25.6	T Head	Block	Opp	Gear	Thermo	Trunnions
Crown, C	3,000	3,400		130	Solid	36x3½	36x4	4	4.1x5.0	27.3	T Head	Block	Opp	Gear	Opt	Trunnions
Croxton, 18				121		36x4	36x4	4	4.1x5.5	27.3	L Head	Block	Right	Gear	Thermo	
Dart								4	3.3x5.0	16.9	L Head	Block	Left	Gear	Thermo	Springs
Dart	3,000	3,400	30	130	Solid	34x3½	38x3½	4	4.1x5.5	27.3	L Head	Block	Left	Hel'l	Pump	Springs
Day Utility, D				115	Pneu	34x4	34x4	4	4.0x4.5	25.6	L Head	Pairs	Left	Gear	Pump	
Decatur, H	3,000	4,000	50	129	Pneu	34x4½	34x4½	4	3.8x5.3	22.5	L Head	Block	Right	Gear	Pump	Springs
Detroit, Mark III	1,000	1,700	39	100	Solid	32x2	32x2½	4	3.3x3.4	16.9	L Head	Pairs	Left	Gear	Thermo	
Diamond, T. J.	3,000							4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	Springs
Diamond, T. G	6,000							4	5.0x5.5	40.0	L Head	Pairs	Left	Gear	Pump	Springs
Diamond, T. G	10,000							4	5.0x5.5	40.0	L Head	Pairs	Left	Gear	Pump	Springs
Dispatch, L	1,000	1,200	30	120	Opt			4	3.5x5.0		2 Cycle	Sep'rt			Air	
Dispatch, N	1,000	1,200	30	120	Pneu	36x3½	36x3½	4	3.5x5.0		2 Cycle	Sep'rt			Air	
Dayton, H	4,000	4,850	23	118½	Solid*	36x4	36x3	4	4.3x5.0	28.9	T Head	Pairs	Opp	Gear	Pump	Springs
Dayton, K	6,000	6,575	28	137	Solid*	36x5	36x4	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	Springs
Dayton, M	10,000	8,650	28	148	Solid*	36x6	42x5	4	5.3x7.0	4.1	T Head	Pairs	Opp	Gear	Pump	Springs
Dorris, H	1,500	2,650	40	130	Solid	35x4½	35x4½	4	4.4x5.0	30.6	Straight	Pairs	Head	Gear	Pump	
Eclipse, B, 2	2,000	3,400		106	Solid	34x3	34x3½	4	3.8x5.3	22.5	L Head	Pairs	Left	Gear	Pump	
Eclipse, D	6,000	5,300		120	Solid*	36x5	36x4	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	
Elk, 2 ton	4,000	4,000		110	Solid*	36x4	36x3	4	4.1x5.3	27.3	L Head	Block	Right	Hel'l	Pump	Springs
Elk, 2 ton	4,000	4,000		120	Solid*	36x4	36x3	4	4.1x5.3	27.3	L Head	Block	Right	Hel'l	Pump	Springs
Elk, 3 ton	6,000	5,800		124	Solid*	36x5	36x4	4	4.5x5.5	32.4	L Head	Pairs	Right	Hel'l	Pump	Springs
Elk, 3 ton	6,000	5,800		112	Solid*	36x5	36x4	4	4.5x5.5	32.4	L Head	Pairs	Right	Hel'l	Pump	Springs
Elk, 5 ton	10,000	8,400		142	Solid*	36x6	36x5	4	4.5x5.5	32.4	L Head	Pairs	Right	Hel'l	Pump	Springs
Elk, 5 ton	10,000	8,400		130	Solid*	36x5	36x5	4	4.5x5.5	32.4	L Head	Pairs	Right	Hel'l	Pump	Springs
Erving, L	3,000			120	Solid	36x3½	36x3½	4	4.5x5.5	32.4		Pairs			Pump	
Federal, C	Opt	Opt	Opt	Opt	Opt	Opt	Opt	4	4.3x4.5	28.9	L Head	Pairs	Left	Gear	Pump	Springs
Federal, D	Opt	Opt	Opt	Opt	Opt	Opt	Opt	4	4.3x4.5	28.9	L Head	Pairs	Left	Gear	Pump	Springs
Ford, T	750	1,200	28	100	Pneu	30x3	30x3½	4	3.8x4.0	22.5	L Head	Block	Right	Gear	Thermo	
Fourwheel Drive, G*	3,000	4,700	23	124	Solid	36x4	36x4	4	4.3x5.0	28.9	T Head	Pairs	Opp	Gear	Pump	Trunnions
Fourwheel Drive, B*	6,000	5,800	23	125	Solid	36x5	36x5	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	Trunnions
Gabriel, G††	Opt	Opt	Opt	Opt	Opt	Opt	Opt	2	5.0x4.0	20	L Head	Sep'rt	Side	Gear	Thermo	
Gabriel, H	Opt	Opt	Opt	Opt	Opt	Opt	Opt	4	3.8x5.1	22.5	L Head	Block	Side	Gear	Pump	
Gabriel, J	Opt	Opt	Opt	Opt	Opt	Opt	Opt	4	4.1x5.3	27.3	L Head	Block	Side	Gear	Pump	
Geneva, C	1,000	1,915		96	Solid	34x2	36x2½	2	5.1x4.5	21.0	L Head	Sep'rt	Side	Gear	Thermo	Springs
Geneva, B	1,200	1,915		96	Solid	34x2	36x2½	2	5.1x4.5	21.0	L Head	Sep'rt	Side	Gear	Thermo	Springs

†Three wheels. ††Two-cylinder opposed. *Drives on four wheels. †††Gas-electric power plant.

ABBREVIATIONS:—Tires: Solid*, solid dual tires in rear. **Cylinders:** Sep'rt, separate. **Valves:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling:** Thermo, themro-syphon. **Radiator Suspension:** S & T, springs and trunnions. **Ignition:** Sing, single; Doub, double; Gov, governor; Auto, automatic. **Magneto or Generator:** Atw K, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Lubrication:** Spl-Pres, splash and pressure; In Fuel, oil fed with gasoline. **Bore and Stroke:** In decimals to nearest 1-10 inch, as 4.3=4¼ etc., .2=3/16, .1=⅛, .3=¼, .4=⅜, .5=½, .6=9/16, .7=11/16, .8=¾, .9=⅞.

Load Capacity and Complete Specifications

IGNITION			Carburetor	Motor Lubrication	TRANSMISSION						RUNNING GEAR					2 BEARINGS	
					Clutch Type	GEARSET			Gear Ratio	Final Drive	SPRINGS		CONTROL				
tem	Magneto or Generator	Control				Type	Location	No. Forw'd Speeds			Front	Rear	Steering Wheel	Gearshift	Emergency Brake	Gearset	Rear Axle
g	Bosch	Fixed	Holley	In Fuel		Plan	Amid	2	3.0-1	Chain	Ell	Ell	Right	Pedal	Pedal	B R & P	Ball
g	Bosch	Fixed	Holley	In Fuel		Plan	Amid	2	3.0-1	Chain	Ell	Plat	Right	Pedal	Pedal	B R & P	Ball
g	Bosch	Fixed	Holley	In Fuel	Cone	Sel	Amid	3	8.0-1	Chain	Ell	Plat	Right	Center	Center	Roll	Ball
g	Bosch	Fixed	Holley	In Fuel	Cone	Sel	Amid	3		Chain	Ell	Plat	Right	Center	Center	B R & P	Roll
g	Bosch		Kingston	In Fuel		Fric			14.0-1	Roller							
al	Remy	Hand		Splash	Disk	Sel	Unit M	3		Int G	½ Ell	½ Ell	Left	Center	Center	Ball	Ball
ub	Briggs	Hand	Optional	Spl-Pres	Disk	Sel	Unit M	3	4.5-1	Bevel	½ Ell	¾ Ell	Left	Opt	Opt	Roll	Roll
al		Hand	Optional	Spl-Pres	Disk	Sel	Unit M	3	7.3-1	Chain	½ Ell	¾ Ell	Left	Opt	Opt	Plain	Ball
al		Hand	Stromberg	Spl-Pres	Disk	Sel	Unit M	3	9.3-1	Chain	½ Ell	¾ Ell	Left	Center	Center	Plain	Roll
ng		Hand	Kingston	Splash	Cone		Unit J	3	7.0-1	Chain	Ell	Ell	Right	Right	Right	Ball	Ball
ng		Hand	Kingston	Spl-Pres	Cone		Unit J	3	6.0-1	Chain	Ell	Ell	Right	Right	Right	Plain	Ball
ng		Hand	Kingston	Spl-Pres	Cone		Unit X	3	3.0-1	Bevel	½ Ell	Ell	Right	Right	Right	Plain	Ball
pt	Eisemann	Hand	Kingston	Splash	Cone	Sel	Amid	2		Chain	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
pt		Hand	Kingston	Splash	Disk	Sel	Unit M	4		Chain	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
ng	Bosch	Fixed	Holley	In Fuel		Plan	Amid	2	9.0-1	Chain	Ell	Cross	Left	Pedal			Plain
ng	Bosch	Fixed	Holley	In Fuel		Plan	Amid	2	7.6-1	Chain	Ell	Ell	Right	Pedal			Ball
ng	Bosch	Fixed	Holley	In Fuel		Plan	Amid	2	8.1-1	Chain	Ell	Plat	Right	Pedal			Ball
ng	Bosch	Fixed	Holley	In Fuel	Cone	Sel	Amid	3	7.9-1	Chain	Ell	Plat	Right	Right			Ball
ng	Bosch	Fixed	Holley	In Fuel	Cone	Sel	Amid	3	7.6-1	Chain	Ell	Plat	Right	Right	Right		Ball
ng	Bosch	Fixed	Holley	In Fuel	Cone	Sel	Amid	3	7.6-1	Chain	Ell	Plat	Right	Right	Right		Ball
ual	Opt	Hand	Rayfield	Spl-Pres	Cone	Sel	Unit X	3		Bevel	Ell	¾ Ell	Right	Center	Center	Ball	Ball
ual	Eisemann	Auto	Holley	Splash	Opt	I. C	Amid	3	3.3-1	Bevel	½ Ell	Ell	Right	Right	Right	Roll	B&R
ual	Eisemann	Auto	Holley	Splash	Opt	I. C	Amid	3	3.3-1	Bevel	½ Ell	Ell	Right	Right	Right	Roll	B&R
ual	Eisemann	Auto	Holley	Splash	Opt	I. C	Amid	3	3.3-1	Bevel	½ Ell	Ell	Right	Right	Right	Roll	B&R
ual	Eisemann	Auto	Holley	Splash	Opt	I. C	Amid	3	3.3-1	Bevel	½ Ell	Ell	Right	Right	Right	Roll	B&R
ual	Remy	Hand	Schebler	Splash	Cone	Sel	Amid	3		Chain	Ell	Ell	Right	Right		Roll	Roll
ual	Remy	Hand	Schebler	Splash	Cone	Sel	Amid	3		Chain	Ell	Ell	Right	Right		Roll	Roll
oub	Bosch	Hand	Schebler	Splash	Cone	Sel	Unit J	3	10.0-1	Chain	½ Ell	Plat	Right	Right	Right	Plain	Ball
ual	Bosch		Schebler	Splash	Disk	Sel	Unit J	3	10.0-1	Chain	½ Ell	Plat	Right	Right	Right	Ball	Ball
ual	Mea	Fixed	Stromberg	Splash							½ Ell	½ Ell	Right		Pedal		Roll
ual	Mea	Fixed	Stromberg	Splash							½ Ell	½ Ell	Right	Pedal	Pedal		Roll
ual	Remy	Hand	Stromberg	Spl-Pres	Cone	Sel	Unit X	3	4.0-1	Bevel	½ Ell	Ell	Right	Right	Right	Roll	Roll
	Opt		Schebler	Spl-Pres	Cone	Sel	Unit J	3		Chain	Ell	Ell	Right	Center	Pedal	Roll	Roll
	Opt		Schebler	Spl-Pres	Cone	Sel.	Unit J	3		Chain	Ell	Ell	Right	Center	Pedal	Roll	Roll
	Opt		Schebler	Spl-Pres	Cone	Sel	Unit J	3		Chain	Ell	Ell	Right	Center	Pedal	Roll	Roll
ual	Briggs	Hand		Spl-Pres	Disk	Sel	Amid	3	7.1-1	Chain	½ Ell	Ell	Left	Center	Center	Plain	Ball
ual	Briggs	Hand		Spl-Pres	Disk	Sel	Amid	3	7.1-1	Chain	½ Ell	Ell	Left	Center	Center	Plain	Ball
ual		Hand		Spl-Pres	Disk	Sel	Amid	3	8.0-1	Chain	½ Ell	½ Ell	Left	Center	Center	Plain	Ball
ing	Eisemann	Hand	Schebler	Splash	Disk	Sel		3	3.50-1	Bevel	½ Ell	¾ Ell	Left	Center	Center	Ball	Ball
ing		Fixed	Optional	Splash	Cone	Sel		3		Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Plain
ual	Eisemann	Gov	Stromberg	Spl-Pres	Opt	Sel	Unit J	3		Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
oub	Remy	Hand	Schebler	Splash	Disk	Pro		3		Bevel	½ Ell	¾ Ell	Left	Center	Center	Ball	Roll
ing	Bosch	Hand	Rayfield	Splash	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
ing		Fixed		Spl-Pres		Plan	Amid	2	6.0-1	Chain	½ Ell	Ell	Left	Center	Center		Roll
ual	Bosch	Fixed	Rayfield	Splash	Disk	Sel	Unit M	3		Worm	½ Ell	½ Ell	Right	Center	Center	Roll	Roll
ual	Bosch	Hand	Rayfield	Splash	Disk	Sel	Unit M	3		Worm	½ Ell	½ Ell	Right	Center	Center	Roll	Roll
ual	Bosch	Hand	Rayfield	Splash	Disk	Sel	Amid	3	12.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
ual	Opt	Hand	Maco.	Splash		Fric	Amid		6.3-1	Chain	Ell	Ell	Right	Pedal	Right	Roll	Roll
ual	Opt	Hand	Maco	Splash		Fric	Amid		6.3-1	Chain	Ell	Ell	Right	Pedal	Right	Roll	Roll
oub	Bosch	Hand	Stromberg	Pressure	Disk	Sel	Amid	3	9.2-1	Chain	½ Ell	Ell	Left	Center	Center	Roll	Roll
oub	Bosch	Hand	Stromberg	Pressure	Disk	Sel	Amid	3	9.4-1	Chain	½ Ell	Ell	Left	Center	Center	Roll	Roll
oub	Bosch	Hand	Stromberg	Pressure	Disk	Sel	Amid	3	12.0-1	Chain	½ Ell	Ell	Left	Center	Center	Roll	Roll
ual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
ual	Bosch	Hand	Stromberg	Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	Ell	Right			Plain	Ball
ual	Bosch	Hand	Stromberg	Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	Plat	Right			Plain	Roll
ual	Eisemann	Hand	Schebler	Spl-Pres	Cone	Sel.	Amid	3		Bevel	½ Ell	¾ Ell	Left	Center	Center	Roll	Roll
ual	Eisemann	Hand	Schebler	Spl-Pres	Cone	Sel	Amid	3		Bevel	½ Ell	¾ Ell	Left	Center	Center	Roll	Roll
ual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Chain	½ Ell	¾ Ell	Left	Center	Center	Roll	Roll
ual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Chain	½ Ell	¾ Ell	Left	Center	Center	Roll	Roll
ual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	½ Ell	¾ Ell	Left	Center	Center	Roll	Roll
ual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	½ Ell	¾ Ell	Left	Center	Center	Roll	Roll
ual		Hand	Schebler	Spl-Pres	Disk	Pro	Amid	3		Chain	½ Ell	Plat					
ing		Fixed	Stromberg	Splash	Cone	Sel	Unit J	3	7.3-1	Chain	½ Ell	½ Ell	Left	Left	Left	Roll	Roll
ing		Fixed	Stromberg	Splash	Cone	Sel	Unit J	3	7.3-1	Chain	½ Ell	½ Ell	Left	Left	Left	Roll	Roll
ing	Own	Hand		Splash	Disk	Plan	Unit M	2		Bevel	½ Ell	Cross	Left	Pedal	Left		
ual	Bosch	Hand	Stromberg	Pressure	Disk	I. C.	Amid	3		Bevel	½ Ell	Plat	Opt	Opt	Opt	Ball	B & R
ual	Bosch	Hand	Stromberg	Pressure	Disk	I. C.	Amid	3		Bevel	½ Ell	Plat	Opt	Opt	Opt	Ball	Ball
ing	Bosch	Hand	Stromberg	Splash		Plan	Amid	2		Chain	½ Ell	½ Ell	Left	Pedal		Plain	Roll
ing		Hand	Stromberg	Spl-Pres	Cone	Sel	Amid	3		Bevel	½ Ell	½ Ell	Left	Center	Center	Plain	Roll
ing		Hand	Stromberg	Spl-Pres	Cone	Sel.	Amid	4		Bevel	½ Ell	½ Ell	Left	Center	Center	Plain	Roll
ing	Bosch	Fixed	Schebler	Spl-Pres	Disk	Plan	Unit J	2		Chain	½ Ell	Ell	Right	Right	Pedal	Ball	Ball
ing	Bosch	Fixed	Schebler	Spl-Pres	Disk	Plan	Unit J	2		Chain	½ Ell	Ell	Right	Right	Pedal	Ball	Ball

BREVIATIONS:—**Clutch:** Exp B, expanding band; Con B, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; I. C., individual clutches. **Gearset Location:** Amid, amidships; Unit M, unit with the motor; Unit J, unit with the jackshaft; Unit X, unit with the rear axle. **Drive:** Bevel, shaft with bevel gears at rear axle; Worm, shaft with worm gears at rear axle; Ext G, external gear; Int G, internal gear. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾ Ell, ¾ elliptic; Plat, platform. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller, B R & P, ball roller and plain.

Motor Truck Chassis on the 1913 Market

NAME AND MODEL	Load Capacity Pounds	Chassis Weight Pounds	Turning Radius Feet	Wheelbase	TIRES Kind	TIRES Front	TIRES Rear	No. Cylinders	Bore and Stroke	S. A. E. H. P.	CYLINDERS Shape	CYLINDERS How Cast	Valve Location	Camshaft Drive	COOLING Circulation	COOLING Radiator Suspension
Gleason, 10††	1,000	1,500		96	Solid	36x2	36x2	2	4.8x4.0	18.0	L Head	Sep'rt	Left	Gear	Thermo	
G. M. C., VC	2,500		38	126	Solid	34x3	36x4	4	3.5x5.3	19.6	L Head	Block	Right	Gear	Pump	Springs
G. M. C., VC	2,500		38	148	Solid	34x3	36x4	4	3.5x5.3	19.6	L Head	Block	Right	Gear	Pump	Springs
G. M. C., SC	4,000			142	Solid*	34x4	36x3½	4	4.0x6.0	25.6	L Head	Block	Right	Gear	Pump	Springs
G. M. C., SC	4,000			175	Solid*	34x4	36x3½	4	4.0x6.0	25.6	L Head	Block	Right	Gear	Pump	Springs
G. M. C., H	7,000	6,500	50	Opt	Solid*	36x5	36x4	4	5.0x5.0	40.0	L Head	Pairs	Left	Gear	Pump	
G. M. C., HL	7,000	6,950	60	170	Solid*	36x5	36x5	4	5.0x5.0	40.0	L Head	Pairs	Left	Gear	Pump	
G. M. C., K	10,000	7,600	50	Opt	Solid*	36x6	36x5	4	5.0x5.0	40.0	L Head	Pairs	Left	Gear	Pump	
G. M. C., KL	10,000	8,100	60	170	Solid*	36x6	36x6	4	5.0x5.0	40.0	L Head	Pairs	Left	Gear	Pump	
Gramm, 1 ton	2,000	3,830	20	108	Solid	34x3½	34x3½	4	4.3x4.5	28.9	L Head	Pairs	Right	Gear	Pump	Springs
Gramm, 2 ton	4,000	4,500	22	116	Solid*	36x4	36x3	4	4.3x4.5	28.9	L Head	Pairs	Right	Gear	Pump	Springs
Gramm, 3 ton	6,000	6,830	24	124	Solid*	36x5	36x4	4	5.0x5.0	40.0	L Head	Pairs	Right	Gear	Pump	Springs
Gramm, 5 ton	10,000	8,140	28½	130	Solid*	36x5	40x5	4	5.0x5.0	40.0	L Head	Pairs	Right	Gear	Pump	Springs
Gramm-Bernstein, 2 ton				Opt	Opt	Opt	Opt	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Gramm-Bernstein, 3½ ton	7,000			Opt	Opt	Opt	Opt	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Great Eagle, A				138	Solid	36x4½	36x4½	4							Pump	
Handy, Wagon	500		12	65	Solid	1.1½	1.1½	2	3.8x3.8		2 Cycle	Sep'rt		Gear	Air	
Handy, Wagon	800		17	86	Solid	1.4	1.4	2	4.1x3.8		2 Cycle	Sep'rt		Gear	Air	
Hart-Kraft, B†	1,000				Solid	34x2½	34x2½	2	4.5x4.0	16.2	L Head	Sep'rt	Side	Gear	Thermo	
Hart-Kraft, BX††	1,500				Solid	34x3	34x3	2	4.5x4.0	16.2	L Head	Sep'rt	Side	Gear	Thermo	
Hart-Kraft, G	1,500			114	Solid	34x3	34x3½	4	3.8x5.3	22.5	L Head	Block	Right		Pump	
Hart-Kraft, E	2,000			121½	Solid	34x3½	36x4	4	3.8x5.3	22.5	L Head	Block	Right		Pump	
Hart-Kraft, C	3,000			127	Solid	34x3½	36x5	4	4.1x5.3	27.3	L Head	Block	Right		Pump	
Hart-Kraft, H	4,000			133	Solid*	34x4	36x3	4	4.1x5.3	27.3	L Head	Block	Right		Pump	
Hart-Kraft, D	5,000			140	Solid*	34x4	38x3½	4	4.5x5.5	32.4	L Head	Pairs	Right		Pump	
Hatfield, J	1,000	1,700	27	88	Solid	34x2	34x2	3	4.1x4.0		2 Cycle	Sep'rt			Air	
Hatfield, K	Opt	Opt	Opt	Opt	Opt	Opt	Opt	3	4.1x4.0		2 Cycle	Sep'rt			Air	
Hercules, E	2,000	2,800	43	110	Solid	36x3½	36x3½	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Hewitt	2,000							4	4.3x6.0	28.9						
Hupmobile, HT	800	1,430		106	Pneu	32x3½	33x4	4	3.3x5.5	16.9	L Head	Block	Left	Chain	Thermo	
Ideal, I	1,500	2,800		109	Solid	36x3	36x2½	4	3.5x4.5	19.6	L Head	Pairs	Left	Gear	Thermo	Springs
Ideal, H	2,000	3,000		115		36x3	36x4	4	3.5x4.5	19.6	L Head	Pairs	Left	Gear	Thermo	Springs
Ideal, H-2	2,000	3,500		124	Solid	36x3½	36x4	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Ideal, G	3,000	4,000		124	Solid	36x4	36x5	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	Springs
I. H. C., A††	1,000	1,997		90	Solid	38x2½	38x2	2	5.0x5.0	20.0	Straight	Sep'rt	Head	Gear	Air	
I. H. C., M††		2,047		Opt	Opt	Opt	Opt	2	4.5x5.0	16.2	Straight	Sep'rt	Head	Gear	Pump	Springs
Indiana, A	3,000	3,320		135	Solid	34x3½	34x4	4	4.0x4.0	25.6		Sep'rt	Right	Gear	Pump	
Indiana, 2 ton	4,000	4,500		144	Solid*	36x4	36x3½	4	4.1x5.3	27.3		Sep'rt	Right	Gear	Pump	
Indiana, 3 ton	6,000	6,000		160	Solid*	36x4½	40x4	4	4.8x5.0	36.1		Sep'rt	Right	Gear	Pump	
Jarvis, 2 ton	4,000	3,700		120	Solid*	36x4	36x3½	4	4.0x6.0	25.6	Straight	Sep'rt	Head	Chain	Pump	Springs
Jarvis, 3½ ton	7,000	5,800		128	Solid*	36x5	36x4	4	4.0x6.0	25.6	Straight	Sep'rt	Head	Chain	Pump	Springs
Jarvis, 5 ton	10,000	7,500		144	Solid*	36x6	38x5	4	4.0x6.0	25.6	Straight	Sep'rt	Head	Chain	Pump	Springs
Johnson, A		2,000		100	Solid	34x3½	34x3½	4	4.3x4.5	28.9	L Head	Pairs	Left		Pump	
Johnson, B		4,000		108	Solid	36x4	36x4	4	4.5x5.3	32.4	L Head	Pairs	Side		Pump	
Johnson, C		8,000		132	Solid*	36x5	36x3½	4	5.0x5.5	40.0	L Head	Pairs	Side		Pump	
Kadix, C	6,000	5,800		148	Solid*	37x5	41x4	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Kadix, C	6,000	5,900		166	Solid*	37x5	41x4	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Kadix, D	8,000	6,200		148	Solid*	37x5	41x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Kadix, D	8,000	6,300		166	Solid*	37x5	41x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Kadix, E	10,000			148	Solid*	42x6	42x6	4	5.0x5.8	40.0	L Head	Pairs	Left	Gear	Pump	Springs
Kadix, E	10,000			166	Solid*	42x6	42x6	4	5.0x5.8	40.0	L Head	Pairs	Left	Gear	Pump	Springs
Kato, H		6,000		120	Solid	34x5	34x5	4	4.8x5.0	36.1	L Head	Pairs	Side		Pump	
Kearns, A	1,500	1,400		100	Solid	34x2	34x2	3	4.0x4.0		2 Cycle	Sep'rt	2 Cycle		Air	
Kelly, K-30	3,000	3,400		120	Solid	36x3½	36x4	4	3.8x5.3	22.5	L Head	Block	Right	Gear	Pump	Springs
Kelly, K-40	7,000			150	Solid	38x5	42x5	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
King, S	7,000	5,950		120	Solid*	36x6	36x4	4	4.5x5.5	32.4	L Head	Pairs	Left	Spi'l	Pump	Springs
Kisselkar	1,500	2,500	22	120	Opt	Opt	Opt	4	4.3x4.3	28.9	L Head	Pairs	Left	Chain	Pump	
Kisselkar	2,000	3,000	24	132	Opt	Opt	Opt	4	4.5x5.3	32.4	L Head	Pairs	Left	Chain	Pump	
Kisselkar	4,000	4,500	25	140	Solid*	36x4	36x3½	4	4.5x5.3	32.4	L Head	Pairs	Left	Chain	Pump	
Kisselkar	6,000	5,300	25	144	Solid*	36x4	36x4	4	4.9x5.0	38.0	L Head	Pairs	Left	Chain	Pump	
Kisselkar	8,000	5,700	26	156	Solid*	37x5	37x5	4	4.9x5.0	38.0	L Head	Pairs	Left	Chain	Pump	
Kisselkar	10,000	6,000	26	156	Solid*	37x5	37x6	4	4.9x5.0	38.0	L Head	Pairs	Left	Chain	Pump	
Kilnekar, 2-10††		1,250		86	Solid	36x3	36x3	2							Thermo	
Knickerbocker, 3	6,000			118	Opt	Opt	Opt	4	4.5x5.0	32.4	L Head	Sep'rt	Left	Gear	Pump	Springs
Knickerbocker, 3	6,000			148	Opt	Opt	Opt	4	4.5x5.0	32.4	L Head	Sep'rt	Left	Gear	Pump	Springs
Knickerbocker, 5	10,000			130	Opt	Opt	Opt	4	4.8x5.0	36.1	L Head	Sep'rt	Left	Gear	Pump	Springs
Knickerbocker, 5	10,000			148	Opt	Opt	Opt	4	4.8x5.0	36.1	L Head	Sep'rt	Left	Gear	Pump	Springs
Knox, R 3	4,000	4,800		145	Opt	Opt	Opt	4	5.0x5.5	40.0	Straight	Sep'rt	Head	Gear	Pump	Springs
Knox, R 15	6,000	7,500		149	Solid*	36x5	36x5	4	5.0x4.8	40.0	Straight	Sep'rt	Head	Gear	Pump	Springs
Koehler††	1,600	2,000	40	86	Solid	34x2	34x2	2	5.3x4.0	22.0	L Head	Sep'rt	Side	Gear	Thermo	Springs
Kopp, H	3,000			120	Solid	36x4	36x5	4	4.3x4.5	28.9	T Head	Pairs	Opp		Pump	
Kopp, L	6,000			116	Solid	36x5	36x4	4	4.9x5.5	38.0	T Head	Pairs	Opp		Pump	
Kopp, M	10,000			126	Solid	36x6	36x5	4	5.3x6.0	44.1	T Head	Sep'rt	Opp		Pump	
Krebs, A	1,500	2,300	20	100	Solid	34x3	34x3	2	4.5x5.0		2 Cycle	Block			Thermo	
Krebs, B	1,500	2,300	20	100	Solid	34x3	34x3	2	4.5x5.0		2 Cycle	Block			Thermo	

†Three wheels. ††Two-cylinder opposed. *Drives on four wheels. †††Gas-electric power plant.

ABBREVIATIONS:—**Tires:** Solid*, solid dual tires in rear. **Cylinders:** Sep'rt, separate. **Valves:** Opp, valves oo opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling:** Thermo, thermo-syphon. **Radiator Suspension:** S & T, springs and trunnions. **Ignition:** Sing, single; Doub, double; Gov, governor; Auto, automatic. **Magneto or Generator:** Atw K, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Lubrication:** Spl-Pres, splash and pressure; In Fuel, oil fed with gasoline. **Bore and Stroke:** In decimals to nearest 1-10 inch, as 4.3=4¼ etc., .2=$\frac{3}{16}$, .1=$\frac{1}{8}$, .3=$\frac{1}{4}$, .4=$\frac{3}{8}$, .5=$\frac{1}{2}$, .6=$\frac{9}{16}$, .7=$\frac{11}{16}$, .8=$\frac{3}{4}$, .9=$\frac{7}{8}$.

Load Capacity and Complete Specifications

IGNITION			Carbureter	Motor Lubrication	TRANSMISSION						RUNNING GEAR					BEARINGS	
					Clutch Type	GEARSET			Gear Ratio	Final Drive	SPRINGS		CONTROL				
System	Magneto or Generator	Control				Type	Location	No. Forw'd Speeds			Front	Rear	Steering Wheel	Gearshift	Emergency Brake	Gearset	Rear Axle
Dual	Remy	Hand	Schebler	Spl-Pres	Disk	Sel	Unit M	3		Bevel	½ Ell	Ell	Right	Right	Right	Plain	B & R
Sing		Hand		Spl-Pres	Cone	Sel.	Amid	3		Chain	½ Ell	¾ Ell	Left	Center	Center	Roll	Roll
Sing		Hand		Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	¾ Ell	Left	Center	Center	Roll	Roll
Sing		Hand		Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	¾ Ell	Left	Center	Center	Roll	Roll
Sing		Hand		Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	¾ Ell	Left	Center	Center	Roll	Roll
Doub		Hand		Splash	Disk	Pro	Amid	3		Chain	½ Ell	¾ Ell	Right	Right	Right	Ball	Roll
Doub		Hand		Splash	Disk	Pro	Amid	3		Chain	½ Ell	¾ Ell	Right	Right	Right	Ball	Roll
Doub		Hand		Splash	Disk	Pro	Amid	3		Chain	½ Ell	¾ Ell	Right	Right	Right	Ball	Roll
Doub		Hand		Splash	Disk	Pro	Amid	3		Chain	½ Ell	¾ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand		Spl-Pres	Disk	Sel	Amid	3	6.0-1	Chain	½ Ell	¾ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand		Spl-Pres	Disk	Sel	Amid	3	7.5-1	Chain	½ Ell	¾ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand		Spl-Pres	Disk	Sel	Amid	4	7.7-1	Chain	½ Ell	¾ El	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand		Spl-Pres	Disk	Sel	Amid	4	9.6-1	Chain	½ Ell	¾ Ell	Right	Right	Right	Roll	Roll
Opt	Opt	Hand	Schebler	Spl-Pres	Disk	I. C.	Amid	3		Chain	½ Ell	¾ Ell	Right	Right	Right	Ball	Roll
Opt	Opt	Hand	Schebler	Spl-Pres	Disk	I. C.	Amid	4		Chain	½ Ell	¾ Ell	Right	Right	Right	Ball	Roll
Dual	Remy	Hand	Stromberg		Cone	Sel	Amid	3		Bevel	½ Ell	¾ Ell	Right	Right	Right		
Sing		Hand	Breeze	Pressure	Disk	Plan	Amid	2		Chain	Ell	Ell	Right	Pedal		Plain	Roll
Sing		Hand	Breeze	Pressure	Disk	Plan	Amid	2		Chain	Ell	Ell	Right	Pedal		Plain	Roll
Dual		Hand		Splash	Disk	Plan	Unit M	2		Chain	Ell	Ell	Right	Right	Pedal		
Dual		Hand		Splash	Disk	Plan	Unit M	2		Chain	Ell	Ell	Right	Right	Pedal		
Dual		Hand		Splash	Cone	Sel	Unit J	3		Chain	Ell	Ell	Right	Right	Right		
Dual		Hand		Splash	Cone	Sel.	Unit J	3		Chain	½ Ell	Plat	Right	Right	Right		
Dual		Hand		Splash	Disk	Sel	Unit J	3		Chain	½ Ell	¾ Ell	Right	Right	Right		
Dual		Hand		Splash	Disk	Sel	Unit J	3		Chain	½ Ell	¾ Ell	Right	Right	Right		
Dual		Hand		Splash	Disk	Sel	Unit J	3		Chain	½ Ell	¾ Ell	Right	Right	Right		
Sing	Bosch	Hand		In Fuel		Fric				Chain			Left		Left		Roll
Sing	Bosch	Fixed		In Fuel		Fric				Chain			Left		Left		Roll
Sing	Bosch	Fixed	Schebler		Cone	Sel	Amid	3	8.2-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	B & R
	Bosch					Plan		2		Chain						Roll	Roll
Sing	Bosch	Hand	Zenith	Splash	Disk	Sel	Unit M	3	3.8-1	Bevel	½ Ell	Cross	Right	Center	Center	B & R	B & R
Sing	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Unit J	3		Chain	½ Ell	¾ Plat	Right	Right	Right	Ball	Ball
Sing	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Unit J	3		Chain	½ Ell	¾ Plat	Right	Right	Right	Ball	Ball
Sing	Eisemann	Hand	Stromberg	Spl-Pres	Cone	Sel	Unit J	3	9.6-1	Chain	½ Ell	¾ Plat	Right	Right	Right	Ball	Ball
Dual	Eisemann	Hand	Stromberg	Spl-Pres	Cone	Sel	Unit J	3	11.0-1	Chain	½ Ell	Plat	Right	Right	Right	Ball	Ball
Triple	Heinze	Hand	Schebler	Spl-Pres	Con Bd.	I. C.	Amid	2		Chain	Ell	Ell	Right	Right	Right	Plain	Roll
Triple	Heinze	Hand	Schebler	Spl-Pres	Con Bd.	I. C.	Amid	2		Chain	Ell	Ell	Right	Right	Right	Plain	Roll
Dual	Bosch	Fixed		Splash	Disk	Sel	Unit J	3		Chain	½ Ell	¾ Ell	Right	Left		Roll	Roll
Dual	Bosch	Fixed		Splash	Disk	Sel	Unit J	3		Chain	½ Ell	¾ Ell	Right	Left		Roll	Roll
Dual	Bosch			Splash	Disk	Sel	Unit J	3		Chain	½ Ell	¾ Ell	Right	Left		Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Amid	3		Chain	½ Ell	¾ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Amid	3		Chain	½ Ell	¾ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Amid	3		Chain	½ Ell	¾ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Gov	Stromberg	Pressure	Cone	Sel	Amid	3		Chain	½ Ell	¾ Ell				Ball	Plain
Dual	Bosch	Gov	Stromberg	Pressure	Cone	Sel	Amid	3		Chain	½ Ell	¾ Ell				Ball	Plain
Dual	Bosch	Gov	Stromberg	Pressure	Opp	Sel	Amid	3		Chain	½ Ell	¾ Ell				Ball	Plain
Sing	Mea	Fixed	Stromberg	Spl-Pres	Disk	Sel	Amid	3	9.4-1	Chain	½ Ell	¾ Ell	Right	Right	Right	Roll	Roll
Sing	Mea	Fixed	Stromberg	Spl-Pres	Disk	Sel	Amid	3	9.4-1	Chain	½ Ell	¾ Ell	Right	Right	Right	Roll	Roll
Sing	Mea	Fixed	Stromberg	Spl-Pres	Disk	Sel	Amid	3	9.4-1	Chain	½ Ell	¾ Ell	Right	Right	Right	Roll	Roll
Sing	Mea	Fixed	Stromberg	Spl-Pres	Disk	Sel	Amid	3	9.4-1	Chain	½ Ell	¾ Ell	Right	Right	Right	Roll	Roll
Sing	Mea	Fixed	Stromberg	Spl-Pres	Disk	Sel	Amid	4	9.4-1	Chain	½ Ell	¾ Ell	Right	Right	Right	Roll	Roll
Sing	Mea	Fixed	Stromberg	Spl-Pres	Disk	Sel	Amid	4	9.4-1	Chain	½ Ell	¾ Ell	Right	Right	Right	Roll	Roll
Sing	Remy	Hand	Schebler	Splash	Cone	Sel	Amid	3		Bevel	½ Ell	Plat				Roll	B & R
Opt	Opt	Hand	Schebler			Frict				Chain	Ell	Ell	Right		Pedal		Ball
Sing		Gov	Breeze	Pressure	Cone	Sel	Amid	3	8.6-1	Chain	½ Ell	¾ Ell	Left	Center	Center	Roll	Roll
Sing		Gov	Breeze	Pressure	Cone	Sel	Amid	3	14.0-1	Chain	½ Ell	¾ Ell	Left	Center	Center	Roll	Roll
Dual	Bosch	Fixed	Schebler	Splash	Disk	I. C.	Unit J	3		Chain	½ Ell	¾ Ell	Right	Right	Right	Ball	Roll
Dual		Hand	Stromberg	Splash	Cone	Sel	Amid	3		Bevel	½ Ell	¾ Ell	Right	Right	Right	Ball	Ball
Dual		Hand	Stromberg	Splash	Cone	Sel	Amid	4		Bevel	½ Ell	¾ Ell	Right	Right	Right	Ball	Roll
Dual		Hand	Stromberg	Splash	Cone	Sel	Amid	4		Chain	½ Ell	¾ Ell	Right	Right	Right	Ball	Roll
Dual		Hand	Stromberg	Splash	Cone	Sel	Amid	4		Chain	½ Ell	¾ Ell	Right	Right	Right	Ball	Roll
Dual		Hand	Stromberg	Splash	Cone	Sel	Amid	4		Chain	½ Ell	¾ Ell	Right	Right	Right	Ball	Roll
Dual		Hand	Stromberg	Splash	Cone	Sel	Amid	4		Chain	½ Ell	¾ Ell	Right	Rigth	Right	Ball	Roll
				Pressure		Plan		2		Chain	½ Ell	Ell					
Dual	Bosch	Hand	Stromberg	Splash	Cone	Sel	Amid	3		Chain	½ Ell	¾ Ell	Left	Left	Left	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Cone	Sel	Amid	3		Chain	½ Ell	¾ Ell	Left	Left	Left	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Cone	Sel	Amid	3		Chain	½ Ell	¾ Ell	Left	Left	Left	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Cone	Sel	Amid	3		Chain	½ Ell	¾ Ell	Left	Left	Left	Roll	Roll
Doub	Bosch	Hand	Stromberg	Pressure	Disk	Sel	Unit M	3	5.4-1	Chain	½ Ell	¾ Ell	Right	Right	Right	Ball	Roll
Doub	Bosch	Hand	Stromberg	Pressure	Disk	Sel	Unit M	3	7.1-1	Chain	½ Ell	¾ Ell	Right	Right	Right	Ball	Roll
Sing	Bosch	Fixed	Schebler	Pressure	Cone	Plan	Amid	2	4.0-1	Chain	½ Ell	Ell	Left	Pedal	Center	Plain	Plain
Doub	Bosch	Hand	Optional	Pressure	Disk	I. C	Amid	3		Chain	Ell	Ell				Ball	Roll
Doub	Bosch	Hand	Schebler	Pressure	Opt	Sel	Amid	3		Chain						Roll	Roll
Doub	Bosch	Hand	Schebler	Pressure	Opt	Sel	Amid	3		Chain						Roll	Roll
Sing	Bosch	Gov	Stromberg	Splash	Cone	Sel	Amid	3	4.5-1	Chain	½ Ell	¾ Ell	Left	Center	Center	Roll	Ball
Sing	Bosch	Gov	Stromberg	Splash	Cone	Sel	Amid	3	4.5-1	Bevel	½ Ell	¾ Ell	Left	Center	Center	Roll	Ball

ABBREVIATIONS:—Clutch: Exp B, expanding band; Con B, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; I. C., individual clutches. **Gearset Location:** Amid: amidships; Unit M, unit with the motor; Unit J, unit with the jackshaft; Unit X, unit with the rear axle. **Drive:** Bevel, shaft with bevel gears at rear axle; Worm, shaft with worm gears at rear axle; Ext G, external gear; Int G, internal gear. **Springs:** ½ Ell, semi-elliptic; Ell, ellipitc; ¾ Ell, ¾ elliptic; Plat, platform. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller, B R & P, ball roller and plain.

Motor Truck Chassis on the 1913 Market

4

NAME AND MODEL	Load Capacity Pounds	Chassis Weight Pounds	Turning Radius Feet	Wheelbase	TIRES			No. Cylinders	Bore and Stroke	S. A. E. H. P.	CYLINDERS		Valve Location	Camshaft Drive	COOLING	
					Kind	Front	Rear				Shape	How Cast			Circulation	Radiator Suspension
LaFrance, 6 ton	12,500	9,000	22½	143	Solid*	36x5	38x6	4	5.5x6.0	48.4	T Head	Pairs	Right	Gear	Pump	Springs
Lambert	1,500			114	Solid	33x4	33x4	4	3.5x4.3	19.6	L Head	Pairs	Right	Gear	Pump	
Lambert, 1 ton	2,000	3,200		114	Solid	36x3	36x3½	4	4.1x4.5	27.3	L Head	Block	Right	Gear	Pump	Springs
Lambert, 2 ton	4,000				Solid	36x3½	36x4	4	4.1x4.5	27.3	L Head	Block	Right	Gear	Pump	Springs
Lange, C	2,000	4,100		125	Solid	36x3½	38x4	4	3.8x5.3	22.5	L Head	Block	Left	Hel'l	Thermo	Springs
Lange, D	3,000	4,400		125	Solid*	36x3½	38x5	4	4.1x5.3	27.3	L Head	Block	Left	Hel'l	Thermo	Springs
Lange, B	4,000	4,800		136	Solid	36x4	38x3	4	4.1x5.3	27.3	L Head	Block	Left	Hel'l	Thermo	Springs
Lauth-Juergens, K	2,000			Opt	Opt	Opt	Opt	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Lauth-Juergens, L	4,000			Opt	Opt	Opt	Opt	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Lauth-Juergens, M	6,000			Opt	Opt	Opt	Opt	4	4.8x5.0	36.1	L Head	Sep'rt	Left	Gear	Pump	Springs
Lewis, 21	5,000	5,200	30	144	Solid	34x4	36x3½	4	4.3x5.0	28.9	T Head	Pairs	Opp	Gear	Pump	Springs
Lewis, 51	10,000	7,600	30	144	Solid*	36x6	38x6	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	Springs
Lewis, 51L	10,000	7,600	30	168	Solid*	36x6	38x6	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	Springs
Lincoln, 27 & 28††	800			87	Pneu	34x3½	34x3½	2	4.1x4.0	13.6	L Head	Sep'rt	Side	Gear	Air	
Lippard-Stewart	1,500	2,500	17	115	Solid	35x4½	35x4½	4	3.8x5.3	22.5	L Head	Block	Left	Hel'l	Pump	Springs
Little Giant, D	2,000	2,100	16	91	Solid	34x2	34x2½	2	5.0x4.0	20.0	L Head	Sep'rt	Head	Gear	Thermo	
Locomobile, A	10,000			Opt	Opt	Opt	Opt	4	5.0x6.0	40.0	T Head	Pairs	Opp	Gear	Pump	Rubber
Longest, 3A	8,000			144	Solid*	36x5	36x5	4	5.0x5.5	40.0	T Head	Pairs	Opp	Gear	Pump	Springs
Longest, 3A	8,000			172	Solid*	36x5	36x5	4	5.0x5.5	40.0	T Head	Pairs	Opp	Gear	Pump	Springs
Lord Baltimore, C	2,000	3,800		130	Solid	34x4	36x4	4	3.8x5.0	22.5	L Head	Block	Left	Gear	Pump	
Lord Baltimore, B	4,000	4,200		135	Solid*	34x4	36x3	4	3.8x5.0	22.5	L Head	Block	Left	Gear	Pump	
Lord Baltimore, A	6,000	7,000		130	Solid*	34x4	38x4	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Lord Baltimore, E	8,000	7,800		135	Solid*	36x5	42x5	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Lord Baltimore, F	10,000	8,400		140	Solid*	36x6	42x6	4	5.3x7.0	44.1	T Head	Pairs	Opp	Gear	Pump	
Luck Utility	1,000			115	Solid			4	3.3x4.0	16.9	L Head	Block	Right	Gear	Thermo	
Mack, 1 ton	2,000			Opt	Solid*			4	4.5x5.5	32.4	L Head	Pairs	Right		Pump	
Mack, 1½ ton	3,000			Opt	Solid*			4	4.5x5.5	32.4	L Head	Pairs	Right		Pump	
Mack, 2 ton	4,000			Opt	Solid*			4	4.5x5.5	32.4	L Head	Pairs	Right		Pump	
Mack, 3 ton	6,000			Opt	Solid*			4	5.5x6.0	48.4	L Head	Pairs	Right		Pump	
Mack, 4 ton	8,000			Opt	Solid*			4	5.5x6.0	48.4	L Head	Pairs	Right		Pump	
Mack, 5 ton	10,000			Opt	Solid*			4	5.5x6.0	48.4	L Head	Pairs	Right		Pump	
Mack, 7 ton	14,000			Opt	Solid*			4	5.5x6.0	48.4	L Head	Pairs	Right		Pump	
Mais, 1½ ton	3,000		19	119	Solid	36x3½	36x5	4	4.0x5.3	25.6	T Head	Pairs	Opp	Gear	Pump	Springs
Mais, 2 ton	4,000		21	132	Solid*	36x3½	36x3½	4	4.0x5.3	25.6	T Head	Pairs	Opp	Gear	Pump	Springs
Mais, 3 ton	6,000		23	160	Solid*	36x4	36x4	4	4.0x5.3	25.6	T Head	Pairs	Opp	Gear	Pump	Springs
Marmon, Delivery	1,500	2,350	40	120	Solid	32x4	32x4	4	4.0x5.0	25.6	T Head	Pairs	Opp	Hel'l	Pump	Trunnions
Mason, 12††	1,000	1,500	20	96	Solid	32x3½	32x3½	2	5.0x5.0	20.0	Straight	Sep'rt	Head	Gear	Pump	
Mason, 12††	1,200	1,500	20	96	Solid	32x3½	32x3½	2	5.0x5.0	20.0	Straight	Sep'rt	Head	Gear	Pump	
Mason, 16-18††	1,600	1,500	20	96	Solid	33x4	33x4	2	5.0x5.0	20.0	Straight	Sep'rt	Head	Gear	Pump	
McIntyre, E	1,500	2,800	20	118	Solid	34x3	34x3½	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Thermo	Springs
McIntyre, A	3,000	3,600	34	144	Solid*	34x3½	36x3½	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Thermo	Springs
McIntyre, A	3,000	3,600	34	120	Solid*	34x3½	34x3½	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Thermo	Springs
McIntyre, G	6,000	5,000	28	144	Solid*	36x4	36x4	4	4.1x5.3	27.3	L Head	Block	Left	Spr'l	Thermo	Springs
McIntyre, G	6,000	5,000	28	168	Solid*	36x4	36x4	4	4.1x5.3	27.3	L Head	Block	Left	Spr'l	Thermo	Springs
Menominee, A	1,500	2,500	20	112	Solid	32x3	32x3	4	3.8x4.5	22.5	L Head	Pairs	Left	Gear	Pump	
Menominee, B	2,000	2,850	22	122	Solid	34x3	34x3	4	4.0x4.5	25.6	L Head	Pairs	Left	Gear	Pump	
Mercury, P††	1,000	1,400		85	Solid	38x2½	40x2½	2	4.3x4.0	14.5	L Head	Sep'rt	Head	Gear	Air	
Modern, B., Bx	1,000	2,200	36	114	Opt	Opt	Opt	4	3.8x4.5	22.5	L Head	Block	Right	Gear	Thermo	Springs
Modern, BR	1,000	2,200	36	114	Opt	Opt	Opt	4	3.8x4.5	22.5	L Head	Block	Right	Gear	Thermo	Springs
Modern, A, AX	1,500	2,280	47	120	Solid	36x3	36x3½	4	4.3x5.3	30.3	L Head	Block	Right	Gear	Pump	Springs
Mogul, G	4,000	4,600		120	Solid	36x4	36x5	4	4.1x5.3	27.3	L Head	Block	Right	Gear	Pump	Springs
Mogul, O	8,000	4,600		142	Solid	36x6	40x6	4	5.0x5.8	40.0	T Head	Pairs	Opp	Gear	Pump	Springs
Mogul, M	10,000	10,000		154	Solid	36x6	40x6	4	5.3x5.8	44.1	T Head	Pairs	Opp	Gear	Pump	Springs
Mogul, V	10,000	11,000		188	Solid	36x7	40x6	4	5.3x5.8	44.1	T Head	Pairs	Opp	Gear	Pump	Springs
Monitor, D	2,000	2,850		100	Solid	34x3½	34x3½	4	3.8x5.0	22.5	L Head	Pairs	Left	Gear	Thermo	Springs
Monitor, C††	2,000	2,850	40	100	Solid	34x3½	34x3½	2	5.3x4.8	22.0	L Head	Sep'rt		Gear	Thermo	Rubber
Monitor, E	3,000	4,000		110	Solid	36x37	40x3½	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Moore, C	1,500	1,800		102	Solid	36x2½	36x3	3	4.0x4.0		2 Cycle	Sep'rt			Air	
Mora, 20††	1,500	2,140	32	94	Solid	36x2	36x2½	2	4.5x4.5	16.2	L Head	Sep'rt		Gear	Thermo	
Moreland, B	2,000			Opt	Opt	Opt	Opt	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Moreland, E	4,000			Opt	Opt	Opt	Opt	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	Springs
Moreland, 13F	6,000			Opt	Opt	Opt	Opt	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Motorette, LJ†	400	670	20	72	Pneu	28x3	29x3½	2	3.8x3.8	11.3	L Head	Sep'rt	Side	Gear	Thermo	
Motorette, N1†	500			72	Pneu	28x3	29x3½	2	3.8x3.8	11.3	L Head	Sep'rt	Side	Gear	Thermo	
Natco, 15		2,700	34	104	Solid	36x3½	[illegible]	[illegible]	3.5x5.0	19.6	L Head	Block	Right	Gear	Thermo	Springs
Nelson-LeMoon, D1	2,000	3,200		Opt	Solid *	36x3	[illegible]	[illegible]	3.8x5.3	22.5	L Head	Block	Right	Gear	Pump	Springs
Nelson-LeMoon, D2	4,000	4,500		Opt	Solid *	36x4	[illegible]	[illegible]	4.1x5.3	27.3	L Head	Block	Right	Gear	Pump	Springs
Nelson-LeMoon, D3	6,000	6,500		Opt	Solid *	36x5	[illegible]	4	4.5x5.5	32.4	L Head		Right	Gear	Pump	Springs
Nyberg	3,000	3,000		Opt	Opt	Opt	Opt	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Old Reliable, 2	6,000	4,500		120	Solid	34x4	Opt	4	4.3x5.0	28.9	T Head	Pairs	Opp	Hel'l	Pump	S & T
Old Reliable, B	10,000	7,300		126	Solid*	36x6	36x6	4	4.8x5.5	36.1	T Head	Pairs	Opp	Hel'l	Pump	S & T

†Three wheels. ††Two-cylinder opposed. *Drives on four wheels. †††Gas-electric power plant.

ABBREVIATIONS:—Tires: Solid*, solid dual tires in rear. **Cylinders:** Sep'rt, separate. **Valves:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling:** Thermo, thermo-syphon. **Radiator Suspension:** S & T, springs and trunnions. **Ignition:** Sing, single; Doub, double; Gov, governor; Auto, automatic. **Magneto or Generator:** Atw K, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Lubrication:** Spl-Pres, splash and pressure; In Fuel, oil fed with gasoline. **Bore and Stroke:** In decimals to nearest 1-10 inch, as 4.3=4¼ etc., .2=$\frac{3}{16}$, .1=$\frac{1}{8}$, .3=$\frac{1}{4}$, .4=$\frac{3}{8}$, .5=$\frac{1}{2}$, .6=$\frac{5}{8}$, .7=$\frac{11}{16}$, .8=$\frac{3}{4}$, .9=$\frac{7}{8}$.

Load Capacity and Complete Specifications

IGNITION			Carburetor	Motor Lubrication	TRANSMISSION						RUNNING GEAR					BEARINGS	
					Clutch Type	GEARSET			Gear Ratio	Final Drive	SPRINGS		CONTROL				
System	Magneto or Generator	Control				Type	Location	No. Forw'd Speeds			Front	Rear	Steering Wheel	Gearshift	Emergency Brake	Gearset	Rear Axle
Dual	Bosch	Hand	Schebler	Spl-Pres		Fric				Chain	½ Ell	½ Ell	Right		Right		Roll
Dual	Bosch	Hand	Schebler	Spl-Pres		Fric				Chain	½ Ell	½ Ell	Right	Right	Right		Ball
Dual	Remy	Hand	Schebler	Spl-Pres		Fric	Unit M			Chain	½ Ell	½ Ell	Right	Right	Right		Roll
Dual	Remy	Hand	Schebler	Spl-Pres		Frin	Amid			Chain	½ Ell	½ Ell	Right	Right	Right		Roll
Doub	Bosch	Hand	Stromberg	Spl-Pres	Disk	I. C.	Amid	3		Roller	½ Ell	½ Ell	Left	Center	Center	R & R	Roll
Doub	Bosch	Hand	Stromberg	Spl-Pres	Disk	I. C.	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center	B & R	Roll
Doub	Bosch	Hand	Stromberg	Spl-Pres	Disk	I. C.	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center	B & R	Roll
Doub	Opt	Hand	Stromberg	Splash	Disk	Sel	Amid	4	7.2-1	Chain	½ Ell	½ Ell	Right			Ball	Ball
Doub		Hand	Stromberg	Splash	Disk	Sel	Amid	4	5.6-1	Chain	½ Ell	½ Ell	Left			Ball	Ball
Doub		Hand	Stromberg	Splash	Disk	Sel	Amid.	4	7.2-1	Chain	½ Ell	½ Ell	Right			Plain	Ball
Dual	Bosch	Hand	Rayfield	Pressure	Disk	Sel	Amid	3	8.5-1	Chain	½ Ell	Plat	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Rayfield	Pressure	Disk	Sel.	Amid	3	9.7-1	Chain	½ Ell	Plat	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Rayfield	Pressure	Disk	Sel	Amid	3	9.7-1	Chain	½ Ell	Plat	Right	Right	Right	Ball	Roll
Sing	K. W.		Schebler	Splash		Fric				Chain	Ell	Ell	Left	Left			Roll
Sing	Eisemann	Auto	Rayfield	Splash	Cone	Sel	Amid	3		Bevel	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Dual	Spld'rf	Hand	Schebler	Pressure	Disk	Plan	Amid	2	8.5-1	Chain	¾ Ell	Ell	Right	Right	Right	B & R	Ball
Dual		Fixed	Own	Pressure	Disk	Sel	Amid		10.3-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Schebler	Pressure	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
Dual	Bosch	Hand	Schebler	Pressure	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
Sing	Bosch	Hand	Schebler	Splash	Cone	Sel	Unit M	3		Int G	½ Ell	½ Ell	Left	Center	Center	Ball	Ball
Sing	Bosch	Hand	Schebler	Splash	Cone	Sel	Unit M	3		Int G	½ Ell	½ Ell	Left	Center	Center	Ball	Ball
Dual	Eisemann	Gov	Holley	Pressure	Cone	Sel	Amid	3	8.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Ball
Dual	Eisemann	Auto	Holley	Pressure	Cone	Sel	Amid	3	9.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Ball
Dual	Eisemann	Auto	Holley	Pressure	Cone	Sel	Amid	3	9.8-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Ball
Dual	Opt	Hand	Opt	Spl-Pres		Plan		2		Bevel	½ Ell	¾ Ell	Right	Pedal	Pedal	B & R	Ball
Dual		Gov	Stromberg	Pressure	Disk	Sel		3		Chain	½ Ell	Plat				Ball	Roll
Dual		Gov	Stromberg	Pressure	Disk	Sel		3		Chain	½ Ell	Plat				Ball	Roll
Dual		Gov	Stromberg	Pressure	Disk	Sel		3		Chain	½ Ell	Plat				Ball	Roll
Opt	Bosch	Gov	Opt	Pressure	Cone	Sel		3		Chain	½ Ell	Plat				Ball	Roll
Opt	Bosch	Gov	Opt	Pressure	Cone	Sel		3		Chain	½ Ell	Plat				Ball	Roll
Opt	Bosch	Gov	Opt	Pressure	Cone	Sel		3		Chain	½ Ell	Plat				Ball	Roll
Opt	Bosch	Gov	Opt	Pressure	Cone	Sel		3		Chain	½ Ell	Plat				Ball	Roll
Sing	Eisemann	Auto	Rayfield	Splash	Exp Bd	Pro	Unit M	3	7.8-1	Int G	½ Ell	½ Ell	Left	Left	Left	Ball	Roll
Sing	Eisemann	Auto	Rayfield	Splash	Exp Bd	Pro	Unit M	3	7.8-1	Int G	½ Ell	½ Ell	Left	Left	Left	Ball	Roll
Sing	Eisemann	Auto	Rayfield	Spalsh	Exp Bd	Pro	Unit M	3	7.8-1	Int G	½ Ell	½ Ell	Left	Left	Left	Ball	Roll
Dual	Bosch	Hand	Stromberg	Pressure	Cone	Sel	Unit X	3		Bevel	½ Ell	Ell	Right	Right	Right	Ball	Ball
Dual	Spld'rf	Hand	Schebler	Spl-Pres	Cone	Plan	Unit M	2		Chain	½ Ell	Ell	Right	Pedal	Right	Plain	Roll
Dual	Spld'rf	Hand	Schebler	Spl-Pres	Cone	Plan	Unit M	2		Chain	½ Ell	Ell	Right	Pedal	Right	Plain	Roll
Dual	Spld'rf	Hand	Schebler	Spl-Pres	Cone	Plan	Unit M	2		Chain	½ Ell	Ell	Right	Pedal	Pedal	Plain	Roll
Dual		Hand	Schebler	Splash	Cone	Sel	Amid	3	6.4-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Ball
Dual		Hand	Stromberg	Splash	Disk	Sel	Unit M	3	8.1-1	Chain	½ Ell	½ Ell	Right	Center	Center	Ball	Ball
Dual		Hand	Stromberg	Splash	Disk	Sel	Unit M	3	8.1-1	Chain	½ Ell	½ Ell	Right	Center	Center	Ball	Ball
Dual		Hand	Stromberg	Splash	Disk	Sel	Unit M	3	4.0-1	Chain	½ Ell	½ Ell	Right	Center	Center	Ball	Roll
Dual		Hand	Stromberg	Splash	Disk	Sel	Unit M	3	4.0-1	Chain	½ Ell	½ Ell	Right	Center	Center	Ball	Roll
Dual		Hand	Schebler	Pressure	Disk	Sel	Unit M	3		Bevel	½ Ell	Plat	Right	Center	Center	Ball	B & R
Dual		Hand	Schebler	Pressure	Disk	Sel	Unit M	3		Bevel	½ Ell	Plat	Right	Center	Center	Ball	Ball
Sing	Remy	Fixed	Own	Spl-Pres	Disk	Plan	Unit M	2		Chain	Ell	Ell	Right	Right	Right		Roll
Sing	Opt	Hand	Opt	Splash	Cone	Sel	Unit J	3	6.5-1	Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Roll
Sing	Opt	Hand	Opt	Splash	Cone	Sel	Unit J	3	6.5-1	Bevel	½ Ell	½ Ell	Left	Center	Center	Ball	Roll
Sing	Opt	Hand	Opt	Splash	Cone	Sel	Unit J	3	6.5-1	Chain	½ Ell	½ Ell		Center	Center	Ball	Roll
Sing	Mea	Hand	Stromberg	Splash	Disk	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Doub	Mea		Stromberg	Splash	Disk	Pro	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Donb	Mea	Hand	Stromberg	Splash	Disk	Pro	Unit J	3		Chain	½ Ell	½ Ell	Right			Ball	Roll
Doub	Mea	Hand	Stromberg	Splash	Disk	Pro	Unit J	3		Chain	½ Ell	½ Ell	Right			Ball	Roll
Sing	Bosch	Hand	Stromberg	Spl-Pres	Disk	Sel	Unit M	3		Bevel	½ Ell	Ell	Right	Center	Center	Ball	B & R
Doub	Bosch	Hand	Schebler	Spl-Pres	Cone	Sel	Amid	3		Bevel	½ Ell	Ell	Right	Right	Right	Roll	B & R
Sing	Bosch	Hand	Schebler	Spl-Pres	Cone	Sel	Unit J	3	8.2-1	Chain	½ Ell	Plat	Right	Right	Right	Ball	Ball
Sing	Bosch	Fixed	Own	In-Fuel	Disk	Plan	Amid	2	5.5-1	Chain	½ Ell	½ Ell	Right	Center	Center	Roll	Roll
Sing		Fixed		Spl-Pres	Disk	Plan	Amid.	2	6.8-1	Chain	½ Ell	½ Ell	Right	Right		Roll	Roll
Dual	Remy	Hand	Schebler	Spl-Pres	Cone	Sel	Unit J	3		Chein	½ Ell	½ Ell	Left	Pedal	Pedal	Plain	Ball
Dual	Remy	Hand	Schebler	Spl-Pres	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Remy	Hand	Schebler	Spl-Pres	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Sing	Bosch	Fixed	Holley	Splash	Cone	Plan	Unit M	2	9.0-1	Chain	Ell	½ Ell	Right	Right	Pedal	Plain	Ball
Sing	Bosch	Fixed	Holley	Splash	Cone	Plan	Unit M	2	9.0-1	Chain	Ell	½ Ell	Right	Right	Pedal	Plain	Ball
Sing				Pressure	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Left	Center	Pedal	Ball	Roll
Sing		Fixed	Rayfield	Splash	Disk	Sel	Unit M	3	Opt	Chain	½ Ell	½ Ell	Right	Center	Center	Roll	Roll
Dual	Bosch	Hand	Rayfield	Splash	Disk	Sel	Unit M	3	Opt	Chain	½ Ell	½ Ell	Right	Center	Center	Roll.	Roll
Dual	Bosch	Hand	Rayfield	Splash.	Disk	Sel	Unit M	3	Opt	Chain	½ Ell	½ Ell	Right	Center	Center	Roll	Roll
Dual	Remy	Hand	Opt	Splash.	Disk	Sel	Unit M	3	9.0-1	Chain	½ Ell	½ Ell	Right	Center.	Center	Ball	Roll
	Bosch	Hand	Schebler	Pressure	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Doub	Bosch	Hand	Schebler	Pressure	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll

ABBREVIATIONS:—**Clutch:** Exp B, expanding band; Con B, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; I. C., individual clutches. **Gearset Location:** Amid, amidships; Unit M, unit with the motor; Unit J, unit with the jackshaft; Unit X, unit with the rear axle. **Drive:** Bevel, shaft with bevel gears at rear axle; Wnrm, shaft with worm gears at rear axle; Ext G, external gear; Int G, internal gear. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾ Ell, ¾ elliptic; Plat, platfnrm. **Bearings:** Roll, roller; B & R, ball end roller; B & P, ball and plain; P & R, plain and roller, B R & P, ball roller and palin.

Motor Truck Chassis on the 1913 Market

5

NAME AND MODEL	Load Capacity Pounds	Chassis Weight Pounds	Turning Radius Feet	Wheelbase	TIRES Kind	TIRES Front	TIRES Rear	No. Cylinders	Bore and Stroke	S. A. E. H. P.	CYLINDERS Shape	CYLINDERS How Cast	Valve Location	Camshaft Drive	COOLING Circulation	COOLING Radiator Suspension
Oliver, A††	1,500	2,500		102	Solid	34x3	34x3½	2	5.0x5.0	20.0	L Head	Sep'rt	Top	Gear	Thermo	Springs
Oliver, B	3,000			133	Solid*	36x3½	36x3	4								
Overland, 60 T	800	1,900	19	110	Solid	33x4	33x4	4	4.0x4.3	25.6	L Head	Sep'rt	Left	Gear	Thermo	Trunnions
Packard, 2 ton	4,000			Opt	Opt	Opt	Opt	4	4.1x5.1	26.4	T Head	Pairs	Opp	Gear	Pump	Springs
Packard, 3 ton	5,000			Opt	Opt	Opt	Opt	4	4.5x5.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Packard, 5 ton	10,000			Opt	Opt	Opt	Opt	4	5.0x5.5	40.0	T Head	Pairs	Opp	Gear	Pump	Springs
Packers, D	4,000	4,300		130	Solid	36x3½	36x5	4	4.3x4.5	28.9	T Head	Pairs	Opp	Gear	Pump	
Packers, E	8,000	5,800		150	Solid*	36x5	36x5	4	5.3x6.0	44.1	T Head	Sep'rt	Opp	Gear	Pump	
Palmer	1,500			110	Solid	34x2½	34x2½	4	3.6x4.8	20.3	L Head	Pairs	Right		Pump	
Pathfinder	1,500	2,300	25	120	Solid	35x4½	35x4½	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Thermo	
Peerless, T C	5,000	5,200	25	151	Solid*	36x4	40x4	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	5,000	6,500	27	174	Solid*	36x4	40x4	4	4.5x5.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	8,000	6,900	25	151	Solid*	36x5	40x5	4	4.5x5.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	8,000	7,200	27	174	Solid*	36x5	40x5	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	10,000	7,600	25	151	Solid*	38x6	42x6	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	10,000	8,000	27	174	Solid*	38x6	42x6	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	12,000	8,200	25	151	Solid*	38x7	42x7	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	12,000	8,600	27	174	Solid*	38x7	42x7	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Pierce-Arrow	10,000			Opt	Solid	Opt	Opt	4	4.9x6.0	38.0	T Head	Pairs	Opp	Gear	Pump	Trunnions
Piggins, 1 ton	2,000	3,800	20	115	Solid	3½	4	4	4.3x4.8	28.9	L Head	Pairs	Left	Gear	Pump	
Plymouth, D-2	2,000	1,000		98	Solid	34x3	34x3½	4	4.0x4.3	25.5	L Head	Pairs	Right	Gear	Pump	Springs
Plymouth, G-2	4,000	1,800		126	Solid	36x5	36x6	4	4.8x5.0	36.1	L Head	Pairs	Right	Gear	Pump	Springs
Pope-Hartford	5,000		21	138½	Solid*	36x6	36x4	4			Straight	Pairs	Head	Gear	Pump	Springs
Pope-Hartford	10,000		21	140	Solid*	36x7	42x6	4			Straight	Pairs	Head	Gear	Pump	Springs
Progress, A	8,000	2,900			Solid	36x3½	36x5	4	4.1x5.3	27.3	L Head	Pairs	Left	Gear	Pump	Springs
Progress, B	6,000	5,700			Solid*	36x5	36x4	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Randolph, 1 ton	2,000			115	Solid			4	3.8x4.5	22.5						
Randolph, 2 ton	4,000			125	Solid	36x4	38x5	4	4.1x5.3	27.3	L Head	Pairs	Side		Pump	
Randolph, 4 ton	8,000			136	Solid*	36x6	40x5	4	4.5x5.5	32.4	L Head	Pairs	Side		Pump	
Randolph, 5 ton	10,000			140	Solid*	36x7	40x6	4	5.0x5.8	40.0	T Head	Pairs	Opp		Pump	
Randolph, R	12,000			140	Solid*	36x7	40x6	4	5.0x5.8	40.0	T Head		Opp		Pump	
Reo, H	1,500	1,700		90	Solid	36x2½	36x3	1	4.8x6.0	9.0	L Head	Sep'rt	Side	Gear	Thermo	
Reo, J	4,000	4,000		130	Solid*	36x4	36x3	4	4.0x4.5	25.6	L Head	Pairs	R & H	Gear	Pump	
Robinson, B	3,000			112	Solid	34x4	Opt	4	4.3x4.8	36.1						
Robinson, D	4,000	4,200		112	Solid*	34x4	Opt	4	4.3x4.8	36.1						
Rowe, A	1,500			120	Solid	34x4½	34x4½	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Rowe, B	2,000			138	Solid	34x3½	34x4	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Rowe, C	3,000			144	Solid	34x3½	34x5	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Rowe, D	4,000			150	Solid*	36x4	36x3½	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Rowe, E	5,000			150	Solid*	36x4	36x4	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Rowe, F	10,000			150	Solid*	36x4	38x5	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
S. & S., 1,500	1,500	2,450		136	Solid	34x4½	34x4½	4	4.1x5.8	27.3	L Head	Sep'rt	Left	Gear	Pump	
Sampson, 3 ton	6,000	6,000		140	Solid*	34x4	36x4	4	4.5x5.5	32.4	L Head	Pairs	Right	Gear	Thermo	Springs
Sampson, 1½ ton	3,000	4,000		110	Solid	32x4	34x5	4	4.0x5.0	25.5	L Head	Pairs	Right	Gear	Thermo	Springs
Sampson, 5 ton	10,000	8,000		155	Solid*	36x6	36x6	4	5.0x5.5	40.0	L Head	Pairs	Left	Gear	Thermo	Springs
Sandusky, B	1,500	2,700	35	120	Solid	34x4	34x4½	4	8.8x5.0	22.5	L Head	Block	Right	Hel'l	Pump	Springs
Sandusky, C	8,000	8,360	35	106	Opt	Opt	Opt	4	3.8x5.0	22.5	L Head	Block	Right	Gear	Pump	Springs
Sanford, J	2,000	2,400	32	88	Solid	38x3	38x3	8	4.0x4.5		2 Cycle	Sep'rt			Air	
Sanford, K	2,000	2,700	34	106	Solid	36x3½	36x3½	4	4.0x4.5	25.5	L Head	Pairs	Left	Gear	Pump	Springs
Saurer, 5 ton	10,000			153½	Solid*	36x5	42x5	4	4.4x5.5	30.5	T Head	Pairs	Opp		Pump	
Saurer, 6½ ton	13,000			159	Solid*	36x5	42x6	4	4.4x5.5	30.5	T Head	Pairs	Opp		Pump	
Schacher, Delivery	1,800			120		34x4	34x4	4	4.3x5.5	28.9	L Head	Block	Right	Spi'l	Pump	
Schacher, 1 ton	2,000	4,000		138	Solid	40x3½	40x4	4	4.3x5.5	28.9	L Head	Block	Right	Spi'l	Pump	
Schacher, 18	4,000			158	Solid*	36x3½	36x3½	4	4.3x5.5	28.9	L Head	Block	Right	Spi'l	Pump	Springs
Schacher, 18	6,000		48	144	Solid*	36x4	36x4	4	4.3x5.5	28.9	L Head	Block	Right	Spi'l	Pump	Springs
Schacher, 21	8,000		48	144	Solid*	36x5	36x5	4	4.3x5.5	28.9	L Head	Block	Right	Spi'l	Pump	Springs
Schleicher, 3 ton	5,000			Opt	Opt	Opt	Opt	4	5.0x5.5	40.0	L Head	Pairs	Left	Gear	Pump	Rubber
Schleicher, 5 ton	10,000			Opt	Opt	Opt	Opt	4	5.5x6.0	48.4	L Head	Pairs	Left	Gear	Pump	Rubber
Schmidt, F††	1,500			90	Solid			2				Sep'rt			Air	
Schmidt, C††	2,000			92	Solid			2				Sep'rt			Air	
Seagrave, C		5,000	40	124	Solid	36x4	38x3½	4	5.8x6.0	53.0	Straight	Sep'rt	Head	Gear	Air	
Seagrave, D2	4,000	5,500	40	136	Solid	36x4	38x3½	6	5.8x6.0	79.5	Straight	Sep'rt	Head	Gear	Air	
Seagrave, F	6,000	7,500	30	148	Solid*	36x4	38x3½	4	5.0x8.0	57.6	T Head	Sep'rt	Opp	Gear	Pump	Springs
Seagrave, G				144	Solid*	36x4	38x3½	6	5.8x6.0	79.5	Straight	Pairs	Head	Gear	Pump	Springs
Seitz	1,500			92	Solid	34x3	34x3	4	8.5x4.5	19.5	L Head	Pairs	Side		Pump	
Seitz, 1 ton	2,000			108	Solid	36x3½	36x3½	4	4.5x4.5	32.4	L Head	Pairs	Side		Pump	
Seitz, 2 ton	4,000			118	Solid*	36x4	36x2½	4	4.5x5.0	32.4	L Head	Pairs	Side		Pump	
Seitz, 3 ton	6,000			124	Solid*	36x5	36x3½	4	5.0x5.0	40.0	L Head	Pairs	Side		Pump	
Seitz, 5 ton	10,000			130	Solid*	36x6	40x4	4	5.5x6.5	48.4	T Head	Pairs	Opp		Pump	
Selden, J	2,000	2,900	25	125	Solid	36x3½	36x4	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	
Selden, J	2,500	2,900	25	145	Solid	36x3½	36x4	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	
Service, J	1,500	2,200	32	115	Solid	36x3	36x3	4	3.8x5.5	22.5	L Head	Block	Right	Gear	Pump	Springs
Service, K	2,000	2,300	32	115	Solid	34x3	34x3½	4	3.8x5.5	22.5	L Head	Block	Right	Gear	Pump	Springs
Service, M	3,000	2,900	38	130	Solid	34x3½	34x4	4	4.1x5.3	27.3	L Head	Block	Right	Gear	Pump	Springs
Smith, 3½ ton	7,000							4	5.0x5.8	40.0	T Head	Pairs	Opp	Spi'l	Pump	
Smith, 6 ton	1,2000							4	5.3x5.8	44.1	T Head	Pairs	Opp	Spi'l	Pump	

† Three Wheel. ††Two-cylinder opposed. *Drives on four wheels. †††Gas-electric power plant.

ABBREVIATIONS:—Tires: Solid*, solid dual tires in rear. **Cylinders:** Sep'rt, separate. **Valves:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling:** Thermo, themro-syphon. **Radiator Suspension:** S & T, springs and trunnions. **Ignition:** Sing, single; Doub, double; Gov, governor; Auto, automatic. **Magneto or Generator:** Atw K, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Lubrication:** Spl-Pres, splash and pressure; In Fuel, oil fed with gasoline. **Bore and Stroke:** In decimals to nearest 1-10 inch, as 4.3=4¼ etc., .2=$\frac{3}{16}$, .1=⅛, .3=¼, .4=⅜, .5=½, .6=$\frac{9}{16}$, .7=$\frac{11}{16}$, .8=¾, .9=⅞.

Load Capacity and Complete Specifications

IGNITION			Carbureter	Motor Lubrication	TRANSMISSSION						RUNNING GEAR					BEARINGS	
					Clutch Type	GEARSET			Gear Ratio	Final Drive	SPRINGS		CONTROL				
System	Magneto or Generator	Control				Type	Location	No. Forw'd Speeds			Front	Rear	Steering Wheel	Gear-shift	Emergency Brake	Gearset	Rear Axle
Dual		Hand	Stromberg	Pressure	Disk	Plan	Unit M	2		Bevel	½ Ell	½ Ell	Left	Pedal		P & R	Roll
			Stromberg	Pressure	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Left		Roll	Roll
Dual	Remy	Hand	Schebler	Spl-Pres	Cone	Sel		3		Bevel	½ Ell	¾ Ell	Right	Center	Center	Ball	B & R
Dual	Eisemann	Auto	Own	Splash	Disk	Pro	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	B & R	Ball
Dual	Eisemann	Auto	Own	Splash	Disk	Pro	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	B & R	Ball
Dual	Eisemann	Auto	Own	Splash	Disk	Pro	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	B & R	Ball
Dual	Spld'rf	Hand	Stromberg	Spl-Pres	Disk	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Koll
Dual	Spld'rf	Hand	Stromberg	Spl-Pres	Disk	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Remy	Hand	Schebler	Splash	Disk	Sel		3		Chain	½ Ell	½ Ell	Right	Center	Center	Ball	Ball
Dual	Eisemann	Hand	Schebler	Splash	Cone	Sel	Unit M	3	4.0-1	Bevel	½ Ell	½ Ell	Right	Right	Right	Ball	Ball
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Doub	Bosch	Hand	Own	Splash	Cone	Sel	Amid	3		Worm	½ Ell	½ Ell	Right	Right	Right	Ball	B & R
Dual	Briggs	Hand	Stromberg	Splash	Cone	Sel	Amid	3	4.0-1	Ext G	½ Ell	Plat	Right	Right	Right	Ball	Ball
Dual	Spld'rf	Hand	Schebler	Splash		Fric	Amid			Chain	½ Ell	Plat	Left	Left	Left	Roll	Roll
Dual	Spld'rf	Hand	Schebler	Splash		Fric	Amid			Chain	½ Ell	Plat	Left	Left	Left	Roll	Roll
Dual	Eisemann	Fixed	Own	Spl-Pres	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell	Left	Center	Center	Plain	Roll
Dual	Eisemann	Fixed	Own	Spl-Pres	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell	Left	Center	Center	Plain	Roll
Dual	Optional	Hand	Stromberg	Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right		Ball	Roll
Dual	Optional	Hand	Stromberg	Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Right			Ball	Roll
											½ Ell	½ Ell	Right	Right	Right		
	Bosch	Fixed		Splash	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right		
Dual	Bosch	Fixed		Splash	Opt	Sel	Unit J	3		Chain	½ Ell	½ Ell				Ball	Ball
Dual	Bosch	Fixed		Splash	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell				Ball	
Dual	Bosch			Splash	Cone	Sel		4		Chain	½ Ell	½ Ell					
Sing		Hand	Holley	Splash	Disk	Plan	Unit M	2	Opt	Chain	½ Ell	Ell	Left	Center	Pedal	Plain	Roll
Dual	National	Hand	Holley	Splash	Disk	Sel	Amid	3	11.0-1	Chain	½ Ell	½ Ell	Left	Center	Pedal	Roll	Roll
		Hand		Spl-Pres	Disk	I. C	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
		Hand		Spl-Pres	Disk	I. C	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual		Hand		Pressure	Disk	Sel	Amid	3		Chain	½ Ell	Plat	Right	Right	Right	Plain	Roll
Dual		Hand		Pressure	Disk	Sel	Amid	3		Chain	½ Ell	Plat	Right	Right	Right	Plain	Roll
Dual		Hand		Pressure	Disk	Sel	Amid	3		Chain	½ Ell	Plat	Right	Right	Right	Plain	Roll
Dual		Hand		Pressure	Disk	Sel	Amid	3		Chain	½ Ell	Plat	Right	Right	Right	Plain	Roll
Dual		Hand		Pressure	Disk	Sel	Amid	3		Chain	½ Ell	Plat	Right	Right	Right	Plain	Roll
Dual		Hand		Pressure	Disk	Sel	Amid	3		Chain	½ Ell	Plat	Right	Right	Right	Plain	Roll
Doub	Eisemann	Fixed	Rayfield	Spl-Pres	Cone	Sel	Unit M	3	4.0-1	Bevel	½ Ell	½ Ell	Right	Center	Center	Ball	B & R
Dual		Hand	Stromberg	Spl-Pres	Disk	Sel	Unit J	3		Chain	½ Ell	½ Ell	Left	Left	Left	Ball	Roll
Dual		Hand	Stromberg	Spl-Pres	Disk	Sel	Unit J	3		Chain	½ Ell	¾ Plat	Left	Left	Left	Ball	Roll
Dual	Bosch	Hand	Stromberg	Spl-Pres	Cone	Sel	Unit J	4		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Remy	Hand	Schebler	Splash	Cone	Sel	Unit J	3	5.0-1	Chain	½ Ell	¾ Plat	Left	Center	Center	Ball	Ball
Sing		Gov	Sebebler	Splash	Cone	Sel	Unit M	3		Chain	½ Ell	¾ Plat	Left	Left	Left	Ball	Roll
Sing	Bosch	Fixed	Holley	Splash	Disk	Plan	Amid	2	4.0-1	Chain	½ Ell	½ Ell	Right		Pedal		Roll
Doub	Remy	Hand	Schebler	Pressure	Disk	Sel	Unit M	3	4.1-1	Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
	Eisemann	Hand	Own	Pressure	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell				Ball	Ball
	Eisemann	Hand	Own	Pressure	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell				Ball	Ball
Dual		Hand	Opt	Spl-Pres	Cone	Sel	Amid	3		Bevel	½ Ell	¾ Ell	Opt	Opt	Opt	Ball	B & R
Dual		Hand	Opt	Spl-Pres	Cone	Sel	Amid	3		Worm	½ Ell	½ Ell	Left	Center	Center		Ball
Doub		Hand	Opt	Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Roll
Doub		Hand	Opt	Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Roll
Doub		Hand	Opt	Spl-Pres	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Roll
Dual	Bosch	Hand	Stromberg	Spl-Pres	Disk	Sel	Unit J	4	5.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Stromberg	Spl-Pres	Cone	Sel	Unit J	4	6.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Sing			Schebler	Spl-Pres		Plan		2		Chain	¾ Ell	Coil	Right	Right			
Sing			Schebler	Spl-Pres		Plan		2		Chain	¾ Ell	Coil	Right	Right			
Doub	Bosch	Hand	Rayfield	Spl-Pres	Cone	Sel	Amid	3	4.4-1	Chain	½ Ell	Plat	Right	Center	Center	Ball	Roll
Doub	Bosch	Hand	Rayfield	Spl-Pres	Cone	Sel	Amid	3	4.4-1	Chain	½ Ell	Plat	Right	Center	Center	Ball	Roll
Doub	Bosch	Hand	Rayfield	Spl-Pres	Cone	Sel	Aimd	3	4.4-1	Chain	½ Ell	Plat	Right	Right	Right	Ball	Roll
Doub	Bosch	Hand	Rayfield	Spl-Pres	Cone	Sel	Amid	3	4.4-1	Chain	½ Ell	Plat	Right	Center	Center	Ball	Roll
Dual	Remy	Hand	Schebler	Pressure		Fric	Amid			Chain	½ Ell	½ Ell					Roll
Doub	Remy	Hand	Schebler	Pressure		Fric	Amid			Chain	½ Ell	½ Ell					Roll
Doub	Remy	Hand	Schebler	Pressure		Fric	Amid			Chain	½ Ell	½ Ell					Roll
Dual	Remy	Hand	Schebler	Pressure		Fric	Amid			Chain	½ Ell	½ Ell					Roll
Doub	Remy	Hand	Schebler	Pressure		Fric	Amid			Chain	½ Ell	½ Ell					Roll
Dual	Briggs		Stromberg	Splash	Disk	Sel	Unit M	3	7.7-1	Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Dual	Briggs		Stromberg	Splash	Disk	Sel	Unit M	3	7.7-1	Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Dual	Briggs	Hand	Stromberg	Spl-Pres		Fric	Amid		6.0-1	Chain	½ Ell	½ Ell	Left	Left		B & R	Ball
Dual	Briggs	Hand	Stromberg	Spl-Pres		Fric	Amid		6.0-1	Chain	½ Ell	½ Ell	Left	Left		B & R	Roll
Dual		Hand	Stromberg	Spl-Pres		Fric	Amid		7.3-1	Chain	½ Ell	½ Ell	Left	Left		B & R	Roll
Doub	Eisemann	Hand	Stromberg	Splash	Disk	Sel	Amid	3		Worm	½ Ell	½ Ell	Right	Right	Right	Roll	B & R
Doub	Eisemann	Hand	Stromberg	Splash	Disk	Sel	Amid	3		Worm	½ Ell	½ Ell	Right	Right	Right	Roll	B & R

ABBREVIATIONS:—Clutch: Exp B, expanding band; Con B, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; I. C., individual clutches. **Gearset Location:** Amid, amidships; Unit M, unit with the motor; Unit J, unit with the jackshaft; Unit X, unit with the rear axle. **Drive:** Bevel, shaft with bevel gears at rear axle; Worm, shaft with worm gears at rear axle; Ext G, external gear; Int G, internal gear. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾ Ell, ¾ elliptic; Plat, platform. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller, B R & P, ball roller and plain.

Motor Truck Chassis on the 1913 Market

NAME AND MODEL	Load Capacity Pounds	Chassis Weight Pounds	Turning Radius Feet	Wheelbase	TIRES Kind	TIRES Front	TIRES Rear	No. Cylinders	Bore and Stroke	S. A. E. H. P.	CYLINDERS Shape	CYLINDERS How Cast	Valve Location	Camshaft Drive	COOLING Circulation	COOLING Radiator Suspension
Speedwell, 2 ton	4,000	4,900	34	115	Solid	36x4	Opt	4	4.1x5.3	27.3	L Head	Block	Left	Gear	.....	.....
Speedwell, 4 ton	8,000	6,600	35	Opt	Solid*	36x5	36x5	4	5.0x5.0	40.0	L Head	Pairs	Left	Gear	.....	.....
Speedwell, 6 ton	12,000	7,200	42½	139	Solid*	36x6	36x6	4	5.0x5.0	40.0	L Head	Pairs	Left	Gear	.....	.....
Standard, 3 ton	6,000	6,100	.....	120	Solid*	36x5	36x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Hel'l	Pump	Springs
Standard, 3 ton	6,000	6,100	.....	148	Solid*	36x5	36x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Hel'l	Pump	Springs
Standard, 3 ton	6,000	6,100	.....	168	Solid*	36x5	36x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Hel'l	Pump	Springs
Standard, 3 ton	6,000	6,100	.....	192	Solid*	36x5	36x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Hel'l	Pump	Springs
Stearns, 5 ton	10,000	6,500	.....	144	Solid	34x5	38x5	4	4.8x6.0	36.1	T Head	Sep'rt	Opp	Gear	Pump	Springs
Stearns	10,000	6,500	.....	190	Solid	34x5	38x5	4	4.8x6.0	36.1	T Head	Sep'rt	Opp	Gear	Pump	Springs
Stegeman, 1 ton	2,000	3,000	.....	Opt	Solid	34x3	36x4	4	3.8x4.1	22.5	L Head	Block	Left	Gear	Pump	.....
Stegeman, 2 ton	4,000	4,200	.....	Opt	Solid*	34x3½	36x3½	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	.....
Stegeman, 3 ton	6,000	5,600	.....	Opt	Solid*	36x4	40x4	4	4.1x5.3	32.4	L Head	Block	Left	Gear	Pump	.....
Stegeman, 4 ton	8,000	6,000	.....	155	Solid*	36x5	40x5	4	4.5x5.5	32.4	L Head	Block	Left	Gear	Pump	.....
Stegeman, 6 ton	12,000	7,000	.....	165	Solid*	36x6	40x6	4	4.5x5.5	32.4	L Head	Block	Left	Gear	Pump	.....
Stegeman, 1,500	1,500	2,400	.....	120	Solid	34x2½	34x3	4	3.8x5.3	22.5	T Head	Block	Opp	Gear	Pump	.....
Sternberg, 2 ton	4,000	4,000	60	116	Solid*	34x4	36x3½	4	4.3x6.8	28.9	L Head	Pairs	Left	Gear	Pump	.....
Sternberg, 2 ton	4,000	4,000	60	140	Solid*	34x4	36x3½	4	4.3x6.8	28.9	L Head	Pairs	Left	Gear	Pump	.....
Sternberg, 2 ton	4,000	4,000	60	160	Solid*	34x4	36x3½	4	4.3x6.8	28.9	L Head	Pairs	Left	Gear	Pump	.....
Sternberg, 3 ton	6,000	6,200	60	130	Solid*	36x4	40x4	4	4.3x6.8	28.9	L Head	Pairs	Left	Gear	Pump	.....
Sternberg, 3 ton	6,000	6,200	60	160	Solid*	36x4	40x4	4	4.3x6.8	28.9	L Head	Pairs	Left	Gear	Pump	.....
Sternberg, 4 ton	8,000	7,300	56	144	Solid*	36x5	40x5	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	Springs
Sternberg, 6 ton	12,000	9,000	56	144	Solid*	36x6	42x6	4	5.3x7.0	44.1	T Head	Pairs	Opp	Gear	Pump	Springs
Stewart, 1,500 lbs	1,500	2,500	32	123	Solid	34x4	35x4½	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Studebaker, 75T	2,500	.....	25	100	Solid	34x3	34x4	4	3.3x5.0	16.9	T Head	Block	Opp	Spi'l	Thermo	.....
Studebaker, 7"T	8,000	.....	50	144	Solid*	38x5	38x5	4	4.4x6.5	30.6	T Head	Pairs	Opp	Spi'l	Pump	Springs
Sullivan, 20	1,000	1,700	38	93	Solid	36x2½	36x2½	4	4.5x4.5	32.4	L Head	Sep'rt	Head	Gear	Thermo	.....
Sullivan, 51	1,500	1,900	38	117	Solid	36x2½	36x3	2	4.5x4.5	16.2	L Head	Sep'rt	Head	Gear	Thermo	.....
Superior, A	2,000	2,500	.....	110	.....	.....	.....	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Toledo, A	2,000	.....	.....	102	Solid	36x3	36x4	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	Springs
Toledo, A	2,000	.....	.....	115	Solid	36x3	36x3	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	Springs
Toledo, B	4,000	.....	.....	130	Solid*	36x4	36x3	4	4.5x5.5	32.4	L Head	Block	Left	Gear	Pump	Springs
Transit, F	4,000	4,800	.....	144	Solid*	36x4	36x3½	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Transit, T	7,000	5,600	.....	144	Solid*	36x5	36x4	4	4.5x5.0	32.4	L Head	Pairs	Right	Gear	Pump	Springs
Transit, V	10,000	6,200	.....	144	Solid*	36x6	40x6	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	Springs
Triumph, 1½ ton	3,000	.....	.....	.....	Opt	Opt	Opt	4	4.5x5.3	32.4	L Head	Block	Left	Gear	Pump	.....
Tulsa, 18	1,500	2,400	.....	116	Solid	36x3	36x3½	4	3.8x4.5	22.5	T Head	Block	Opp	Gear	Thermo	Springs
Tulsa, 1 ton	2,000	2,700	.....	132	Solid	36x3½	36x4	4	4.1x5.3	27.3	T Head	Block	Opp	Gear	Pump	Springs
Tulsa, 1½ tons	3,000	2,800	.....	144	Solid*	36x3½	36x3	4	4.1x5.3	27.3	T Head	Block	Opp	Gear	Pump	Springs
Tulsa, 1½ tons	3,000	2,800	.....	137	Solid*	36x3½	36x3	4	4.1x5.3	27.3	T Head	Block	Opp	Gear	Pump	Springs
Universal Truck††	12,000	.....	.....	132	Solid*	36x5	36x5	4	5.0x6.0	40.0	Straight	Pairs	Right	Gear	Pump	Springs
Universal, C	2,000	3,200	19	130	Solid	34x3½	34x5	4	3.8x5.3	22.5	L Head	Block	Right	Gear	Thermo	Springs
Universal, A	6,000	5,400	18	132	Solid*	36x5	36x4	4	4.0x5.5	25.6	T Head	Pairs	Opp	Gear	Pump	Springs
U. S., E	4,000	4,500	.....	132	Solid*	34x3½	36x3½	4	4.1x5.3	27.3	L Head	Block	Left	Spi'l	Pump	Springs
U. S., D	6,000	6,200	.....	144	Solid*	34x5	36x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Spi'l	Pump	Springs
Velie, Y	5,000	5,500	50	148	Solid*	36x4	36x3½	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Velie, Z	7,000	6,500	50	148	Solid*	36x5	40x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
V. C., B	.....	3,600	.....	130	Solid	36x4	36x4	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Trunnions
Vevrac, B††	2,000	1,550	40	86	Solid	.....	.....	2	4.0x4.0	.....	2 Cycle	Sep'rt	.....	.....	Air	.....
Vulcan, 3 ton	6,000	.....	.....	144	Solid*	36x4	36x4	4	4.6x5.5	34.3	L Head	Pairs	Side	.....	Thermo	.....
Vulcan, 4 ton	8,000	.....	.....	162	Solid*	36x5	36x5	4	4.4x5.5	30.6	L Head	Pairs	Side	.....	Thermo	.....
Vulcan, 4½ ton	9,000	.....	.....	162	Solid*	36x6	36x5	4	4.4x5.5	30.6	L Head	Pairs	Side	.....	Thermo	.....
Vulcan, 5 ton	10,000	.....	.....	.....	.....	.....	.....	4	4.4x5.5	30.6	L Head	Pairs	Side	.....	Thermo	.....
Vulcan, 6 ton	12,000	.....	.....	.....	.....	.....	.....	4	4.8x5.5	36.1	L Head	Pairs	Side	.....	Pump	.....
Vulcan, 7 ton	14,000	.....	.....	156	Solid*	36x7	42x6	4	4.8x5.5	36.1	L Head	Pairs	Side	.....	Pump	.....
Wagenhals	800	1,000	30	80	Solid	28x3	32x4	4	3.5x3.4	19.6	L Head	Pairs	Right	Gear	Pump	.....
Ware, A	4,000	5,000	10	124	Solid	37x5	37x5	4	4.5x6.0	32.4	Straight	Sep'rt	S & H	Gear	Pump	Rubber
Warren, 12-30	1,000	.....	.....	110	Solid	32x4	32x4	4	4.0x4.5	25.6	L Head	Block	Side	.....	Pump	.....
White Star, B	.....	3,200	.....	132	Solid	34x3½	36x4	4	4.0x4.5	25.6	L Head	Pairs	Left	Gear	Pump	S & T
White Star, C	.....	[illegible]	.....	144	[illegible]	34x4	36x5	4	4.0x4.5	[illegible]	L Head	Pairs	Left	Gear	Pump	S & T
White Star, D	.....	4,500	.....	156	Solid*	34x4	36x3½	4	4.3x5.5	[illegible]	T Head	.....	Opp	Gear	Pump	S & T
White, G B E	1,500	.....	.....	[illegible]	[illegible]	34x4½	34x4½	4	3.8x5.1	22.5	L Head	Block	Left	Gear	Pump	.....
White, G T B	[illegible]	.....	.....	144	[illegible]	[illegible]	[illegible]	4	3.8x5.1	22.5	L Head	Block	Left	Gear	Pump	.....
White, G T A	[illegible]	.....	.....	[illegible]	[illegible]	[illegible]	[illegible]	4	3.8x5.1	22.5	L Head	Block	Left	Gear	Pump	Springs
White, T C	[illegible]	.....	.....	[illegible]	[illegible]	[illegible]	[illegible]	4	4.3x5.8	28.9	L Head	Block	Right	Gear	Pump	Springs
White, TKA	10,000	.....	.....	145	Solid*	36x5	[illegible]	4	4.3x5.8	28.9	L Head	Block	Right	Gear	Pump	Springs
Wichita, A	2,000	.....	.....	[illegible]	Solid	34x3	34x3½	4	3.3x5.0	16.9	L Head	Block	Left	Gear	Thermo	Springs
Wichita, B	4,000	.....	.....	[illegible]	Solid*	34x3½	[illegible]	4	3.3x5.0	16.9	L Head	Block	Left	Gear	Thermo	Springs
Wilcox, I	[illegible]	.....	.....	[illegible]	[illegible]	36x3	[illegible]	4	4.3x4.5	28.9	L Head	Pairs	Side	.....	Pump	.....
Wilcox, K	[illegible]	.....	.....	[illegible]	[illegible]	[illegible]	[illegible]	4	4.3x4.5	28.9	L Head	Pairs	Side	Gear	Pump	.....
Wilcox, J	[illegible]	.....	.....	[illegible]	Solid*	36x4	[illegible]	4	4.3x4.5	28.9	L Head	Pairs	Side	Gear	Pump	.....
Willet	4,000	.....	.....	144	Solid*	36x4	[illegible]	4	4.5x5.0	.....	2 Cycle	Block	Right	.....	.....	.....
Wolverine, C	1,000	1,650	35	96	[illegible]	32x4	32x4	1	4.5x5.5	8.1	L Head	Sep'rt	Right	Gear	Thermo	.....
Zimmerman, T	800	.....	.....	[illegible]	[illegible]	[illegible]	[illegible]	2	4.5x4.0	16.0	L Head	Sep'rt	Side	Gear	Air	.....

*[illegible] wheels. ††Two-cylinder opposed. *Dem[illegible]

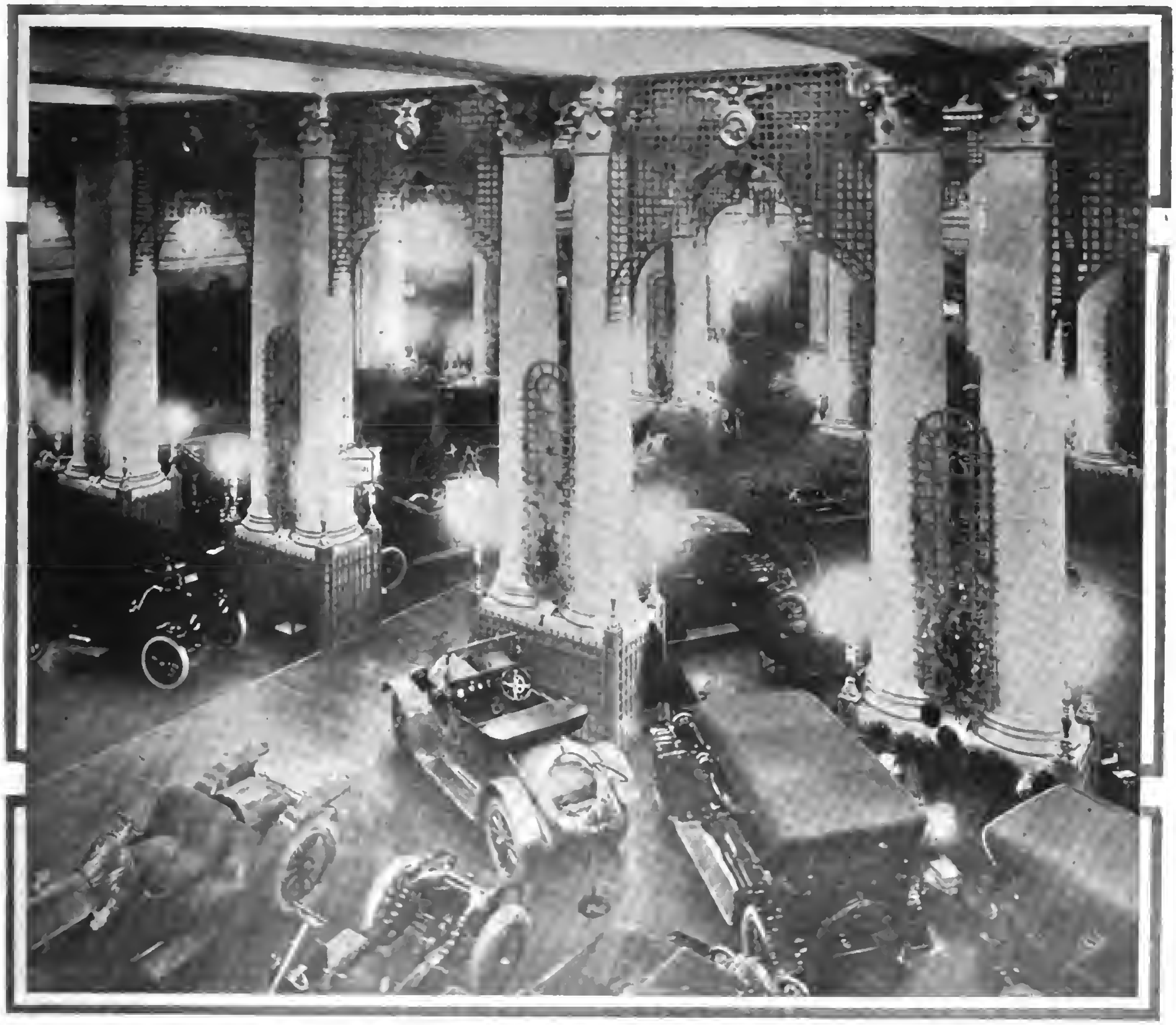
ABBREVIATIONS: Tires: Solid*, [illegible] tires in rear. Cylinders: [illegible] Valves: [illegible] opposite sides of cylinder. Head, both valves in head; L & H, left side and in head; R & H [illegible] Camshaft Drive: Gear, [illegible] Cooling: [illegible] Radiator Suspension: S & T, springs and trunnions. Ignition: Sing[illegible] governor. Auto, automatic. Magneto or Generator: [illegible] Fuel Feed: [illegible] Lubrication: Sp-Pres, splash and pressure; In Ful[illegible] Bore and Stroke: In decimals to nearest [illegible]

Load Capacity and Complete Specifications

IGNITION			Carburetor	Motor Lubrication	TRANSMISSION						RUNNING GEAR					BEARINGS 6	
						GEARSET			Gear Ratio	Final Drive	SPRINGS		CONTROL				
System	Magneto or Generator	Control			Clutch Type	Type	Location	No. Forw'd Speeds			Front	Rear	Steering Wheel	Gearshift	Emergency Brake	Gearset	Rear Axle
Sing	Eisemann	Auto		Splash	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center		
Sing	Eisemann	Auto		Splash	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center		
Sing	Eisemann	Auto		Splash	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Center	Center		
Sing	Eisemann	Gov	Zenith	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Sing	Eisemann	Gov	Zenith	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Sing	Eisemann	Gov	Zenith	Spl-Pres	Disk	Sel	Uint M	3		Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Sing	Eisemann	Gov	Zenith	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Amid	4	9.0-1	Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Roll
Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Amid	4	9.0-1	Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Roll
Sing	Eisemann	Auto	Stewart	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Left	Center	Left		Ball
Sing	Eisemann	Auto	Stewart	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Left			Ball	Ball
		Auto	Stewart	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Left			Ball	Ball
		Auto	Stewart	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Left			Ball	Ball
		Auto	Stewart	Spl-Pres	Disk	Sel	Unit M	3		Chain	½ Ell	½ Ell	Left			Ball	Ball
		Auto	Stewart	Spl-Pres	Disk	Sel	Unit M	3		Bevel	½ Ell	½ Ell	Left	Right	Left	Ball	Ball
Dual	Eisemann	Auto		Splash	Disk	Sel	Amid	3		Chain	½ Ell	Plat	Right	Right	Right	Ball	Roll
Dual	Eisemann	Auto		Splash	Disk	Sel	Amid	3		Chain	½ Ell	Plat	Right	Right	Right	Ball	Roll
Dual	Eisemann	Auto		Splash	Disk	Sel	Amid	3		Chain	½ Ell	Plat	Right	Right	Right	Ball	Roll
Dual	Eisemann	Auto		Splash	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Eisemann	Auto		Splash	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Eisemann	Auto		Pressure	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Dual	Eisemann	Auto		Pressure	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Roll
Sing	Bosch	Fixed	Rayfield	Spl-Pres	Disk	Sel	Amid	3	3.4-1	Bevel	½ Ell	½ Ell	Left	Center	Center	Roll	Roll
Sing	Eisemann	Auto	Own		Exp Bd	Sel	Unit M	3		Int G	½ Ell	½ Ell	Right	Center	Center	Ball	Ball
Sing	Eisemann	Auto	Own		Exp Bd	Sel	Unit M	4		Int G	½ Ell	½ Ell	Right	Center	Center	Ball	Ball
Sing	Bosch	Fixed	Schebler	Spl-Pres	Disk	Plan	Unit J	2		Chain	Ell	Ell	Left	Pedal	Center	Ball	Ball
Sing	Bosch	Fixed	Schebler	Spl-Pres	Disk	Plan	Unit J	2		Chain	Ell	Ell	Left	Pedal	Center	B & P	Ball
Sing			Rayfield	Splash	Cone	Sel	Unit J	3	7.8-1	Chain	½ Ell	½ Ell	Right	Right		Roll	Ball
Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Unit M	3	9.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Unit M	3	9.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Cone	Sel	Amid	3	12.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Briggs	Hand	Stromberg	Splash	Disk	Sel	Unit J	3	9.4-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual		Hand	Stromberg	Splash	Disk	Sel	Unit J	3	10.7-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Briggs	Hand	Stromberg	Pres	Disk	Sel	Unit J	3	12.1-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Sing	Bosch	Hand	Stromberg	Splash	Cone	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Ball
Doub	Opt	Hand	Opt	Splash	Cone	Sel	Unit M	3		Chain	½ Ell	Plat	Right	Right	Right	Plain	Ball
Doub	Opt	Hand	Opt	Splash	Cone	Sel	Unit M	3		Chain	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
Doub	Opt	Hand	Opt	Splash	Cone	Sel	Unit M	3		Chain	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
Doub	Opt	Hand	Opt	Splash	Cone	Sel	Unit M	3		Chain	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
Doub	Briggs	Hand	Schebler	Spl-Pres						Ext G	½ Ell	½ Ell	Right		Pedal		B & R
Dual	Eisemann	Hand	Holley	Splash	Disk	Sel	Unit M	3		Worm	½ Ell	½ Ell	Left	Center	Center	P & B	Ball
Dual		Hand	Holley	Splash	Disk	Sel	Amid	3	12.0-1	Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	G & A		Cone	I. C	Amid	3	8.0-1	Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Roll
Dual	Bosch	Hand	G. & A		Cone	I. C		3	7.8-1	Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Roll
Doub	Bosch	Hand	Stromberg	Spl-Pres	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Doub	Bosch	Hand	Stromberg	Spl-Pres	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Schebler	Spl-Pres	Cone	Sel	Amid	3	8.0-1	Chain	½ Ell	½ Ell	Left	Center	Center	Ball	Ball
Doub	Opt	Hand	Krice	In Fuel	Disk	Plan	Amid	2	6.2-1	Chain	¾ Ell	Ell	Left	Left	Pedal	Ball	Ball
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Unit Jt.	3		Chain	½ Ell	½ Ell	Right	Right	Right		
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right		
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right		
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right		
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right		
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Unit J	3		Chain	½ Ell	½ Ell	Right	Right	Right		
Doub	Briggs	Hand	Marvel	Spl-Pres	Cone	Plan	Unit M	2	9.0-1	Chain	½ Ell	½ Ell	Center	Pedal	Pedal		Roll
Dual	Briggs	Hand	Kingston	Spl-Pres	Disk	Sel	Amid	4		Bevel	Ell	Plat	Right	Pedal		Roll	B & R
Doub	Bosch	Fixed	McCord	Splash	Cone	Sel	Amid	3		Bevel	½ Ell	¾ Ell				Plain	B & R
Sing	Eisemann	Auto	G. & A	Spl-Pres	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
Sing	Eisemann	Auto	G. & A	Spl-Pres	Disk	Sel	Amid	3		Bevel	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
Sing	Eisemann	Auto	G. & A	Spl-Pres	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Right	Right	Right	Plain	Roll
Sing	Mea	Hand	Own	Spl-Pres	Cone	Sel	Amid	4		Bevel	½ Ell	½ Ell	Right	Right	Right	Ball	Ball
Sing	Mea	Hand	Own	Spl-Pres	Cone	Sel	Amid	4		Bevel	½ Ell	½ Ell	Right	Right	Right	Ball	Ball
Sing	Mea	Hand	Own	Spl-Pres	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell	Right	Right	Right	Ball	Ball
Sing	Mea	Hand	Own	Spl-Pres	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell	Left	Center	Left	Ball	Ball
Sing	Mea	Hand	Own	Spl-Pres	Cone	Sel	Amid	4		Chain	½ Ell	½ Ell	Left	Center	Left	Ball	Ball
Opp	Opp	Hand	Stromberg	Spl-Pres	Cone	Sel	Unit J	3	7.3-1	Chain	½ Ell	½ Ell	Right	Center	Center	B & R	Ball
Opp	Opp	Hand	Stromberg	Spl-Pres	Cone	Sel	Unit J	3	8.3-1	Chain	½ Ell	½ Ell	Right	Center	Center	B & R	Ball
Dual	Bosch	Hand	Bennett	Splash	Cone	Sel	Amid	3		Chain	Ell	Plat				Roll	Roll
Dual	Bosch	Hand	Bennett	Splash	Cone	Sel	Amid	3		Chain	Ell	Plat				Roll	Roll
Dual	Bosch	Hand	Bennett	Splash	Cone	Sel	Amid	3		Chain	Ell	Plat				Roll	Roll
Dual	Eisemann	Auto	Zenith	In Fuel	Disk	Sel	Amid	3		Chain	½ Ell	½ Ell	Left	Pedal	Center	Roll	Roll
Sing	Battery	Hand	Holley	Splash		Fric	Amid			Bevel	½ Ell	½ Ell	Left	Left	Pedal	Roll	Roll
Sing	Battery		Schebler	Spl-Pres	Disk	Plan	Amid	2		Chain	¾ Ell	Ell	Right	Right	Pedal	Plain	Ball

ABBREVIATIONS:—Clutch: Exp B, expanding band; Con B, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; I. C., individual clutches. **Gearset Location.** Amid, amidships; Unit M, unit with the motor; Unit J, unit with the jackshaft; Unit X, unit with the rear axle. **Drive:** Bevel, shaft with bevel gears at rear axle; Worm, shaft with worm gears at rear axle; Ext G, external gear; Int G, internal gear. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾ Ell, ¾ elliptic; Plat, platform. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller, B R & P, ball roller and plain.

General view of Madison Square Garden, looking towards main entrance. The scheme of decoration is that of a crystal palace with the walls under the gallery continuous mirrors, the gallery faces and pillars in white. The roof studded with brilliant electric chandeliers relieved with flowers. A general profusion of flowers along the face of the second gallery adds a touch of summer to the setting



In the Grand Central Palace the cars are exhibited on two floors. The general scheme of the main floor is shown on this page. The space is broken up by the dual pillars. The scheme of decoration is that of a Viennese garden with a generous supply of lattice work and the walls covered with touring scenes from the different states of the Union, the general decorative effect being exceedingly pleasing

Main entrance to Madison Square Garden

Main entrance to Grand Central Palace

Automobile America at the Shows

Eighty-Eight Different Makers of Pleasure Cars Represented Electric Cranking, Lighting and Ignition Systems in Favor

WITH the slogan "In Two Buildings for 2 Weeks," the largest automobile show yet staged in this country swung open its doors to an exacting public at 8, January 11. For the next 2 weeks the metropolis will be the Mecca of all those interested in the motor car and its relatives. This year both the Palace and the Garden are under the same management and they opened simultaneously. Although no official count of the attendance for the opening day has yet been given out, Secretary Merle L. Downs gave it as his opinion that about 30,000 people viewed the cars and accessories at both the Garden and the Palace on Saturday night.

A few statistics of this, the Thirteenth National Automobile Show, will serve to reveal the magnitude of the undertaking which has been so ably managed by the committee, consisting of Col. George Pope, chairman, Alfred Reeves, and Merle L. Downs. For the pleasure car exhibition there are 467 exhibits, including car makers, accessory makers, and motorcycle manufacturers. At the Garden, where are assembled the car manufacturers who formerly composed the A. L. A. M., which has now passed out of existence, forty-two makes of pleasure cars are submitted to the public, while at the Grand Central Palace, forty-six other makers of pleasure vehicles are holding forth.

So far the attendance has run way ahead of that of last year in both Palace and Garden, although the greatest percentage of increase is at the Palace. As compared with the Paris Salon the combined floorspace of the two buildings used to stage this year's show exceeds that of Paris by 15,000 square feet. The number of exhibitors, although below the total of 565 which exhibited at Paris, when added to the number who will appear for the second week will swell the total to 702.

There are a number of new cars among the Palace gathering. The Edwards-Knight, the Davis, Lenox, the Chevrolet, the Little, the Keeton, have been brought into the fold and installed among their older contemporaries at the Palace. Yet this pleasure at seeing the newcomers is somewhat tempered by the fact that several of the cars which were with us when the industry was young are now absent. Among these may be mentioned the Brush, the Thomas, Elmore, Marquette, Gaeth, Corbin, DeTamble and the Lion.

Of course the electrics this year are few and far between at either building; but this is easily accounted for when it is remembered that these makers decided to be exclusive recently and held a show of their own several weeks ago. Only a few electric makers deigned to appear at the gasoline assemblage, among which more democratic contingent were the Buffalo, Borland, Argo, Church-Field and Standard.

Entering the Garden, we find ourselves in a veritable crystal palace emblazoned with thousands of electric lights and the entire outer wall of the lower floor lined with mirrors. The color scheme is white and gold with many touches of green and red here and there. One idea of the use of the mirrors is stated by the show committee to give an effect of great spaciousness to the already enormous structure. The ceiling is covered with azure material which lends further to the idea of infinite space as of a large slice of sky above the array of automobiles and their parts.

Three enormous crystal chandeliers and many smaller ones add to the decorative scheme and hang from the dome, while along the balconies and the railings flowers are entwined in infinite array. Lattice work adds to the decoration of the flowers and tempers the brightness of the profusion of electric bulbs. A noteworthy feature of the lighting arrangement this year is the placing of rows of lights above each show space under the balcony on the first floor of the venerable Garden. Heretofore some of these spaces have been a little dark, due to the absence of sufficient light with the attendant disadvantages to the exhibitors who wish to show off every feature of their product. But this year there are no unilluminated corners for the many incandescent bulbs take care of this and they are assisted in their work by the mirrors along the side walls at the back of the booths. Indeed so far as light is concerned the management has left nothing to be desired.

At the Grand Central Palace a less expensive decoration is necessary, for the building itself is exceedingly attractive when devoid of any festive dress. It has been converted into a palace of Versailles, we are told. There are great landscape paintings adorning the walls which are assisted in their work of beautification by lattice construction into which flowers have been entwined. These wall panels depict scenes of famous motoring spots throughout the country. The Delaware Water Gap, the Berkshire Hills, the Palisades of the Hudson form the decorations for the walls on the lower floor, while on the mezzanine floor western scenes predominate. Here we see the Grand Canyon, Rocky Mountain canyons and passes and beautiful California views. Everywhere masses of flowers have been used unsparingly. It is hard to conceive a more beautiful effect than that worked out on so extensive a scale for the approval of the great motoring public.

Show space arrangement this year is somewhat more cramped at the Garden and is responsible for the perhaps lower total number of cars shown. There are no machines on the second balcony at the Garden, while the concert hall, lower floor, which was used as an overflow space last year, is not pressed into service this time. In the basement the accessory space has also been curtailed somewhat. At the same time the second balcony has been somewhat widened, which partially compensates for the other subtractions. At the Palace practically all the available space is utilized. Here the car exhibitors have the first floor exclusively, and they also command most of the mezzanine, although a number of

Upper—View down one of the corridors in the Concert Hall. Lower—Accessory exhibits in basement at Madison Square Garden

accessory exhibitors are also seen here. The balcony is naturally devoted entirely to accessories. Space has also been allotted to the motorcycle contingent which appears in connection with the National Shows for the first time.

The attendant social functions and business meetings always in evidence at show time have not been overlooked this year. On Monday a meeting of the executive board of the A. A. A. was held at the Hotel Belmont, while on Tuesday evening a dinner was tendered to the Pioneer Automobile Manufacturers by the Big Village Motor Boosters at the Murray Hill Lyceum at 11 o'clock. On this day also the executive committee of the Motor and Accessories Manufacturers' Association, the finance committee of the same organization and also its board of directors held meetings at their offices on West Forty-second street. The Motor and Accessories Manufacturers were also active on Wednesday, when at 5:30 p. m. at the Waldorf-Astoria they held their tenth annual meeting and a little later partook of their fifth annual banquet.

The social program for Thursday includes a dinner in honor of W. H. Blood, Jr., given by the Electric Vehicle Association of America at Delmonico's, and the first meeting of the midwinter session of the Society of Automobile Engineers at 9:30 a. m. in the ballroom of the Hotel McAlpin. The S. A. E. also holds professional sessions both Thursday afternoon and evening, while on Friday, both morning and afternoon will be devoted to serious work by this body, and in the evening the McAlpin will again be the scene of the annual society dinner. More professional sessions of this society bring the scheduled doings of the week to a close on Saturday.

Although we have mentioned many of the important events which the week has held in store for the visiting automobile hosts, there are many unscheduled entertaining features given by various organizations to members in attendance at the show. All in all, it will be a busy week for those connected with the industry. Many organizations have planned dinners beginning at night after the show closes which, although alive with features for enjoyment, work to the detriment of all-essential sleep.

Decorations at the Garden and at the Palace as well lend themselves admirably to the display of the automobiles inasmuch as they are subdued and harmonize with most any car body color. This year there is an absence of striking color designs on most of the cars shown, although here and there a flashy body type is in evidence. The tendency seems to be toward more subdued colors and genuine luxuriousness of finish and equipment rather than freakish ideas designed to make a show of the occupants of the car. Conspicuousness in body colors has had its day if the showing in New York this year can be regarded as any criterion. Dark reds, blues, blacks and greens predominate and the finish in every case reflects the great care which has been exercised by every maker for harmony in body colors as well as for the ultra-refinement of finish.

Every style of body is to be seen. Touring cars, limousines, coupés, roadsters bring out the great strides which have been made in the body builders' art. Every conceivable feature for the comfort of the passengers has apparently been provided, and it is hard to see where further improvement is possible in body design. The fore-door type is universal, although many of the makers are exhibiting raceabouts of the characteristic openness. Among these may be mentioned the National, Moon, Mercer, Pathfinder, Stutz, Fiat, Abbott and a score of others.

In nearly every case body interiors correspond in color to the exteriors, although often in lighter shades. Black bodies have black leather finish within; dark blue types have corrresponding seating and side leather; brown exteriors carry brown

Upper—Diagonal view of the main floor at the Garden, looking toward the entrance
Lower—Another diagonal view at the Garden, looking away from the main entrance

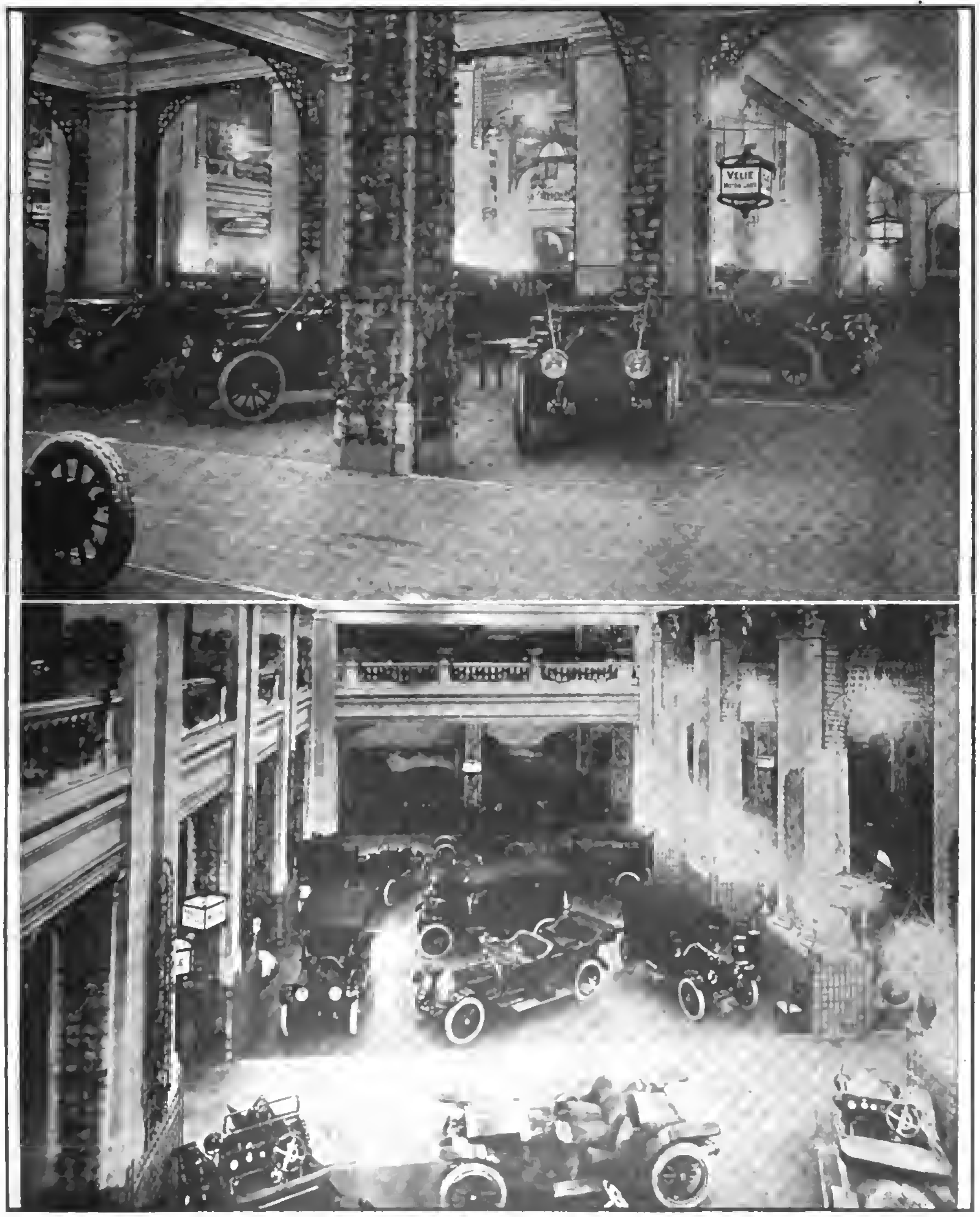
leather cushions and linings. Everywhere harmony is the keynote.

Looking at specific instances of ultra refinement in body design we may turn to the Locomobile limousine, which is a two-compartment type, the forward for the driver. This machine is of a dark maroon color and ranks in beauty favorably with any car yet brought out for the fastidious tastes of the automobile buyer. The interior of the passenger compartment of this beautiful car is transformed into a miniature drawing room. The walls and ceiling are lined with an old rose material into the pattern of which a flower design is woven. Miniature golden lamps are placed in the corners and every detail which will add to the comfort of the occupants has been included. Milady could scarcely wish for anything more in the way of refinement.

Striking in color is the Premier touring coupé, so called. This machine is finished in a bright green outside and shows a tendency to amalgamate foreign ideas of body construction with those of the American maker. This coupé is constructed somewhat on the landaulet idea, the top folding down, although the sides are on the coupé order. The top is also of the striking green which characterizes the body proper. Within, the finish is very elaborate, being in bird's-eye maple and light brown upholstery. Drive is on the left and control in the center. To add to the distinctive appearance of the whole, wire wheels are used, bringing out still more the dash of foreign style which has been added to the body design.

Stevens-Duryea models this year have a foreign air also as regards body design. The hood is of a new sloping type, rounded into the dash in a way which we are wont to credit to our contemporaries from England, France, Belgium, Germany or Italy. Fenders, too, on these cars are worthy of note in that they are very wide and substantially attached to the chassis. They are entirely welded together, no rivets being used. This construction but reflects the welding tendencies which are in evidence on many of the all-steel truck bodies now upon the market.

Very distinctive is the sedan limousine exhibited by Peerless. This machine has the rounded roof and the air of the royal equipage of earlier days. It is finished outside in yellow and black, while the interior leaves nothing to be desired in the way of luxuriousness. Packard, too, appears with the usual richness of body color and fineness of finish. Three Packards are shown, one an outside-drive coupé model finished in a dark blue. A noticeable feature of the body design of these cars this year is the absence of a door at the left of the driver's seat. This is true of the open models only, however, the closed cars retaining the door. The left front side of the bodies being thus closed, it is necessary for the driver to enter from the right front side. Reasons advanced for the design convey the idea that the left front door is of very little value inasmuch as the Packard control levers, which are placed at the left of the driver, make access from this side rather cramped and the other door is usually made use of anyway.

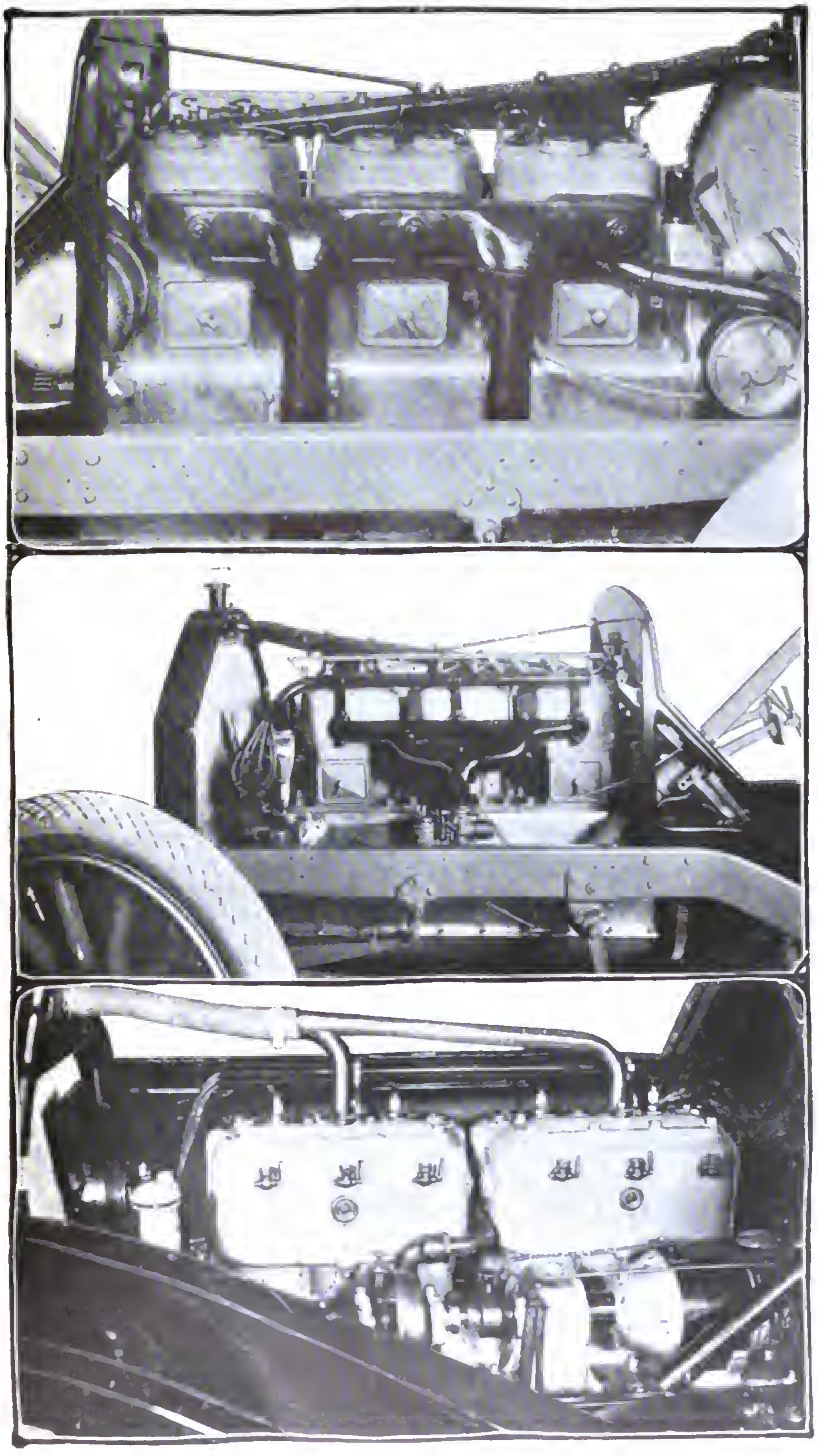


Two views of some of the exhibits on the main floor at the Grand Central Palace, showing the absence of crowding of the cars on display and giving an idea of the decorative scheme

Exhibitors are continually searching for novelties which will attract the spectators to their booths. An original idea has been used by the Packard company. In the glass of the headlights of one of the cars attractive scenes have been worked depicting Packard cars in the foreground. When the headlights are switched on, these scenes show to best advantage. Though a small thing, the idea is unique and attracts much attention.

Alco exhibits a single touring car model in its space at the lower end of the balcony at the Garden. It is placed on a raised platform at the back of the space and in front of it are spread rugs within the confines of the space, the boundaries of which are defined by brown rope draperies, thus further carrying out the color scheme. No chassis is shown.

A number of the makers are not showing a stripped chassis this year, among which are the Packard, Flanders, Oldsmobile and Maxwell, in addition



New Motors Seen at the Shows

Mitchell six (at top) is an entirely new design for the company and is a T-head engine with cylinders in pairs. It makes use of a transverse forward shaft for driving the magneto and water pump. The exhaust manifold has two branches which unite below the frame level. Both sets of valve mechanisms are inclosed and the Esterline cranking motor is mounted transversely at the right rear beneath the footboards, whereas the lighting generator is located under the driver's seat. The motor is clean cut. In fact, the entire chassis deserves mention on this score. The three-blade propeller type of fan is mounted in rear of the radiator. The motor shown at the bottom is that of the six-cylinder 60-horsepower Firestone-Columbus. It has a bore of 4.25 and a stroke of 5.25 inches. The North East electric system is used

to the Alco and several others. Nevertheless, chassis revealing mechanical constructions are in evidence at most of the spaces and it is to be noted that they are all in charge of better-informed attendants than was the case at shows of the past. Intelligent answers to questions has been the rule this year, for the maker realizes that the public is becoming motor-wise and must have facts. Thorough knowledge of the mechanical features of the car must now flow more freely than commendatory phrases regarding body advantages which are equally as evident to the layman as to the demonstrator.

Many new sixes are seen for the first time at the show. There is the new Garford, which has been heralded for some time, and it involves many features of foreign design, although produced by an American engineer—the creator of Overlands. The elements of torque tube construction, rear axle design and general chassis arrangements are more like those seen at the Importers' Salon at the Astor than typical American practice. The placing of a single headlight in the top of the radiator is a feature of the new Garford which cannot be credited to anyone save the designer of the car. This feature has already been discussed in a previous issue of THE AUTOMOBILE. Another new six is the Mitchell, which also involves a number of ideas obtained from the other side. The exhaust manifold on this car is perhaps the most radical feature for pleasure car design. There are two passages leading from the horizontal section of the manifold where it connects to the cylinders and running vertically downward into the main exhaust pipe which passes horizontally back to the muffler. Some such form of manifold construction is often utilized in racing car design, but it appears as rather a departure as applied to the passenger vehicle.

The Lozier light six also comes in for its share of attention inasmuch as it involves a number of features not formerly looked upon as characteristics of Lozier construction. The motor is an L-head type and carries a number of refinements, details of which would be irrelevant here. The reader is referred to last week's issue of THE AUTOMOBILE for a more comprehensive summary of the car's design. Although this new Lozier product is not in the small car class, it is designated as the light six to distinguish it from the larger model, which has heretofore been the exclusive production of the Lozier plant.

At the Palace the Chevrolet and Little sixes are on display for the first time, being products of subsidiaries of the recently-formed Republic Motors Company, a highly capitalized combine.

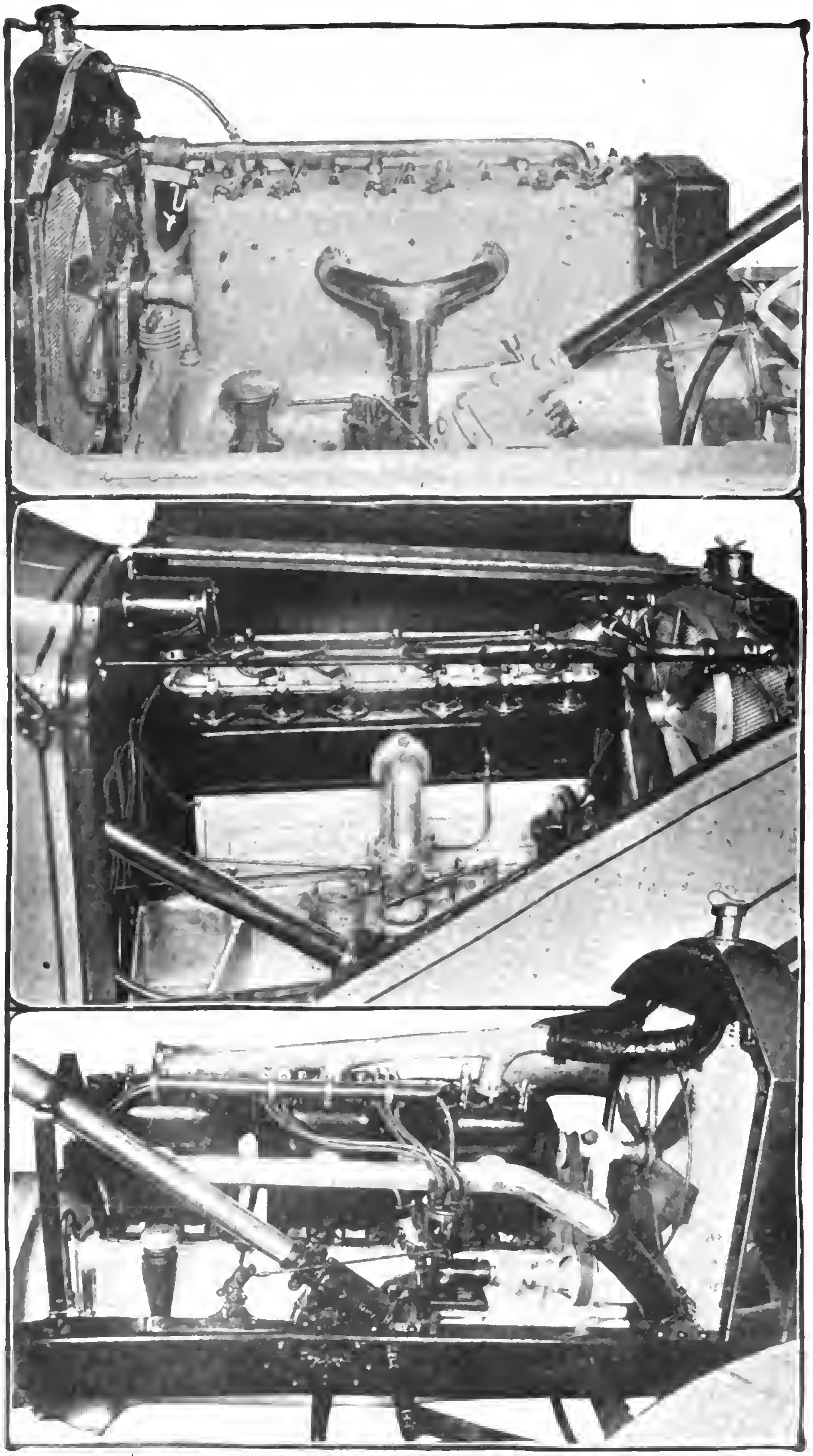
The Chevrolet involves many of the ideas of Louis Chevrolet, who has won distinction in the racing game. Naturally, a number of foreign ideas are incorporated. At the Palace also we find the new Studebaker line, which comprises two fours and a six of monobloc-cast motor construction. Here also is the new six-cylinder Stutz, product of Indianapolis. The little Herreshoff six-cylinder type is also to be seen, as well as a number of others.

Among the non-poppet valve type motor equipped cars, the Palace houses a rival of the Knight type, inasmuch as the Speedwell company exhibits its new car equipped with a Mead rotary-valve engine. This motor, although it has been exhibited at the shows before, is seen for the first time as a part of any particular make of car. The motor involves the use of two sleeves, one at either side of the cylinder heads of the monobloc casting, which sleeves are driven from the crankshaft by silent chains. When slots in these sleeves register with similar openings in the cylinder walls they permit the passage of gases either to or from cylinders as the case may be. Lubrication of these sleeves is accomplished through the placing of a small quantity of lubricating oil in the gasoline. As applied to the Speedwell car this motor appears at the show in connection with a touring car model.

The Knight-equipped cars this year have been augmented by the Edwards car, which makes its début at the Palace. The older adherents to this sleeve-valve motor, namely, the Stearns, Stoddard and Columbia concerns, are again on deck. The Stearns people have added the six-cylinder Knight-equipped car to their line, which shows no constructional features differing radically from those incorporated in this sleeve-valve motor as placed on cars of this make somewhat over a year ago when the company switched from the poppet-valve motor to the exclusive manufacture of the design of Charles W. Knight.

The Edwards-Knight, details of which appeared in a previous issue of THE AUTOMOBILE, is the only American car in this year's show to be equipped with a worm-driven rear axle. The worm is placed underneath the wheel, a position recommended by most engineers versed in this subject, although there are many who champion the use of the overhead worm.

Most notable of all the tendencies at the show this year is the almost universal adoption of some form of cranking system. A careful canvass of all the cars to be seen at the Garden shows that out of fifty models under investigation 70 per cent. are equipped with electric starting in some form or

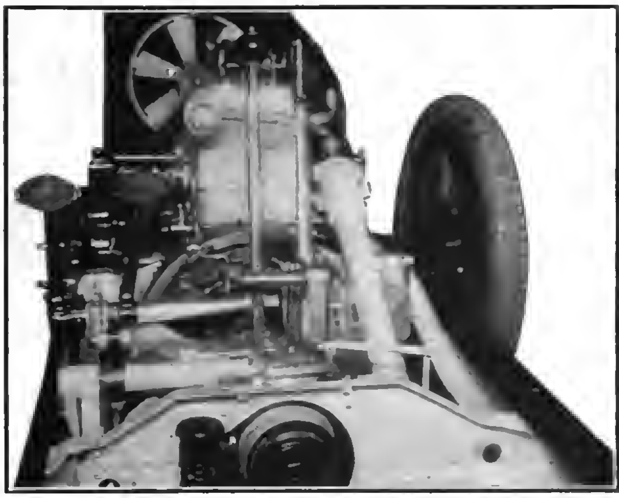


New Motors Seen at the Shows

Garford six (at top) with block casting having top portion of crankcase integral with cylinders and cylinder heads separate in the form of a large plate

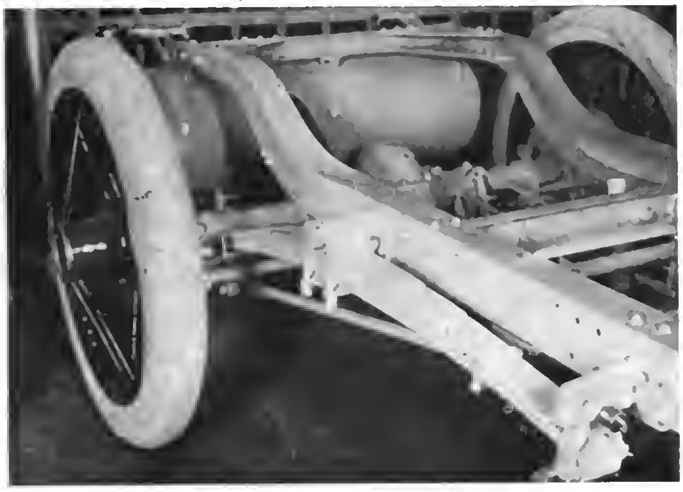
American six (center) is a T-type block design, the intake side of which is shown herewith. The cylinders measure 4.5 by 6 inches. The Electro motor-generator for cranking and lighting is used

Havers six (bottom) is not a new motor, but shows that type of design in which the cylinders are cast in pairs and have valves located on one side. The normal-sized water pipes for the thermo-syphon cooling are seen, as well as the Atwater-Kent ignition apparatus



Showing how propeller shaft is carried through large opening in center of cross piece of frame and how levers are mounted

One of the luxurious berline bodies is the Locomobile finished lavishly with gold trimmings



The Lanchester type of spring on the new Edwards-Knight chassis, showing how spring weight is carried on the car frame

other. Three of these cars carry acetylene starters, while four machines of this fifty are provided with an air starting system. Only six carry no provision for cranking the motor from the seat. In every case where electric starting is used, there is also electric lighting. Many of the electric starting systems with which our readers are already familiar are prominent in the chassis on display, although many new makes are also placed on well-known cars.

Considering the electric cranking situation, it is a noteworthy fact that the majority of the systems make use of three separate units to perform the various electrical functions, although there are a number of instances of the use of a single combined unit which takes care of the ignition, lighting and cranking. The principal illustration of this type of installation is the Delco system as utilized on the cars of the General Motors make. In all other cases under investigation either the magneto lighting generator and cranking motor are separately installed or two of these units are combined. Most of the two-unit applications combine the motor and generator into a single machine, while the magneto is entirely separate. The table, page 228, covering fifty machines taken at random, serves to bring out great diversity in the use of electric equipment on the cars of this year. The two-unit system, by which is meant the use of two electrical components to take care of the three functions, starting, lighting and ignition, usually appears in a combination of the motor and generator, while in a few cases notably the Westinghouse design, the electric generator and the magneto are combined in one unit while the cranking motor is made a separate unit

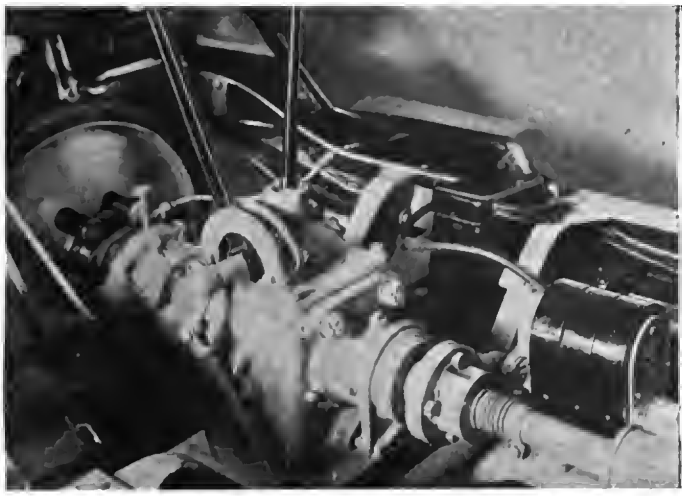
Segregating electric lighting from the other two electrical functions of cranking and ignition, it may be said that there are very few cases this year which do not incorporate electrical lighting as standard equipment, even though the starter may be of another type or one may not be used at all. The American buyer demands electrical lighting and it has become practically a universal feature, every concern fitting electric lights to at least one of its models. Of course, where no electric starting system is employed a storage battery charged from some external source is used for lighting.

The addition of these combined electric systems on such a large majority of the cars has meant the cluttering up of the power plants more or less, dependent upon the ingenuity of the engineers making the installation. Very little uniformity exists in the method of attachment of electric generators and cranking motors, although the application of this motor so that it will indirectly turn the crankshaft through gearing on the face of the flywheel predominates. Cranking motors the gears of which engage with these flywheel teeth are placed in innumerable positions, the applications beihg almost as varied in number as there are different makes of cars. One engineer places the electric motor forward of the flywheel, another back of it, another underneath, while a fourth mounts it above and crosswise, thus using bevel, spiral or worm gearing in connecting to the flywheel teeth. Several cases are to be noted in which the starting motor drives through silent chain or timing gears at the forward end of the engine.

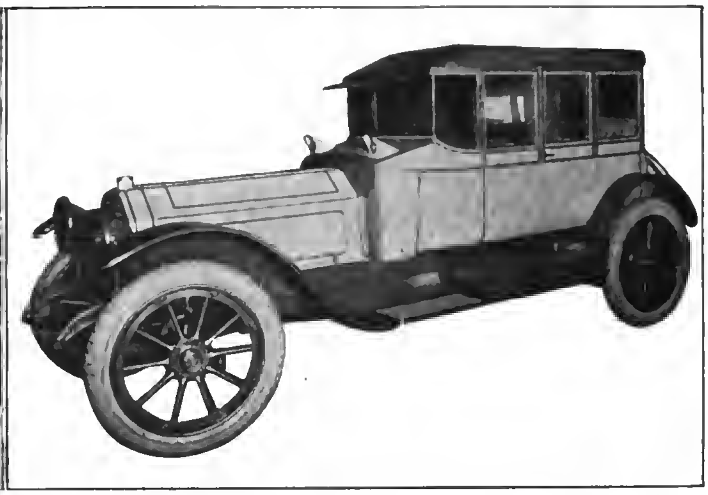
Then there are other installations which replace the flywheel of the engine by the rotating part of a motor generator. Notable examples of this is the design made by the United States Light & Heating Company and the installation mounted in the Rambler car. More detailed descriptions of starting systems appear elsewhere in THE AUTOMOBILE.

Air tire pumps appear on many of the cars exhibited, which is another feature tending toward convenience of the car operator. Makers installing air starting systems on their models, of course, have very little trouble in adding a connection which will allow the conveying of air to the tires. However, other makers who have electrical equipment have provided separate compressors or small tire pumps as an additional accessory. Considerable diversity of location of such pumps is in evidence.

Underslung springs are gaining in popularity. This construction must not be confused with the true underslung principle which involves the placing of the frame under the axles and suspending it by the springs, as in the American and Regal constructions. In underslinging the springs, the frame remains above the axles, while the springs are held up against the axle from underneath by means of spring bolts, as distinguished from the fastening of these springs above the axles as in average practice. This design must be credited to the Franklin company.



Compact gearbox on new Mitchell chassis and how gearshift and brake levers are mounted on it



New Peerless sedan body which is attracting general attention. The sides and front are all windows

which has been mounting its springs in this manner for some 5 years. The principle advantages of such construction are due to the permissible lower hanging of the frame without decreasing the road clearance. This allows the center of gravity of the entire construction to be lowered somewhat and tends to make the machine more stable, reducing the side sway and causing the car to cling to the road better. Examples of the underslinging of both front and rear springs are the Franklin, Mitchell, Abbott-Detroit and the Stevens-Duryea. The Oakland models are also provided with underslung springs, both front and rear, on the four-cylinder models and in the rear only on the six. The new Garford model also has underslung rear springs.

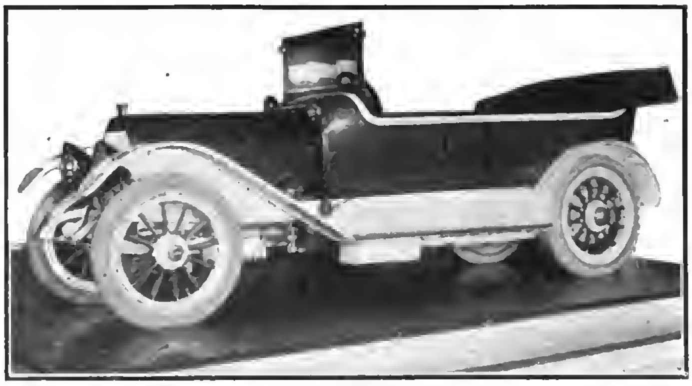
Departures from the conventional flat type of American radiators are also seen this year. Several have adopted V-shaped construction, notably the Oakland, Knox and Chevrolet. This type of radiator is not new in Europe, although just beginning to appear in this country. It was utilized last year in the Abbott Bulldog, which is seen again at the Palace. The Jackson cars are also equipped with a new radiator, which is rounded, the resultant effect of greater cooling surface being the same as that obtained through the use of the pointed or V-shaped type.

Taking up the question of drive and control, we find a number of concerns who have this year shifted to left drive, although the right-side driven car still appears to predominate. A list of the cars on the American market giving the drive is printed herewith and will serve to bring out the relative status of the various positions of the steering wheel. Only a few concerns make the drive optional with the purchaser of the car, these being the American, Knox, Moon, Pullman and several others. Among the makers at the show who are exhibiting entirely new models, the left drive is popular. Rather surprising was the appearance of all Packard models with left drive and control. When the little six Packard was brought out last fall with left drive and control it was the only machine of this make to be thus equipped, but now the Packard company announces complete change to this method of drive. On the other hand, the Peerless cars on which right or left drive was made optional last year have reverted to the use of right-hand drive exclusively.

The carrying of tires has been quite uniformly made a feature of the cars of the year in that special tire brackets are provided. In nearly every case the tires are carried at the rear on specially designed brackets, differing widely in construction. There are a few notable exceptions to this position of tire mounting, some concerns retaining the old placing on the running boards.

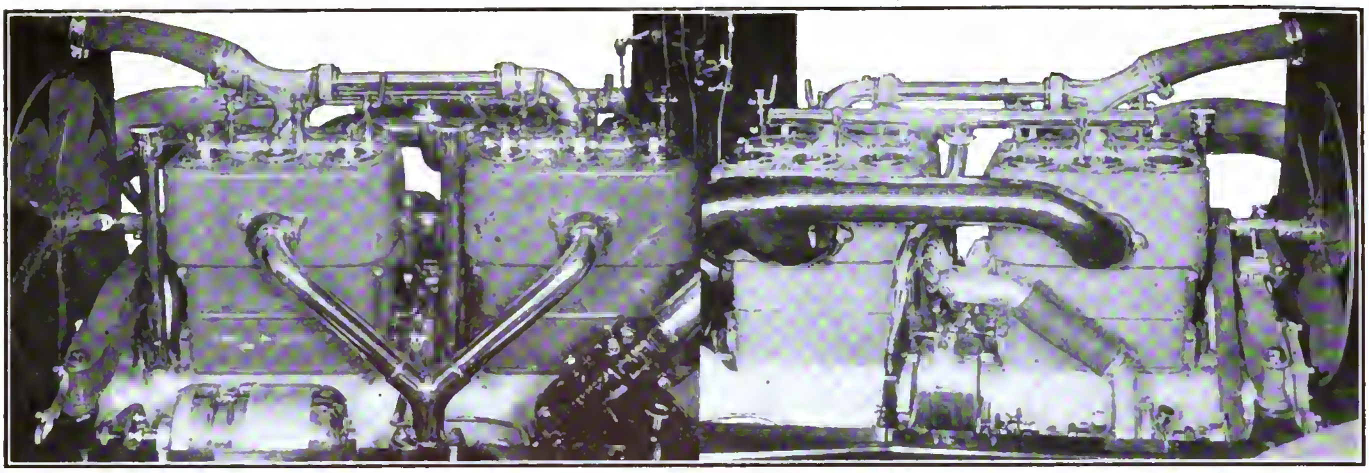
Wire wheels are gaining, if the number of cars so equipped at the show can be given as a criterion. One of the Stevens-Duryea cars is equipped with them, as well as one Premier model, a Haynes, a National, a Stutz and an Imperial. The price ranges

Three-quarter elliptic rear spring underslung on the new Garford six chassis



Owing to its small space the Alco showed but one model and mounted it on an elevated platform

from $125 to $200 extra for a set of five wheels, which are fitted with a demountable feature. Other companies which have adopted this wheel construction are the Keeton, Henderson, Pathfinder and Fiat. The increasing difficulty in the securing of first-class American hickory will no doubt in time work to the advantage of the wire wheel in this country. In the opinion of several exhibitors good hickory for spokes is rapidly becoming scarce and, consequently, too high in price. Hence the adoption of wire wheels is not far ahead.



Left—Intake side of the motor of the Little six, showing long Y-shaped intake manifold and mounting of electric starter, as well as substantial base of the steering column. Right—Chevrolet six motor, showing water connection between pump and cylinders

Transmission brakes have found very little favor in this country, although many of the European cars are provided with them, largely because their use is compulsory in several European countries, notably France. This year, however, we have one of our own cars equipped with a transmission brake. This is the National, which is equipped with a shoe bearing upon a collar on the driveshaft, and which is held out of engagement by a spring. This shoe is interconnected with the clutch pedal and when the latter is operated it is brought into play.

A growing tendency in motor design is that for the use of transverse shafts for driving magnetos and pumps, or pumps only. Such a construction allows the pump and magneto to be made very accessible from the sides of the motor, which constitutes one of the principal advantages. Among the makes of cars using cross-shafts are the Mitchell, Auburn, Marion, Pope-Hartford, Studebaker, Imperial, Fiat and Velie. The Stevens-Duryea cars have a cross-driven shaft for the pump only located at the front of the motor. The driving of such transverse shafts takes several forms, as does the location of the shaft with respect to the motor. In some cases the drive is through worm and gear, while in others spiral gears are used. Often the cross-shaft passes through the crankcase somewhere around the mid position of the motor. Examples of this are the Imperial and the Marion. In the new Mitchells and Studebakers the shaft is placed forward of the motor between it and the radiator.

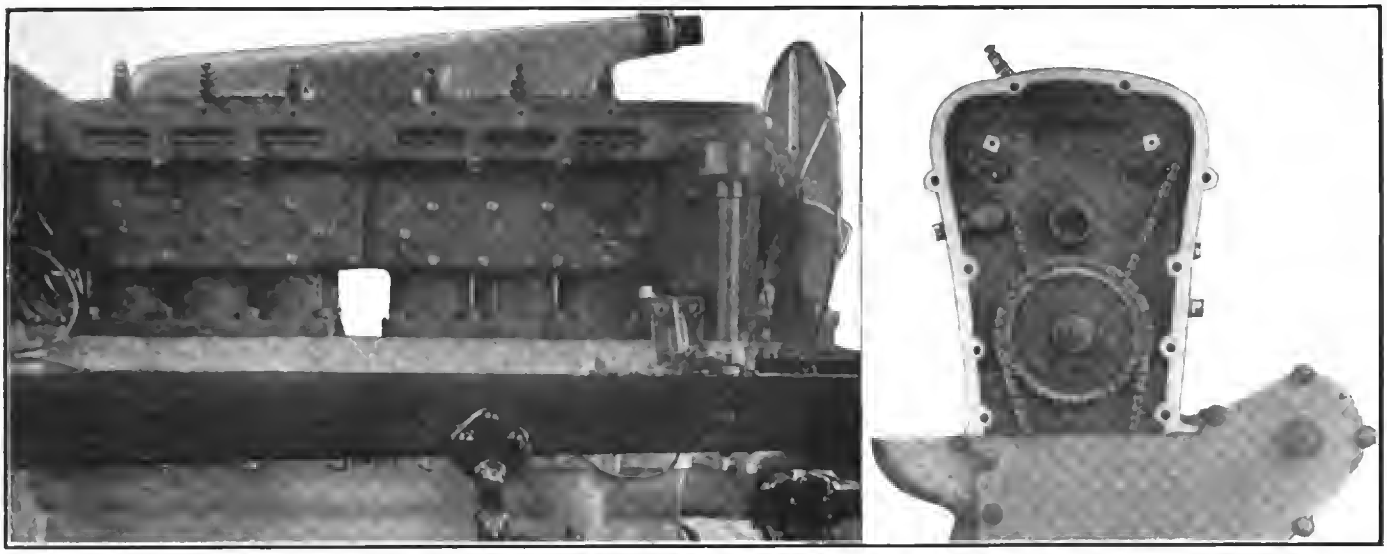
Dash gasoline tanks are also with us in several machines, among them being the Henderson, Hupmobile, Cartercar and Paige. The principal advantages of this location are that it allows for easy filling of the tank as well as permitting the mounting of the carbureter higher. This latter feature makes the carbureter more accessible. The disadvantage has been advanced that such a location of the gasoline tank increases the danger of explosion or fire should anything ignite in the vicinity of the power plant.

Silence has been striven for more than ever this year, as evidenced by the designs which are on view at Garden and Palace. Noisy brake rods, fenders which would in time work loose, and squeaking springs are tabooed. On the Mitchell, for instance, brake ribbons of steel carried on rollers replace brake rods as a silence feature. This construction is similar to that used on the Panhard cars. More universal housing of valve springs is found, which may again be traced to desire for silence. Accessible grease cups are provided on nearly every one of the new models, so that the oiling of springs and other parts is made a simple matter. Even the operation of the spark and throttle levers is made quieter.

All down the line refinements in detail in the accessories have kept pace with the general refinements in motor car construction. Magnetos are being made more compactly, and are rendered waterproof in many cases. Rear axles are made of better mate-

Lighting, Cranking and Ignition Equipment of 50 Models

Name of Car	Type of Starter	Make of Starter	Type of System, if Electric	What Electric Compon. Combined (if a 2 unit)	Make of Magneto if Separate	Make of Generator	Make of Starting Motor
Winton	Air	Own			Bosch	Optional	
Mitchell	Electric	Esterline	3		Bosch	Esterline	Esterline
Locomobile	Electric	G. & D.	3		Bosch	Adlake	G. & D.
Peerless	Electric	G. & D.	3		Bosch	G. & D.	G. & D.
Stevens-Duryea	Acetylene	Duryea			Bosch	Adlake	
Pope-Hartford	Electric	G. & D.	3		Bosch	G. & D.	G. & D.
Stearns	Electric	G. & D.	3		Mea	G. & D.	G. & D.
Franklin	Electric	Entz	2	Mo.-gen.	Bosch	Entz	Entz
Flanders	Electric	G. & D.	3		Splitdorf	G. & D.	G. & D.
Maxwell	Acetylene	Disco			Splitdorf		
Stoddard-Knight	Electric	G. & D.	3		Bosch	G. & D.	G. & D.
Stoddard 48	Electric	G. & D.	3		Bosch	G. & D.	G. & D.
Stoddard 38	None	None			Bosch		
Stoddard 30	None	None			Bosch		
Lozier Big Six	None				Bosch	G. & D.	
Lozier Light Six	Electric	G. & D.	3		Bosch	G. & D.	G. & D.
Olds Six	Electric	Delco	1	Mo.-gen.	Delco	Delco	Declo
Olds 4	None				Briggs	Stor.Bat.	
Overland 69	Electric	U.S.L.	2	Mo.-gen.	Bosch	U.S.L.	U.S.L.
Pierce	Air	Own			Bosch	Westingh.	
Chalmers	Air	Own			Splitdorf	G. & D.	
Reo	Electric	G. & D.	3		National	G. & D.	G. & D.
White	Electric	Own	2	Mo.-gen.	Mea	Own	Own
Oakland 6	Electric	Delco	1				
Hudson	Electric	Delco	1				
Packard	Electric	Delco	2	Mo.-gen.	Bosch	Delco	Delco
Buick	Acetylene	Disco			Remy	Vesta	
Cadillac	Electric	Delco	1		Delco	Delco	Declo
Cartercar	Electric	Jesco	2	Mo.-gen.	Briggs	Jesco	Jesco
Marmon	Electric	North East	2	Mo.-gen.	Bosch	North East	North East
Garford	Electric	U.S.L.	2	Mo.-gen.	Bosch	U.S.L.	U.S.L.
Columbia	Electric	G. & D.	3		Bosch	G. & D.	G. & D.
Moline	Electric	W.-Leon	3		Bosch	W.-Leon	W.-Leon.
Premier	Air	Own			Eisemann	Remy	
Pullman	Electric	North East	3	Mo.-gen.	Bosch	North East	North East
Alco	None				Bosch	G. & D.	
Jackson	Electric	Auto-Lite	3		Remy	Auto-Lite	Auto-Lite
Mercer	Electric	Rushmore	3		Bosch	Rushmore	Rushmore
Auburn	Electric	Electro	2	Mo.-gen.	Remy	Electro	Electro
Haynes	Electric	Luce-Nev.	3		Eisemann	Luce-Nev.	Luce-Nev.
S.G.V.	None				Bosch	Stor-Bat.	
Cunningham	Electric	North East	2	Mo.-gen.	Bosch	North East	North East
Knox	Electric	Berdon	3		Bosch	Berdon	Berdon
Moon	Electric	Wagner	2	Mo.-gen.	Bosch	Wagner	Wagner
Matheson	Electric	Westingh.	2	Mo.-gen.	Bosch	Westingh.	Westingh.
Selden	Electric	G. & D.	3		Bosch	G. & D.	G. & D.
National	Electric	G. & D.	3		Bosch	G. & D.	G. & D.



Mead rotary valve motor. The side view shows the six ports or gas passages and there are six similar ones at the opposite side. The end view shows chain drive for the two rotary valves

rials and their gears are being cut with added accuracy and care in order to eliminate where physically possible chances of noise and failure. Steering gears have been refined and provided with more accessible points of lubrication and adjustment, so that the lay operator of the motor car will have no trouble keeping them in good condition. Lamps which are finished in any but nickel and black enamel are conspicuous by their absence, as were the former varieties several years ago. With the coming of electric lighting the compactness and general appearance and construction of lamps has been developed to the utmost.

The accessory exhibitors have duplicated their exhibits in some cases, that is, they have exhibits at both the Garden and the Palace. This is true of several of the tire people, one or two magneto makers and several in other lines.

Table Showing Status of Various Steering Wheel Positions on American Cars

Car	Left	Right	Center	Optional
Abbott-Detroit	0	2	0	0
Adams-Farwell	0	1	0	0
A. E. C.	1	1	0	0
Alco	0	1	0	0
Alpena	0	0	0	2
American	1	4	0	0
Ames	1	0	0	0
Apperson	0	3	0	0
Arbenz	1	0	0	0
Atlas	1	0	0	0
Auburn	0	5	0	0
Austin	3	0	0	0
Bergdoll	0	3	0	0
Buick	0	3	0	0
Burg	0	1	0	1
Cadillac	0	1	0	0
Cameron	0	4	0	0
Carbartt	0	2	0	0
Carroll	0	0	0	3
Cartercar	0	1	0	0
Case	0	2	0	0
Chadwiek	0	2	0	0
Chalmers	0	3	0	0
Chevrolet	1	0	0	0
Cino	0	3	0	0
Coey	0	0	0	1
Colby	0	3	0	0
Cole	0	3	0	0
Columbia	0	2	0	0
Corbitt	0	1	0	0
Correja	1	4	0	0
Crane	0	1	0	0
Crow-Elkbart	0	6	0	0
Crawford	0	2	0	0
Croxton	2	0	0	0
Cunningham	1	0	0	0
Cutting	1	1	0	0
Diamond	0	1	0	0
Davis	0	2	0	0
Day	1	0	0	0
Detroiter	1	0	0	0
Dispateh	0	1	0	0
Dorris	0	1	0	0
Duryea	0	0	4	0
Duquesne	2	0	0	0
Edwards	1	0	0	0
Empire	0	1	0	0
Enger	0	2	0	0
Fal	0	1	0	0
Fiat	0	3	0	0
Firestone-Columbus	3	0	0	0
Flanders	1	1	0	0

Car	Left	Right	Center	Optional
Ford	1	0	0	0
Franklin	0	4	0	0
Garford	1	1	0	0
Gleason	0	1	0	0
Glide	1	1	0	0
Great Eagle	0	2	0	0
Great Southern	2	0	0	0
Great Western	0	1	0	0
Grout	0	2	0	0
Halladay	0	2	0	0
Havers	0	2	0	0
Haynes	2	1	0	0
Henderson	1	0	0	0
Herreshoff	2	0	0	0
Holly	1	0	0	0
Hudson	0	2	0	0
Hupmobile	0	2	1	0
Imperial	1	3	0	0
Inter-State	1	0	0	0
Jackson	0	3	0	0
Keeton	1	0	0	0
King	1	0	0	0
Kissel	0	4	0	0
Kline	0	4	0	0
Knox	0	2	0	2
Krit	1	0	0	0
Lambert	0	2	0	0
Lenox	2	0	0	0
Lexington	1	0	0	0
Lion	1	0	0	0
Little Four	1	1	0	0
Locomobile	0	3	0	0
Lozier	2	0	0	0
Luverne	1	0	0	0
Marathon	0	3	0	0
Marion	0	2	0	0
Marmon	2	0	0	0
Mason	0	2	0	0
Matheson	0	1	0	0
Maxwell	1	1	0	0
McFarlan	0	3	0	0
McIntyre	0	2	0	0
Mereer	0	2	0	0
Metz	1	0	0	0
Michigan	2	0	0	0
Midland	2	0	0	0
Miller	0	1	0	0
Mitchell	3	0	0	0
Moline	0	1	0	0
Moon	1	0	0	2
Morse	0	1	0	0
Motorette	0	1	0	0

Car	Left	Right	Center	Optional
Moyer	0	2	0	0
National	3	0	0	0
Norwalk	0	1	0	2
Nyberg	6	0	0	0
Oakland	0	3	0	0
Oldsmobile	0	1	0	0
Omaha	0	1	0	0
Only	0	1	0	0
Overland	0	2	0	0
Paeific Special	0	1	0	0
Paekard	2	0	0	0
Paige	1	1	0	0
Palmer-Singer	0	2	0	0
Paterson	0	2	0	0
Pathfinder	0	1	0	0
Peerless	1	3	0	0
Perfex	0	1	0	0
Pieree-Arrow	0	3	0	0
Pilot	0	2	0	0
Pope-Hartford	0	3	0	0
Pratt	0	3	0	0
Premier	2	0	0	0
Pullman	0	3	0	1
Rambler	0	1	0	0
Rayfield	0	1	0	0
R. C. H.	1	0	0	0
Reeves, Sextoaut	0	1	0	0
Regal	0	3	0	0
Reo	1	0	0	0
Republic	1	1	0	0
Richmond	0	2	0	0
Schacht	1	0	0	0
Schlosser	0	1	0	0
Selden	0	1	0	0
S. G. V.	0	2	0	0
Simplex	0	4	0	0
Spaulding	1	0	0	0
Speedwell	1	0	0	0
Spoerer	0	2	0	0
Staver	2	3	0	0
Stearns	0	2	0	0
Stevens-Duryea	0	2	0	0
Stoddard-Dayton	1	3	0	0
Studebaker	0	5	0	0
Stutz	0	2	0	0
Touraine	0	3	0	0
Triumph	0	1	0	0
Velie	2	1	0	0
Warren	0	3	0	0
Westcott	0	2	0	0
White	3	0	0	0
Winton	0	1	0	0
Zimmerman	0	2	0	0

Digest of the Leading Foreign Journals

Standards Accepted by French Truck Makers and Exceptional Designs Found Necessary for Special Work—Mechanical Means for Adapting the Diesel System to Small High-Speed Motors and Getting Benefits of Cheap Universal Fuels

TRUCKS at Paris Show.—While the economical advantage of motor trucks is identified in the United States mainly with the amount of wages to drivers, attendants and stablemen which is saved for a given amount of transportation work and, in the large cities, with the very considerable real estate values which are released for other uses through the abandonment of horse stables. the more direct reduction of operating and maintenance cost which may be effected through attention to construction details occupies the minds of French commentators on the situation much more prominently. The mechanical efficiency of the machine is considered the indispensable basis which must be worked out in minute details first of all. This view has almost excluded the electric storage battery vehicle from consideration but, on the other hand, has led to the adoption of steam vehicles for certain forms of work, to the use of trailers and tractors, to the development of four-wheel driving and steering and to the resumption of electric transmission, with a view to certain well-defined classes of work for which the mechanical efficiency cannot be attained by the usual construction. A review of the situation from the French viewpoint is summarized in the following extract of an article by Duanier.

The difficulties of the past, may now be considered to have been overcome, judging from the showing made at the recent Paris Salon. They consisted mainly in four factors: (1) A mistaken tendency to exaggerated tonnage, which proved incompatible with the actual condition of roads and bridges and also held vehicles too long waiting for full loads and made running uneconomical with small loads; (2) the distrust and ignorance of the public; (3) the mistaken idea of competing with railroads rather than supplementing and extending their work, and (4) the working out of technical questions relating to proportions in power, capacity, speed, strength of organs, spring suspensions. wheels and tires.

Though the whole range from 2 to 5 tons capacity is economically available, the standard motor truck is the 3½ ton vehicle, because this size permits the loading of an ordinary European railway freight car in three trips and yet, when operated with less than full load or empty, is fairly economical, having a considerable advantage at the latter point over the 5-ton truck.

For delivery vehicles intended to run at a speed as high as 20 miles per hour and shod with pneumatic or cushion tires, the scale of weights and power which seems to be established calls for chassis weighing from 2,000 to 3,500 pounds, bodies weighing from 1,760 to 2,200 pounds, loads from 1,760 to 3,500 pounds and motors ranging from 12 to 20 horsepowers.

The two makes of heavy steam trucks intended for loads from 4 to 8 tons, which are the Exshaw (formerly the Purrey) of Bordeaux, and the Fodens, are used chiefly for the transportation of coal, cement and paper.

The only electric storage battery vehicles are the forecarriage trucks made by the F. R. A. M. company and used mainly for pulling municipal sweepers. sprinklers and garbage carts.

For the moving of loads up to 15 tons over roads of any grade encountered in practice. the tractor construction which has been developed depends for sufficient road adhesion upon the use of four driving-wheels, and a trailing vehicle serves to distribute the heavy load over a sufficient road surface. The lead in this development was taken by the Panhard company which at the beginning of 1912 introduced, for military purposes, a gasoline motor truck with four-wheel drive and four-wheel steering and said to have been designed by the Austrian archduke Salvator, [described and illustrated in these columns; see THE AUTOMOBILE, March 21, 1912]. At the Paris Salon there were shown two equally interesting constructions of the same order, the Latil motor tractor, Fig. 1, and the Balachowsky & Caire tractor with electric transmission, Fig. 2.

The Latil tractor-truck has six forward and two reverse gear speeds obtained by a three-speed gear box worked in conjunction with a double bevel gear upon the differential. A separate lever controls the bevel gears, engaging one or the other. [This expedient is not new but is perhaps improved in details, as compared with the form in which it first appeared in 1902 or 1901. —ED.] The vehicle has three differentials from two of which the wheels are driven through transverse cardan shafts. The main differential is located upon the gear box, and from it the two other differentials upon the axles are driven by fore-and-aft shafts and worm gears. As the four wheels take equal parts in the steering, one differential might have sufficed, but the use of three of them renders the vehicle much easier to handle on rough lumpy ground where the four wheels cover irregular individual distances. Among the reference letters in Fig. 1, A denotes the 24 horsepower 4-cylinder motor, B the gear box, C the central differential, DD the differentials of the two driving axles, E the steering gear, FF the brakes of the four wheels, H the cone clutch, II the worm gear shafts, KK the transverse cardan shafts, L the steering shaft, MM casings for the wheel-gears, O hook for attaching trailer, PP steering levers, R the radiator with the centrifugal ventilation now universally used in French trucks.

In the Balachowsky tractor-truck with electric transmission no clutch, gears or chains are used. The energy developed in the 4-cylinder gasoline motor is delivered to a flywheel-dynamo and from the latter by wiring to four motors in the wheels. Self-excitation of the dynamo—whose armature constitutes the motor flywheel—is obtained by a special arrangement the nature of which is not published but which involves neither the use of a storage battery nor of an independent exciter. Self-regulation is attained by creating a zone of compensating currents in the center of the armature by the action of which currents the flow of electromotive force is diminished the moment the amperage increases, and obversely, so that the power absorbed by the dynamo remains constant when the speed of the motor remains constant. The whole gamut of power development and utilization is thus regulated operatively by the throttle alone. and the speed of the vehicle is independent of the motor speed, regulating itself as a function of the motor power and the resistance to traction. A switch is sufficient for starting the vehicle, forward or backward.

In the very simple chassis resulting from this construction, as shown in Fig. 2, *b* is the switch box, *c* the controller, *d* the dynamo-flywheel, d_1 the disconnector, d_2 the starter, *e* electric cables, *f* the hand-brake, f_1 brake levers, *k* trailer hooks, *m* the 4-cylinder gasoline motor, *r* the electric wheel-motors, *s* the muffler and *t* the brake drums.

These three types of four-wheel drive vehicles are intended largely for the work of transporting beets to the sugar refineries, for hauling stone and sand from quarries and pits, for hauling bricks and cement over the bad and steep roads usually found where these articles are made, for excavating and contracting work in general and, in the military field, for the engineering and artillery service, as for hauling siege ordnance and construction material for bridges. At recent maneuvers, one of them made it possible to transport a nine-inch siege mortar equipment, which was distributed in three trailer loads of four tons each, over ditches and ravines and to set it up in a plowed field.—From *Génie Civil,* December 21.

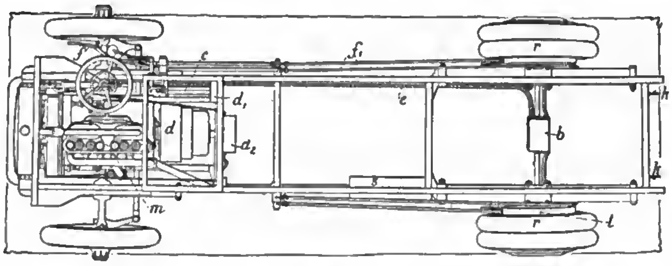


Fig. 2—Balachowsky & Caire tractor-truck with electric transmission and four-wheel drive

PROSPECTS for Diesel Motors for Automobile Use.—The rapid adoption of the automobile for serious transportation work, upon whose continuance prosperity in peace and success in war may at any time come to depend, looks more and more like a leap in the dark, so long as nothing decisive has been done to make sure of the fuel supply. To all Europeans this shadow upon the development looks especially gloomy, as the doubling of the price demanded for gasoline derived from American petroleum has made it very clear that they are at the mercy not only of the limitations of the natural supply but also of the good will of a foreign nation and of speculators in that nation as well as in their own. The only other fuel of which it is known that it can be used in the existing automobile motors is benzol, which is a by product of cokeries and gas works and which now, since the demand for it has set in, threatens to rival gasoline in price. The mere chance that petroleum wells may be located in Africa and China from which a good fuel may be obtained gives only scant comfort. Much more promising is the chance of adapting the automobile motor to fuels which may be produced in any quantity in any country.

The Diesel motor is such an engine, for while it is at present operated mostly with the heavy residue of petroleum as a fuel because the supply thereof is still cheap and abundant—though rising in price—it is adapted for burning oil of coal tar with equal success and also any animal or vegetable oil. At present prices for heavy oil in Germany it can be operated at a fuel cost of 3 pfennig per horsepower-hour and at one-half of this cost where tar oil is a local product, while the same amount of work performed by an automobile motor with gasoline costing 45 pfennig per liter (about 40 cents per gallon) comes to 18 pfennig, being 6 times higher, and with benzol at the present price of 30 pfennig per liter, comes to 12 pfennig, or 4 times higher. Furthermore, the Diesel motor loses little in economy when adjusted down to half power or less, while the automobile motor loses heavily in fuel efficiency under the throttle, under which condition it is mostly used.

But the Diesel motor is very heavy and very costly, and it has never been operated successfully at much more than 550 revolutions per minute. These features completely unfit it for the automobile. The question is whether they can be circumvented or not. Diesel himself has said that he is still working upon its adaptation to automobile work. An engineer, Otto Malms of Mannheim, discusses in a recently published article the possibilities for overcoming the great technical difficulties which stand in the way. These arise from (1) the very high compression and piston pressures which render a very substantial construction necessary, from (2) the need of measuring accurately very small amounts of fuel in a liquid state and carrying it to the injector valves in the same state with a frequency at least three times greater than that required in any regular stationary or marine Diesel motor, and (3) from the same necessity for combining accuracy, high speed and infinitesimal quantity in the injection and atomizing of the fuel.

ONE PROBLEM ALREADY HALF SOLVED

The question of strength and weight does not seem half as formidable as it appeared a few years ago, as some of the latter-day automobile motors work with pressures of 25 to 30 atmospheres and the pressure in a small-sized Diesel motor does not usually exceed 35 atmospheres. Moreover, aviation motors are produced which sustain similar pressures at a weight of only 2 to 3 kilograms per horsepower, or less than one-half of what the advanced automobile motors weigh. It must therefore be assumed that the quality of materials and the art of incorporating them in the design of motors have already reached a point at which 35 atmospheres can be taken care of without notably increasing the present weight of automobile motors, their pistons, connecting-rods, crankshafts and camshaft mechanism. To be sure, the compressor plant for the injection of the fuel means an additional weight, but on the other hand the weight of the magneto and the carbureter is saved.

THE PRINCIPAL PRACTICAL DIFFICULTY

The operation of a Diesel motor depends absolutely upon having a strictly measured amount of liquid fuel dosed into the injector nozzle of each cylinder preceding each combustion stroke and to be deposited there in a liquid state ready to be blown into the cylinder by the use of compressed air at the beginning of the stroke and during a portion of its duration. These small fuel doses must be reduced exactly in proportion if the load of the motor is reduced. When the motor runs idle they should be about one-fourth as large as at full load.

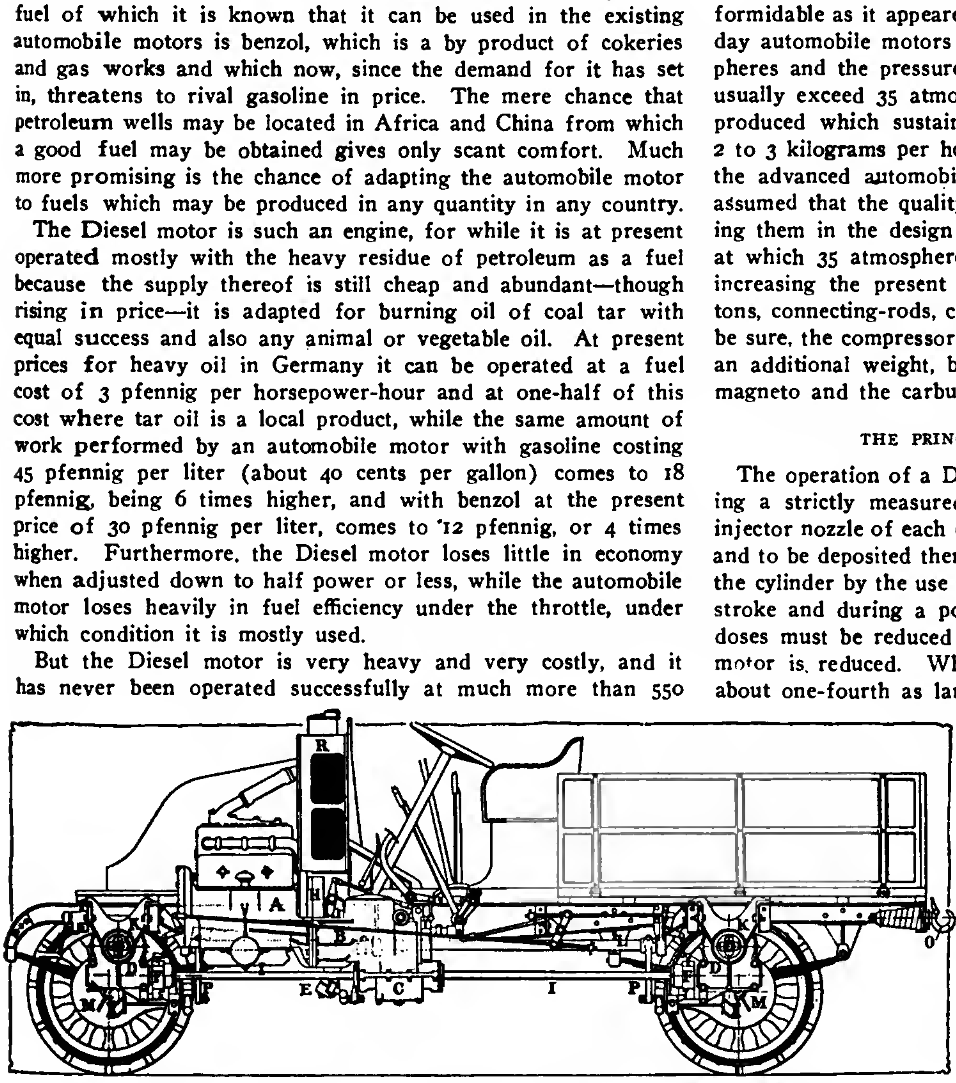


Fig. 1—The Latil tractor-truck with four-wheel driving and steering

The quantities to be measured in this manner in an automobile motor of fairly high speed would be exceedingly small and would have to be delivered up to 700 to 750 times per minute for each cylinder in the case of a four-cycle motor and twice as rapidly if the two-cycle system were adopted, as it now usually is in Diesel motors for use in boats and ships. A simple calculation, based on burning 10 liters of fuel per hour in a 40 horsepower motor of 4 inch bore and 5¼ inch stroke, shows that the dose to be delivered at each action would involve only a stroke of 3.1 millimeters of a pump piston 5 millimeters in diameter at full power of the motor; and with the motor running idle the pump stroke could be only 0.8 millimeter long. Such miniature work and workmanship are scarcely practicable. In ordinary Diesel motors of much larger size the pumps are made to handle a 3 times larger quantity of fuel at each stroke than that momentarily required and a provision is made for returning each time from 2/3 to 11/12 thereof to the suction pipe, but even with this system of differential pumping the quantities to be handled in an automobile motor would be far too small. In other words the fuel pumps of Diesel motors have to be redesigned for automobile purposes.

A number of methods may be imagined and have been more or less seriously proposed or even tried, but in each of them some difficulty crops out upon closer investigation. Fig. 3 indicates, for example, a method which seems very plausible, and the feature of the open nozzle which is incorporated in it and which also is used in most of the modern stationary Diesel motors seems in fact indispensable for any high-speed automobile Diesel motor, as it admits of introducing the fuel against low pressure rather than against the 50 to 60 atmospheres of the air compressor and also renders it possible to use the pressure air at a higher temperature, so that special cooling of it becomes unnecessary.

According to Fig. 3 the fuel is kept in a tank under constant but low pressure and is admitted through the needle valve *n* into the nozzle *d* during the suction stroke of the motor when the resistance is small. The needle valve is controlled by the cam *o*, and by the use of a slidable oblique cam the time during which the valve is kept open—the stroke of its needle—may be adjusted to correspond with variations of the motor load. Certain measured amounts of fuel may thus be introduced if only the pressure in the fuel tank is kept constant, and this may easily be done by means of an air pump with a certain amount of dead space.

The fatal objection to the arrangement is that, when the amount of fuel introduced in the open nozzle depends upon the time during which the valve is open, it also thereby depends upon the speed of the motor, while the size of each dose should depend upon the load of the motor.

ONE SOLUTION OF THE FUEL FEED PROBLEM

Figs. 4 and 5 show sketches of an arrangement promising results more in accordance with the requirements. It is meant to sustain a pressure upon the fuel supply proportionate to the power requirement at any moment. The arrangement is not proposed as final but as one showing that the problem can be practically solved. It is assumed that piston pumps should be used, since rotary pumps are less positive and more efficient at high than at low speed, while the requirement is exact measurement independently of the speed. It is also assumed that these piston pumps should be of such a size that they can be practically manufactured and operated. To this end each pump stroke is arranged to furnish fuel for more than one combustion, the pumps being geared down to run much slower than the motor. To get a perfectly constant stream of fuel, two pump pistons may be driven from two cams n_1 and n_2 so shaped that the two pressure strokes blend into a perfect continuity, and the distribution to the four nozzles of the four motor cylinders can be made on the plan shown in Fig. 3, using one positively operated admission valve for each cylinder nozzle, and these valves may, under the varying fuel pressure, always be worked with the same stroke of the needle valve and the same duration of the fuel admission.

In order to reduce the fuel admission when this is required, the cams may be made laterally displaceable and oblique of conformation. It may be a mechanical task to shape such cams properly in the first place, considering that at any adjustment they should produce a perfectly measured pressure-flow of the fuel [and it seems that it would be necessary to provide a spring-resistance to this fuel pressure, and possibly a safety valve, in the fuel receptacle from which it is fed to the valves and nozzles.—ED.] But, once made and tested out, it could be easily reproduced in a milling machine.

Fig. 5 illustrates how a pair of cams cut on curves of the Archimedean spiral may be designed so as to produce for any one-sixteenth of a revolution of the camshaft the same amount of advancement in the pressure stroke of one or the other of the two pistons. The actions of the two pistons can also be made to overlap.

With this style of fuel feed, the same size of pump can be made for different sizes of motors, the pumps being driven with a greater speed reduction the smaller the motor is.

How the difficulties relating to the injection of the fuel into the cylinders by means of compressed air may be overcome forms the subject of another chapter.—From *Allgemeine Automobil Zeitung*, December 18 and 20.

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"Solid Air" is the taking name of a new tire-filling substance which according to the reports from the Paris Salon can be injected in tires at different tensions, to correspond with the weight and normal load of the vehicle as well as the size of the tire casing. Injected in a liquid state it becomes plastic in a few hours and generates occluded gas in millions of cells. It is said to be compressible and inextensible, while rubber is incompressible but extensible.—From *L'Auto*, December 21.

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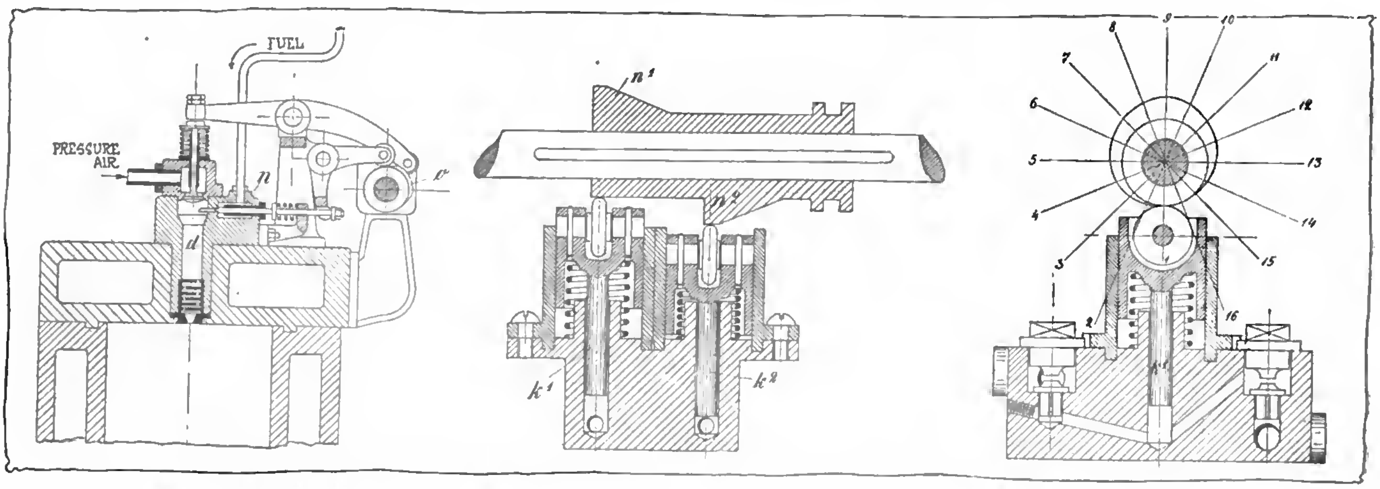
Neat Metal Foot Boards are taking the place of wooden ones in some English cars. Nazarro, in his Italian car, shows an inclined metal dashboard of rare elegance.

Inside Twin Tire.—At the stand of J. Faure at the Paris Salon means were shown for adding a twin tire on the inner side of a wheel. A better mechanical makeshift—where there is room for it—than adding it on the outer side!



Figs. 4, 5 and 6—Details in the reconstruction of the Diesel fuel feed system for use in automobile motors

Stroke vs Bore

America . . . 1.22
France 1.65
Gt. Britain . . 1.43

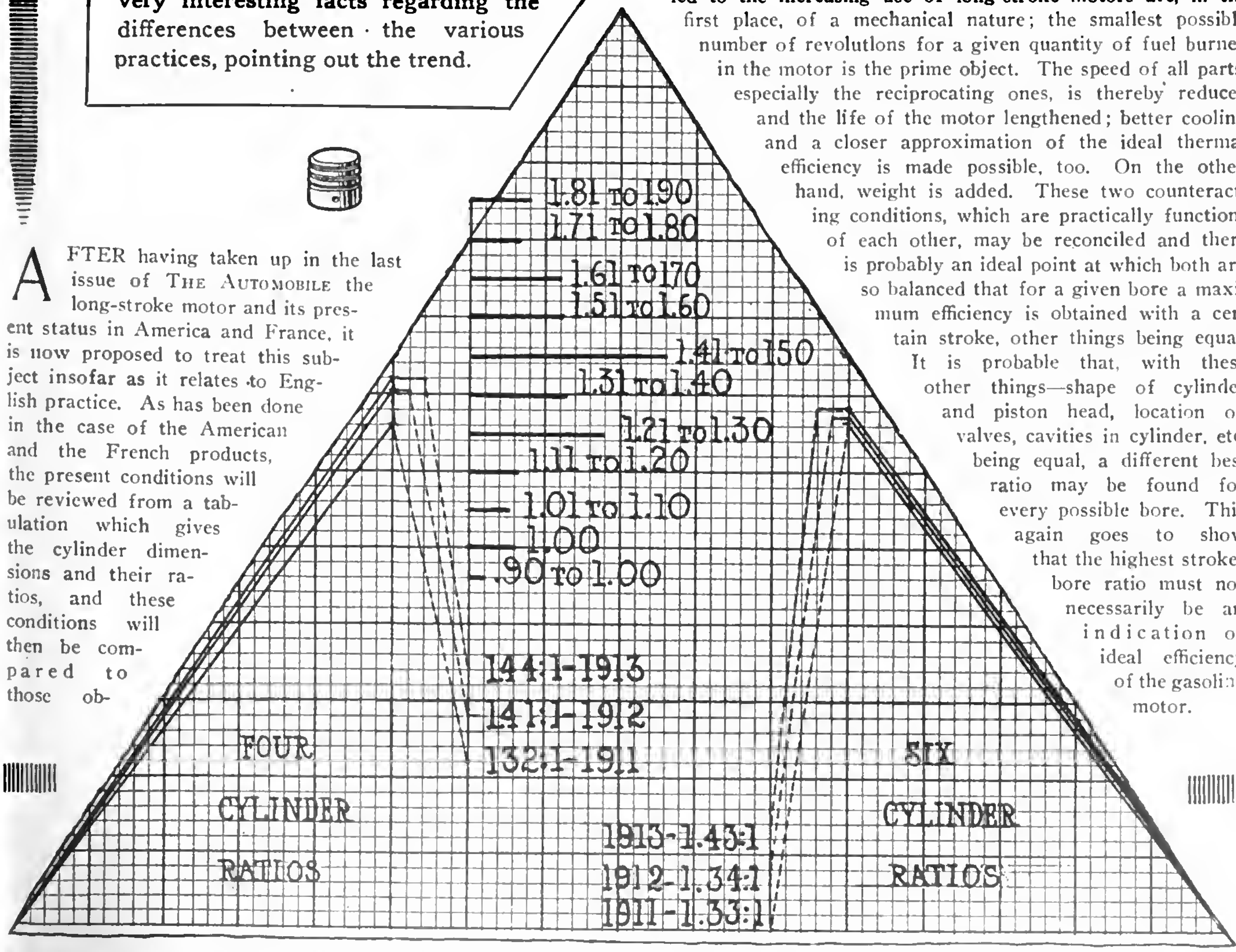
Installment II

¶ The English motors, which range in average stroke-bore ratio between the American and French averages, are reviewed in this article and the British situation is compared to those obtaining in the United States and on the continent.

¶ This comparison brings out some very interesting facts regarding the differences between the various practices, pointing out the trend.

AFTER having taken up in the last issue of THE AUTOMOBILE the long-stroke motor and its present status in America and France, it is now proposed to treat this subject insofar as it relates to English practice. As has been done in the case of the American and the French products, the present conditions will be reviewed from a tabulation which gives the cylinder dimensions and their ratios, and these conditions will then be compared to those obtaining in the 2 preceding years. This process shows that during each of the past 3 years England stood midway between France and America in respect of the average stroke-bore ratio, and that this ratio has risen constantly during this time and at a rate practically parallel to that of the increase in French and American motors.

Remembering that this article takes into consideration only the stroke-bore ratio in general, as well as particular and striking instances, the reader should not attempt to draw too bold conclusions from the subject of the article. The subject of horsepower, which is more closely related to piston displacement than to anything else, is beyond the scope of this review, and there is every reason for this being so. The considerations which have led to the increasing use of long-stroke motors are, in the first place, of a mechanical nature; the smallest possible number of revolutions for a given quantity of fuel burned in the motor is the prime object. The speed of all parts, especially the reciprocating ones, is thereby reduced and the life of the motor lengthened; better cooling and a closer approximation of the ideal thermal efficiency is made possible, too. On the other hand, weight is added. These two counteracting conditions, which are practically functions of each other, may be reconciled and there is probably an ideal point at which both are so balanced that for a given bore a maximum efficiency is obtained with a certain stroke, other things being equal. It is probable that, with these other things—shape of cylinder and piston head, location of valves, cavities in cylinder, etc. being equal, a different best ratio may be found for every possible bore. This again goes to show that the highest stroke-bore ratio must not necessarily be an indication of ideal efficiency of the gasoline motor.



Stroke-bore ratios of English motors for the past 3 years, showing its constant increase, and in center classification of motors by ratios

The 1913 list of English motors shows a total of 114 motors of which ninety-two are fours and twenty-two sixes, corresponding to percentages of 80.5 and 19.5. This compares with 1912 as follows: In that year there were eighty-six fours and twenty-three sixes or 78.9 and 21.1 per cent. respectively, making a total of 109 power plants. In 1911 there were eighty-seven motors of which seventy-one were fours and sixteen sixes, the percentages being 81.6 and 18.4 respectively. The ratios of fours and sixes during the past 3 years were as follows:

	1911	1912	1913
Four cylinder	1.32	1.41	1.44
Six cylinder	1.33	1.34	1.37

The following tabulation shows the distribution of English 1913, four and six-cylinder motors classified by their stroke bore ratios:

Ratio	Fours	Sixes	Total
1.01 to 1.10	4	1	5
1.11 to 1.20	6	..	6
1.21 to 1.30	15	3	18
1.31 to 1.40	11	2	13
1.41 to 1.50	17	9	26
1.51 to 1.60	11	1	12
1.61 to 1.70	11	1	12
1.71 to 1.80	5	1	6
1.81 to 1.90	7	..	7
Square motors	3	3	6
Short stroke	2	..	2
Totals	92	22	114

The greatest number of motors have a ratio between 1.41 and 1.50 and the average would be about 1.45 were it not for the fact that the bore-stroke ratios below 1.40:1 outnumber by far the motors having a greater ratio than 1.50:1.

As the accompanying tabulation of the bore and stroke ratios for the past 3 years shows, the leaders for 1913 are found among the four-cylinder designs, the greatest ratio being 1.88:1. This is the ratio of the Belsize, of the smallest bore. The same ratio is used in the larger Calthorpe, the little Humber and the larger Vulcan model. Then follows one each of the Star and Sunbeam cars with a ratio of 1.87:1, the next highest in the line being the second Calthorpe, 1.81:1. Without quoting any further high ratios which may be seen upon examining the tabulation, attention is called to the peculiar manner in which the great majority of British cars range within narrow limits of ratio, thereby differing considerably from American practice, in which a relatively high percentage of motors is distributed through a ratio range from 1.00 to 1.50:1.

Among the sixes the larger Daimler car leads with a ratio of 1.75:1 and its closest follower is the Armstrong, 1.67:1, next to which ranks the small Napier, 1.55:1. While there are no short stroke designs among the 1913 sixes, three square motors or 13.7 per cent. of the total of twenty-two motors, show that the conservative idea of a relatively short stroke is still alive.

Twenty-one out of the ninety-two four-cylinder motors have greater ratios than last year's product of the same make and twelve motors have smaller ratios, corresponding to 23 and 13 per cent. of the total, respectively. Among the sixes there are four increases of ratio and one case of decrease, or 18 and 4.5 per cent. respectively.

The greatest gain in ratio among the four-cylinder designs is that of the Star which has a ratio of 1.67:1, this being 25 per cent. in excess of last year. Next is the Humber, fourth of its name in the tabulation, the ratio of which has been increased 23 per cent. since 1912. The third Argyll has a ratio 18 per cent. larger than last year. Britton and B. S. A. have each increased their ratios by 15 per cent., the third Armstrong by 12 per cent., the Enfield has gained 13 per cent. and there are a number of designs which have been enlarged in their ratios by less than 10 per cent. The largest decrease is that of the Argyll appearing as the second of its name in the tabulation, namely, 32 per cent. The Austin, with a decrease of 16 per cent. is second, the Clement third with 11 per cent., and the Straker fourth with 6.5 per cent.

In the six-cylinder class the larger Daimler leads with a ratio increase of 46 per cent. against last year. The other increases of ratio are comparatively insignificant, the Armstrong being second with a gain of 11.4 per cent. and the Vauxhall third, with 4.5 per cent. The Sunbeam is the only case of lessened ratio, this year's being 10 per cent. smaller than that of 1912.

If we consider the meaning of these

Stroke-Bore Ratio of Four-Cylinder English Motors

NAME	1911			1912			1913		
	Bore	Stroke	Ratio	Bore	Stroke	Ratio	Bore	Stroke	Ratio
Aberdonia	....	....	....	3.50	5.00	1.43	3.50	5.00	1.43
Adams	3.35	4.74	1.42	3.46	4.72	1.37	3.46	4.72	1.37
Albion	4.88	5.00	1.02	3.13	5.00	1.60	3.11	5.00	1.61
Alldays	....	....	....	....	....	....	3.35	4.25	1.27
Alldays	3.38	4.49	1.34	3.39	4.29	1.25	3.39	4.29	1.25
Alldays	....	....	....	3.94	5.12	1.30	3.98	5.12	1.29
Argyll	....	....	....	4.00	5.13	1.28	3.98	5.12	1.29
Argyll	3.15	4.72	1.50	3.56	5.50	1.55	3.15	4.72	1.50
Argyll	2.83	4.72	1.67	2.81	3.94	1.42	2.83	4.72	1.67
Armstrong	3.94	4.72	1.20	3.75	4.72	1.25	3.94	4.17	1.20
Armstrong	3.15	4.72	1.50	3.15	4.72	1.50	3.51	5.31	1.68
Armstrong	3.35	4.72	1.41	3.56	5.31	1.49	3.35	5.31	1.58
Arrol-Johnston	....	....	....	2.72	4.72	1.74	2.72	4.72	1.74
Arrol-Johnston	3.15	4.72	1.50	3.15	5.51	1.75	3.15	5.31	1.68
Austin	3.50	4.49	1.28	3.50	4.52	1.29	3.50	4.52	1.29
Austin	4.38	5.00	1.14	4.38	5.00	1.14	4.33	5.00	1.16
Austin	2.99	4.33	1.45	2.50	3.50	1.40	2.99	3.50	1.18
Baguley	....	....	....	3.54	5.12	1.45	3.54	5.12	1.45
Bell	3.98	5.51	1.39	4.01	5.51	1.38	3.98	5.51	1.39
Bell	3.54	4.72	1.33	3.58	4.72	1.32	3.54	4.72	1.33
Bell	4.53	5.90	1.30	4.53	5.90	1.30	4.60	5.90	1.29
Belsize	....	....	....	2.72	5.12	1.88	2.72	5.12	1.88
Belsize	3.54	4.72	1.33	3.66	4.72	1.29	3.70	4.76	1.29
Bentall	3.94	3.74	.98	3.94	3.74	.98	3.94	3.74	.98
Briton	3.54	4.72	1.33	3.54	4.72	1.33	2.95	4.49	1.53
B. S. A.	3.54	4.72	1.33	3.54	4.72	1.33	2.95	4.49	1.53
Calthorpe	3.54	4.72	1.33	3.15	5.90	1.88	3.15	5.90	1.88
Calthorpe	3.95	5.11	1.73	2.72	4.92	1.81	2.72	4.92	1.81
Chambers	3.38	3.98	1.18	3.38	3.98	1.18	3.38	3.98	1.18
Clement	4.01	4.37	1.09	4.21	5.12	1.32	4.21	5.12	1.32
Clement	3.15	4.72	1.50	3.35	4.72	1.41	3.74	4.72	1.26
Clement-Talbot	3.15	4.72	1.50	3.15	4.72	1.50	3.15	4.72	1.50
Clement-Talbot	3.98	4.49	1.13	4.00	5.50	1.37	3.98	5.51	1.39
Crossley	4.02	5.51	1.37	4.02	5.51	1.37	3.97	5.51	1.39
Crossley	3.11	4.72	1.52	3.15	4.72	1.50	3.11	4.72	1.52
Crowdy	5.00	5.51	1.10	5.00	5.51	1.10	5.00	5.51	1.10
Daimler	4.88	5.12	1.05	4.88	5.12	1.05	4.88	5.12	1.05
Daimler	....	....	....	3.54	5.12	1.45	3.54	5.12	1.45
Daimler	3.98	5.12	1.29	3.98	5.51	1.39	3.98	5.51	1.39
Daimler	3.15	5.12	1.63	3.15	5.12	1.63	3.15	5.12	1.63
Deasy	2.95	4.33	1.47	2.95	4.33	1.47	2.95	4.49	1.52
Deasy	3.15	5.12	1.62	3.15	5.12	1.62	3.15	5.12	1.62
Deasy-Knight	3.54	5.12	1.45	3.54	5.12	1.45	3.54	5.12	1.45
Dennis	3.54	4.33	1.22	3.54	5.12	1.45	3.54	5.12	1.45
Dennis	....	....	....	....	....	....	3.15	5.12	1.62
Dennis	3.94	5.09	1.29	3.94	5.12	1.30	3.94	5.12	1.30
Dodson	3.15	4.72	1.50	3.15	4.72	1.50	3.15	4.72	1.50
Dodson	3.93	5.51	1.40	3.93	5.51	1.40	3.93	5.51	1.40
Enfield	3.94	4.53	1.15	3.94	4.53	1.15	3.94	5.12	1.30
Enfield	2.95	3.94	1.34	2.99	4.72	1.58	2.99	4.72	1.58
Enfield	3.38	4.25	1.26	3.38	4.25	1.26	3.38	4.25	1.26
Hillman	5.00	5.00	1.00	5.00	5.00	1.00	5.00	5.00	1.00
Hillman	3.50	3.78	1.08	3.50	4.33	1.24	3.50	4.33	1.24
Humber	....	....	....	2.68	4.72	1.76	2.72	5.12	1.88
Humber	....	....	....	3.54	4.72	1.33	3.54	4.72	1.33
Humber	....	....	....	4.13	5.51	1.33	4.13	5.51	1.33
Humber	....	....	....	3.07	4.33	1.41	2.95	5.12	1.74
Iris	3.15	4.49	1.43	3.15	4.49	1.43	3.15	4.49	1.43
Iris	4.25	5.24	1.23	4.25	5.24	1.23	4.25	5.24	1.23
Iris	5.00	5.24	1.05	5.00	5.24	1.05	5.00	5.24	1.05
Lanchester	4.02	4.02	1.00	4.02	4.02	1.00	3.98	3.98	1.00
Light Car	....	....	....	....	....	....	2.95	4.72	1.60
Maudslay	3.54	5.12	1.45	3.54	5.12	1.45	3.54	5.12	1.45
Napier	2.23	5.00	1.50	2.23	5.00	1.50	2.23	5.00	1.50
New Engine	4.49	4.49	1.00	4.49	4.49	1.00	4.49	4.49	1.00
New Engine	5.00	4.49	.90	5.00	4.49	.90	5.00	4.49	.90

figures we find that they indicate a slackening of the long-stroke tendency in English practice. This is true, despite the fact that the average stroke-bore ratio has increased 3 per cent. for 1912 and 4.4 per cent. for 1913, and that the rate of increase of long-stroke motors is seemingly the same, or approximately the same, as in America. The fact, however, that among thirty-nine British motors which have altered their stroke-bore ratio there are twenty-five, or 64 per cent., in which it has been increased, and fourteen, or 36 per cent., in which it has been decreased, indicates that English designers are traveling a different road from their American confreres. Of course, there are many long-stroke motors which have been continued without change from 1912 to 1913 and these serve to maintain the average of 1.43:1 for this year; but the fact that only twice as many makers have increased the ratio of their product than have decreased it is a strong indication of a change of mind on the part of English designers and engineers. This is so much more remarkable as French practice does not show any such change of tendency, but the long-stroke idea continues in favor.

It would be most interesting to study the circumstances which have brought about this change of pace on the part of the British manufacturer, but unfortunately this material is in the hands of the individual makers and is not accessible to outsiders. It may be expected, however, that the year 1913 will clear the situation and show whether this reversal of stroke-bore ratio development has been accidental or not, whether it was a step in a new direction or merely an attempt to go back to an engineering fashion of the past.

Nevertheless, an exact study of the tabulation of French motor dimensions and ratios as shown on page 78 of THE AUTOMOBILE for January 9 brings out the fact that England does not stand entirely alone in the retardation of the movement in the long-stroke direction.

The French motors which have what might be termed a long stroke, even in French eyes, that is 2.00:1 or more, have in most cases had this ratio during 1912, there being practically no creations of 1913 having such a high ratio. The tabulation mentioned above shows that 1913 has produced a very small number of new motors, among which there are only seven of a ratio of 2.00:1 or more. Still, the number of French motors having such ratios is more than twenty, so that hardly one-third of these long-stroke designs are products of the 1913 season.

American practice, on the other hand, does not indicate in any manner that it will follow the British designer on the path which he seems to have chosen. As has been shown in the first installment of this article, the American trend is very strong toward longer stroke and it might be reasoned that the optimum lies somewhere between the present ratios of England and France or is perhaps identical with the latter. This would explain the slower movement of English and French motor practice toward a high stroke-bore ratio. It is only reasonable to expect that when the advantages of long-stroke design are developed beyond a certain point they begin to make themselves felt as disadvantages or at least are not desirable for ordinary road work. The lengthening of the stroke with the continued use of a given bore naturally calls for either a higher center of gravity, or a wider crankcase and an increase of weight on the part of the latter or else an increase of the reciprocating mass in the motor. This increase of weight, if continued far enough, will offset the advantages derived from a long stroke, namely the lower angular velocity for a given piston speed. If this were not the case it would be very strange that so many French manufacturers who used a stroke-bore ratio of, say 2.04 in 1912 did not further increase it for 1913, although the Sizaire-Naudin car with its 2.48:1 ratio has had splendid success during the past 2 years, especially in racing practice. Furthermore, the fact that the ratio of the latter has been continued without change appears to be a silent way of admitting that the designer of this product has reached what he considers the limit in the long-stroke line.

Stroke-Bore Ratio of Four-Cylinder English Motors

NAME	1911			1912			1913		
	Bore	Stroke	Ratio	Bore	Stroke	Ratio	Bore	Stroke	Ratio
Pilot	3.54	4.72	1.73	2.56	4.33	1.69	2.56	4.33	1.69
Rothwell	3.11	5.00	1.61	3.11	5.00	1.61	3.15	5.00	1.59
Rothwell	3.91	5.00	1.28	4.02	5.00	1.24	3.98	5.00	1.26
Rover	3.78	5.12	1.36	3.54	5.12	1.45	3.54	5.12	1.45
Rover	3.35	4.33	1.29	2.95	5.12	1.74	2.95	5.12	1.74
Singer	3.54	5.12	1.45	3.54	5.12	1.45	3.54	5.12	1.45
Sirron	3.35	4.72	1.41	3.35	4.72	1.41	3.15	4.72	1.50
Sirron	....	....	....	....	....	....	3.15	5.00	1.59
Standard	3.50	4.25	1.21	3.11	4.72	1.52	3.11	4.72	1.52
Star	3.15	4.72	1.50	3.15	4.72	1.50	3.15	4.72	1.50
Star	3.50	5.51	1.57	3.15	5.90	1.87	3.15	5.90	1.87
Star	3.54	4.72	1.33	3.54	4.72	1.33	3.54	6.90	1.57
Straker	3.42	4.72	1.38	3.42	4.72	1.38	3.42	4.37	1.29
Sunbeam	....	....	....	3.54	6.30	1.78	3.54	6.30	1.78
Sunbeam	3.15	4.72	1.50	3.15	5.90	1.87	3.15	5.90	1.87
Swift	....	....	....	3.68	4.33	1.64	4.56	4.33	1.69
Swift	....	....	....	....	....	....	3.95	5.12	1.74
Swift	3.35	4.72	1.41	3.35	4.72	1.41	3.54	4.72	1.33
Thornycroft	3.98	4.49	1.13	3.98	4.49	1.13	3.98	4.49	1.13
Turner	....	....	....	2.95	4.72	1.60	2.71	4.33	1.60
Turner	....	....	....	2.36	3.94	1.67	2.36	3.94	1.67
Vauxhall	3.54	4.72	1.33	3.54	4.72	1.33	3.74	5.51	1.47
Vulcan	3.15	4.72	1.50	3.15	4.72	1.50	3.15	4.72	1.50
Vulcan	....	....	....	....	....	....	3.15	5.90	1.88
Wolseley	3.54	4.76	1.34	3.54	4.76	1.34	3.54	4.72	1.33
Wolseley	4.01	5.12	1.28	3.98	5.12	1.29	3.98	5.12	1.29

Stroke-Bore Ratio of Six-Cylinder English Motors

NAME	1911			1912			1913		
	Bore	Stroke	Ratio	Bore	Stroke	Ratio	Bore	Stroke	Ratio
Armstrong	....	....	....	3.54	5.31	1.50	3.54	5.90	1.67
Arrol-Johnston	3.15	4.72	1.50	3.15	4.72	1.50	3.15	4.72	1.50
Austin	4.37	5.00	1.50	4.33	5.00	1.25	4.33	5.00	1.25
Clement-Talbot	....	....	....	3.15	4.72	1.50	3.15	4.72	1.50
Daimler	3.98	5.12	1.29	3.98	5.12	1.29	3.98	5.51	1.75
Daimler	3.15	5.12	1.63	3.54	5.12	1.45	3.54	5.12	1.45
Deasy	....	....	....	3.54	5.12	1.45	3.54	5.12	1.45
Lanchester	4.02	4.02	1.00	4.02	4.02	1.00	3.97	3.97	1.00
Maudslay	....	....	....	3.54	5.12	1.45	3.54	5.12	1.45
Napier	5.00	5.00	1.00	5.00	5.00	1.00	5.00	5.00	1.00
Napier	4.02	5.00	1.25	4.02	5.00	1.25	4.02	5.00	1.25
Napier	3.23	5.00	1.55	3.25	5.00	1.55	3.23	5.00	1.55
Rolls-Royce	4.45	4.69	1.04	4.45	4.69	1.04	4.49	4.72	1.05
Sheffield-Simplex	3.35	5.00	1.49	3.50	5.00	1.43	3.50	5.00	1.43
Sheffield-Simplex	4.49	4.49	1.00	4.49	4.49	1.00	4.49	4.49	1.00
Star	....	....	....	3.15	4.72	1.50	3.15	4.72	1.50
Sunbeam	3.15	4.72	1.50	3.54	6.30	1.68	3.54	5.11	1.45
Vauxhall	3.54	4.72	1.33	3.54	4.72	1.33	3.74	4.72	1.39
Vulcan	3.15	4.72	1.50	3.54	4.72	1.33	3.54	4.72	1.33
Wolseley	3.54	5.12	1.45	3.54	5.12	1.45	3.54	5.12	1.45
Wolseley	4.49	5.75	1.28	4.49	5.75	1.28	4.49	5.75	1.28

Communications from The Manufacturer

J. A. Cleveland Finds Electric Truck About 50 Per Cent. Cheaper Than Horse and Wagon

THE evolution and rapid development of the automobile has been an important factor in facilitating the transaction of business and the transportation of merchandise within cities. The automobile has almost entirely supplanted the horse for ordinary pleasure and business service, and the automobile truck has begun to displace the dray and cart horse for commercial purposes.

As a result of this development in the automobile industry a great opportunity is presented to the central stations of the country for obtaining an important and valuable adjunct to their load, and from which they can derive an extremely profitable class of business. The electric vehicle is generally used during the day and evening and can be most conveniently charged during the night. This introduces a class of business which will use electrical energy during the very hours that the load upon the station is light. As a result, this business will tend to improve the daily load factor of the central station, and, furthermore, as the pleasure vehicles are used more in summer than in winter the business will improve the yearly load factor as well. The current used in charging is an off-peak load. coming on at the time of the lowest point in the load curve and requiring no increase in station investment. The load is one in which there are no fluctuations. As a current consumer the electric vehicle is decidedly attractive, the consumption varying as it does from 1,500 to 12.000 kilowatt-hours per car per annum.

The electrification of our city street railways marked an important step in the development of travel within cities and supplied the central station with an important consumer. The electrification of our city merchandise transportation system now presents another consumer of great possibilities. Commercial conditions are requiring a more rapid transfer of merchandise and in our larger cities the congestion of merchandise is becoming a serious problem. The electrical system applied to trucks offers advantages over the gasoline system in many respects. Electric motors are more simple in construction, and more durable and efficient in operation than the gasoline engine. Improvements in batteries during the past few years have greatly increased their efficiency. The speed of the electric truck is limited by the size of the motor and the number of cells in the batteries, and a check is thereby secured upon reckless driving which would result in disastrous accidents. Furthermore, the slower and more uniform speed prevents severe jolting of all parts of the machine and results in a lower maintenance cost.

Work for Central Stations

Opportunities are now offered to the central stations to help foster and develop the use of the electric vehicle and thereby secure for themselves an increased revenue. Inasmuch as this class of business is a non-peak load, special low rates are generally given. This increases the sales, but it has also been found to induce carelessness on the part of the consumer. This carelessness and excessive use of current results in frequent overcharging and ruining of the batteries. This practice will tend to cause dissatisfaction and will result in retarding the increase in use of electric vehicles. It is therefore evident that the central station must lend its assistance in educating the people regarding the proper methods to be used in charging the batteries, as well as handling the machine, in so far, as the electrical equipment is concerned. A number of central stations in the larger cities employ a man especially for this purpose, and his services are available to the public without any charge. This is, of course, impracticable except in large cities, but every company usually has some electrical employee possessing more or less knowledge in regard to the operation and care of electric vehicles and he could with some assistance and help increase his knowledge so that he would be of assistance to the public in this connection. The successful introduction and wide use of these vehicles depends upon the education of the public in their proper application and care. An educational campaign and some expert assistance is needed so that the vehicles used may be adopted to the purpose and service demanded of them. This business demands the same care and attention as is given to the prospective power user in recommending to him the proper type and size of motor adapted to his needs, and to the merchant in explaining to him the best system of illumination to adopt.

The aim of the central station being to help increase and develop this class of business, it naturally follows that the company itself should be among the first to utilize the service. Instead of using line wagons, repair wagons and meter wagons, it should use electric trucks for these purposes. In addition to thus daily advertising this service, the company itself can increase the efficiency of its own organization.

Actual Daily Truck Record Kept

In Saginaw the companies now have two electric trucks in daily use, one a 1,000-pound gas company truck as a meter and service truck, and the other, a 2.000-pound truck, used by the power company as a service and line repair truck. These trucks were purchased during the past summer from the Argo Electric Vehicle Company, of Saginaw, and have given most satisfactory service under all conditions. The smaller truck was put in operation June 12, 1911, and was used by the power company in connection with extensive pole and line work that was being done. Instead of purchasing an additional team and wagon, which would have been needed at this time, it was thought best to try an electric truck. It was found, however, that a 1,000-pound truck was too light for the heavy loads of wire and line material and later on a 2,000-pound truck was ordered and placed in operation in October. The smaller truck was then transferred to the gas company to be used as a meter and service truck, taking the place of two horses and wagons.

From the day the first truck was put in operation, a record was kept showing the number of miles traveled each day, and the actual number of hours and minutes each day that was spent in traveling as distinguished from the time that the truck was standing still while the men were at work at any one location, and the number of men each day that were employed upon the work.

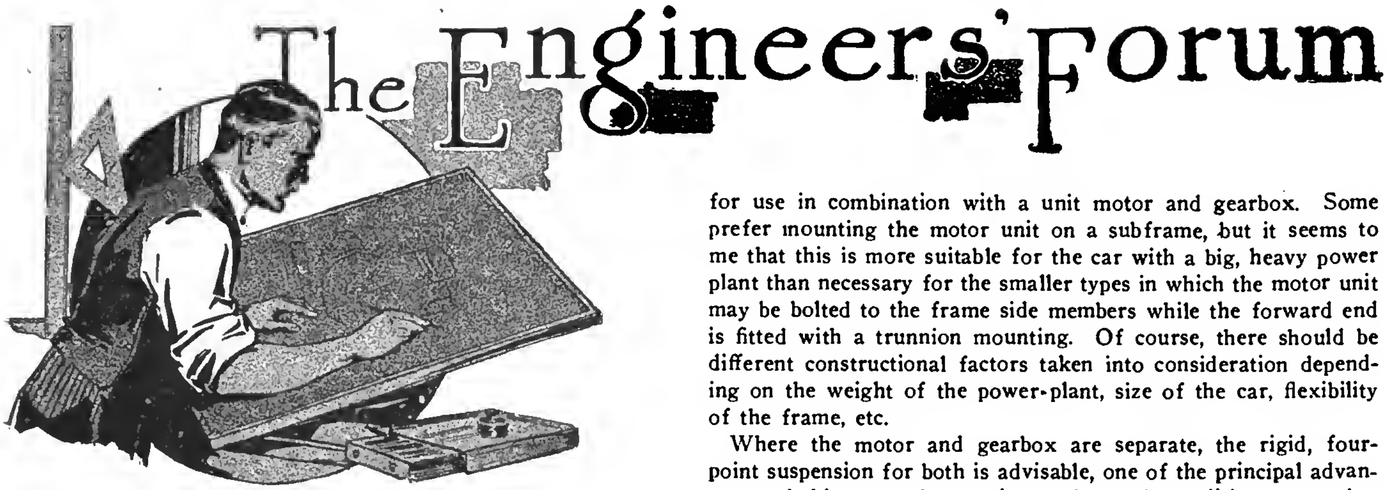
The maintenance cost of the automobile truck was found to be greater than that of the horse and wagon, but the extra amount paid in wages in the case of horse and wagon operation still resulted in a saving of nearly 50 per cent. in operating costs by the use of the truck.

Our records show that the total yearly cost of the automobile truck is about 50 per cent. of the cost of the horse and wagon in doing the same work, which in our case means a yearly saving of nearly $1,000.

The following additional figures in regard to the operation of the truck during the period may be of interest:

Number days of truck operation	94	days
Number hours of truck operation	199.4	hours
Average number hours per day operation	2.12	hours
Total number of miles traveled	2009	miles
Average miles traveled per day	21.4	miles
Maximum miles traveled per day	53.5	miles
Average miles traveled per hour	10.08	miles
Total K.W.H. used	768	K.W.H.
K.W.H. used per day	8.17	K.W.H.
K.W.H. used per mile	0.38	K.W.H.
Energy cost per mile at 5 cents per K.W.H	$ .0190	
Battery renewal and repair cost per mile	.0314	
Mechanical repair cost per mile	.0090	
Tire renewal cost per mile	.0150	
Total operating cost per mile	.0744	
Total operating cost per day	$1.5900	

JOHN A. CLEVELAND, *Saginaw Power Company.*



3-Point vs. 4-Point

G. P. Dorris Likes 3-Point Type of Suspension—Would Like to See Return to Transmission Brake as Emergency Brake

ST. LOUIS, MO.—Editor THE AUTOMOBILE:—Noticing that another instalment of the discussion of three-point versus four-point suspension for motor and gearbox appeared in a recent issue of THE AUTOMOBILE, I herewith submit my views on the subject:

Use a rigid unit power plant, consisting of motor, clutch, transmission and electric systems. Mount this rigidly in a narrow or strangled frame, not to exceed 30 inches, permitting the swiveling of the front axle with the least torsional strain on the frame.

Mount the rear of frame on three-point support platform springs, allowing the rear axle as much freedom as posssible, and the least torsional strain at the rear of the frame. This construction relieves the frame body and power plant of practically all torsional strains, and consequent squeaking and working of body and other ills.

For future argument, I would like to see a return to the transmission brake, as an emergency brake. It should be lever-operated, using the big external rear hub brake as the service brake, as is done in Europe. This system has the following advantages: Lighter rear axle and a smaller amount of unsprung weight.

Less overall weight eliminates the necessity of oiling the brake shafts and the chance of their rusting and seizing. A reduction of brake rods and equalizers eliminates chance of brake rattles—removes necessity of taking off rear wheels to adjust internal brakes. Single rear brakes alternated with transmission brake on long grades, gives divided and better radiation. The external rear brakes are directly accessible for adjustment.—G. P. DORRIS—Dorris Motor Car Company.

Favors Three-Point Suspension

DETROIT, MICH.—Editor THE AUTOMOBILE—I have read with great interest the discussion which has been carried on in the Engineers' Forum recently regarding the advantages and disadvantages of three-point and four-point suspension for motor and gearbox. As the Forum is apparently open to the readers of THE AUTOMOBILE for discussion of various points of engineering practice, I venture to submit my views on suspension.

The three-point type of suspension has always appealed to me for use in combination with a unit motor and gearbox. Some prefer mounting the motor unit on a subframe, but it seems to me that this is more suitable for the car with a big, heavy power plant than necessary for the smaller types in which the motor unit may be bolted to the frame side members while the forward end is fitted with a trunnion mounting. Of course, there should be different constructional factors taken into consideration depending on the weight of the power-plant, size of the car, flexibility of the frame, etc.

Where the motor and gearbox are separate, the rigid, four-point suspension for both is advisable, one of the principal advantages of this type of mounting under such conditions appearing to me to be the preservation of alignment. The firmness of both parts in position and the resulting durability constitute desirable features.

A number of manufacturers make the gearbox integral with the rear axle housing. It would naturally seem that in this type of construction the motor should be mounted in some form of three-point suspension. In this way the inequalities of the road would affect the forward part of the frame before reaching the rear portion where the gearbox is situated and thus the torsional strains which the frame would be called upon to stand would be lessened and distributed more evenly than where these strains fall all at once upon the forward end of a frame which has also to bear the weight of the entire power plant. This construction has other advantages, though it has also some disadvantages, for the added weight of the gearbox increases the strain upon the rear axle housing, etc. Taken all in all, it seems to work out satisfactorily in practice, however.

In the mounting of motor and gearbox on trucks there are different features to be considered, depending on the weight and size of the motor equipment and gearbox, their relative position, the space in which they are to be accommodated, etc.—J. F. BRANFORD.

Correction on Carburetion

In the article on Carburetion in the November 14 issue of THE AUTOMOBILE, page 1002, the specific heat of air should have given as 0.237 instead of 0.259 and the calorific value of the fuel at 288 British Thermal Units per pound, namely $9/5 \times 160$ calories. This makes:

$$\left.\begin{array}{lr} \text{Air} \ldots\ldots\ldots\ldots & 15 \times 0.237 = 3.6 \\ \text{Fuel} \ldots\ldots\ldots\ldots & 1 \times 0.500 = 0.5 \\ & \overline{4.1} \end{array}\right\} \text{Temp. drop}$$

and for 160 calorie fuel $160 \div 4.1 = 39$ deg. C.
for 288 British Thermal Units fuel $288 \div 4.1 = 70$ deg. Fahr.

An Ingenious Danger Signal

LONDON, ENG.—A very interesting device was recently tested and examined by the authorities of Scotland Yard and of the home office in this country. The instrument is styled the Farometer, and it is a machine which has been designed and developed to register in large numbers on a prominent part of a motor-omnibus or taxi-cab the number of miles per hour the vehicle is traveling at any given moment, so that the public may see when a vehicle is exceeding the legal limit of 12 miles an hour in the case of the bus and 20 miles an hour for the taxi-while those carried on the vehicle, as well as the driver, are also shown the same figure. Should the vehicle pass the legal limit a gong sounds to draw the attention of the driver to the fact. If he persists in going faster a red flag appears. the machine being electrically illuminated at night.

Bad Roads Hurt Gearset—Peculiar Case of Short Circuit—Layout for Garage Addition—Sliding Universal Joint—Starting on Magneto System—Broken Connection in Coil Box—Reasons for Heavy Flywheels

Rough Roads Affect Transmission

EDITOR THE AUTOMOBILE:—As I am having trouble with my transmission, due to rough roads, I would like to know if this can be remedied to some extent by putting on wire wheels and larger tires.

2. What is the next larger size tire that can be put on a 3.5 by 34 rim?

3. Would a car equipped with 4 by 32 wheels in place of 3.5 by 34 climb the hills better aud reduce speed on the level? Which tires would wear longer under a five-passenger 2,600-pound car?

4. The rear wheels of my car still have that cracking sound after having been tightened and kept in water. How could this be removed?

Glasco, N. Y. SUBSCRIBER.

—If your trouble is due to poor alignment of the drive shaft and gears, the fitting of wire wheels would not help you. The trouble might possibly be due to a loosening of the rivets connecting the gearset housing to the side members of the chassis. If this is the case it will be necessary to cut out the present rivets, ream the holes and re-rivet with larger rivets. Another trouble might be in the fact that the bearings on the gearset shafts are too far apart or are not of sufficient length or diameter.

2. The next size tire would be the 3.5 by 34 over-sized tire, which could be secured from most of the larger companies.

3. The difference in hill-climbing abilities would not be noticeable. The larger size tire would wear longer.

4. Any wheelwright should be able to remedy this trouble. The cracking sound is an indication of looseness or play in some part of the wheel. This looseness may be in the spokes or it may be in the felloe. Putting the wheel in water will tighten up the spokes for 1 or 2 days, and they will then dry out and be looser than they ever were. The only thing you can do is to take the wheel to a good wheelwright and have a permanent job made.

Short Circuit in Flanders Motor

Editor THE AUTOMOBILE:—I have a Flanders 20, 1910 model. Recently in endeavoring to start the car I threw out the clutch as usual in order to change the speed, and in so doing killed the engine just as though I had thrown off the switch. I have had the engine all down, ground the valves, adjusted the tappets, rewired with new wire and also had a new Stromberg carbureter put on. After having replaced and adjusted everything as nearly as possible, I tried again, with the same result. As long as the clutch is left in the motor runs very nicely, but as soon as you disengage it it stops.

Bloomington, Ill. J. E. CAMP.

—According to the service department of the Studebaker Corporation in New York City it occasionally happens that the spark control rod will be pushed against the breaker box of the magneto, causing a short circuit.

Plan for a Garage Addition

Editor THE AUTOMOBILE—I am looking for an up-to-date sketch or plan for an addition to my garage, which is 50 by 100. I want to add 50 by 100 with clear floorspace, upper floor to be used for paint shop, machine shop, vulcanizing and battery repair room.

Can you give me some light on this subject?

Waukesha, Wis. E. J. FOSTER.

—The best solution of your problem would be to construct, as you suggest, an upper floor on your present garage building. This floor would, of course, have to be 50 by 100 feet like the garage proper, and there should be no difficulty in so arranging the various shops on this floor as to arrive at a very efficient scheme. Since this floor is to be the highest in the building the proper location of windows and skylights to give suitable illumination for the painters and the repair work is a relatively easy thing. We would suggest the following arrangement for the departments which you want to install on this floor:

An elevator is required to bring automobiles from the street floor to the upper one, and it would be a happy idea to locate this elevator in the middle of one of the longer walls so that it projects as far as 20 feet from this wall and has a practically central position. The best place for the elevator would not be at the actual center of the building, but the installation should bear against one of the longer walls, preferably the back wall of the building. In front of the elevator there should be a 10-foot passage through which an automobile may be steered to either side of the floor. The paint shop might be advantageously located to one side of the elevator, giving it the full depth of 50 feet and a width of 40 feet. Two windows each on the front and rear side of the paint shop and three or four in the side wall of the building should give ample light and, if necessary, could be assisted by a 10 by 25-foot skylight.

Opposite to the elevator on the front side of the building a battery room 10 feet along the wall and extending 20 feet into the building should be located, being separated from the rest of the floor by a slidable wire door. Adjacent to the battery room should be a vulcanizing department 15 feet wide and 20 feet deep. This room, like the battery charging department, should have a wire door toward the passageway between it and the elevator. The rest of the floor, practically 1750 square feet, should be devoted to the repair shop, divided into three departments. A tool and stock room, in which small tools and a supply of the most necessary repair parts is kept, is 20 feet square and situated adjacent to the elevator, on the side opposite to the paint shop. A lockable door separates the tool room from the rest of the shop, the department next to it being the machine tool room, in which a lathe, planer, shaper, drill and arbor press and emery wheel should be stationed. This room should be 20 feet wide and should extend from the back wall 30 feet toward the front wall. This leaves a space of approximately 20 by 35 for the rest of the repair shop. In this room, benches ought to be arranged alongside the windows, and a useful addition to the equipment would be a stand 4 feet above the ground and fitted with inclined runways on which an automobile may be moved up to the stand. This piece of equipment adds greatly to the ease of repair work and enables a man to do more work in a given time on a car with less fatigue than otherwise.

Depending on whether you think that this addition to your garage would be final or whether you expect to increase it again at some later date, the construction of the upper floor should be made lighter or more substantial. This point determines also the construction of the elevator shaft; if the upper floor will be the last addition to the building the elevator might open toward three sides of the room, being supported on structural beams positioned in the corners of the shaft; whereas if you expect to add another floor in the future only the front side of the elevator shaft should be open, the two sides being formed as walls, which aid in supporting an additional floor if the latter is built on the second story which you now intend to erect.

National Uses Sliding Universal Joint

Editor THE AUTOMOBILE:—Would you kindly tell me what type of universal joint is used on the National 40 car and what the different parts which go to make up this joint are named?

2. I have been troubled with a squeak from the worm and gear steering on my car, it is carried on ball bearings and I do not understand why it should give me this trouble. How can this be remedied?

Baltimore, Md. E. SUMMERFIELD.

—1. An illustration of this universal joint is given in Fig. 1. The upper shaded view shows the sliding portion while the lower view shows a large part of the assembly detail. The universal joint consists of a main steel portion attached to the gearset shaft by two keys. It revolves on the annular ball bearing shown in the illustration. The driving shaft is turned to a ball shape and has the hardened pin shown in both views running through it. Upon this pin work the two steel squares shown in the lower illustration. These slide within slots in the main portion of the joint and give the joint its name, sliding. A metallic housing incloses the joint and likewise a plentiful supply of grease for its lubrication.

2. The squeaks in the steering gear are due to a lack of lubrication between the worm and the gear. If you will pack the gear housing with grease the trouble will be removed. The general arrangement of the parts is shown in Fig. 2.

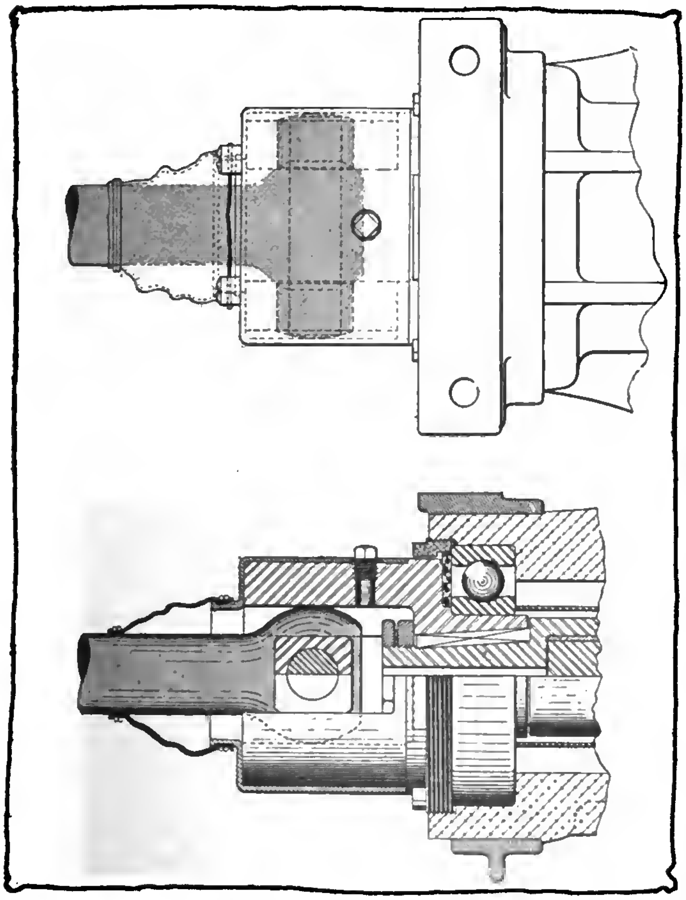


Fig. 1—National universal joint of the sliding type used on 40-horsepower cars

Removing Chalmers Valve Caps

Editor THE AUTOMOBILE:—I have a Chalmers 36 and am about to grind the valves. Can you tell me how I can remove the valve caps? The instrument supplied with the car slips off when I begin to pull on it. I cannot start the caps with a cold chisel and hammer. Is there any wrench made that will fit these caps or can you tell me how I can have one made?

Salem, Mass. H. S. L.

—The New York agency has an extensive repair shop in which it repairs nothing but Chalmers cars. In this shop the method used for removing these caps is by placing a brass bar against them and hammering on the bar. The use of a cold chisel for this is bad because it will chip off the metal while the brass being softer will not harm it. It has been the experience of this shop that there are no valve caps which cannot be removed by this method, although some are much stiffer than others.

Weight of Flywheel Required

Editor THE AUTOMOBILE:—Can a six-cylinder motor be made with a flywheel of materially less weight than that used on a four-cylinder motor? Is it possible for an eight-cylinder motor to run without a flywheel? Why is it that a flywheel must be installed in a gasoline engine, and not on an electric motor? Is it because the revolving armature takes the place of the flywheel?

Philadelphia, Pa. L. F. RENBER.

—An increase in the number of cylinders lessens the necessity for a flywheel, but even with eight cylinders it is necessary to have some sort of rotating balancing member in order to get smoothness of action. With a single-cylinder motor the weights of flywheel used with automobile engines have run up as high as 1200 pounds, and in stationary motors the weight has gone far above this in order to get perfectly smooth action without jar when the motor is crossing dead center. In automobile practice flywheels on multi-cylinder motors are reduced for as small a size as possible and still secure even running, the greatest trouble being to secure a perfectly smooth action when crossing dead center under a heavy load causing the motor to turn over slowly. In average practice the flywheel on a four-cylinder motor of about 30 horsepower will average somewhere around 80 pounds. For a six-cylinder motor it will often be as low as 60 pounds, while motors with a flywheel of less weight than this have been made.

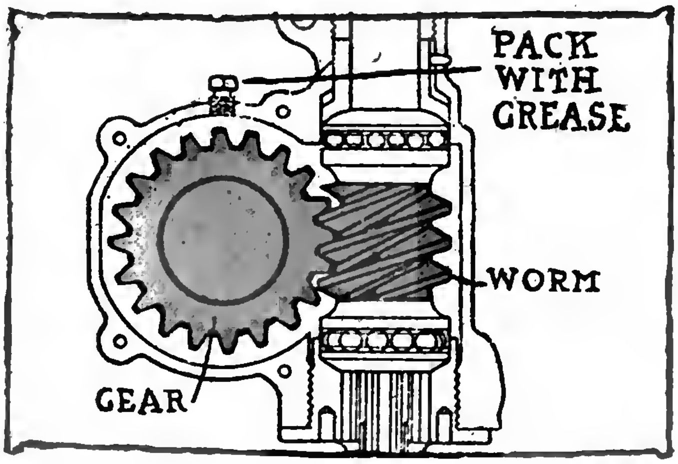


Fig. 2—Indicating point in worm and gear steering where grease should be applied

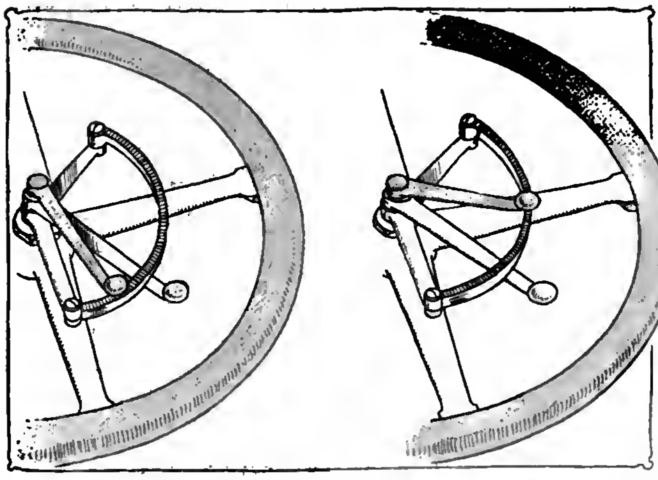


Fig. 3—Shaded levers show position of spark advance when started; left for battery, right for magneto

The weight of the flywheel required depends to a large extent on the balance of the machine itself as well as on the weight of the reciprocating parts and their distribution around the axes of the crankshaft. The reason a flywheel is not required on an electric motor is because the impulse is constant and there is no dead center over which the armature must be carried.

Curing Ford Clutch Trouble

Editor The Automobile—I have a Ford model T which has run about 6,500 miles, and wish to overhaul it.

1—The engine knocks, especially when pulling hard. Do you think this is due to carbon deposits in cylinder?

2—Do you think it necessary for the cylinders to be ground?

3—The clutch does not act as quickly as it should. I have tightened it, but that does no good. Is there any danger of having it too tight?

4—How many miles will the differential gear last in this make under good care?

5—Should this car run almost like new when overhauled?

Piqua, Ohio. M. O. F.

—1. The trouble evidently is in the fact that you have carbon in the cylinders. The carbon should be scraped from the cylinders and the valves ground.

2. If the valves have not been ground since you have had the car they are now probably in need of grinding.

3. The high speed adjustment should be tightened. The three set screws on the gear case should be given a one-half to a full turn, each screw being given the same adjustment.

4. This depends altogether on how the car is driven. Taking corners at high speed and otherwise abusing the car may materially shorten its life.

5. When thoroughly overhauled the car should run as good as new.

Starting on the Magneto

Editor The Automobile:—How is it when you wish to start on the magneto it is necessary to advance the spark lever from one-half to two-thirds the way on the quadrant? When this is done, where does the spark occur; before or after dead center?

2. Where does the spark occur when the spark lever is fully advanced?

3. What is the advantage of having cells (dry) in multiple series?

Boston, Mass. Subscriber.

—The reason that the spark lever must be advanced when using the magneto is because the lag of the spark is much greater in the magneto than in the battery. This is due not only to the actual lag of the magneto but also to the relative lag caused by the motor being turned over rapidly or spun when started on the magneto. The relative positions of the spark lever when starting by battery and magneto are shown in Fig. 3. The shaded levers in this illustration are the spark levers. The spark occurs at about dead center.

2. When the spark lever is fully advanced the spark occurs before dead center is reached. The maximum of advance is in the neighborhood of 35 degrees before dead center on the average touring car.

3. When the cells are connected in multiple series they last longer than if connected in series. So much current is contained in each cell and when these cells are increased in number a greater supply of current is available. When this supply is removed at the same rate or in other words when the same amount of current is consumed at the same time the greater number of batteries will last longest. Hence it is that a multiple series connected last longer than a single series.

To Find Gas Leaks in Motor

Editor The Automobile:—Could you tell me of a good method by which to locate the leaks in a gasoline motor. If the leak is very elusive I find that it cannot be exactly determined by the process of putting oil or soapy water on the different joints and connections, except by mere chance.

Chenango, Mich. Carl Spirone.

—First flush out each cylinder with about a pint of kerosene oil, after shutting off the gasoline from tank; then drain the crankcase to get the kerosene out of it. Now cut out the ignition, and be mighty careful you cut it out, or later, when you are pressing down on the starting crank, you may find a 30-40 horsepower kick which will most likely injure your arm if not break it. Close up tightly all priming cups, and on cylinder No. 1; take an oil can filled with kerosene and flood the plug from top to bottom, being sure to get enough oil in and around the base of the plug so that any escaping air will cause a bubble to appear when you tnrn the engine over its compression. Be sure you put the kerosene around the priming cup also, for these leak a trifle at times where they are seated, and any leak, however small, will cause trouble in the proper running of the motor. After you use the oil, take the starting crank and press it slowly downwards, at the same time watching carefully the cylinder and priming cup for any air bubbles which may appear. Repeat until all cylinders are tested, being careful not to skip any one of them by looking at the wrong one under compression. It is more certain to open all relief or compression cocks except the one you are testing, closing them as you progress with the work. If a bubble appears between the shell of the plug and porcelain or mica, it is evidence that the plug needs tightening or a new gasket fitted. If the bubble appears at the seat of the plug it is evidence that the plug is not properly seated and needs to be taken out and a good coat of flake graphite mixed with cylinder

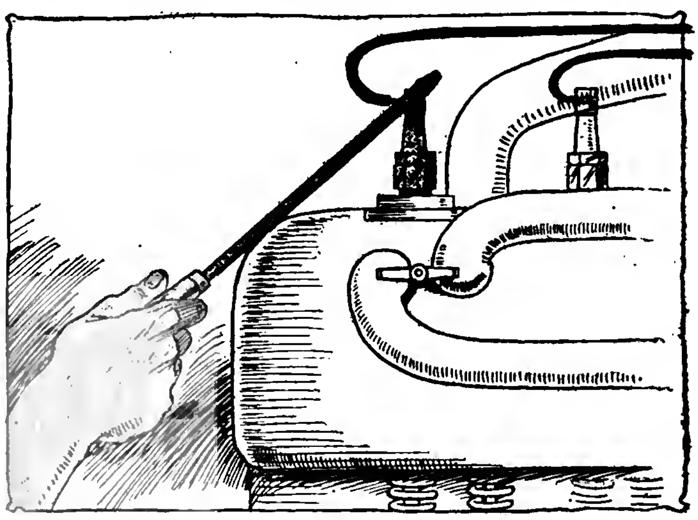


Fig. 4—Short circuiting plug to detect which cylinder is missing

oil, to the consistency of putty, placed all over the threads of the plug. Then screw it carefully into its seat, not too tightly, as this would cause it to crack its porcelain and cause it to stick at times. If you have no new gaskets on hand you can make as many as you please by taking a piece of asbestos and a pair of shears and cut out a round ring to fit over the porcelain and then screw the packing nut tightly home. If you test for these slight leaks you will be surprised at finding them when you least expect to do so.

Bad Connection in Coil Box

Editor The Automobile:—We have a Rambler model 53, sold in 1910. It has a Splitdorf vibrating coil and we cannot crank the motor on this coil or battery side, but if we will press on the starter button on the side of the coil box we get a good spark at the cylinder. If we crank this motor on the magneto it will run as well as ever, but when the switch is on the battery side it will stop at once unless the button is pressed on the side of the battery box. As long as this is done the motor will run as well as ever, but the moment we stop pressing on this button it will stop. When switched on the magneto is runs well. The batteries are good (testing 28). The vibrator points are clean and we get a good spark at the plugs when we press the button, but rarely get one when not pressing the button.

Can you help us out of this trouble?

Iuka, Kan. Maynard & Phillips.

—The trouble is in a broken connection in the coil box, the spring not being in contact with the rest of the circuit. When the starting button is pressed the contact is made and hence the motor will run. The box cover should be removed and the spring bent up slightly, or the coil should be sent to the Kansas City Splitdorf agency, where the disconnected parts will be put in good order.

Wiring Used on Six Cylinder Cars

Editor The Automobile:—What is the best wiring scheme to use on the 48-horsepower six-cylinder Pierce Arrow car?

2. How can you detect which cylinder is missing on a six-cylinder car?

New York City. Jerome Wilson.

—The wiring diagram which depicts the wiring scheme more clearly than it could be described is shown in Fig. 5.

2. If you will take a screw-driver, place it first against the metal of the cylinder and then against the tops of the spark-plug in the manner shown in Fig. 4 you will be able to detect which cylinder is missing fire. The method of procedure is to do this with each cylinder in turn, noting the effect. Whenever you reach the cylinder that does not indicate any effect or difference in the running when the plug is short-circuited in this manner you will find the one which is misfiring.

Engineer on Ether for Starting

Editor The Automobile:—Having seen a number of requests lately in your journal regarding the action of ether as a primer for starting in cold weather, it may be of value to your readers to know that I have used for this purpose for the past 7 years a mixture of one-half gasoline and one-half "commercial" or "washed" ether.

The mixture is placed in an ordinary half-pint can with a cork over the tip when not in use.

I squirt about one-quarter ounce of the mixture into each priming cup and have never known any motor to fail to start with one-quarter turn of the crank, that is, one pull up.

I have had the motor occasionally start on the spark even in very cold weather.

I have absolutely no bad effects from its use in any way.

Contrary to a popular impression ether does not cause abnormally high pressures in the cylinders.

The washed ether costs 35 cents per pint at wholesale drug-

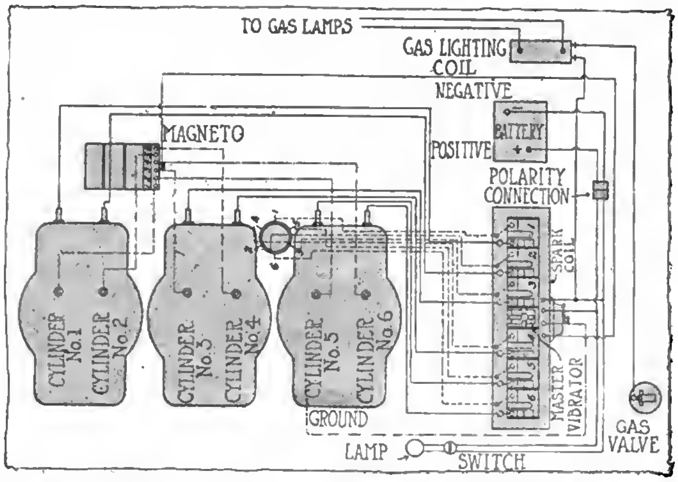


Fig. 5—Wiring diagram for ignition and gas lighting as used in the six-cylinder Pierce-Arrow 48, 1912 model

gists and comes in sealed tin cans. Two pints will usually last me through the winter, so that the expense thereof is but a trifle.

Detroit, Mich. Edward T. Birdsall, M. E., Consulting Engineer.

Blames Low Test Fuel

Editor The Automobile:—I have two cars which seem to lose much power in cold weather, yet they seem faultless in carbureter, ignition and compression. I blame much of this trouble on low test gasoline which I find tests as low as 59. Would you consider a higher test gas, say 73-76, would be better for use in winter when cars are usually cold? If so, kindly explain in what way, also if it is quicker and better at any time. I also have trouble in plugs becoming sooty.

2—I note the Standard Oil Company marks its shipments of 73-76 gasoline "Naptha." Has that any particular significance?

I am not prone to pay a high price to get a high test gas but would prefer to do so if it is much superior. Please advise through Letters Answered and Discussed.

Whitehouse Sta., N. J. J. H. Dilts.

—In cold weather a car will never pull well until the motor becomes warm. If the radiator area used in winter is the same as that used in summer it stands to reason that the motor will run cooler and hence with much less efficiency. Therefore, it is necessary to cover the radiator in cold weather to prevent the radiation of the heat from the motor. If this is done you will find that a short time after starting the motor will pull as well in winter as it does in summer. As a matter of fact, there is more power in the lower test fuel than there is in the higher and after once getting the motor started, the lower grade will give good satisfaction. If you are burning too rich a mixture or using oil which is just as heavy as that used in summer, the trouble with the plugs is explained. Try a lighter grade of lubricating oil.

2—The name given by the oil concerns to the gasoline used in automobiles is auto-naptha. This is merely a name and has no special significance any more than it marks a certain limit in the distillation. That is, it indicates that in the refining process the cut, or lower limit of the refined product has been set at a definite point.

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The Editor of this department is holding numerous letters signed Reader, Subscriber and by various initials which cannot be answered until the name of the sender be known. Owing to the large number of inquiries received many letters are answered by mail instead of through these columns; those of general interest being selected for the latter purpose. Anyone may receive a direct reply by mail by stating their desire and enclosing postage.

Electric Cranking and Lighting

Part I

Giving An Elementary Review of the Requirements of a Complete Electric System and a General Introduction to the Subject Before Taking Up a Consideration of Each System

Subject Digest

¶ For electric cranking it is necessary that a supply of current be on hand to operate the cranking motor for a sufficient length of time to start the engine under the most adverse conditions. Since there are no moving parts before starting the engine the source of the current must be a battery.

¶ The length of time that a battery can supply current for any purpose is limited; therefore, it is necessary that some means be provided to replenish the current drawn from the battery after it has started the engine by means of the cranking motor. The means must be generator mounted on the car because an outside source is impracticable.

¶ Three types of electric system are used. The single-unit system combines in one instrument the generator for lighting and ignition and the cranking motor. The double-unit system combines any two of these and has the other unit separate. The three-unit system has the generator, the cranking motor and the magneto separate.

¶ Each unit must be protected and regulated so that it will be impossible for it to be damaged or to cause damage.

WITH the adoption of electric cranking on 69 per cent. of the cars which are using starters at all, the problem of proper electric installation both from a standpoint of standardization and good practice, becomes highly important. On such a car the primary requirement is that electric current must be available for three purposes—namely: ignition, lighting and cranking.

The requirements of the ignition system, when independent, are few and have been solved in the past. The sole duty of the ignition system is to supply a current at the electrodes of the spark-plug of such strength that it will cause a spark to jump across the gap. The source of the current may be either a battery, a magneto, or a device performing the functions of the latter.

For lighting it is necessary that a continuous flow of current be delivered at the lamps. The current for the lamps must maintain a steady pressure or voltage in order that the glow of the lamps will be uniform and that the filaments will not be destroyed owing to excessive pressure or, in other words, voltage. The source of supply may be from a battery or a generator.

For electric cranking a current must be drawn by the cranking motor which will be of sufficient quantity to turn the engine. **The sole purpose of the electric motor is to crank the engine, and when through with this work the current need not be supplied to it. Therefore, the current must be controllable by the driver.** The source of this current must be a battery because when the cranking is required there will be no units in motion, and hence nothing about the car which can generate the current necessary at the time.

The above three paragraphs show that the battery may supply current for either cranking, lighting or ignition.

Since the length of time that a battery can supply current is limited, and since for at least cranking and lighting the battery must be always available, it is evident that there must be a means of producing electrical energy which will replace that taken out. This energy may be either from an outside source or it may be from a generator of electric current on the car itself. Discarding the outside source as obviously impractical and unhandy, only one alternative remains, namely, to mount a generator on the car. Since it is impossible to store an alternating current in a battery the generator must supply a direct current.

It should be noted here that a magneto is a generator which supplies an alternating current, and therefore could never be used for storing a battery. For that reason alternating current generators are not used for auto lighting.

A direct current generator supplies a current which may be used for storing electric energy in a battery, for ignition purposes and for lighting purposes. It is therefore evident that a battery and a generator used in conjunction with one another are sufficient to maintain a supply of current at the disposal of the operator of the car for any purpose to which he wishes to put it.

From what has been said it may be seen that there are three units necessary for an electric cranking system. First, a battery which may be compared to the water tank on the top of a house which holds a supply that may be available for any purpose whenever it is desired to draw it off. Second, a generator which has its parallel in the water pump which raises the water into the tank. Third, the cranking motor which is like the water wheel or water motor which is operated by the water in the tank. The switches controlling the supply of current and its application may be directly compared to the various valves used for turning on and off the water and for controlling the direction of its flow.

Regulation and protection of the various units of an electric system are necessary in order that they continue to bear the proper relationship to one another under all operating conditions.

The battery must be protected in two ways: First, against discharge of the current contained at improper times or when the battery is not in use. Second, against the injury which would result should the battery be charged too rapidly. This occurs when the outside source supplies the current at too high a rate or when the generator on the car is driven rapidly at high engine speeds, such as in fast running or hill climbing. These two danger points are the same as those which must be guarded against in the case of the water tank, to which the battery is comparable. It must be guarded against the leakage of its supply when the pump is stopped or against being filled so rapidly and by such a violent stream that the water is thrown out of the tank or even, in an extreme case, destroys the tank itself.

The electric circuit, of which the lamps are a part, must be protected against an excessive voltage, or electrical pressure, which would burn out the delicate filaments of the lamps. These would be destroyed first because they are the weakest part of the circuit.

The protection of one unit in an electric system is secured by the regulation of others. To prevent the battery from allowing its charge to pass back through the generator when the latter is stopped, a reverse current cutout is used. Its use and purpose correspond exactly to that of a ball check valve, which permits the water to flow from the pump into the tank on the house, but prevents its return back through the pump when the pump is stopped.

The protection of the battery against an excessive charging rate is accomplished by regulating the generator in four ways, as follows:

1—Mechanically, by a centrifugal governor and a clutch which is allowed to slip as the speed of the engine increases. This is shown diagrammatically in Fig. 5.

2—Electro-magnetically, by the changes in magnetic power of an iron core due to the variations in the current passing through a coil wound around that core and the electrical output is made a function of the engine speed. Generally the magnet acts against a spring and extends or compresses it in proportion to the power of the magnet. This method of regulation is shown diagrammatically in Fig. 5. This control of electrical output may be a function of the speed in one case or of the pressure or voltage in another.

3—Inherently, by making the generator in such a manner that throughout the range of working speeds a nearly constant current output is produced. This is accomplished by compound windings which operate against each other in such a manner that the resultant is always the same. It may be compared to a man rowing against a stream whose current is swifter toward the center. If he moves against the stream at a constant rate he must row more rapidly as he gets into the faster current, but the difference in his actual speed and the speed of the current will be constant.

4—Thermally, by the increase of resistance due to a rise in the temperature of a conductor, the increase coming into play when the generator output is too great. It requires more energy to send an electric current through a wire when it is hot than when cold. Advantage is taken of this principle in one method of regulation.

With the system in mind as so far outlined it would be well to turn to a complete hydraulic parallel with an idea of showing clearly the relative conditions which must obtain between each member of the system. The diagrammatic layout in Fig. 4 shows this completely. The battery is represented by a storage tank, the generator by a pump, the cranking motor by a water motor or water wheel, the lamps by small water wheels, the switches by hand-operated valves, the reverse current cutout by a check valve, the generator output regulator by a governor, which disconnects the pump when the speed becomes too great, and the wires by pipes.

With a clear outline of the electric system in mind the study of its operation and manipulation becomes simply a matter of taking up the action of each unit. With the system stationary the first move must be caused by the current which is in the battery. It is necessary to draw on the supply which has previously been stored there. There must be sufficient current in the battery to operate the cranking motor for a sufficient length of time to make starting certain under the most adverse circumstances. Given the source of electrical energy and the necessary units with which to transform the same into work or vice versa, the application of the principles is all that remains.

Electric systems on automobiles may be classified according to the grouping of the elements of which the system is made up. There are three systems, the single-unit, the two-unit and the three-unit.

The single-unit system—In this system the cranking motor and the generator are combined in one unit which is known as a motor-generator. In addition the generator portion of this unit performs the functions of a magneto.

The two-unit system—The two-unit system is subdivided into two classes:

A—Where the cranking motor and the generator are combined in one unit and the magneto forms the other. In this system the units are known as a motor-generator and a magneto.

B—Where the cranking motor and the generator are separate units and the generator performs the functions of a magneto; or, in other words, supplies the current for ignition.

The three-unit system—In this system the cranking motor, the generator and the magneto are all separate and distinct units.

The different classifications may be brought out diagrammatically.

In applying the different units to the engine certain laws of

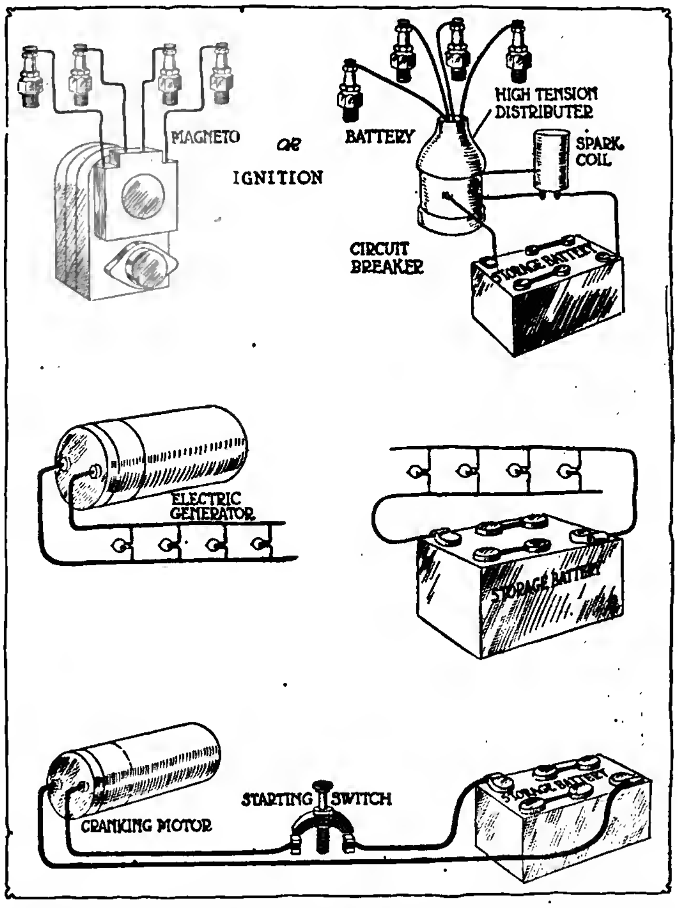


Fig. 1—The fundamental requirements of electric ignition, lighting and cranking. Top—Magneto or battery furnishing current for ignition. Center—Generator or battery furnishing current for lighting. Bottom—Battery furnishing current for electric cranking

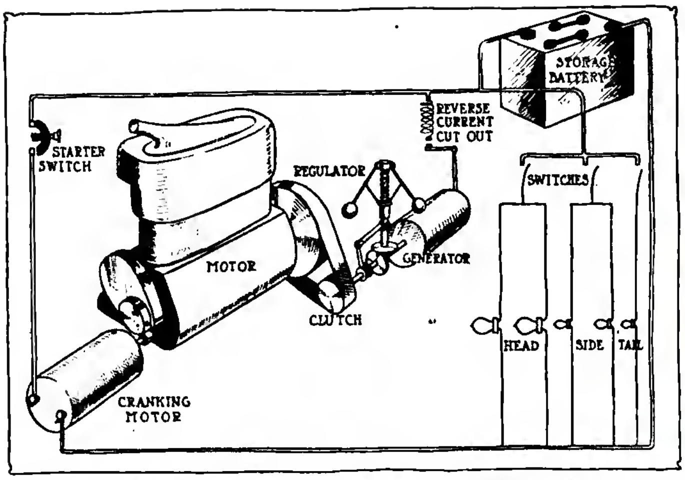


Fig. 2—The elementary layout of an electric starting and lighting system

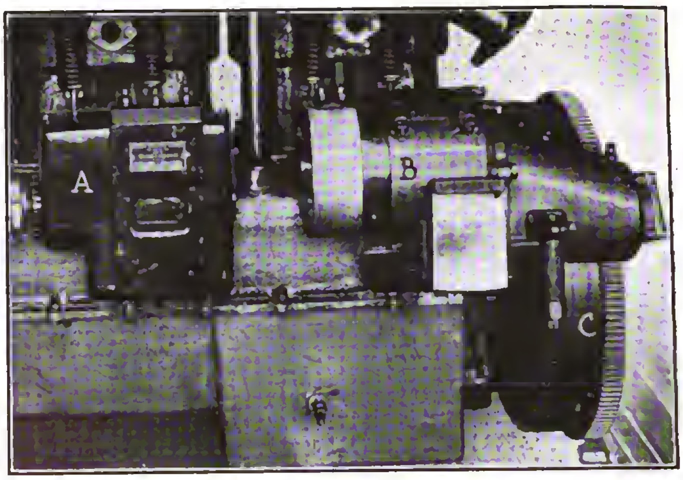


Fig. 3—The installation of the Locomobile cranking motor B on flywheel C

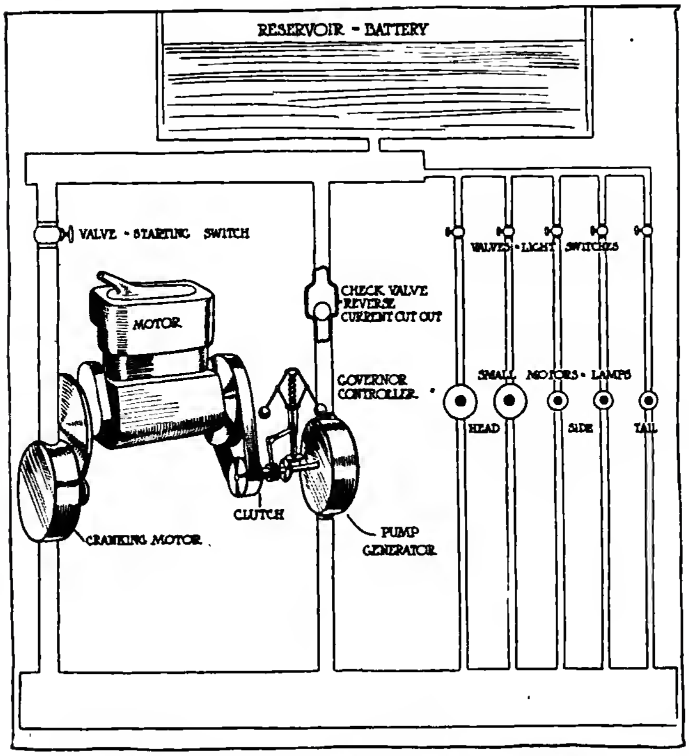


Fig. 4—Diagram showing hydraulic parallel of an electric ignition starting and lighting system.

relationship must self-evidently hold; these may be stated as follows:

The generator of the ignition current must bear a constant relationship to the engine crankshaft for proper ignition timing. Every time the crankshaft of the engine is in a given position the ignition-current generator shaft must be in a fixed, definite position in order that the spark will occur at the proper time.

The generator for the lighting current need not bear a constant relationship to the engine crankshaft, although the gear ratio between the two will be constant for any given installation. The difference is caused by control features which will be explained later. These permit the driving mechanism to revolve more rapidly than the driven. The gear ratio between the generator and the crankshaft varies between 1 to 1 and 4 to 1.

The cranking motor may be installed in any number of ways. It may rotate at crankshaft speed or at 100 times crankshaft speed, i. e., from no reduction to 100 to 1 reduction. When not needed for cranking the motor and when mounted as an independent unit, the cranking motor is at rest. A motor-generator may run at two speeds: first, when operating as a generator, and, second, when operating as a cranking motor; it must also have an automatic means for making the change. The devices used for this purpose are roller clutches, eccentric gears, epicyclic gears, etc. The object of these devices is simply to use the most advantageous speed for the motor when used as such and then to change to a speed which would be suitable for the generator.

To sum up the situation, it may be stated with the above gear ratios in mind that in the single-unit system the single instru-

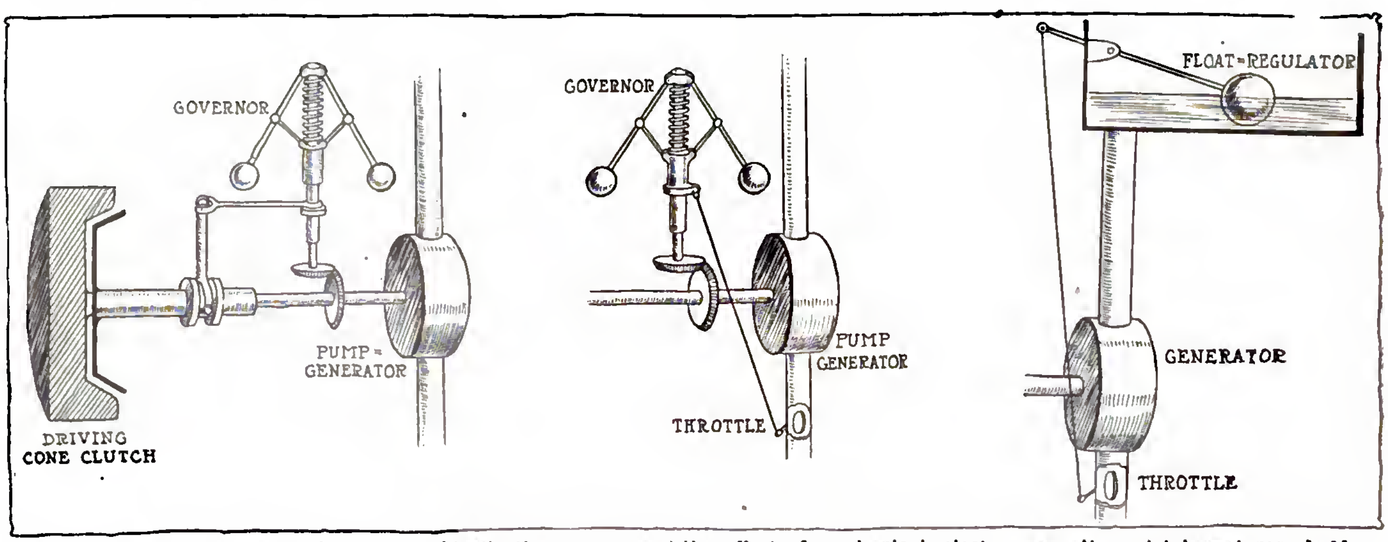


Fig. 5—Mechanical diagrams, showing graphically the purpose and the effect of mechanical, electro-magnetic and inherent regulation of generator output

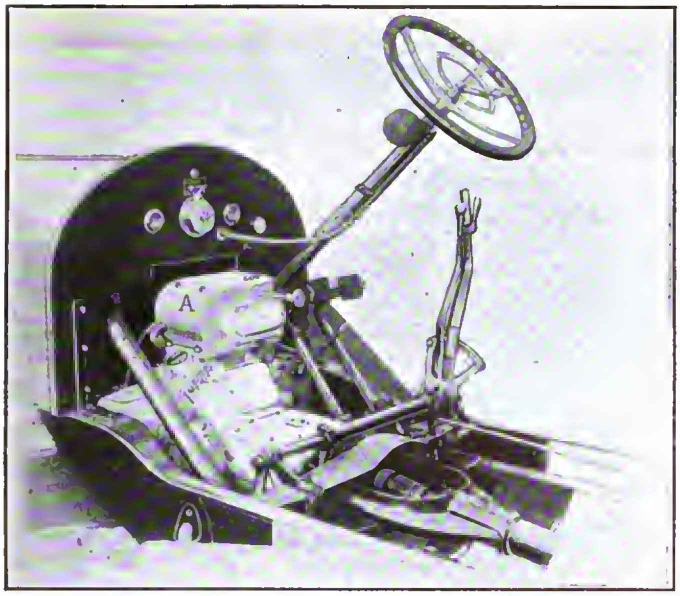


Fig. 6—Pathfinder installation with motor-generator, A, on flywheel

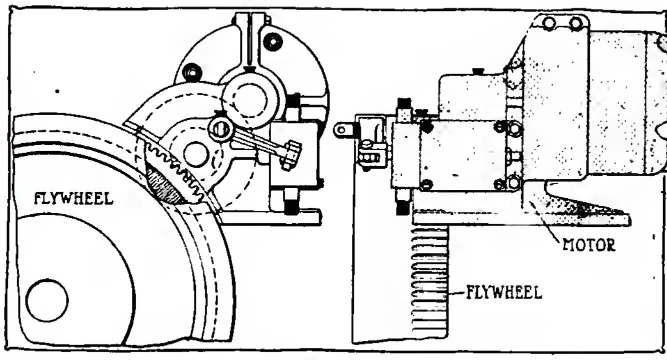


Fig. 7—Mounting of the Elyria-Dean cranking motor on flywheel of engine

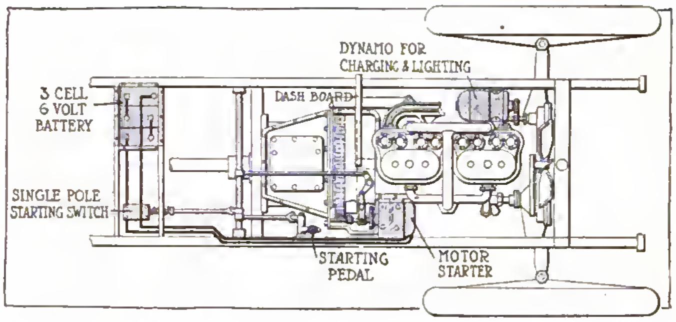


Fig. 8—Gray and Davis installation, showing wiring and location of parts

ment is in positive engagement with the engine and rotates whenever the latter is in motion.

In the motor-generator two-unit system the motor-generator is in positive engagement with the engine and rotates whenever the latter is in motion. The magneto does likewise. When the magneto is incorporated with the governor and the cranking motor is separate the generator rotates with the engine while the cranking motor is only in engagement with the engine when it is desired to start.

In the three-unit system the cranking motor is only in engagement with the engine when it is desired to start. The generator and the magneto both rotate with the engine.

In all three systems it may be noted in summing up the situation that, unless the cranking motor be incorporated with the generator into a single unit, the cranking motor will be in engagement with the motor only when cranking and when the engine is running under its own power the cranking motor will be at rest.

The methods of connecting the cranking motor to the engine are at the present moment a matter of concentrated study on the part of both the car manufacturer and the designer of the electric system. The life of the cranking system depends to such a degree on its installation that this matter is of supreme importance. The problem of motor-generator reduction gearing has been met by the following methods: planetary gearing, eccentric gearing, direct connection and silent chain. The first two allow of different speeds when used as a motor or generator. When the cranking motor is separate from the generator it may be direct connected, through spur gears, by worm gear, by slid-

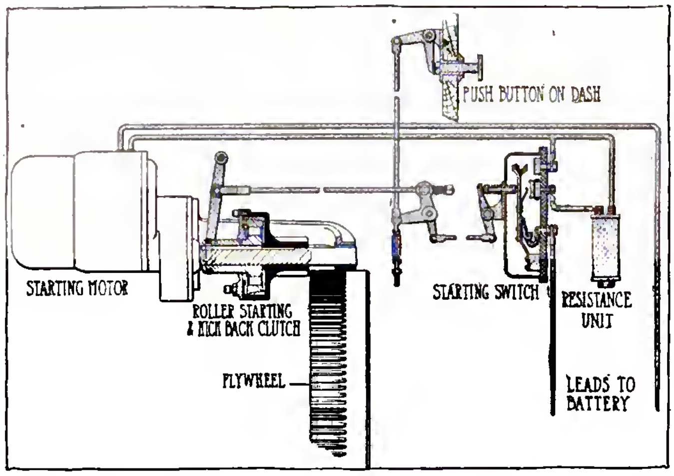


Fig. 9—Esterline control system governed from dash by push button. This button and a meter are the only fittings necessary on the dash

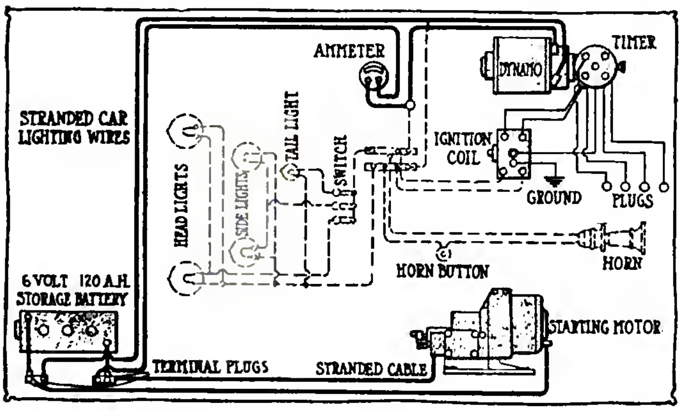


Fig. 10—Elyria-Dean wiring scheme, showing disposition

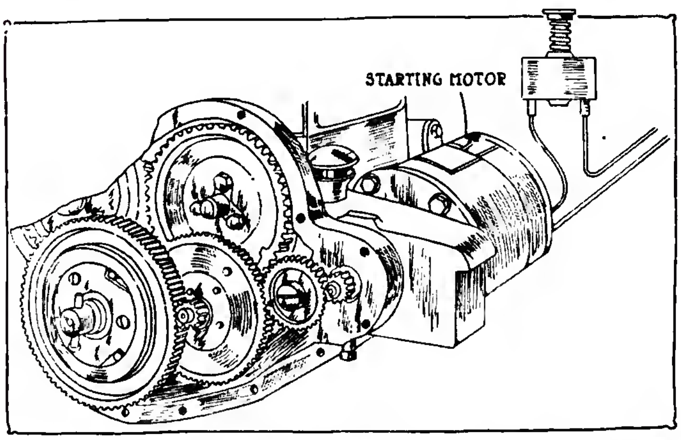
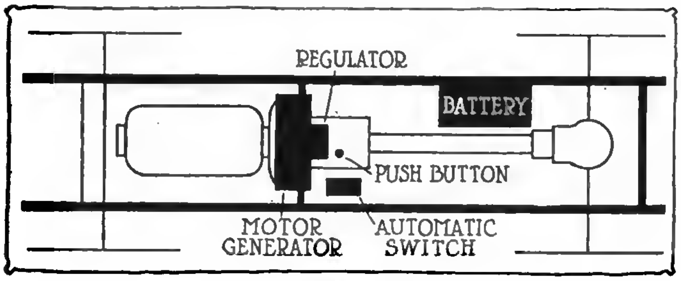
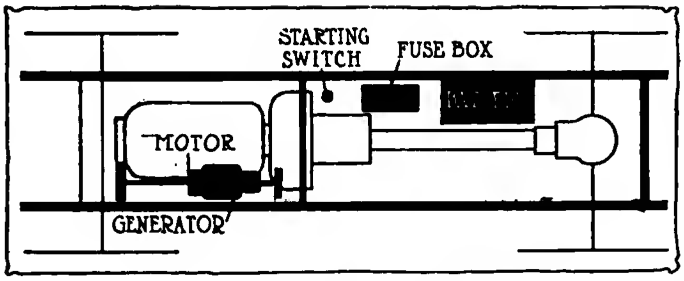


Fig. 11—The Abbott cranking installation is through spur gears



U. S. L.



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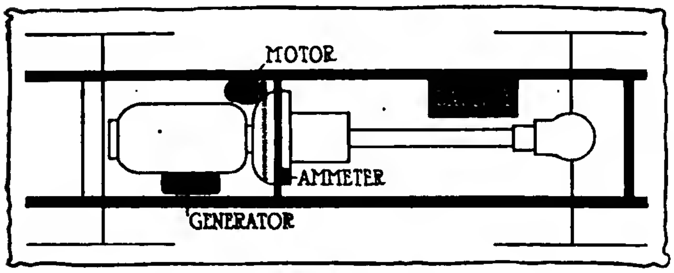

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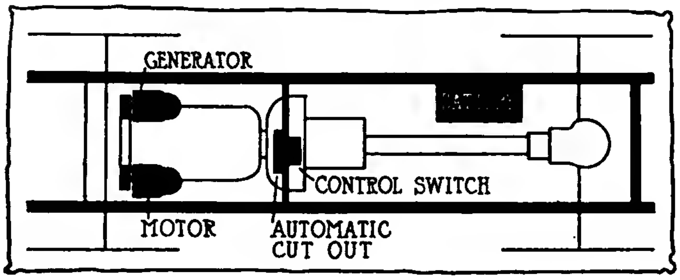

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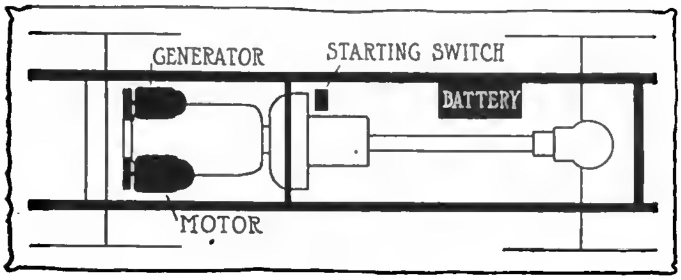

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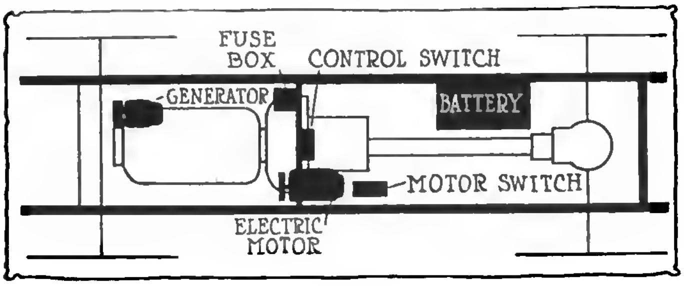
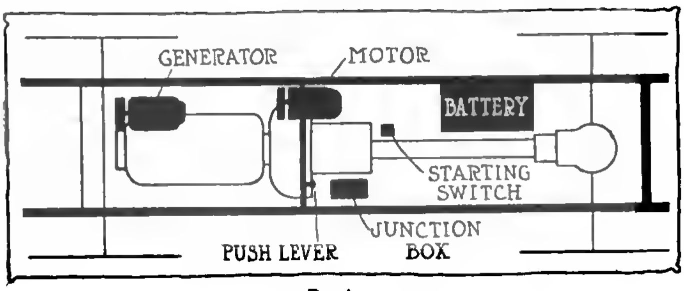


Electro



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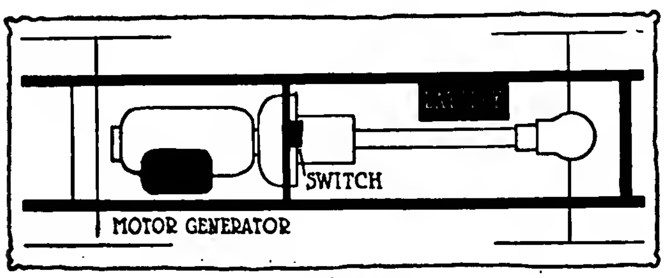


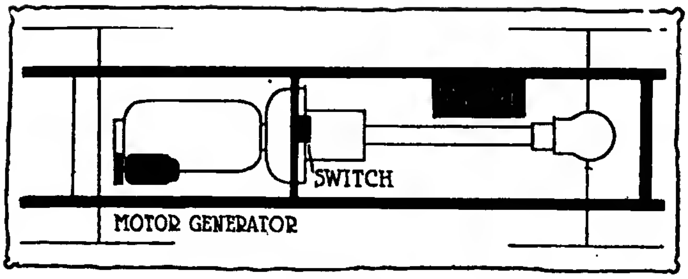
White

ing gear or by silent chain. Direct connected motor generators are commonly mounted in or replace the flywheel and perform its functions.

Since, when the cranking motor is separate from the generator, it is disengaged from the engine, the driving mechanism must be supplemented by some device which will disengage it. This is generally in the form of an overrunning clutch. Besides this it may also have a kickback release which is so designed that when a back kick occurs the cranking motor is automatically disengaged. Some type of anti-clashing device which prevents injury to the gears in engaging and releasing is also a part of the installation on some cars. In some instances the device which prevents the clashing of the gears is incorporated in the control mechanism.

After considering the connection of the cranking motor to the engine, the connection of the storage battery to the cranking motor should be considered. The connecting link between the battery and the cranking motor is the starting switch. These switches are of three types: the knife switch, the laminated switch or the two-point switch. The first two mentioned are common switch types and need no explanation, the two-point switch, however, should be explained. The first point in the switch and the second point are connected by a resistant material. When the switch is closed at the first point the complete circuit is closed, but the current must pass through the resistance between the first and second points. When the second point is closed the resistance no longer comes into play and the obstruction to the current is removed. The object of the two-point switch is to allow the cranking motor to revolve slowly at first in order to secure a perfect mesh of the gears without the clash which might occur were it attempted to mesh the gears when the cranking motor was revolving rapidly.

As far as the operator is concerned the devices which he must use to control the starter should be simple and also sightly. They must be simple in order that a driver who is not a mechanical genius may be able to operate the system without damaging it and they must be sightly because the mounting is generally in a conspicuous or at least exposed position. Two types of controller as usual, although there are several variations in isolated cases. The two usual types are the foot or hand push switch and the lever switch. The foot switch is placed on the floor of the car in such a position that it may be readily reached by the foot of the driver. On some cars it takes the place of the muffler cut-out. The lever switch is used very commonly with two-unit systems. The running position of the lever is generally down or in, and when in this position the motor-generator is in continuous operation. When the car is traveling less than a



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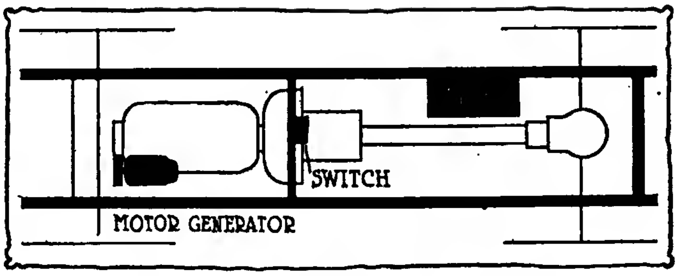
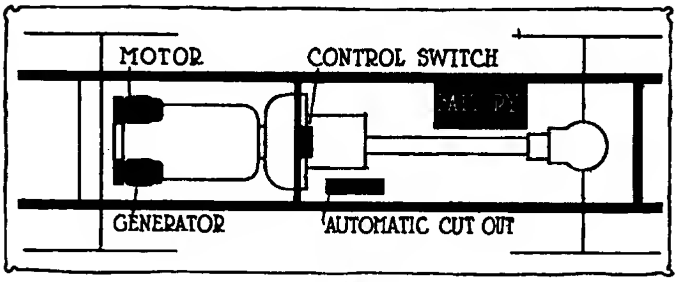


Northeast



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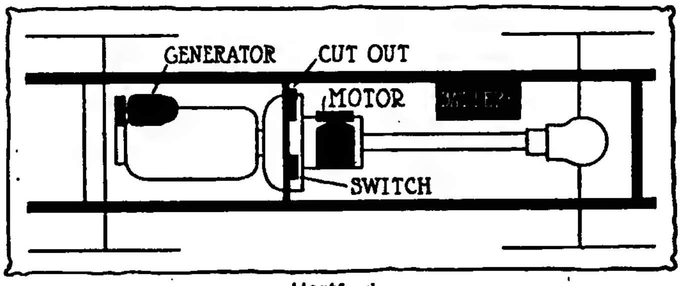
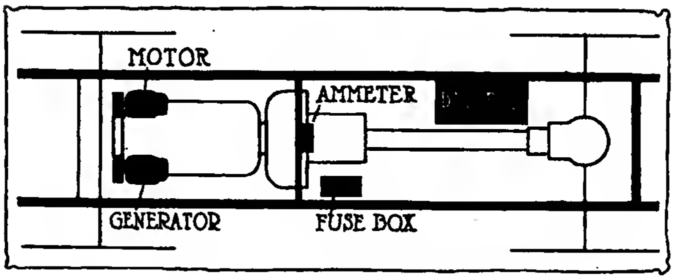


Hartford



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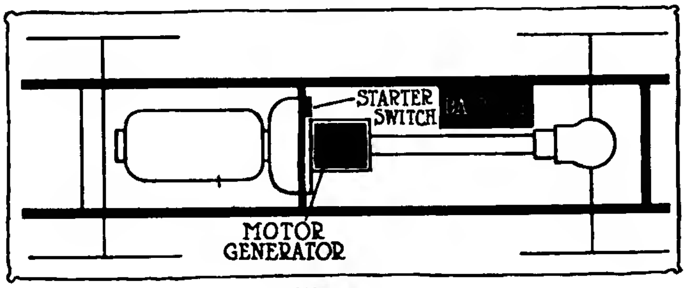


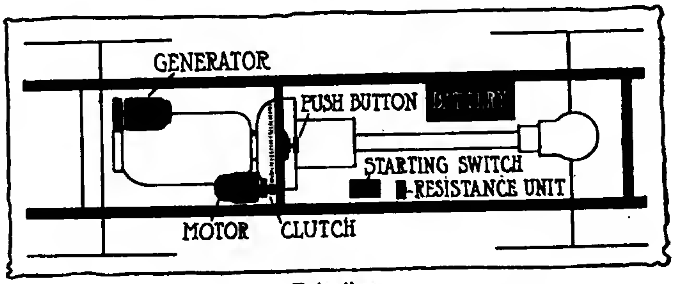
Warner

certain speed the motor-generator is acting as a motor and is aiding in the propulsion of the car. When the speed mounts above a certain point the motor-generator acts in the capacity of a generator and charges the storage battery. When the lever is up or out, electric connection between the battery and the generator is broken.

The question of wiring is an important one. Given a system which operates at 6 volts, the wiring should be of low enough resistance to deliver the 6 volts at the terminals. With a larger wire than necessary the resistance to the current is so great that in some cases it will render the system inoperative. The voltages used in electric cranking and lighting systems range between 6 and 24. Where the lighting voltage is different from the cranking voltage, different wire is often used for the two systems. The three-wire system is common with many of the lighting systems. Where a 24-volt battery is used and the lights are operated at 12 volts a wire is run from the center of the battery so that the difference in potential between the end wires and the center or neutral wire is 12 volts. The wires are then strung across between the end wires and the center wire.

—

Charging of batteries should be begun at the highest rate given in the instruction of the makers and should be continued at that rate until gassing sets in, when the rate of charging should be reduced to such a degree that the development of gas ceases and continued at that rate. When gassing begins again the rate must be reduced once more and then the battery is charged the full capacity, at the so-called finishing rate, which is also given in the instructions accompanying the battery when received from the manufacturer. Another important point is that the battery should not be left standing idle or rather in discharged state, as the formation of a lasting or at least stubborn deposit of lead sulphate is apt to be the result of such a treatment.



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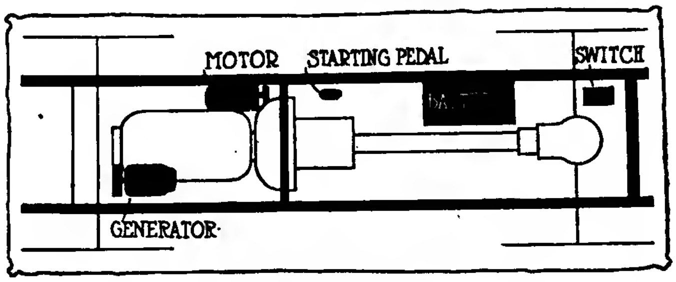
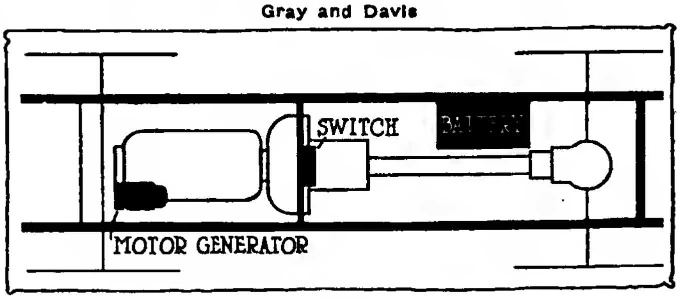


Gray and Davis



Entz

Late Developments in the Contest Field

Teddy Tetzlaff Disqualified as Racing Driver Till May 28
Chicago Club's Novel Reliability To Be Run June 25-28
Eighteen Racing Cars Entered in the French Grand Prix

AT a meeting of the Contest Board held at A. A. A. headquarters, Friday, Jan. 10, at which were present David Beecroft, P. D. Folwell, H. W. Knights, Frank G. Webb, Wm. Schimpf, chairman, the following action was taken:

The automatic disqualification of Teddy Tetzlaff, of Los Angeles, registered racing driver No. 166, for driving exhibitions at an unsanctioned race meeting held at San Fernando, California, on November 28, 1912, was definitely fixed to expire on May 28, 1913. E. E. Hewlett, of Los Angeles, manager of Tetzlaff and owner of the Fiat car driven by him at such unsanctioned meeting, was rendered ineligible for participation in any event sanctioned by the A. A. A. for a like period.

The application for reinstatement to good standing of the Staver Carriage Company, of Chicago, manufacturers of Staver-Chicago cars, who were on October 21, 1912, disqualified and suspended to June 1, 1913, for violation of rule 75 of the contest rules in advertising the performance of the Staver-Chicago cars which participated in the Around-Lake-Michigan tour conducted as a Grade III Non-Stock run, as being the performance of Stock Cars was considered and denied.

Frank C. Hamlin, of Los Angeles, entrant and driver of the Franklin car which won the 1912 Los Angeles-to-Phoenix desert road race, was disqualified and suspended until April 1, 1913, for violation of rule 75 in advertising and winning Franklin as a regular stock car, when the race in question was conducted as a non-stock, free-for-all event.

To Arrange Jacksonville-Atlanta Run

ATLANTA, GA., Jan. 10—The Atlanta Automobile and Accessory Association, at its meeting Thursday, appointed a committee to co-operate with a similar committee of the Jacksonville Automobile Club in promoting a run from Jacksonville to Atlanta in April. Some time during that month there will be a week of Metropolitan Grand Opera Company productions in the Gate City and the run will be held at a time when the tourists can attend these affairs.

Chicago Club Plans Novel Reliability

CHICAGO, ILL., Jan. 13—The Chicago Automobile Club, encouraged because of the success of the 1912 Elgin road races, which it promoted in conjunction with the Elgin Automobile Road Race Association, has determined to venture into the promotion of other motor contests. Announcement was made today that the C. A. C. would stage one of the most novel reliability runs ever attempted—a non-motor stop, night-and-day trip from Chicago to Boston by way of New York City. This will be run the last week in June and it is figured that the trip can be made in 3 1-2 days.

As roughly outlined now, it will be a non-stock event run under grade 3 of the A. A. A. rules, but maybe a stock car division will be added if enough entries are forthcoming. There will be a change of drivers and observers both morning and night, and it will be necessary to secure a special train to follow the tour to carry the relief crews and the officials. The rules will require that the motors be kept running continuously, even when taking on fuel and water, in order to escape penalization. It has been suggested that the entry fee be placed at $200, which would give the entrant the choice of starting one, two or three cars.

Co-operation with other clubs along the route will be sought. The Bay State Automobile Association already has proffered its services and it is thought Buffalo, Cleveland, New York and other big cities will do likewise.

CHICAGO, ILL., Jan. 13—*Special Telegram*—Dates selected for the reliability are June 25 to 28. The tentative schedule calls for controls at Toledo, Erie, Rochester, Albany, New York City and Boston. The distance is 1,276 miles and it is estimated that it will require 67,967 hours to make the journey.

Eighteen Cars Entered in Grand Prix

PARIS, Jan. 3—On the last day of the old year the entry list at ordinary fees closed for the French Grand Prix race to be run near Amiens early next July. The list contained eighteen cars, and unless manufacturers decide to pay double fees at the rate of $1,600 per car, this number of competitors will start in the classic. The low number comes as a surprise, but is due to the high entry fee charged, the ordinary rate of $800 per car having kept several out, and also to the peculiar difficulties of building cars to compete under limited fuel rules.

The entrants are, for France, three Peugeots, three Th. Schneiders and two DeLage; for England, four Sunbeams; for Germany, one Mathis and one Opel; for Italy, three rotary-valve Italas; for Belgium, one Excelsior.

A curious incident has arisen in connection with the Mercedes entry. Last September the Belgian agent for the Mercedes car sent a check to cover the entry of three cars. This was refused, for the rules state that all entries must be made by manufacturers. Just before the final closing a second check was sent by the Mercedes agent in Belgium, and also by the English agent, acting through the Royal Automobile Club. They were both refused, according to the rules, but it was believed that the agents would induce the factory to make the entry for them. This they have evidently been unable to do, for no direct entry has been sent. The Belgian agent has ordered a set of special cars from the Mercedes factory, but has evidently overlooked the fact that he would not be allowed to enter them himself.

Indiana Tour to Start July 1

INDIANAPOLIS, IND., Jan. 6—Eight o'clock on the evening of July 1 Indiana's great automobile tour to the Pacific Coast will leave this city. So definitely are the preparations being made that even the time of the departure can be announced.

At its recent meeting the Indiana Automobile Manufacturers' Association adopted the plans proposed for the big journey from the Hoosier capital to either San Francisco or Los Angeles. It will be a pathfinding expedition for the great rock road which some day will extend from the Atlantic to the Pacific Oceans, and for hundreds of tourists who yearly travel across the continent. Not only did they heartily approve of the general route and the details, but they also supported this by the definite promise of the entry of twenty-six cars.

Minor Shows Throughout the Country

All Milwaukee Dealers Join in Show for the First Time—Automobiles To Be Shown at Panama-Pacific Exposition Attendance at Montreal Over 35,000—Business $300,000

MILWAUKEE, WIS., Jan. 13—The striking feature of the fifth annual Milwaukee motor show, which opened in the Auditorium on Saturday evening, January 11, and closes Friday evening, January 17, is that for the first time since motor expositions were started in Milwaukee, every local dealer is represented by an exhibit.

Not being included in the national show circuit fostered by the manufacturers' organizations, Milwaukee was obliged to do a lot of tall hustling to make its show a success as compared with the expositions of nearby cities, notably Minneapolis, Kansas City, Denver, Indianapolis, Detroit and Cleveland, but it has done so.

There are represented in the show seventy-one distinct makes of pleasure cars, with an aggregate of 169 models on display; seven makes of electric cars, with twenty-three models on display; fourteen distinct makes of commercial vehicles, with forty-seven models on display, and twenty-seven distributors of supplies, accessories and parts, representing more than 500 factories.

From these figures it will be seen that Milwaukee could have done no better, and probably not as well, had it been included in the national show circuit.

Milwaukee dealers have fared well with their factories in being able to present cut-out chasses, polished chasses, and other novelties in stripped or finished cars which make a show more interesting than otherwise. In this connection it may be said that the cut-out chassis of the Hickman-Lauson-Diener Co., state agent for the Ford, is one of the most elaborate and instructive exhibits in the show.

It is also worthy of note that in addition to exhibits from every dealer in Milwaukee, outside factory representatives, factories or large distributors whose cars are not represented in Milwaukee by direct agents are showing products. Among these are the Peerless, Cole, Pathfinder and Enger. Cars which gained representation in Milwaukee since the last show in January, 1912, and now in the Milwaukee show for the first time include: Cartercar, Staver, Little, Chevrolet, Marathon, McFarlan 6, Stanley, Pullman, Nyberg, Davis Flyer, Metz, Premier, Stevens-Duryea and Velie.

There are meetings during the week of the Wisconsin Retail Automobile Dealers' Association, the Wisconsin Association of State Agents, the Wisconsin State Automobile Association, the organization of owners; the Wisconsin Commercial Car Association, the Wisconsin Accessories Association, and a half dozen lesser organizations which have to do with the sale and use of motor cars, parts, etc.

Automobiles for 1915 Panama Show

America may have in 1915 at the Panama-Pacific exposition to be held in San Francisco one of the greatest automobile exhibitions in its history. Negotiations are now under way looking to the erection of a separate building to house a motor exhibit to continue from the opening until the closing of the exposition. Capt. Baker of the exposition took up the matter of such a building with not a few of the automobile manufacturers nearly 1 year ago and since then the work of bringing the exposition authorities and the car makers together has continued.

Only this week the National Association of Automobile Manufacturers received word from San Francisco stating that the exposition company will erect a special building affording 210,000 square feet of exhibit space, and devoted exclusively to automobiles, motorcycles and accessories. The building will be a one-story structure 600 feet long and 350 feet wide.

So far the proposal has not been definitely accepted by the motorists, but it is being referred to the individual concerns and it is expected that no difficulties will be encountered. The discussed plan, in case of the acceptance of the proposal, is to handle the exhibit space similarly to the national shows. Foreign manufacturers will receive the same opportunities to exhibit as American builders.

The completion and occupancy of this automobile palace will mark the beginning of a new era so far as motor exhibits at great expositions are concerned, in that it will be the first time at which a separate building will be devoted to the automobile, the motorcycle and accessories.

Montreal Show a Great Success

MONTREAL, QUE., Jan. 11—With a wild tooting of horns and shrieks of sirens the seventh annual automobile show at the Drill Shed and Sixty-fifth Armory closed on Saturday night.

In point of the numbers of exhibits, the attendance and the business done, the show just closed showed a great advance on those of previous years. It is estimated that between 35,000 and 40,000 people attended the two shows, and the actual sales reported by dealers amount to $300,000. Not that these figures comprise all the sales made, for some of the firms approached reported that it was against their business policy to either report the sales made or label the cars sold. Privately they admitted that business and the prospects for the future could not have been better, and from $500,000 to $750,000 roughly estimates the business done. With the sales to dealers at outside points from samples shown in the show the estimate is over $1,000,000 mark.

Columbus Show Is Drawing Near

COLUMBUS, O., Jan. 11—The organization of the Columbus Auto Trades Association was completed recently when a constitution and by-laws were adopted. More than fifty dealers attended and much enthusiasm was shown in the affairs of the association. The constitution is modeled after those governing the chapters founded in many of the Eastern cities. Plans for the automobile show were discussed. The new association will co-operate with the automobile club in giving the show.

WASHINGTON, D. C., Jan. 11—A new motor organization, to be known as the Washington Motorists' Association, is being formed to take the place of the Automobile Club of Washington, which was disbanded several weeks ago. A committee from the old club, with W. C. Duvall as chairman, has drawn up a tentative constitution and by-laws.

The AUTOMOBILE

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Problems To Solve

THE progress of the first few days of the dual automobile show, running this week at Grand Central Palace and Madison Square Garden, one of the greatest in the history of the industry so far as numbers of exhibits is concerned, is marked by an undercurrent of unrest with a majority of the makers, due in not a few cases to the cranking motor avalanche, to the wire wheel wave and also to the electric lighting movement.

Of these three the motor starting movement, or, as it has been designated by many, the cranking motor movement, occupies premier place. The uncertainty connected with it is not in every case confined to the automobile maker but often to the maker of the cranking apparatus. This is but natural as the movement has precipitated itself with such hurricane speed that there are some makers of cranking motors who marketed a product and scarcely had it installed on test cars for more than a week when it was found inadequate and new designs were immediately pushed through. **There is scarcely a manufacturer of electric cranking motors who is not already busy on improvements.** In fact the automobile maker is demanding something definite for his 1914 models to which he is at present looking forward. The next 4 months will witness unparalleled activity in the cranking motor field. A few are now well settled on their types.

A visitor at the show can glean in a cursory round of the exhibit spaces the unpreparedness of many car makers for the electric cranking motor. The different apparatuses are installed wherever there was available space and not where they enter into the general layout of the car to the best advantage. **As a result some of the chassis are cluttered up worse than they have been since the days of the introduction of the magneto.** As it is with many today, the installment of the cranking motor began and ended in the assembly room, whereas it should begin in the pattern shop. There are a few makers who realized well in advance that they were going to fit a certain make of cranking motor and generator to furnish electric current for lighting and cranking, and they made provision in the crankcase for such parts, but their numbers are small when compared with those who solved the problem, if the word may be used, in the assembly department.

Before another year this will all be changed, and it is a realization of this that is spurring the car builder to push the makers of cranking motors to their utmost activity. There are some exhibitors who refused to list cranking motors as equipment before the opening of the shows and have since been forced by the pressure of agents to add them. This in itself shows the country-wide influence of the movement and the strength of it. **It would seem that the buying public is asking more about cranking motors than about merit in motor and chassis design, or materials used or workmanship bestowed on these materials.** It will be impossible for the makers of cranking motors to supply the demand of the next few months and an equally difficult task with many of them to get their 1914 types ready in time.

The wire wheel movement has taken hold in real earnest. This wheel is here to stay. Its advent is creating not a few far-reaching problems. Some want to continue with the demountable rim, but the advocates of the wire wheel argue that the use of the demountable rim will rob the wheel of one of its leading merits, namely, the light peripheral weight with the consequent increase of flexibility in the car. It is expected that the final solution of this problem will largely rest with the action of the Society of Automobile Engineers, which has recently created a new division of the standard committee to handle this subject. There are few, if any, exceptions taken to the wire wheel because of the difference in appearance, when compared with the wood type. The general publicity of the wire type has reached nearly every city in the country and has paved the way for a general acceptance of it when the time comes that supply will equal demand and prices will be finally adjusted. The merit of the wire wheel in conducting heat out of the tire, and so increasing its life, is commented upon very generally.

Electric lighting has made nearly a clean sweep of the field and today it is only a question of adaptation of the desired generator to the motor and installing the lamp equipment. In this respect there are a few novelties along the line of coupling the headlights and dashlights in one, and another innovation in using a single headlight and incorporating it in the radiator. Incorporating dashlights in the baseboard of the windshield is becoming more general, and it is in this respect that the superiority of the electric bulb as a lighting source appears to advantage, as the entire outfit can be nested in the thickness of a standard windshield baseboard. Makers of pressed metal bodies with the cowl dash are incorporating miniature hooded portions for the lights.

There has not been the anticipated progress in body lines, although in such matters as improved upholstery and a little added room there has been a very pronounced advance. With a great majority of the makers, the general lines of last year are continued. The blending of hood and body has not been carried to the anticipated extent, although many use cowled dashes, yet few of them have altered the hood lines or the body lines to conform with these.

On closed cars the pronounced downward curve of the roof over the driver's seat imparts an air of smartness that is generally commented upon, and another year will witness many modifications of it. A few makers are building limousine bodies lower than last year and some are so low that the passengers' hats will be endangered if rough roads are encountered. One or two makers are showing concealed door hinges and more are talking about fitting them for another year. The die-made sheet metal body is being used by not a few. It is a clean-cut job with the various stampings welded into one piece, not a seam showing. Such bodies are expensive except when made in large quantities as the necessary dies for a certain design will cost between $10,000 and $20,000. Many more of these bodies will be used this season and there are evidences of a general movement in favor of them.

Automobile Chamber of Commerce Formed

AT the annual meeting of the Automobile Board of Trade held January 14, the fifty-one members present unanimously voted in favor of amalgamation with the National Association of Automobile Manufacturers under the new name of the Automobile Chamber of Commerce. As the executive committee and a majority of the members of the N. A. A. M. have also voted favorably it is but a matter of form until the amalgamation takes place and the time-honored name, National Association of Automobile Manufacturers, becomes a matter of history, and with it will go the more recent organization, the Automobile Board of Trade, which came into being after the decision against the Selden patent 2 years ago, which brought about the end of the licensed association and out of which came the Automobile Board of Trade, as it is known to the industry at the present time.

The new Automobile Chamber of Commerce will be joyously hailed by all, as it means the end of the dual organizations which have been practically covering the same field. For example, the N. A. A. M. has at present 105 members and the Board of Trade has sixty-five, and of these sixty-five all excepting one are also members of the N. A. A. M. Amalgamating the two will mean the end of two separate committees on legislation, two separate committees on roads, etc., etc. Amalgamation means a 50 per cent. simplicity in the management of the industry.

There yet remains much to be done before the final act will be accomplished and the dissolution of the two present organizations accomplished. Each organization will get the unanimous approval of its entire membership roster. A charter will then be applied for the Automobile Chamber of Commerce and a general meeting of the membership of both organizations called, at which meeting the organization of the new body will take place. It is expected that the articles of incorporation will be practically identical with those of the present Board of Trade. When the Chamber of Commerce is formed all of the present membership of the two organizations will be permitted to join and the open-door policy will be extended to outside manufacturers.

The Automobile Chamber of Commerce will undoubtedly take over the present assets of both existing organizations and the work of them will be carried on under the new management. These will include shows, legal, patents, good roads work, statistical, etc.

At the meeting the Automobile Board of Trade reelected its officers of the past year, namely: Charles Clifton, president; C. C. Hanch, vicepresident; R. D. Chapin, secretary; George Pope, treasurer; H. A. Bonnell, general manager, and the following directors: Hugh Chalmes, John N. Willys, S. D. Waldon, W. C. Leland and S. T. Davis, Jr.

C. GORDON REEL, the New York State Superintendent of Highways, has submitted to the State Legislature the annual report on highway construction, maintenance and improvements, from which the following is an extract:

The status of highway improvement to date in the State of New York is as follows:

	Miles
State highways and county highways now improved	3,578
State highways and county highways now under contract	1,627
Expedited routes not contracted for but the construction of which was contemplated in the expediting bills of 1910-11	298
Remaining state highway and county highway to be improved	6,483
Total	11,986

Of the town highways to date there have been macadamized	3,514
Improved as gravel roads	8,500
Shaped, crowned and standardized as to width	50,000
Put in safe condition for travel	6,000
Total	68,014

Total mileage of public roads in the State of New York, 80,000 miles.

All of the original $50,000,000 bond issue has been appropriated and is accounted for as follows:

Original authorized bond issue highway improvement fund	$50,000,000.00
Expended appropriations to January 1, 1912	22,188,593.56
Balance unexpended January 1, 1912	$27,811,406.44
Expended for all purposes from highway improvement fund to December 1, 1912	8,073,157.58
Remaining from previous appropriations unexpended December 1, 1912	$19,738,248.86
Appropriation, chapter 247, Laws of 1912, available October 1, 1912	1,045,000.00
Balance unexpended, salary appropriations reverting to highway improvement fund October 1, 1912	27,372.24
Comptroller's balance, highway improvement fund, December 1, 1912	$20,810,621.10

Obligation

Balance due on contracts not expedited December 1, 1912	$8,455,810.58
Elimination of grade crossings ordered to date	199,733.49
Balance original bond issue not obligated December 1, 1912	284,518.03
Balance due on contracts for expedited routes December 1, 1912	9,447,546.91
Balance available for expedited routes not under contract December 1, 1912	2,422,972.09
	$20,810,621.10

During the calendar year there has been placed under contract 1,003 miles of State highway and 517 miles of county highway, and there has been completed a total of 662 miles.

Standards Committee of the S. A. E. Meets

Tentatively Adopts Report of the New Division on Motor Testing Which Presages Standardization of Methods for Testing Automobile Engines

THE Standards Committee of the Society of Automobile Engineers held a meeting at the headquarters of the Society, Wednesday, at which the various division reports were submitted to the committee as a whole and passed to the Society for consideration later in the week according to the program. Chairman Henry Souther called the meeting to order at 10.30 a. m.

The report of the Aluminum and Copper Alloys Division was the first to be read by the chairman, Wm. H. Barr, whose communication was short. Two alloys were recommended by the division for addition to the list already listed by the Society as standard. These are two bronzes, the first of which is intended for valves, light gears and the like. The composition follows:

Copper	87 to 89	per cent.
Tin	9.5 to 10.5	per cent.
Manganese	1.5 to 2.5	per cent.

The other alloy submitted by the Division was for a gear bronze, which is similar to the English gear bronze and it is recommended for its quiet running. Its composition is given:

Copper	88 to 89	per cent.
Tin	11 to 12	per cent.
Phosphorus	0.15 to 0.30	per cent.

Report of the Broaches Division

In speaking of the work of this division, Chairman Souther stated that its work is progressing just as it should. His only criticism of the report was as to the close limits set for the amount of copper in the gear bronze, namely the restricting of the limits between 88 and 89 per cent. He questioned the advisability of fixing such close limits if there were any possibility of such restriction affecting the manufacturing cost of the alloy. However, members of the division assured the chairman that such close limits of apportionment would not be very difficult of attainment and that they would not cause any rise in the commercial market price of the alloy. The report was then accepted and its submission to the Society directed.

Chairman C. W. Spicer, of the Broaches Division, submitted a short report of the work of his committee since the last session of the society. It is essentially a report of progress, he said and while the division has no new data to proposed at this meeting of the society, nevertheless there are a number of special considerations to be brought up. The hobbing of splined shafts was touched upon and the machining of these shafts in this way was characterized as a step forward in their manufacture.

There was no discussion of the Broaches Division report, Mr. Souther stating that the manufacture of broaches is still in the process of evolution and that any more definite report by the Broaches Division at this time would not be advisable on this account. It was, therefore, passed to the society as read.

A new division on Motor Testing was created at the last summer meeting of the society with J. O. Heinze as its chairman. While in operation only 3 months the activities of the division have been very marked and Mr. Heinze spoke very interestingly of what has been done. A number of diagrams were submitted showing installations of apparatus as used at the Northway plant in Detroit by Mr. Heinze for the determination of various data in connection with motors.

Although Mr. Heinze stated that the work of his committee has not progressed rapidly enough to make his report a basis for motor testing, a very clear and comprehensive foundation has been laid for a line of standardization of motor testing which will be of undoubted benefit to every member of the society interested in motor manufacture and testing. The division is endeavoring to fix upon and develop those tests which should prove of greatest practical value rather than striving for scientific accuracy. Several questions were submitted by Mr. Heinze in order to determine the policy of the division. Should the division specify just what procedure should be followed in making a test as to the arrangement of the apparatus and the sizes of the dynamometers and other instruments or should these points be left to the engineer making the tests? Should certain testing instruments be made standard by the division? Should the division fix upon what tests are important and direct their use? Should there be standard curve and data sheets printed by the society and distributed to members so that comparative results could be determined?

In fact Mr. Heinze stated that the whole matter is yet up for discussion and he solicited the fullest criticism and suggestion from the members as a whole. In order for the division to arrive at any conclusive and definite results for the approval of the society it must have more time for its work. Three months is a short period for any concrete ideas.

A sample curve and data sheet which was drawn up by Mr. Heinze was submitted. On this sheet it was proposed to include the specific gravity of the fuel, various necessary temperatures, barometric reading, the kind and size of motor under test, the type of dynamometer used, the carbureter and the magneto makes. Below spaces for this data the curves were drawn. In connection with the sample curves shown, it was brought out that it is a question as to what curves are of sufficient importance to be plotted. Should only the indicated horsepower curve be submitted or should curves of volumetric efficiency, air consumption of the motor with and without the carbureter, torque, gasoline consumption and the like be added. It is a question as to just what points would be of greatest assistance to the society at large.

The several charts showing suggested arrangements of apparatus were next touched upon by Mr. Heinze and while in each case the layout depicted only one arrangement for the determination of any one factor, there are of course a number of other arrangements which would probably work equally as well. Those shown in each case embodied the schemes employed at the Northway plant and are the ideas of Mr. Heinze. One cut showed the method of arriving at air and gasoline consumption; another for accurately fixing the timing. In his tests of this nature Mr. Heinze eliminates the primary timing and works upon the secondary spark in an effort to dispose of the errors of secondary spark ignition. It is advisable not only to determine the position of the secondary spark but also to arrive at the heat units of the spark and for that purpose another proposed method of determination was submitted. It is also necessary to measure the vibration of motors. All have a critical speed at which they have their greatest period of vibration and this should also be determined. An arrangement of apparatus by which the engine under test is mounted upon a set of springs and its vibration amplitude at various speeds determined was next shown. Another proposed test is in order to measure the acceleration of carbureters. Some instruments accelerate better and more steadily than others and it is important for the engineer to be able to determine that device best fitted to the engine which he manufactures. The proposed arrangement for such determination was pointed out to consist essentially of a drum rotated by a descending weight and so connected as to gradually open the carbureter throttle as the weight lowers. Cylinder compression should be measured also, and further, manograph curves should be obtained. As scheme of obtaining such curves was shown in which the standard reflecting type was somewhat modified so as to eliminate the objectionable feature, i.e., the long air pipe.

A scheme of test was also illustrated by means of which the radiator maker could design his product for certain size motors with acccuracy.

Sheet Metal Division's Work

T. V. Buckwalter, chairman of the Sheet Metals Division, next presented the report of his committee. The work divides itself into two heads, he said. The first of these comprises the submission of specifications for sheet metal materials while the second refers to the specifications for dimensions for these materials. He advocated the standardization of gauges. It is first necessary to know what sizes of sheets and rods are used by the manufacturers before it is possible to arrive at what standards to recommend. For this purpose sheets have been prepared by the division to be sent to the various members of the society on which they are requested to signify these sizes. It is hoped that the returns on this matter will be complete enough at the time of the summer meeting so that a concrete report may be submitted then. Specifications for manganese bronze were submitted by the division as follows:

Copper	56 to 60 per cent.
Tin	0.50 to 1.50 per cent.
Iron	0.50 to 1.50 per cent.
Manganese	0 to 0.75 per cent.
Lead impurities	Not to exceed 0.25 per cent.
Zinc	Remainder.

In thus submitting the formula for this metal, the committee has endeavored to tie the specifications down to chemical combinations rather than to chemical and physical combinations, according to Mr. Buckwalter.

There was some difference of opinion as to whether this specification belonged rightfully in the reports of the Sheet Metals Division or whether it should be included in the list of alloys standardized by the Alloys Division. Inasmuch as it is not intended to be a formula for cast bronze, W. R. Webster stated that it should stay where it was. The question was merely one of reference. The engineer would naturally look under alloys for this composition, Mr. Souther thought. He finally proposed that the specification be listed in both places, which cleared the discussion and allowed the report to be passed to the society.

The work of the Truck Standards Division since the last session was next gone over by its chairman, W. P. Kennedy. The report this time was not very extensive for the reason that returns from all the manufacturers on the questions asked have not been received, although the blanks sent out have been replied to by the majority of the large manufacturers. As was pointed out at last summer's meeting and again emphasized by Mr. Kennedy on Wednesday, the information requested of the truck makers is not for publication but is required for use in determining the standards. Although unprepared to present definite standards on any parts as yet, it is the sense of the committee that it should proceed slowly to fix a number of the more important points such as the size of motors in relation to load carrying capacities and the tire sizes for different loads and capacities. If five or six such main points are determined, the division will have gone as far as it can proceed as a first step. The report was referred to the society.

Mr. Kennedy is also chairman of the Wheel Dimensions and Fastenings for Tires Division, the report of which he next presented. This is the fourth report of this division, the work of which has been characterized as the masterpiece of the society. The report of this division follows:

S. A. E. Standard Motor Truck Wheel

Edges of Permanent Metal Felloe Band

"We recommend that the permanent metal felloe band be rounded on the two outside edges with the radius not to exceed 1-16 inch, and that one inside edge of the band have an angle of about 45 degrees, extending about 1-16 inch from the edge.

Tolerance in Width of Permanent Metal Felloe Band

"We further recommend that the previous recommendation as to tolerance in width of permanent metal felloe band be modified to read as follows:

	Plus	Minus
Tolerance in width	1-64 inch	1-64 inch

"And, in consequence of the last mentioned above recommendation, that the previous recommendation as to trueness of band when placed on surface plate be modified to read as follows:

Either side of the band when laid on a surface plate must not clear more than 1-64 inch at any point.

Tolerence in Circumference of Permanent Metal Felloe Band

In June, 1911, the Division voted that the tolerance in circumference should be:

	Plus	Minus
Before application to wheel	1-16"	0
After application to wheel	1-8"	0

In February, 1912, the Division, in view of the then more extensive manufacture of rigid-base tires, recommended that the circumferential tolerance should be:

	Plus	Minus
Before application to wheel	1-32"	1-32"
After application to wheel	1-16"	1-32"

Both of these recommendations were accepted by the Society, the latter, of course, superseding the former.

In this connection the point has been made by wheel manufacturers that if the 1-32" plus tolerance be taken up in the manufacture of the band, the wheel manufacturer has left to him only one-half or 1-32" of his 1-16" plus tolerance in the application of the band to the wheel.

The first view of the Committee at its meeting of November 13, 1912, was that no change in circumferential tolerance should be recommended until a greater demand for such change should be evident. After a long discussion, however, upon notice, duly seconded, it was

Voted that the last mentioned above tolerance in circumference of permanent metal felloe band should be modified to read:

	Plus	Minus
Before application to wheel	0	1-16"
After application to wheel	1-16"	1-32"

Measuring Circumference of Bands

In measuring circumference of the band, if there is no allowance on the tapeline itself, a correction amounting to three times the thickness of the tapeline should be made.

A rather prolonged discussion of this paper was held. Bert Morley, of Kelsey Wheel Company, stated that his concern has held close to the S. A. E. recommended limits since last fall. He brought up the advisability of machining bands of 6 inches or under and recommended that this not be done. F. H. Moyer, of the Firestone company, was particularly opposed to this machining although he stated that the Firestone company has had no trouble in adhering to the dimensions adopted as the result of the division's recommendations. While he stated that it is perfectly possible to machine the bands, it certainly adds to the cost of production and questioned if the increased cost is compatible with the benefits derived from the requirement. O. W. Mott, of the Jackson Rim Company, is also opposed to machining bands unless absolutely necessary, although he stated that it could be done, of course, at somewhat extra cost. Is such accuracy necessary and does it pay in the increased life of the tire, was asked. Mr. Kennedy stated that this requirement had been recommended only after urgent pressure had been brought to bear by the majority of the tire people. Although not unanimously in favor of it, he said that his committee had to be governed by the desires of the majority. Inasmuch as there was such a difference of opinion on this point he suggested that its adoption be suspended until the summer meeting.

Chairman Souther then took up the internal strife at present existing among the members of the United Rim Association and pointed out that this organization is soon to be disrupted with the result that the market will be flooded with many types of rims. There are at present about five types of quick detachables and as many demountables. With this situation in view it is now the psychological moment for the society to step in and standardize this product. Accordingly he proposed the formation of a committee to deal with the subject which would be so constituted as to be unbiased in its views. It was finally voted by the standards committee to recommend to the council the widening of the scope of the recently formed Wire Wheels Division so as to deal with the situation. It was suggested that the name of this division be changed from wire wheels to Pleasure Wheel Division.

Of particular interest at this time was the report of the Division on Lamp Standards by Chairman Palmer. The relative advantages of the grounded and ungrounded returns for lighting systems commanded attention on account of the rapid development in electric lighting recently. It was brought out that the grounded return provides bigger contact points and better insulation of the lamp receptacles. Further with grounded returns there are fewer connections at the switch; that an ordinary system involving head, side and tail lamps has eleven connections with the grounded as against fourteen with the ungrounded system.

As to the advantages of the ungrounded return they all hinge on the fact that accidental grounds on the battery side of a grounded return system short-circuits the current and damages the battery; whereas in the ungrounded return system it would be necessary to ground both sides of the circuit simultaneously. With grounded systems horns and other dash electric devices must be carefully insulated from the metal parts of the body. No definite recommendation was made on this point.

This report recommended that standard electric light bulbs be known as 7-volt bulbs and have an efficiency of 1.1 watts per candle at voltages between 6.5 and 7 volts. Standard electric headlights are to be 2 1-16 inches diameter size and capable of being focused in a reflector of 7-8 inches or greater focal length. An effort is being made to get data from battery makers from which to specify standard dimensions of batteries and plates, giving three standard plate sizes from which batteries of any capacity can be made by increasing the overall battery length.

Chairman Riker of the Miscellaneous Division mentioned work on method of designating gear ratios. His report dealt chiefly with yoke and rod end sections.

The use of low grade fuel for motor trucks was discussed by N. B. Polk, who considered different types of fuel such as kerosene, distillate and naphtha as substitutes for gasoline and suggested the requirements of carbureter for the purpose and also gave some hints on overcoming the difficulties of hard starting. Mr. Polk's paper precipitated a lively discussion on engine fuels and particularly the change in the grade of gasoline during the past few years. As an outcome it is probable that a committee will be appointed to seriously consider the gasoline problem and its effect on the industry as a whole.

Paper on Brakes Read at Indiana S. A. E.

INDIANAPOLIS, IND., Jan. 13—A paper on the subject of Brakes was read by Professor C. B. Veal, of Purdue University, Lafayette, at a meeting of the Indiana Section of the Society of Automobile Engineers, held at the Claypool Hotel in this city last Tuesday night.

Professor Veal is identified with the mechanical engineering department and testing department at the university and is recognized as one of the most able experts in engineering matters in the state. His views on the subject of brakes were therefore received with considerable interest. Professor Veal urged the necessity of applying the standard practice to brake construction and complimented Indiana manufacturers highly.

Packard Has Big Year

Gross Earnings for Current Year Were $3,412,862.05—Firm's Gross Sales Have Increased to $14,613,057.27

Capital Stock of Packard Company Is $10,000,000 which Is Equally Divided Between Common and Preferred

DETROIT, MICH.—In a report just issued by Henry B. Joy, president of the Packard Motor Car Company to the directors of the company for the fiscal year ending August 31, 1912, it is shown that the concern's gross sales including commercial vehicles have increased from $11,624,588.37 in the previous year to $14,613,057.27 in the year covered by the report. The gross earnings for the current year were $3,412,862.05. Deducting from this the depreciation of buildings, machinery, tools and development leaves net earnings for the year of $2,182,376.20. Subtracting the dividends upon the preferred stock, which amounted to $350,000, the net surplus for the current year is $1,832,376.20, which amount swells the total surplus (considering that which was on hand at the beginning of the fiscal year) to $4,816,398.01. From this total the Board of Directors has authorized deductions to reduce the amount at which "rights, privileges, franchises, etc.," be carried on the books from $3,274,958.89 to $1.00 and to adjust the books to the inventory taken December 31, 1911, by the charging off of $342,656.30, leaving a final net surplus on August 31 last of $1,198,783.82.

The capital stock of the Packard company is $10,000,000 which is equally divided between common and preferred. In the general balance sheet, the resources include real estate valued at cost at $285,312.49, buildings at $2,084,865.81, machinery at $1,145,381.22, and material stock, consisting of raw materials, that in process of construction and finished vehicles, of $5,351,217.23. In the above items depreciation has been deducted from buildings and machinery.

In submitting the report, Mr. Joy points out that wages have constantly increased during the year and that they are higher than ever before, they being higher in Detroit than in other cities investigated. The increased volume of Packard business is shown to be made possible by the new scheme of manufacture now in force. The former endeavor was to bring out of the engineering department two models of chassis of two sizes at the same time to be turned over to the manufacturing department simultaneously in order to have them ready for the market at the same time, both models thus going along together through the factory. This has proven impracticable for many reasons, and causes delayed deliveries and restricted output. Under the present scheme, one model of chassis is developed and manufacturd at a time and offered to the market when ready. Thus the Packard "38" came on the market this fall and winter, and the "48" will be submitted to the trade next spring and summer.

No dividends on the Packard common stock have been paid for the last 3 years, all earnings in excess of the preferred stock dividends going into the capital account. Mr. Joy states that he feels confident the current year will see a resumption of payments of a small dividend rate on the common stock, although the largest share of the earnings must, however, be added to the working capital to meet added requirements of increased volume of business.

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The Indiana Automobile Manufacturers' Association, which journeyed from the Hoosier capital eighty-five strong in a special train to the shows, held a shore dinner Sunday afternoon at Coney Island which over 100 attended. The occasion was exceedingly enjoyable, according to the diners.

Automobile Securities Quotations

Tendencies in the automobile stock market were slightly upward this week, with few exceptions. Consolidated common was a feature, scoring a ten-point advance over last week; Peerless and Swinehart advanced likewise, and the same holds good of International Motor common and Chalmers. Alco common and Goodrich common fell off slightly. Generally speaking, the tone of trading was firm and the volume of transactions fair. Willys-Overland stock was strong and advanced slightly during the week. The table follows:

	1911		1912	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	180	200
Ajax-Grieb Rubber Co., pfd	..	..	95	101
Aluminum Castings Co., pfd	..	..	98	101
American Locomotive, com	34	35	40	41
American Locomotive, pfd	103	103½	104	106
Chalmers Motor Company	..	..	130	145
Consolidated Rubber Tire Co., com	5	12	14	16
Consolidated Rubber Tire Co., pfd	10	25	60	70
Firestone Tire & Rubber Co., com	178	185	328	332
Firestone Tire & Rubber Co., pfd	108	110	105½	107
Garford Company, preferred	..	..	100	102
General Motors Company, com	35	36	33½	34½
General Motors Company, pfd	77	78	76	78
B. F. Goodrich Company, com	..	..	62½	63
B. F. Goodrich Company, pfd	..	..	105	105½
Goodyear Tire & Rubber Co., com	252	258	440	450
Goodyear Tire & Rubber Co., pfd	104	106½	104½	106
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	5	15
International Motor Co., pfd	..	..	40	60
Lozier Motor Company	..	..	25	35
Miller Rubber Company	..	..	165	170
Packard Motor Company, pfd	..	..	103	105
Peerless Motor Company	..	..	120	125
Pope Manufacturing Co., com	40	44	34	35
Pope Manufacturing Co., pfd	67	70	79	80
Reo Motor Truck Company	8	10	10	10½
Reo Motor Car Company	23	25	20¼	20¾
Studebaker Company, common	..	..	32	35
Studebaker Company, preferred	..	..	92	94½
Swinehart Tire Company	..	..	110	112
Rubber Goods Mfg. Co., pfd	100	105	105	107
U. S. Motor Company, com	..	..	..	..
U. S. Motor Company, pfd	..	..	..	..
White Company, preferred	..	..	105½	107
Willys-Overland Co., com	..	..	73	74½
Willys-Overland Co., pfd	..	..	99	109

Weed Patents Again Upheld

Preliminary Injunction Granted

CHICAGO, ILL., Jan. 11—Again affirming the validity of the Parsons chain-grip patents, under which the Weed Chain Tire Grip Company is the sole licensee, the United States Circuit Court last Tuesday upheld the claims of the Weed interests in the appeal by the H. Channon Company from the District Court. A preliminary injunction was granted as a result of the original hearing before Judge A. L. Sanborn on April 25. The appeal hearing was granted for the October session of the October term of the United States Circuit Court of Appeals, Judges Baker, Seaman and Kohlsaat sitting. In the decision handed down by Judge Baker the following evidence was considered: That the Parsons patent, No. 723,299, relates to an anti-skidding means held across the tire by two rings, of smaller diameter than the tire, but held so loosely that the anti-skidding means may travel circumferentially around the tire, and thus not injure the tire, as would anti-skidding means held rigidly on the tire. The appellants held that, whereas the Channon device employed a means of attaching the side-rings securely to the tire, so that the anti-skidding means would not creep on the tire, and it was sold with instructions that it be so used, it was not an infringement on the Weed device.

The court ruled, however, that, whereas the device manufactured by the Channon company was identical with the Weed device, except in this particular, the securing means was a cover and a sham, and that as the creeping ability of the original device was desirable, the user could innocently remove the securing means to protect the tire; and that, therefore, the Channon device was an infringement.

Market Changes for the Week

The feature of interest in tin in the domestic market yesterday was the advance of $.25 per hundred pounds, the holders of supplies taking advantage of light stocks and the consumers' needs to force the rise. Bessemer steel and open-hearth steel each experienced a rise of $1.00 on Thursday, due to good trading conditions. The copper market was demoralized yesterday with speculators operating feverishly in standard warrants and both domestic and foreign consumers remaining out of the market temporarily. Copper electric suffered a loss of $.00 7-8 per pound and copper Lake $.00 3-4. Lead was dull but steady, remaining at $4.30 per hundred pounds throughout the week. Linseed oil and cottonseed oil experienced change in prices, linseed oil a gain of $.01 and cottonseed oil a loss of $.10.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, per lb..	.08¾	.08¾	.08¾	.08¾	.08¾	.08¾	....
Beams & Channels, per 100 lbs.....	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, Pittsburgh, ton..	27.50	28.50	28.50	28.50	28.50	28.50	+1.00
Copper Elec., lb..	.17½	.17¼	.17¼	.17⅛	.16⅞	.16⅝	— .00⅞
Copper, Lake, lb.	.17¾	.17½	.17⅜	.17⅜	.17¼	.17	— .00¾
Cottonseed Oil, Jan., per bbl...	6.18	6.16	6.12	6.05	6.07	6.08	— .10
Cyanide Potash, lb	.19	.19	.19	.19	.19	.19	....
Fish Oil (Menbaden), Brown....	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 lbs. @.....	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime...	.90	.90	.90	.90	.90	.90	....
Lead, 100 lbs.....	4.30	4.30	4.30	4.30	4.30	4.30	....
Linseed Oil, prime	.46	.46	.46	.46	.46	.47	+ .01
Open-Hearth Steel, per ton........	28.00	29.00	29.00	29.00	29.00	29.00	+1.00
Petroleum, bbl., Kansas crude...	.83	.83	.83	.83	.83	.83	....
Petroleum, bbl., Pa. crude......	2.05	2.05	2.05	2.05	2.05	2.05	....
Rapeseed Oil, refined....	.69	.69	.69	.69	.69	.69	....
Silk, raw Italy....	....	4.35	....	....	4.35	4.35	....
Silk, raw Japan...	....	3.67½	....	....	3.72½	3.77½	+ .10
Sulphuric Acid, 60 Beaumé.....	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb.......	50.50	50.35	50.25	50.20	50.15	50.75	+ .25
Tire Scrap.......	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	....

Now Maxwell Motor Co., Inc.

New Company Takes Over U. S. M.

On Thursday, January 9, Judge Hough, of the United States District Court for the Southern District of the State of New York, ordered the sale of the assets and good will of the United States Motor Company and its subsidiaries to the reorganization committee under condition that the committee agree to pay all unpaid expenses and obligations incurred by the receivers in the administration of the properties, all compensation to receivers and ancillary receivers and their attorneys, and the following percentages on all claims as finally adjudged against the following companies: United States Motor Company, 32.5 per cent.; Alden-Sampson Company, 24 per cent.; Brush Runabout Company, 33 per cent.; Columbia Company, 91 per cent.; Dayton Company, 39 per cent.; Maxwell-Briscoe Company, 60 per cent.

The Standard Motor Company was incorporated January 11 under the laws of Delaware, with a capital of $31,000,000 to take over the property and business of the United States Motor Company. As the name of this organization was found to conflict with the names of other companies, the name was changed on Monday, January 13, to the Maxwell Motor Company, Inc. The Delaware incorporation stands.

Judge Hough signed the order transferring the property of the United States Motor Company to the new company on Saturday. The transfer of the property was effected on Monday. The legal representatives of the new organization state that at the present time 98 per cent. of the company's indebtedness is paid up. They predict that the company's affairs will probably be in a more or less settled condition by February 15.

Empire Tire Busy Again

On January 2, $1.000,000 Worth of Stock Issued and Sold to Creditors —No Settlement of Liabilities

Turns Out 2400 Inner Tubes and 700 Casings a Day—Export Trade Amounts to 365,000 Tubes a Year

After it had been announced some time ago that the Empire Tire Company, Trenton, N. J., had been dissolved, it is now becoming known that this was not so. The company which, like the Empire Rubber Manufacturing Company of the same city, is practically controlled by General Edward Murray, was consolidated with the latter concern about December 1. At that time, the liabilities of the Empire Tire Company were $300,000 and the quick available assets $1,200,000, but the company suffered from a shortage of cash with which to carry on its business. It was on this account that on January 2 $1,000,000 worth of stock, half common and half preferred, was issued and sold, partly to the creditors, but was not offered to them as a settlement of the company's liabilities. These creditors, who were largely firms supplying the Empire Tire Company with raw materials, were invited to subscribe to 90 per cent. of the stock issue and the stock was sold at a little below par value.

With the ample capital now on hand, the Empire plant turns out 2400 inner tubes and 700 casings a day, according to the New York sales manager of the company. An increasing percentage of this output consists in red rubber tubes and casings. The export trade of the firm, which is given considerable attention, amounts to a very high portion of its total business, there being a total export of 365,000 tubes a year. In addition to continuing its former line of products the Empire company has begun to manufacture a non-skid tread casing, the projections of which are oblong and 3 inches in length, arranged longitudinally on the casing surface proper.

Keeton Company Buys Oliver Plant

Detroit, Mich., Jan. 14—The property at Breckenridge street, Lawton avenue and the Michigan Central tracks, formerly occupied by the Oliver Motor Truck Company, has been purchased by the Keeton Motor Car Company at a purchase price of $50,000. In the group of buildings are three of modern factory construction, 220 by 80 feet each, and one building 140 by 80 feet. A fifth building 110 by 80 feet will be added at once.

Streator's Personal Property Sold

Chicago, Ill., Jan. 15—*Special Telegram*—All the personal property of the Streator Motor Car Company, Streator, Ill., manufacturer of Halladay cars was sold yesterday at auction to the Merchants' Realization Company, of Chicago. The price paid was $56,000 which included all cars and those in the course of construction, together with the machinery contained in the plant. The sale is to be confirmed by the court sometime during the week of January 20 and in the event that the court should call the sale void the property will be reauctioned immediately. Also it is expected that the entire plant will be sold, including personal and real property. As yet no bids have been received for the latter but disposition will probably be made of it soon.

Swinehart Resigns—C. A. Swinehart has announced his resignation as sales manager of the Swinehart Tire & Rubber Company, to take effect February 1. Although his plans for the future have not been definitely decided upon, he will continue in the tire business.

Hartz Succeeds Hupp As R. C. H. President

Vice-Presidency Taken by Former President—Seider, Secretary—Board of Directors Elected

Dealers in Forty-Two Foreign Countries Ordered 1,200 Cars—Last Year Over 7,000 Cars Were Sold

DETROIT, MICH., Jan. 13—At the meeting of the R. C. H. Corporation, J. F. Hartz, of Detroit, became president and treasurer of the concern, succeeding R. C. Hupp, who was elected vice-president. C. P. Seider, formerly vice-president, is now secretary. The company at present has on its books orders from American dealers for 15,000 cars. Dealers in forty-two foreign countries have ordered 1,200 cars. Last year more than 7,000 R. C. H. cars were sold.

Mr. Hartz, the new president and treasurer, is very well known to the business interests of Detroit, being president of the J. P. Hartz Company, president of the C. M. Hall Lamp Company and vice-president of the Williams Brothers' Company.

Besides the officers the new board of directors of the R. C. H. Corporation comprises G. W. Rogers and J. G. Robertson, of Akron, O.; John Kelsey and Joseph H. Clark, of Detroit; G. Jahn, of New York, and C. C. McCutcheon, of Jackson, Mich. January 1 Peyton R. Janney, formerly of the General Motors staff, became general manager, retaining Fred R. Bump as assistant general manager.

Automobile Insurance Takes New Form

The Maryland Motor Car Insurance Company, Baltimore, Md., and New York City, which for some time has issued separate policies for liability, car loss, accidents and fire, has combined with the United States Fidelity & Guaranty Company, New York City, for the issue of a combination policy covering all these possibilities. While the rates are not influenced by this arrangement, it serves to simplify the handling of insurance for the broker as well as for the holder of a policy. Under the arrangement, the user of a policy has the option of separate insurance for any of the above subjects or of a joint policy. The separate insurance business is so being shared between the Maryland and the U. S. Fidelity company that the former specializes on fire insurance and the latter of liability.

Texas Increases Freight Charges

AUSTIN, TEX., Jan. 13—The State Railroad Commission has issued an order amending its circular relating to the transportation of baggage from passenger trains in this state, so as to provide that automobiles shall not be accepted as baggage in regular baggage cars, but they may be transported in extra baggage cars at additional compensation. A charge of 10 cents per mile for automobiles or other motor vehicles, with a minimum of $5 for each automobile, in addition to the regular charges for extra cars, is provided. The order will become effective January 20.

Aluminum Companies in Combine

WASHINGTON, D. C., Jan. 15—At a session of the House Committee on Ways and Means on January 14, President Arthur V. Davis, president of the Aluminum Company of America, admitted that his company, the only aluminum factory in the United States, owns the Canadian Aluminum Company, which in turn had agreements with each of the seven foreign aluminum companies. This agreement embraces the aluminum industry of the world, with the exception of the United States. This country is excepted, according to Mr. Davis, due to the Sherman anti-trust law.

President Davis testified that the total surplus of the company is $12,000,000 and that the company is capitalized at $30,000,000 on which dividends are being issued at 4 per cent. on the capital stock. During the past three years the concern has been earning annually from 15 to 17 per cent. It was brought out that of the $30,000,000 of capital, only $1,860,000 was actually paid in, the remainder representing earned profits. Davis protested against any reduction of the tariff on aluminum and denied that his company exported any of the metal.

$100,000 for Cheap Fuel

PARIS, Dec. 24—Seriously alarmed at the increasing cost of gasoline, the International Association of Recognized Automobile Clubs, at its meeting here, decided, on the proposal of René de Knyff, to offer a prize of $100,000 for the best alternative fuel for use in existing internal-combustion motors. The regulations of the competition have yet to be drawn up and will not be made public until a promise has been obtained from the governments of the interested countries that the new fuel will be either free from taxation or admitted at a very low fixed tax. The fuel must be available in big quantities, and must be of such a nature that it cannot be monopolized by trusts.

The countries represented at the conference were France, Great Britain, Germany, Austria, Belgium, Denmark, Holland, Hungary, Italy, Russia, Switzerland, Sweden, Egypt, Roumania and America. The American delegates were George Heath and William S. Hogan. The national clubs of these nations have agreed to raise the sum of $100,000 for the fuel prize.

Tone Corporation Seeking Factory

INDIANAPOLIS, IND., Jan. 13—The Tone Car Corporation, organized in Indianapolis some time ago to manufacture a line of motor cars, has submitted a bid of $100,100 for the plant of the T. B. Laycock Manufacturing Company, which is in the hands of a receiver. It is understood, however, that the court will order the receiver to reject the bid, on the ground that it is too low. Fred I. Tone is president of the Tone company, which hopes to find a location soon so that active operations may be started.

Toner Leaves Flanders Company

DETROIT, MICH., Jan. 13—Thomas Toner, assistant sales director of the Flanders Motor Company, has resigned. His successor has not been chosen as yet. Mr. Toner says he has several offers under consideration, but has not decided anything definitely except that he will stick to the automobile business. He declares he has not had a vacation in 7 years and that he will take a good rest before going to work again.

The Drouet-Page Company has been formed to handle the Palmer-Singer cars in New York, Brooklyn and Westchester. Henry Drouet is president and Fred H. Page, sec-treas.

The New York bankers are selling at 100 and accrued dividends $1,000,000 worth of the 7 per cent. cumulative preferred stock of the recently formed Stewart-Warner Speedometer Corporation. Financial statements place the combined net earnings for last year of the Stewart and Warner companies in excess of $925,000.

London Rubber Sale Opened

The leading event in the crude rubber trade during the last week was the opening of the fortnightly sale of plantation grades in London. There was a good demand and the sale started at firm prices, but later on an easier tone developed.

127,287 Automobiles Manufactured in 1909

Government Census Report Shows Production for That Year To Be Thirty Times That of 1899

U. S. Post Office Department To Take Bids for 100 Additional Motor Vehicles For Parcels Post Service

WASHINGTON, D. C., Jan. 11—An abstract of the full census report has just been issued by Director Durand, in which he makes the following report relative to autcbiles:

"The growth of the automobile industry has been phenomenal. In 1899 the general statistics for the industry were included with those for carriages and wagon manufacture, and only 3,897 automobiles were reported. In 1904, the total number, including automobiles made by the concerns classified under other industries, was 22,830, while in 1909 the number was 127,287, or nearly thirty times the number reported in 1899. The value of all products of the industry proper was $249,202,075 in 1909 and $30,033,536 in 1904. Gasoline machines formed 95.1 per cent. of the total number made in 1909 and 86.2 per cent. in 1904. Of the total manufactured in 1909, 3,226, or 2.5 per cent., were rated at 50 horsepower or more; 51,218, or 40.5 per cent., at from 30 to 49 horsepower; 35,257, or 27.8 per cent., at from 20 to 39 horsepower; 29,353, or 23.2 per cent., at from 10 to 19 horsepower, and 7,539, or 6 per cent., at less than 10 horsepower. Passenger vehicles constituted 97.4 per cent. of the total number and business vehicles 2.6 per cent.

In addition 694 automobiles, valued at $830,080, and bodies and parts, valued at $4,415,266, were made by establishments engaged primarily in the manufacture of products other than those covered by the industry designated.

U. S. to Buy 100 More Trucks for P. P.

WASHINGUTON, D. C., Jan. 15—Postmaster General Hitchcock decided today to take in bids for the U. S. Mail department, on 100 trucks suitable to take care of the rapidly increasing parcels post work in cities. All these trucks will be painted red, which color is to be adopted as standard for postal vehicles.

Reports from forty-eight representative post offices show that for the first week of the parcels post system, from January 1 to 7, a total of 1,989,687 pieces of matter were handled by these offices. No estimate of the receipts in money have yet been made, but officials at Washington state that the new system has already exceeded all expectations. During the first week 76,500 incoming packages were received at the New York office, while 371,800 outgoing parcels were handled, bringing the total to 448,300. Naturally, this was the greatest amount of business done by any city. Chicago comes next with 438,000 pieces handled; Philadelphia reports 146,595, while Jersey City totaled 60,000.

With such a large amount of business when the system is yet in its infancy, there can be no doubt of the benefit which makers of light and medium commercial vehicles will derive from the project when it actually gets under way.

Court Holds Prest-O-Lite Patents Dead

CHICAGO, ILL., Jan. 8—Decision was rendered yesterday in the United States Circuit Court of Appeals, Seventh Circuit, against the Presto-O-Lite Company, of Indianapolis, in the appeal of the patent infringement suit filed by them last spring in the Circuit Court, as it was defeated last June. The original suit was denied in the United States Circuit Court by Judge Kohlsaat and the present suit is an appeal to the Circuit Court of Appeals by the Indianapolis interests. The case was heard by Judges Baker, Seaman and Humphrey and the former decision was affirmed in the decree handed down yesterday by Judge Humphrey. Attorneys Weinter, Bartlett and Hamill represented the Prest-O-Lite company and Parkons and Lane defended the Searchlight company. The suit was brought by the Commercial Acetylene Company, holder of the Claude and Hess letters patent No. 664,383 and the Prest-O-Lite Company, sole holders of license from the Commercial Acetylene Company to manufacture under the Claude and Hess patents. These patents refer to a closed vessel, containing a supersaturated solution of acetylene gas supplied with a reducing valve for the release of the gas at substantially uniform pressure, and expire on their face December 5, 1917, after considerable favorable litigation, starting February, 1909, in which the Avery Portable Light Company, of Milwaukee, was restrained from further manufacture and sale of its product, followed by similar action against the Auto Tank Manufacturing Company, the Acme Acetylene Appliance Company and the Des Moines Auto Gas Company. Judge Kohlsaat rendered the first decision against the Prest-O-Lite interests in refusing to grant a motion for a preliminary injunction against the Searchlight Gas Company on April 26, 1912. He ruled that the American patents had expired by reason of the expiration of the British patents held identical with the Claude and Hess patents. The Prest-O-Lite company then brought suit in the Circuit Court, charging infringement, and was defeated again. In the appeal just decided the defendant claims non-infringement on the grounds of the expiration of the British patents.

Michigan Wants Better Gasoline

DETROIT, MICH., Jan. 12—Every Michigan automobile owner is interested in a bill prepared for the Legislature by Representative L. J. Wolcott, of Albion. The bill is aimed to regulate the sale and quality of gasoline in Michigan. It provides for a specific gravity of at least 60 degrees Beaumé for all gasoline and the labeling of all containers with the specific gravity of the gasoline they hold. All below 60 degrees must be labelled "naphtha." The bill also provides for state inspection of all gasoline, the law on the statute books at present providing only for the inspection of kerosene. The fact that the price of gasoline in Michigan has been increased from 10 cents per gallon to 15 1-2 cents per gallon in the last year without any increase in the quality is given by Representative Wolcott as his reason for the bill. He declares at the present time much of the gasoline being sold in the state is no better than naphtha.

Government Truck Contracts Awarded

WASHINGTON, D. C., Jan. 11—After having the bids under consideration for nearly 2 months the general supply committee has awarded the following contracts for furnishing motor trucks to the government during the balance of the fiscal year: The White Company, Cleveland, O., 1,500-pound and 2,000-pound trucks, $1,950; 3,000-pound trucks, $2,750. The Hupp Motor Car Company, Detroit, 1,000-pound trucks, $950. It is expected nearly a dozen trucks will be purchased under this contract, and at its expiration it is likely new bids will be invited. The trucks will be used in Washington.

Franklin Capital Jumps to $1,500,000

SYRACUSE, N. Y., Jan. 13—The capital of the H. H. Franklin Manufacturing Company has been increased from $300,000 to $1,500,000 which consists of 9,000 shares of common stock and 6,000 of 7 per cent. cumulative preferred stock.

A.A.A. Committee Meets

[illegible]

President Enos Recommends Appointment of Committee on National Reliability Tour of Commercial Vehicles

Next Annual Meeting of the Association to Take Place in Richmond—Date To Be Decided in June

AT Tuesday's meeting of the executive committee of the American Automobile Association two resolutions were read and approved from President Enos, who was too ill to attend, one of these being a recommendation to appoint a committee to take up with the National Association of Automobile Manufacturers the subject of a national reliability tour of commercial vehicles during the coming summer; and the other to appoint a committee on the subject of the national reliability tour of passenger vehicles. The outcome of the tour of commercial vehicles will largely depend on how the suggestion is received by the manufacturers. It is more than possible that the national passenger vehicle tour for this year will not be over the course laid out for last season, namely, from Detroit to New Orleans. At present Minneapolis is bidding for the tour with the object of running it from the Twin Cities to the Black Hills of Dakota and return. Dr. Dutton, president of the Minnesota state association, is fathering the movement.

Ex-President Hooper was presented with a gold watch, in appreciation of services rendered.

Preston Belvin of Richmond, Va., asked that the annual meeting of the association, which will take place in Richmond during the coming fall or winter, be held between November 1 and 15 instead of in December as at present. The matter will be decided at the semi-annual meeting to be held in Philadelphia in June. Mr. Belvin also moved for a consolidated tour at the time of the annual meeting, the tourists from all sections meeting in Richmond and spending a week there for the meeting.

Big Matheson Agency for Canada

MONTREAL, CAN., Jan. 11—The organization has just been completed of the Matheson Automobile Company of Canada, Ltd., incorporated with a fully paid capital of $50,000, all of which is common stock. The company is the Canadian distributor of two makes of automobiles manufactured in the United States, namely, the Matheson Silent Six, manufactured at Wilkes-Barre, Pa., by the Matheson Automobile Company, and a line of four and six-cylinder cars manufactured by the Auburn Automobile Company, Auburn, Ind.

The directorate of the new company is exceptionally strong, and numbers among its members some of the financially strongest men in Montreal. The officers and board are as follows: President, W. W. Butler, vice-president of the Canadian Car & Foundry Company; vice-president, H. A. Dorsey, president of the Dominion Park, Limited; L. H. Timmins, president of the Hollinger Gold Mines, Limited; N. A. Duncan, general manager of the Canadian Car & Foundries, Limited; F. A. Skelton, secretary and treasurer of the Canadian Car & Foundries Company, Limited; W. Carruthers, of James Carruthers & Company, grain merchants; L. J. Perron, attorney.

The sales organization is under the charge of two experienced and well-known automobile men, J. Scott Innes and G. C. Murray.

New Jersey To Use Convicts on Roads

The conversion of New Jersey, a northern state, to the plan of prison labor will be of much interest to all good roads promoters of the country. For several years some of the southern states have been employing convict labor almost exclusively on road work, but in many of the northern states the plan has met with more or less opposition.

Col. Edwin A. Stevens, state road commissioner of New Jersey, after one season's trial of convict labor on the roads of his state, is enthusiastic in indorsing the policy generally. In a communication to the A. A. A. National Good Roads Board the commissioner writes:

"The experiment of convict labor on state roads, which was proved to be a success in one week, is only the beginning of good road building beyond what we already have and at a price which will spread out the money of the state beyond its present confines."

Minnesota Has 28,700 Automobiles

MINNEAPOLIS, MINN., Jan. 13—In 1912, 28,700 automobiles were registered by owners in Minnesota. This is an increase of 17,075 over 1910 and 9,425 over 1911. This increase at an average price of $1,000 a car means that $9,425,000 has been spent by Minnesota people in buying new cars in the year just closed. R. B. Anderson, Minneapolis, publisher of the State official automobile guide, reports that registration is continuing rapidly in 1913. His figures are as follows: 1910, 11,625; 1911, 9,275; 1912, 28,700. Beginning in 1912, automobile license tags were issued for 3 years each at $1.50 for the 3 years. The State book of licenses was issued June 1 and monthly bulletins have been issued since that time to keep the list up to date for subscribers.

Delaware Needs Automobile Commissioner

WILMINGTON, DEL., Jan. 13—Governor Pennewill, in his biennial message to the General Assembly, recommending the establishment of a state commissioner of motor vehicles, whose duty it shall be to issue the licenses for all motor vehicles and their operators and have general supervision over the use of such vehicles in the state. The chief object, aside from relieving the secretary of state of the duty of issuing the licenses, being to provide a state officer who can give direct attention to the enforcement of the law.

Franklin Men Meet at Factory

SYRACUSE, N. Y., Jan. 11—A conference of Franklin Pacific Coast dealers was held at the Franklin factory Friday, January 10, with John F. McLain, Pacific Coast district manager, presiding. Among those present were Ralph C. Hamlin, of Los Angeles, Cal.; Louis Normandin and F. B. Campen, of San José, Cal.; W. M. McCormach, of Pendleton, Ore.; R. H. Tuttle, of Walla Walla, Wash., and J. A. Nichols, Jr., of North Yakima, Wash.

Other Franklin men who attended the conference were C. H. Rockwell, Cleveland district manager; F. H. Sanders, Cincinnati district manager; W. J. Marshall, of Detroit, Mich.; J. J. O'Keefe, of Wheeling, W. Va.; A. Auble, Jr., of Akron, O.; Guy L. Smith, of Omaha, Neb.; S. C. Crane, of Dayton, O.; Murray Carr, of Pittsburgh, Pa.; O. C. Belt, of Columbus, O., and W. G. Langley, of Dallas, Tex.

After the conference the Pacific Coast men went to New York to attend the automobile show.

PIERRE, S. D., Jan. 12—The Good Roads League of South Dakota is going to push its plans before the State legislature. It will ask that convict labor be employed on State highways; that the good roads fund be increased by converting $40,000 now in the State game fund to the good roads fund; that the income from taxing automobiles be turned into the good roads fund and that the annual license fee be increased.

New York Club Formed

Aim Is To Provide Social and Protective Connection Between Automobile Owners in the City

Concerted Action To Be Taken for Saner Municipal and State Legislation—Three Types of Membership

IN order to provide social connection between automobile owners of New York City and to unite them for concerted action in support of the various organizations which are now working for saner city and state legislation, the Automobile Club of New York has been organized, with temporary headquarters at 1737 Broadway. Other aims of this club are to stimulate the public interest in automobile matters and bring about a closer relation between automobile users and trade.

The temporary headquarters contain the offices, lounging and reading rooms, but the permanent accommodations on Columbus Circle, which will be ready by September next, will include, besides these rooms, assembly and exhibition halls, dining and sleeping rooms, gymnasium, swimming pool and roof garden.

It is expected that the club will have a membership of several hundred automobilists shortly, judging by the great interest which is being taken in this matter by New York users of cars and trade members. Some of the most prominent people of New York, interested in the automobile business, have taken out memberships so far. There are three types of memberships, the founder membership limited to 500, at $25 a year, membership for New York City residents at $50 a year and out-of-town membership at $25 a year.

Motor Boosters Dine—The Big Village Motor Boosters' Dinner was held Tuesday evening in New York City. It was attended by about 300 enthusiasts, many who were from out of town. The Hoosier State was well represented.

Wisconsin's Governor on Automobiles

MADISON, WIS., Jan. 14—For the first time in the history of Wisconsin, the automobile, its use, operation and the consequences thereof received treatment in the biennial message of the governor of Wisconsin, at the opening of the 1913 Wisconsin Legislature on January 9 at the Capitol buildings in this city.

The governor arrives at the conclusion that after all the proper theory of taxing motor cars is on the basis of the effect their use and operation may result in by reason of wear and tear on roads. Thus, he suggests, the present uniform license fee of $5 per car per year be changed so that owners be required to pay a fee based on the weight or horsepower, the lightest cars to pay a minimum and the heaviest and highest-powered cars to pay a maximum fee.

The proceeds of this tax, the governor says, should accrue to the state highway fund, instead of being parcelled out *pro rata* to the county as at present, so that there may be more intelligent and efficient work in the direction of constructing and maintaining lines of traffic in continuity, to connect the principal villages and cities of the state and eventually result in a system of state highways.

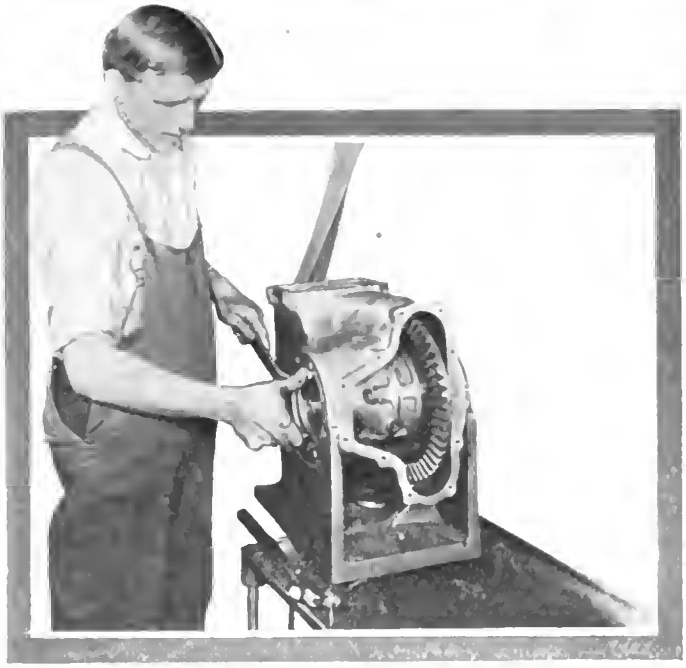
The employment of Wisconsin convicts in the building of permanent highways is urgently advocated by the governor.

Corrections on Electric Issue—In the Electric issue of THE AUTOMOBILE, January 2, captions were transposed on two photographic reproductions of the Ohio electric cars. The photograph at the lower right, page 15 should have appeared as "Ohio Straight Line Brougham. Price $3,200," and that in the lower left corner of page 17 as Ohio Semi-colonial Brougham, $2,900.

In the January 2 issue of THE AUTOMOBILE, page 18, the statement was made that the Bailey long roadster presented last year has not been continued. This roadster has been continued for the coming season and is equipped with 60 A-4 or 52 A-6 cells of Edison battery. It has a mileage radius of 80 to 100 and a speed of 25 miles per hour. The controller gives six forward and four reverse variations. This vehicle is fitted with 33 by 4-inch pneumatic tires. It is fitted with wheel steering and mechanical brakes located on the rear axle and countershaft.

On page 1236, in the issue of THE AUTOMOBILE for December 12, the Locomobile line for 1913 is described. In the table giving the motor dimensions models M and R are transposed. In the description of the big six, which is model M, the principal motor dimensions should read: bore, 4.5 inches; stroke, 5.5 inches; wristpin diameter, 1.125 inches; connecting rod length, 12 inches. The horsepower and torque curves of the model M motor are given on page 1238. The oiling system as described on page 1237 is for the four-cylinder, 30-horsepower motor. On the six-cylinder cars, the oil is pumped independently to the main bearings and to the splash troughs.

Franklin Pacific Coast dealers who met in conference at the factory in Syracuse, N. Y., January 10



Some of the manufacturing operations which are most expensive, both in time and money, are those little steps toward the perfected mechanism which are least in the limelight. The picture shows a workman adjusting the bearing in the differential of a White 1.5-ton truck so that the gears will mesh perfectly when the parts are assembled

KEETON Purchases Factory—The Keeton Motor Company, Detroit, Mich., has purchased the automobile plant formerly occupied by the Oliver Motor Car Company, paying $50,000. Immediate plans to enlarge the factory were started and work will be commenced upon the additions at once. The factory buildings, of which there are four, are located on 1¼ acres of ground. In the group are three buildings of modern factory construction 220 feet by 80 feet each and one building 140 feet by 80 feet. With other smaller buildings, the factory will comprise 50,000 square feet. The company's supplies for 1913 have been ordered and are being delivered at present. Active manufacturing started on January 17.

Speedway Plant Planned—The Speedway Tire Company, Louisville, Ky., is the name of a $250,000 concern which will establish a large factory in that city.

Dodge Brothers Award Contracts—Dodge Brothers, Detroit, Mich., manufacturers of automobiles, have awarded contracts for the erection of a new brick heat treatment building.

Reo Plant Completed—The Reo Motor Car Company, Lansing, Mich., advises that it is not in the market for equipment, as its new assembling plant has been completed and equipped.

General Vehicle's Factory—The General Vehicle Company, New York City, has plans for a large factory which will be erected in the automobile manufacturing district of Long Island City, N. Y.

Petersborough Establishes Factory—The Petersborough Machine & Lubricator Company, Ltd., Petersborough, Ont., recently incorporated at a capital of $600,000, will establish a plant for the manufacture of motors, etc.

New Concern Operates Plant—The plant of the American Automobile Manufacturing Company, New Albany, Ind., which failed some time ago, is to be operated by a new concern known as the Ohio Falls Motor Car Company.

Biggest Automobile Factory—What is declared will be the largest automobile factory in the world is shortly to be erected at Bridgeport, O., by the Bridgeport Auto Company, which has recently been organized with nominal capital of $5,000.

Ford's St. Louis Plant—The Ford Motor Car Company, Detroit, Mich., which recently began construction of an assembling plant at St. Louis, Mo., has bought additional ground for the enlargement of the plant as originally contemplated.

Amherst Firm Completes Plant—The Nova Scotia Carriage & Motor Car Company has completed a new four-story factory at Amherst, N. S. The main building is 300 feet by 100 feet. The office and power house are situated in separate buildings.

Cumberland's Pineville Factory—The Cumberland Motor Company is to establish a factory at Pineville, Ky., for the manufacture of a patented spring motor to be used in the operation of sewing machines. Machine tools are the principal items to be purchased.

Maritime's Coldbrook Plant—The Maritime Motor Car Company, St. John, N. B., is erecting a plant at Coldbrook, N. B., for the manufacture of automobiles. The buildings, two in number and each 250 feet by 100 feet, will be equipped with electrically-driven machinery.

Lee & Porter Building—The Lee & Porter Manufacturing Company, Dowagiac, Mich., is preparing to erect a frame addition to its plant, 32 feet by 90 feet. The installation of about $8,000 worth of machinery is also planned. The company expects to manufacture automobile axles on a large scale.

Gunn's Factory—The Gunn Motor Car Company, Utica, N. Y., has let a contract for additions to its plant, which will include a reinforced concrete building, 60 feet by 175 feet, two stories high, a kiln building 22 feet by 104 feet and a power plant 45 feet by 60 feet with a radial brick chimney 11 feet high.

Abbott Abolishes Factory Office—The management of the Abbott Motor Company has abolished the office of factory manager, the duties formerly attached to this position being divided between the general manager and the factory superintendent. G. C. Shoemaker continues as factory superintendent in charge of all production.

Akron Plant to Be Rebuilt—The International Harvester Company, Akron, O., which sustained the loss of several large buildings at its plant, after securing a promise from the city authorities, for better fire protection, announces that the plant will be rebuilt. The concern manufactures automobiles almost exclusively at the plant.

Jonas & Pimmat's Factory—Jonas & Pimmat, Syracuse, N. Y., have completed their new factory, which is of cement block construction, cement floors and steam heat, with electric lights at each workman's bench. The force of workmen will be doubled by spring. The company manufactures automobile accessories, including tonneau tops.

Albion's Canadian Factory—The Albion Motor Car Company, Ltd., of Glasgow, Scotland, has recently made arrangements with Montreal, Quebec, people to establish a factory garage for assembling commercial cars in that city, and it is intended in the near future to manufacture these cars in that country. There are some sixty Albion trucks running in Canada.

Purchases Vulcanizing Plant—The vulcanizing plant of the Canadian Consolidated Rubber Company, Vancouver, B. C., has been purchased by E. W. Starke. The plant is up-to-date and well equipped in every department. A vulcanizing plant equipped to handle everything in vulcanizing, retreading and tube work is part of the business. Besides there is machinery for putting on solid tires and other work of a similar nature.

Bridgeport Will Erect—The Bridgeport Auto Company, Wheeling, Va., will erect a factory.

McKinnon's Plant—The McKinnon Motor Vehicles, Ltd., Toronto, Ont., recently incorporated with a capital of $100,000 to manufacture automobiles, will establish a plant.

Aldis Briscoe Superintendent—Fred Aldis has been made superintendent of the Briscoe Manufacturing Company's plant in Detroit, Mich. He succeeds F. C. Farlinger.

Speedway's Factory—The Speedway Tyre Company, Louisville, Ky., recently incorporated, has selected three factory sites, and when one is selected an eight-story concrete building will be put up.

Streator Plant Sold—Pursuant to a decree of the United States District Court at Peoria, Ill., the plant, stock and other assets of the Streator Motor Car Company, Streator, Ill., was offered for sale at auction on January 14.

Cataract Rubber's Addition—The Cataract Rubber Company, headquarters at Buffalo, N. Y., plans to erect an addition to the Wooster, O., plant at which solid tires will be manufactured. I. C. Emery is the superintendent. The addition will be ready for occupancy May 1, and will cost $100,000.

Speedwell Adds Machine Shop—Stockholders of the Speedwell Motor Car Company, Dayton, O., ratified a plan to authorize a bond issue of $150,000 for extension of business. The Speedwell company will use Mead sleeve type of engine in place of the Continental or poppet type. A machine shop will be added to the plant.

Maxwell Factory Manager Leaves—Christian Pretz, for several years factory manager of the Maxwell-Briscoe Motor Company, was honored by a dinner at Tarrytown, N. Y., recently. The occasion was a sort of farewell affair to the employees of that plant, many of whom will remove to the Newcastle, Ind., plant, to which place most of the machinery already has been shipped.

Penn Sale January 21—The date of the sale of the Penn Automobile Company, near Newcastle, Pa., has been set for January 21. There are said to be two groups of men interested in the sale, one of which expects to continue the manufacture of automobiles, chiefly commercial vehicles; the other group would remodel the plant so as to make it suitable for other manufacturing purposes.

Assignee Sells Canadian Plant—The Harding Motor Car Company, Ltd., of London, Ont., which undertook to build cars in that Canadian city about a year ago, was sold by the assignee on January 14. The assets are appraised at $24,176, of which plant, machinery, patterns, tools and equipment are valued at $14,583.90, and stock in trade, which includes finished and unfinished parts, $9,190.71. The remaining $400 represents a demonstrating runabout.

Ford Ships 868 Cars—Enlargements on the Ford Motor Company's factory at Detroit, Mich., which have been under way for some months were completed shortly after the middle of December. As a result the output of the Ford factory has been enormously increased. In a single day, December 23, there were shipped from the Ford factory 868 cars, and during the month of December a total of 11,181 cars were produced by that company.

Three-quarter view of the plant of the Peninsular Steel Castings Company, Wight and Iron streets, Detroit, Mich. The company moved into the building shortly after its organization in November

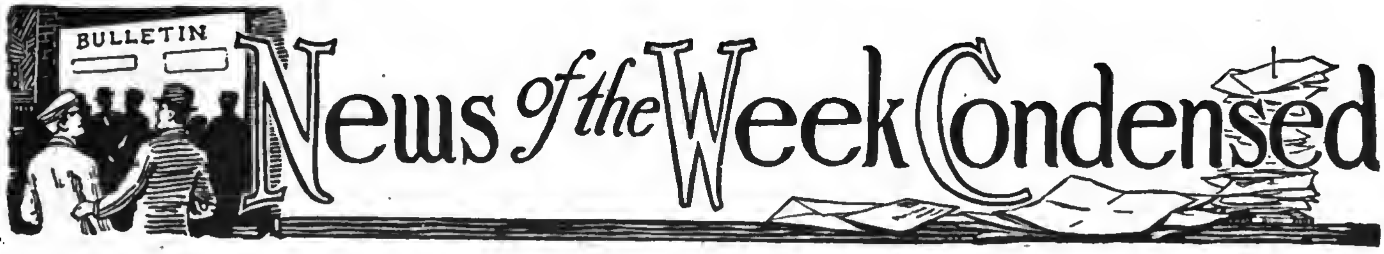
The Automobile Calendar

Shows, Conventions, Etc.

Jan. 11-18.........Milwaukee, Wis., Annual Show, Auditorium, Milwaukee Automobile Dealers' Association.
Jan. 11-25.........New York City, Thirteenth Annual Show, Madison Square Garden and Grand Central Palace, Automobile Board of Trade.
Jan. 14............Cleveland, O., Meeting, Chamber of Commerce Building, Cleveland Engineering Society.
Jan. 14............New York, Beefsteak Dinner, Big Village Motor Boosters.
Jan. 15............New York City, Banquet, Waldorf-Astoria, Motor and Accessory Manufacturers
Jan. 15............New York City, Lunch and Meeting, Prince George Hotel, New England Motor Supply Jobbers.
Jan. 16............New York City, Meeting, Hotel McAlpin, Society of Automobile Engineers.
Jan. 16............New York City, Dinner in Honor of W. H. Blood, Jr., Retiring President, Electric Vehicle Association of America, Delmonico's.
Jan. 17............New York City, Banquet, Hotel McAlpin, Society of Automobile Engineers.
Jan. 18-25.........Philadelphia, Pa., Annual Automobile Show.
Jan. 21-26.........Toledo, O., Annual Show, Exposition Building, Toledo Automobile Shows Company.
Jan. 25-Feb. 1.....Montreal, Que., Montreal Automobile and Truck Show, R. M. Jaffray, Manager.
Jan. 25-Feb. 1......Providence, R. I., Annual Show, State Armory, Rhode Island Automobile Dealers' Association, Inc.
Jan. 27-Feb. 1.....Philadelphia, Pa., Truck Show.
Jan. 27-Feb. 1.....Buffalo, N. Y., Annual Automobile Show.
Jan. 27-Feb. 1.....Detroit, Mich., Annual Automobile Show.
Jan. 27-Feb. 1.....Ottawa, Ont., Ottawa Motor Show, Howick Hall, Louis Blumenstein.
Jan. 27-Feb. 1.....Rochester, N. Y., Annual Show, Exposition Park, Dealers' Association.
Jan. 27-Feb. 1.....Scranton, Pa., Annual Automobile Show, Hugh B. Andrews.
Jan. 27-Feb. 13....Troy, N. Y., Annual Show, State Armory, Troy Automobile Club.
Feb. 1-8...........Chicago, Ill., Annual Automobile Show, Coliseum and 7th Regiment Armory.
Feb. 3-8...........Washington, D. C., Annual Show.
Feb. 8-15..........Hartford, Conn., Annual Show, State Armory, Hartford Automobile Dealers' Association.
Feb. 8-15..........Minneapolis, Minn., Annual Automobile Show.
Feb. 10-15.........Chicago, Ill., Truck Show.
Feb. 10-15.........Winnipeg, Man., Show, A. C. Emmett.
Feb. 11-15.........Binghamton, N. Y., Annual Show, State Armory, Dealers' Association, R. W. Whipple.
Feb. 15-22.........Albany, N. Y., Annual Show, State Armory, Dealers' Association.
Feb. 15-22.........Newark, N. J., Annual Automobile Show, First Regiment Armory, New Jersey Automobile Exhibition Company.
Feb. 16-23.........Richmond, Va., Annual Show.
Feb. 17-22.........Kansas City, Kan., Annual Automobile Show.
Feb. 18-19.........Madison, Wis., Annual Show, City Market Building, Dealers' Association.
Feb. 18-21.........Grand Forks, N. D., Annual Show, Auditorium, Dealers' Association.
Feb. 18-22.........Baltimore, Md., Annual Show, B. A. D. A.
Feb. 19-22.........Bloomington, Ill., Annual Show, Coliseum, McLean County Automobile Club.
Feb. 19-22.........Geneva, N. Y., Automobile Show, Armory, Louis Blumenstein.
Feb. 19-23.........New Orleans, La., Annual Show.
Feb. 19-27.........Topeka, Kan., Annual Show.
Feb. 20-22.........Canadaigua, N. Y., Automobile Show, Louis Blumenstein.
Feb. 22-Mar. 1.....Brooklyn, N. Y., Annual Show, 23rd Regiment Armory.
Feb. 24-27.........Kansas City, Mo., Truck Show.
Feb. 24-Mar. 1.....St. Louis, Mo., Annual Show.
Feb. 24-Mar. 1.....Memphis, Tenn., Annual Show.
Feb. 24-Mar. 1.....Omaha, Neb., Annual Automobile Show.
Feb. 24-Mar. 1.....Paterson, N. J., Annual Show, Paterson Automobile Trade Association.
Feb. 24-Mar. 5.....Cincinnati, O., Annual Show, Music Hall, Cincinnati Automobile Dealers' Association.
Feb. 25-March 1...Syracuse, N. Y., Annual Show, Syracuse A. D. A.
Feb. 26-Mar. 1.....Fort Dodge, Ia., Annual Show.
Feb. 26-Mar. 1.....Glen Falls, N. Y., Automobile Show, Louis Blumenstein, Manager
Feb. 27-Mar. 1.....Toronto, Ont., Annual Show, Toronto Automobile Trade Association.
March 3-8.........Bridgeport, Conn., Show, Park City Rink, B. B. Steiber.
March 3-8.........Pittsburgh, Pa., Annual Automobile Show.
March 3-18........Des Moines, Ia., Annual Show, Pleasure Car Section, Coliseum, Dealers' Association.
March 5-8.........Tiffin, O., Annual Show, Tiffin *Daily Advertiser*.
March 8-15........Boston, Mass., Annual Automobile Show.
March 12-15.......Ogdensburg, N. Y., Automobile Show, Louis Blumenstein, Manager
March 12-15.......Louisville, Ky., Annual Show, Dealers' Association.
March 19-26.......Boston, Mass., Annual Truck Show.
March 20-24.......New Orleans, La., Annual Show, N. O. A. D. A.
March 24-29.......Indianapolis, Ind., Annual Automobile Show.

Race Meets, Runs, Hill Climbs, Etc.

May 30............Indianapolis, Ind., 500-Mile Race, Speedway.



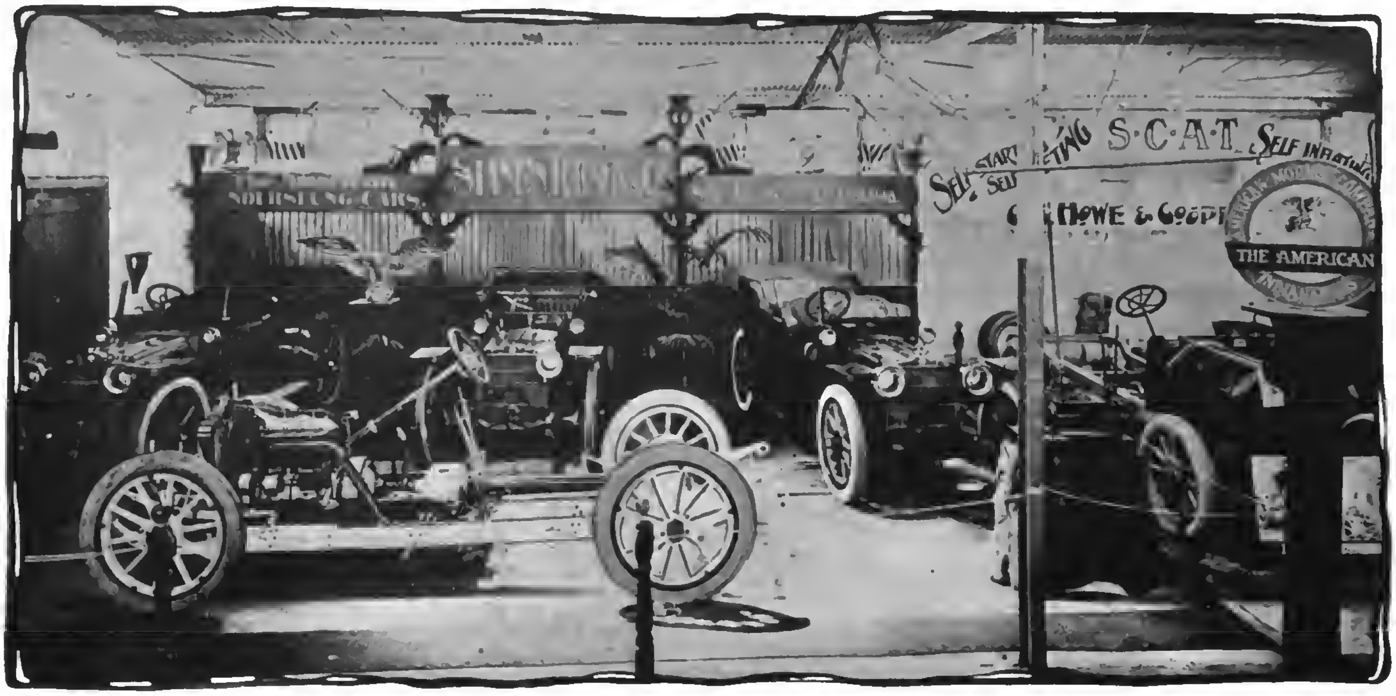


Exhibit of the American Motors Company at the recent automobile show held in Sydney, Australia

AMERICAN'S Australian Exhibit—An evidence of the growing popularity of the American cars abroad, was the exhibit of the American underslung, made by the American Motors Company, Indianapolis, Ind., in the automobile show held recently in Sydney, Australia. Three models, the Traveler, Tourist, and Scout and a chassis were exhibited.

New Columbus Tire Concern—The Columbus, O., Auto Tire Company is the name of a new concern which has opened a vulcanizing and retreading concern. H. R. Anderson is president of the company.

Columbus Supply House Opened—The Automobile Supplies Company is the name of a new concern which has opened in Columbus, O., to handle a full line of automobile supplies. C. S. Holmes is manager.

U. S. Tire's Columbus Branch—The United States Tire Company has opened a Columbus, O., branch located at 89 North Third street. B. L. Crippen, formerly connected with the J. C. Sherwood Rubber Company, is manager.

Syracuse Show Date Changed—Manager Harry T. Gardner, of the Syracuse, N. Y., automobile show, announces to the press and class publications that the official date of the show has been changed from February 25 to March 1, instead of the later date as first selected.

Woodhull Sales Manager—R. S. Woodhull who was manager of the horse-drawn vehicle department of the Columbus Buggy Company, of Columbus, O., has resigned to accept the position of general sales manager of the Ohio Electric Company, of Toledo, O., manufacturer of electric cars.

To Handle Knox Trucks—The Canadian General Electric Company, with head offices in Toronto, Ont., has completed arrangements with the Knox Automobile Company, of Springfield, Mass., to handle the Canadian sales of commercial vehicles and fire apparatus manufactured by the latter company.

Thomas Company Moves—The C. E. Thomas Company, Columbus, O., agent for the Studebaker line of cars, has moved its sales rooms and service department from 264 North Fourth street to a new structure at 166 North Fourth street. The new rooms are 25 by 180 feet and are equipped with a modern repair shop.

Hayes with Abbott—John A. Hayes, formerly connected with the sales department of the Lyon Motor Car Company and United States Motor Company, Detroit, Mich., has been appointed special sales representative for the Abbott Motor Company and left this week for northwest Canada where he will spend some time looking after the company's interests.

Cost of Maintenance High—The Baltimore, Md., authorities are trying to devise a plan to reduce the annual cost of maintenance of the four motor cars used by the Sewerage Commission, water department, city engineer department and street cleaning department which the past year reached close to $12,000. The officials blame improper handling for the high cost and will try to rectify this waste.

California Invests $58,230,000—At the close of business December 31, 1912, the records of Secretary of State Jordan's office shows how California invested approximately $58,230,000 in automobiles and leads the continent in the number of motor cars proclaimed during the past 12 months. The approximate revenue from motor vehicles for 1912 will amount to $75,000. This is an increase of $25,000 over 1911.

Dissolution of Columbus Concern—Dissolution of the Columbus Motor Car & Transportation Company, of Columbus, O., and the distribution of the funds is asked for in a petition filed in court recently by the thirty stockholders of the concern. It is alleged that the company failed to accomplish its purpose which was to compete with the street car company during the strike in Columbus several years ago.

Peculiar Washington Ruling—When the motor of an automobile stops on a railroad crossing and the owner runs up the track 1,000 feet to meet an oncoming train, striking matches, waving his arms and trying to attract the attention of the engineer, the railroad company must reimburse him to the value of the car if the engineer pays no attention and the train demolishes the vehicle. Such was the decision of the Supreme Court of the State of Washington in sustaining the decision of the Pierce County Superior Court in favor of John Nicol against the Oregon-Washington Railroad and Navigation Company.

New Agencies Established During the Week

PLEASURE CARS

Place	Car	Agent
Aledo, Ill.	Moon	E. B. Miller.
Butte, Mont.	Lozier	Motor Car Distrib. Co.
Calgary, Alta.	Cole	Central Gar. & Mach. Shop.
Carcall, Ia.	Moon	Swaney Auto. Co.
Columbus, O.	Detroiter	Frank Corbett.
Columbus, O.	Empire	S. W. Schott & Co.
Columbus, O.	Cameron	M. Cameron.
Davenport, Ia.	Lozier	Hawkeye Motor Co.
Des Moines, Ia.	Crow-Elkhart	Bothne Motor Co.
Des Moines, Ia.	Imperial	Bothne Motor Co.
Des Moines, Ia.	Richmond	Capital City Carriage Co.
Des Moines, Ia.	Royal	Bothne Motor Co.
Edmonton, Alta.	Cole	International Motor Co.
Hannibal, Mo.	Moon	Long Mfg. Co.
Hartford, Conn.	Lozier	H. D. Graves.
Indianapolis, Ind.	Broc	Treat & Warren.
Lima, O.	Cole	Thomas Motor Co.
Memphis, Tenn.	Moon	Chickasaw Motor Car Co.
Montreal, Ont.	Hupmobile	V. O. Reed.
Montreal, Ont.	Atlas	V. O. Reed.
Montreal, Ont.	Brockville	V. O. Reed.
Montreal, Ont.	Speedwell	V. O. Reed.
Orange City, Ia.	Moon	Aerrote Van Der Wilt.
Petersburg, Va.	Moon	W. P. Atkinson & Co.
Phœnix, Ariz.	Auburn	D. E. Nelson.
Phœnix, Ariz.	Chalmers	A. Ainsworth.
Phœnix, Ariz.	Ford	Ed Rudolph.
Prescott, Ariz.	Buick	Massing Bros.
Prince Albert, Sask.	Cole	Broadfoot & Manville.
Regina, Sask.	Cole	H. A. Gordon.
Taylor, Tex.	Moon	Prewitt Auto Co.
Tiffin, O.	Studebaker	H. P. Klaiss & Co.
Wakefield, Nebr.	Moon	Utecht & Eimer.
Wilkes-Barre, Pa.	Moon	Regal Sales Co.

Abbott Moves—The Abbott Motor Sales Company, Toledo, O., has moved to 1420-22 Madison avenue.

One County Without Automobile—There is only one county in Alabama without an automobile. This is Winston county.

Hermes Builds First Car—The Hermes Motor Car Company, Cincinnati, O., has built its first car. It will be sold for $1,700.

Biddeford Moves—The Biddeford Motor Mart, Biddeford, Me., is now located at 305 Main street. It will handle the Studebaker cars.

Bunnell Moves—The Bunnell Auto Sales Company, Toledo, O., has moved from Erie street into new quarters at 1416 Madison avenue.

Eisenman Branch in Detroit—A Detroit, Mich., branch has been opened by the Eisenman Magneto Company, Germany, at 802 Woodward avenue.

Guatemala's New Decree—By a recent presidential decree all invoices for goods to enter Guatemala must be accompanied by the bill of lading.

Stewart Sales Manager—L. I. Stewart has accepted a position as sales and advertising manager of the Warner Manufacturing Company, Toledo, O.

MacFarland in New Home—The MacFarland Auto Company, Denver, Colo., has moved to 25 Colfax avenue. Its new home is 72 feet by 182 feet.

McCann Secures Faurote—F. L. Faurote has accepted a position with the McCann Advertising Agency, Detroit, Mich., as head of the copy department.

Alabama's Improved Roads—During 1912 the Alabama state highway commission had actual charge of the construction of 118 miles of improved roads.

Gardner Manager Syracuse Show—Harry T. Gardner will manage the annual Syracuse, N. Y., automobile show in place of W. R. Marshall, who has removed to Calgary.

Add to Delivery Equipment—Six automobiles have been added to the delivery equipment at the New Orleans, La., postoffice due to the added business caused by the parcel post.

Quarles Opens New Quarters—The E. B. Quarles Company, Baltimore, Md., representing the Brown scientific pneumatic inner tube, has opened new quarters at 1922 North Charles street.

Syracuse Federal Moves—A. J. Jackson, Syracuse, N. Y., agent for Federal motor trucks, has moved from No. 511 S. Clinton street to No. 571, the same street, thereby doubling his show space.

Conducted on Dealership Basis—The Baltimore, Md., branch of the Franklin Automobile Company, Syracuse, N. Y., has been taken over by W. F. Kneip who will conduct it on a dealership basis. Mr. Kneip is a former Franklin engineer.

Ohio's Convict Labor—Advocates of good roads in Ohio have held frequent consultations with the Ohio State Board of Administration recently with reference to using convicts confined in the Ohio penitentiary for road improvement during 1913.

Oppose Passage of Law—Automobilists in Ohio are preparing to oppose the passage of a law by the legislature, changing the system of registration fees from a flat rate for electrics and gasoline cars, to a sliding scale based on the horsepower of vehicles.

Randall Resigns—F. M. Randall on January 1 resigned as Detroit, Mich., manager of the Charles H. Fuller Company, in order to become associated with Gleeson Murphy in the general management of the middle west organization of the H. K. McCann Company, advertising agents, with headquarters in the Boyer Building, Detroit, Mich.

Studebaker's 10-Year Lease—The Studebaker Corporation has closed for a 10-year lease on a new five-story building at the corner of Peachtree and Harris streets, Atlanta, Ga., which will be used by its southern branch. The consideration is $150,000 for the 10 years.

Manitoba Highway Improvement—A report issued by A. McGillivray, highways commissioner for the province of Manitoba, shows that a sum of over $1,000,000 will be spent during 1913 on the highways of that province. One of the main travelled highways which will receive the greatest attention is that portion of Canadian territory between Winnipeg and the United States boundary line at Emerson.

Correction on Keeton—The Keeton Motor Company, Detroit, Mich., is not an outgrowth of the Croxton-Keeton Company except that Mr. Keeton formerly licensed the Croxton-Keeton Company to build a French type car of his design. The Keeton Motor Car Company makes only one chassis, a six-cylinder, 48-horsepower model, the monobloc motor having a 3.75 inch bore by 5.5 inch stroke with a four-bearing crankshaft. An electric starting and lighting system is fitted.

Pierson Appointed Receiver—Edward W. Pierson has been appointed receiver for the Indianapolis Dash Company, of Indianapolis, Ind., and has given bond in the sum of $25,000. The receiver was appointed on applications made to the superior court by the John Reilly Company and the E. H. McCormack & Sons Company, creditors in excess of $4,000. Several creditors have brought proceedings in the Federal Court to have the company adjudged bankrupt. Included in the liabilities are notes for $21,000 due Indianapolis banks.

Difficulty in Gasoline Contracts—The municipal authorities and other large users of gasoline in Indianapolis, Ind., are finding it difficult to place satisfactory contracts for gasoline for this year. The best figure that is being quoted is one-half cent off of the market price. In the past it has been possible to make contracts at from 9½ cents to 10½ cents a gallon, with the benefit of any reduction below the contract price. Most of the large users are now paying from 14 to 15 cents a gallon for gasoline, while some of the smaller users are paying from 18 to 20 cents a gallon.

The Baldwin Locomotive Company, Philadelphia, recently constructed four gasoline locomotives. The picture shows one of these fitted with a 6 by 6-inch four-cylinder motor and a Hele-Shaw clutch negotiating a 5 per cent grade with a load of 100,000 pounds

First view of the Collegiate Range, Continental Divide, coming into Buena Vista from Trout Creek Canyon, on top of Monarch Pass, crossing the Sangre de Christo Range of the Continental Divide; altitude, 12,000 feet

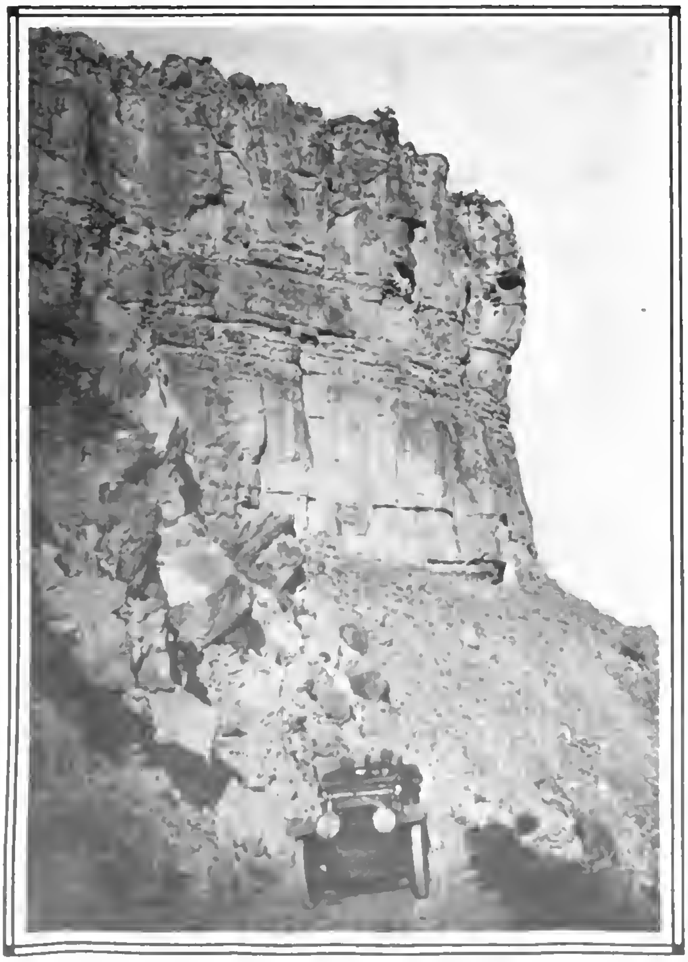
The illustrations shown herewith are made from photographs taken on a recent trip through Colorado in the six-cylinder White car, which is shown in the foreground of each of the pictures

St. Mary's Hose Truck—St. Mary's, O., will have a new motor hose truck, the purchase having been authorized by the city council.

Cary Sales Manager—The International Acheson Graphite Company, Niagara Falls, N. Y., has appointed Richard Cary sales manager of its lubrication department.

Marshall in Concrete Business—W. R. Marshall, secretary of the Syracuse, N. Y., Automobile Dealers' Association, will soon leave for Calgary, Can., to engage in the concrete construction business.

Winnipeg Adds Hose Wagons—Winnipeg, Man., has added two hose wagons to the fire department motor equipment. The latest additions are a Kisselkar and a Commer. Both machines have a capacity for 1,800 feet of hose and six men and are equipped with all the latest accessories for use in fire fighting.



In the Canyon of the Grand River, below Glenwood Springs

Formation of Co-Partnership—Alexander Muir and A. C. Davidson have formed a co-partnership under the name of the Muir-Davidson Steel Company, New York City, to act as general agents in the United States and Canada for the Samuel Fox & Company, Ltd., steel manufacturers of Sheffield, England.

Space at Winnipeg Show—The allotment of space for the Winnipeg motor show, Winnipeg, Man., provides space for twenty-six different exhibitors who will display at least sixty different makes of cars. The building will be most elaborately decorated and the show will be under the management of A. C. Emmett. The dates are February 10 to 15.

Change in Handling Electrics—The Union Electric Light & Power Company, St. Louis, Mo., has announced a change in its method of handling the electric automobile business. It has given up its agencies and will close its garage, as a public garage, just as soon as the customers can be accommodated elsewhere. The firms which the Union Electric Company has represented will shortly open places of their own, and in the future that company will act in an advisory capacity for the good of the business as a whole.

Automobile Incorporations

AUTOMOBILE AND PARTS

Boston, Mass.—Pope Manufacturing Company; capital, $6,500,000; to manufacture automobiles. Incorporators: S. L. Pope, G. Pope, R. P. Clapp.

Baidgeauag, Ont.—League of Canadian Automobilists, Ltd.; $5,000,000: to carry on the business of manufacturers, buyers and sellers of automobiles, motor vehicles and supplies, macbinery, implements, etc. Incorporators: James Steller Lovell, William Bain, Robert Gowans, Joseph Ellis, Samuel Goodman Crowell.

Buffalo, N. Y.—Buffalo Automobile Sales Corporation; capital, $15,000; to manufacture and sell motors, engines, machines, etc. Incorporators: W. J. Harris, W. U. Heverly, Maud MacDonald.

Buffalo, N. Y.—F. A. M. Auto Supply Company; capital, $20,000; to deal in automobiles. Incorporators: F. A. Marburg, J. B. Green, R. H. Templeton.

Cleveland, O.—Anderson Rolled Gear Company; capital, $100,000; to manufacture and deal in machinery and supplies of all kinds. Incorporators: F. A. Barker, D. H. Foster, W. C. Krkkbride, H. N. Anderson, G. H. Sensabaugh, R. M. Calfee.

Cleveland, O.—Alco Motor Company; capital, $10,000; to deal in automobiles, trucks, parts, etc. Incorporators: M. Kluger, C. K. Halle, F. Butler, A. J. Halle, E. L. Geisner.

Cleveland, O.—Forest City Garage Company; capital, $5,000; to deal in automobiles and accessories. Incorporators: Christian Mortx, E. T. Mertz, J. T. Harding, J. W. Wald.

East Orange, N. J.—Rickey Machine Company; capital, $125,000; to deal in sutomobiles. Incorporators: C. A. Hauswirth, M. H. Rickey, F. A. Nott, Jr.

Louisville, Ky.—Standard Automobile Company; capital, $25,000; to deal in automobiles. Incorporators: G. A. Dunham, C. L. Alderaon, J. H. Alderson.

Montreal, Que.—Grenier-Warrington Motor Car Company; capital, $50,000; to manufacture and deal in automobiles. Incorporators: Dr. E. Ostigny, Theopile Viau, J. T. Wsrrington, Aime Grenier, Hector Paiment.

Painesville, O.—Vulcan Msnufacturing Company; capital, $300,000; to manufacture automobiles. Incorporators: E. B. Heartwell, F. H. Murray, J. C. Ward, Wm. Truby, H. E. Hammer.

Building $10,000 Garage—Edward Rudolph, Phoenix, Ariz., agent for the Ford, is building a $10,000 brick garage on East Adams street.

Motor Tractors at Baton Rouge—Motor tractors for farm use will be demonstrated at a farmers convention to be held in Baton Rouge, January 14 and 15.

Hartzell to Manage Goodyear—R. S. Hartzell has been appointed manager of the Cleveland, O., branch of the Goodyear Tire & Rubber Company, Akron, O.

Hutchinson Advertising Manager—F. B. Hutchinson, Jr., has been appointed advertising manager of the Kelly-Springfield Motor Truck Company, Springfield, O.

Firestone Opens Three Branches—The Firestone Tire and Rubber Company, Akron, O., announces the opening of three new branches in Cincinnati, O., Memphis, Tenn., and Milwaukee, Wis.

Inderrieden Sales Manager—A. J. Inderrieden has been appointed eastern district sales manager for the Stewart-Warner Corporation, Beloit, Wis., with headquarters in New York City.

New Orleans Anti-Noise—Open mufflers and oppressive forms of signalling devices on automobiles are to be prohibited by an ordinance now being compiled by the New Orleans, La., commissioner of public safety.

Fisk Opens Winnipeg Branch—The Fisk Rubber Company, of New York, will open on February 1 at Winnipeg, Man., a completely equipped branch house at 307 Fort street. Mr. R. Phillips will be in charge as local manager.

American Changes Name—Announcement has been made that the American Automobile Corporation, New Albany, Ind., has changed its name to the Ohio Falls Motor Car Company, and that the capitalization of the company is $450,000.

Roberts with Mais Truck—W. M. Roberts, sales manager for the Packers Motor Truck Company, Wheeling, W. Va., has resigned his position with that company, to accept a position with the Mais Motor Company, Indianapolis, Ind., as general sales manager.

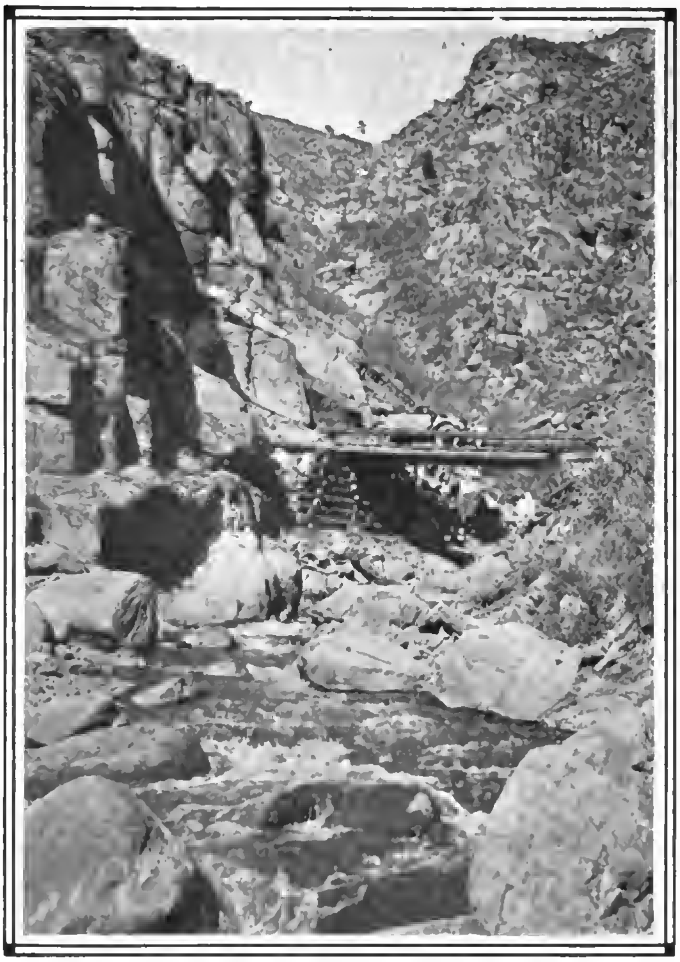
Automobile in Eden—A movement to have the highways of the town of Eden, of which Bar Harbor, Me., is a part, reopened to automobiles, has been instituted. A bill introduced in the legislature provides that the town may open its roads to automobiles.

Ready Resigns from Lozier—W. J. Ready recently resigned his position as superintendent of the Lozier Motor Company, to become manager of the Star Motor Car Company, Ann Arbor, Me., which will manufacture trucks of 1,500 and 2,000-pound capacity.

Lynn Show January 20—The Automobile Dealers' Association of Lynn, Mass., at its annual meeting recently voted to have an automobile show. This will be held during the week of January 20 to 25, at the Eighth Regiment Building. Percy I. Reynolds is secretary-treasurer.

Extends Invitation to Show Visitors—An invitation has been extended by the Miller-Brisben Company of West 63d street, to the out-of-town buyers during the week of the automobile show, extending to them the use of the available cars to facilitate the purposes of these visitors.

Broc Sales Increase—Among the announcements of 1912 sales increases, is one made by the Broc Electric Vehicle Company, Cleveland, O., of practically 100 per cent. for the entire year, and as an evidence of the increasing favor of electrics, may be cited the fact that the Broc management will again double its output of pleasure cars.



In the Phantom Canyon of 4-Mile Creek, near Cripple Creek

Looking down into the Black Canyon of the Gunnison River, 2,000 feet deep

Automobile Incorporations

Pittsburgh, Pa.—Keystone Motor Supply Company; capital, $12,000; to deal in automobiles.

Toledo, O.—Kero Carburetor Company; capital, $25,000; to manufacture and deal in carburetors, engines and parts and accessories. Incorporators: M. O. Rettig, W. J. Brunn, H. C. Lyon, Martha Arndt, W. C. Bugman.

GARAGES AND ACCESSORIES

Brooklyn, N. Y.—Mol Stringer's Garage Corporation; capital, $10,000; to carry on a garage business. Incorporators: Mol Stringer, Jas. Culleeny, F. R. Huntington.

Cleveland, O.—Euclid Square Garage Company; capital, $25,000; to operate storage rooms for automobiles and to carry on a general livery business. Incorporators: C. K. Fauver, J. A. Pritchard, H. E. Downing, H. Allchin.

Elyria, O.—J. & H. Taxicab Company; capital, $2,500; to carry on a general taxicab business. Incorporators: A. L. Jackson, M. F. Harrison, L. B. Fauver.

Louisville, Ky.—Speedway Tire Company; capital, $250,000; to manufacture automobile tires. Incorporators: H. L. Lewman, G. W. Greene.

Tacoma, Wash.—B. Bennett & J. B. Baldy; capital, $5,000; to conduct a garage, tire and vulcanizing plant. Incorporators: W. B. Sbumacker, B. B. Bennett, J. B. Baldy.

Trenton, N. J.—Empire Rubber & Tire Company; capital, $1,000,000; to manufactnre and sell rubber hose, tires, etc. Incorporators: C. H. Baker, C. E. Murray, J. C. Murray.

CHANGES OF CAPITAL AND NAME

Cleveland, O.—Cleveland Auto Livery Company; increase of capital from $10,000 to $25,000.

Cleveland, O.—Stuyvesant Motor Car Company; decrease of capital stock from $200,000 to $10,000.

Indianapolis, Ind.—American Automobile Corporation; change of name to the Ohio Falls Motor Car Company.

Moline, Ill.—Velie Motor Vehicle Company; increase of capital from $600,000 to $800,000.

MECHANICAL WHEEL—In which the tire is supplanted by helical springs which take the place of the ordinary wooden spokes.

This patent refers to a wheel construction in which hub H and rim R, Fig. 1, are not connected by the ordinary type of spoke, but by telescoping spokes S containing helical springs S1. Each spoke is fixed at one of its ends to the hub H and at the other to a block which slidably engages the spoke-supporting elements E secured to the rim R. The helical spring which is contained in the telescoping spoke tubes of each spoke member is reinforced in its longitudinal direction by a rod R1 which projects through a slot in the aforementioned block.

No. 1,049,162—to John H. Sparks, Camden, N. J. Granted December 31, 1912; filed January 30, 1911.

Device for Tire-Tube Repairs—Which comprises two curved springs between which the inner tube is held in place.

Fig. 2 shows the subject matter of this patent, which serves for holding an inner tube in place while repairing it. For this purpose two curved spring members S are used, which are bent toward one another so that their convex faces are nearest along the median lines of both members. The tube is placed between both members S and by applying pressure by means of the wing nuts P, the inner tube is compressed.

No. 1,049,090—to Adolph R. Hoeft, Chicago, Ill. Granted December 31, 1912; filed October 3, 1910.

Automobile Carbureter—Consisting of two concentric float chambers which supply fuel through two separate vaporizing nozzles.

This device, Fig. 3, consists in principle of an outer wall O and an inner one, between which a central chamber C is formed which serves as the mixing chamber of the carbureter. Between the outer and inner walls is an intermediate wall which divides the space surrounding the mixing chamber into two independent, concentric chambers; floats F, F1 are in position in these chambers. Each float chamber has an independent supply pipe through which fuel flows into it, the flow being controlled by valves V and V1 for the float chambers containing floats F and F1, respectively. The valves are controlled by levers suitably fulcrumed at some place on the outer casing and moved by the rising or falling float. By means of nozzles M, which lead from the two float chambers into the central mixing chamber C, fuel is brought into the flow of air which is drawn into the motor by the suction of the latter and thereby vaporized.

No. 1,048,620—to Eugene B. Williams, Stockton, Cal. Granted December 31, 1912; filed May 8, 1912.

Clincher-Tire Rim—Consisting of two rim sections which are brought farther from or nearer to each other by an expansible hoop.

The rim construction described in this patent is shown in Fig. 4 and consists of two rim sections constructed as follows: Each section R is composed of a ring S at a right angle to the wheel axis and of one parallel to this axis. An inclined surface rising from the parallel ring to that which is at a right angle to the axis has its upper flange turned in so as to be capable of holding the bead of a clincher tire in place. An expansible hoop H lies between the two inclined parts of the rim sections and by its varying adjustment serves to space them.

No. 1,049,287—to Samuel Barnett, Tipton, Eng. Granted December 31, 1912; filed September 9, 1912.

Automobile Spring Suspension—Consisting in the use of short curved springs which counteract excessive deformation of the semi-elliptical spring.

The spring invention referred to in this patent is shown in Fig. 5. It consists of semi-elliptical leaf spring S1, the ends of which are attached to members M, while intermediate its length members N are secured to it. To each of these members N are fixed the free ends of a set of strongly curved springs L, the other end of the curved springs being secured to the chassis frame together with the ends of springs attached to the members M. It is clear that while the auxiliary springs do not interfere with normal spring action, they must prevent excessive deformation of the leaves of S1, as well as their recoil and consequent breakage.

No. 1,049,097—to George M. Huston, New York City. Granted December 31, 1912; filed August 7, 1912.

Resilient Automobile Tire—Consisting of a rigid rim and rigid spokes, resiliency being supplied by helical springs between the rim and tread.

The resilent tire described in this patent and shown in Fig. 6 consists of a rim and a tread band surrounding it concentrically. Rim and tread are resiliently spaced by means of a series of helical springs R which seat on projections formed on the rim and tread surfaces. The rim is formed in several sections the ends of which are formed with beveled faces engaging as do E and E1. The outward radial projections of E and E1 are held together by a suitable mechanism, such as a ring locked tight on these ends.

No. 1,049,067—to Otto Erickson and Olaf G. Sunden, Chicago, Ill. Granted December 31, 1912; filed February 17, 1912.

Carbureter Construction—Comprising a double evaporating chamber the parts of which come into action one after another.

This patent dealing with carbureter construction includes the combination of two vaporizing portions having a common outlet, with a throttle adapted to connect first one of the vaporizing portions and then both of them with the outlet. A fuel duct supplies the hydrocarbon fuel and a single valve is used to connect it first with one of the vaporizing and then with both, throttle and fuel regulating valve being operated simultaneously.

No. 1,046,014—to William H. Ratcliff, Newark, N. J. Granted December 3, 1912; filed September 7, 1910.

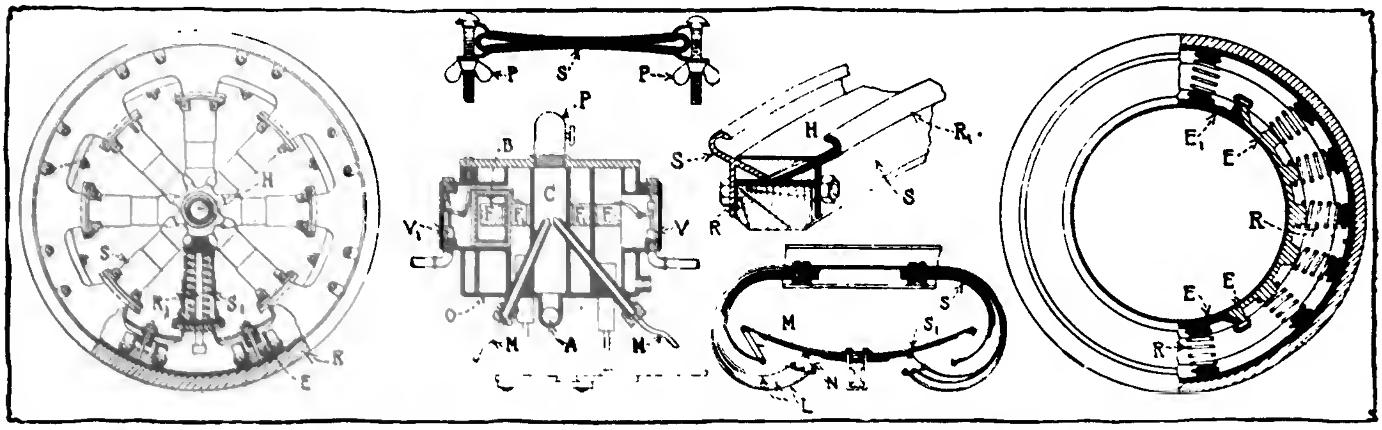


Fig. 1—Sparks mechanical wheel. Fig. 2—Hoeft tube-repair device. Fig. 3—Williams carbureter. Fig. 4—Barnett clincher rim. Fig. 5—Huston spring suspension. Fig. 6—Erickson-Sunden tire

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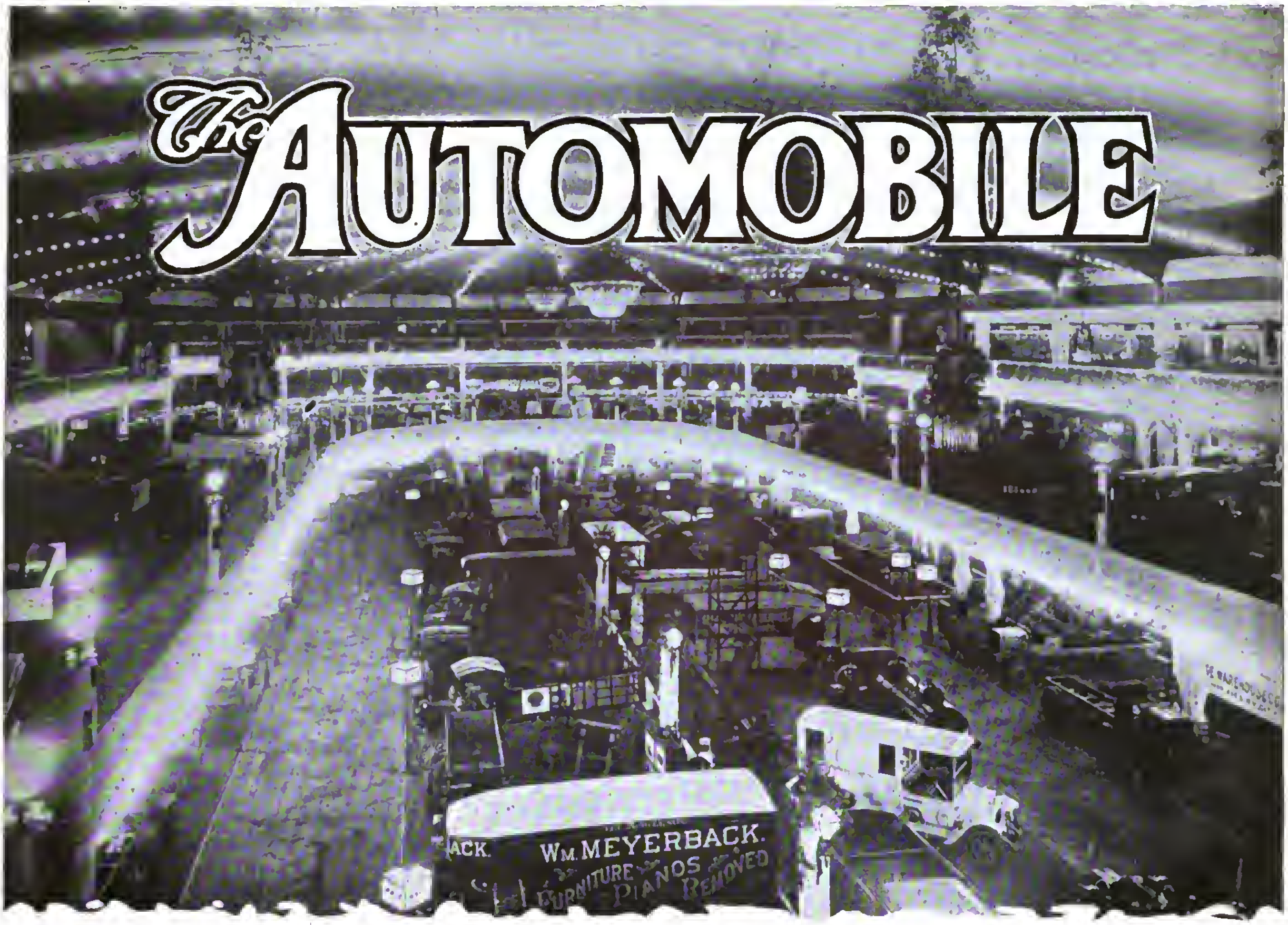


New York's Truck Show Opens

Sixty Makers of Gasoline Vehicles and Seven of Electrics Attendance Unprecedented—10,000 at Garden Opening Night

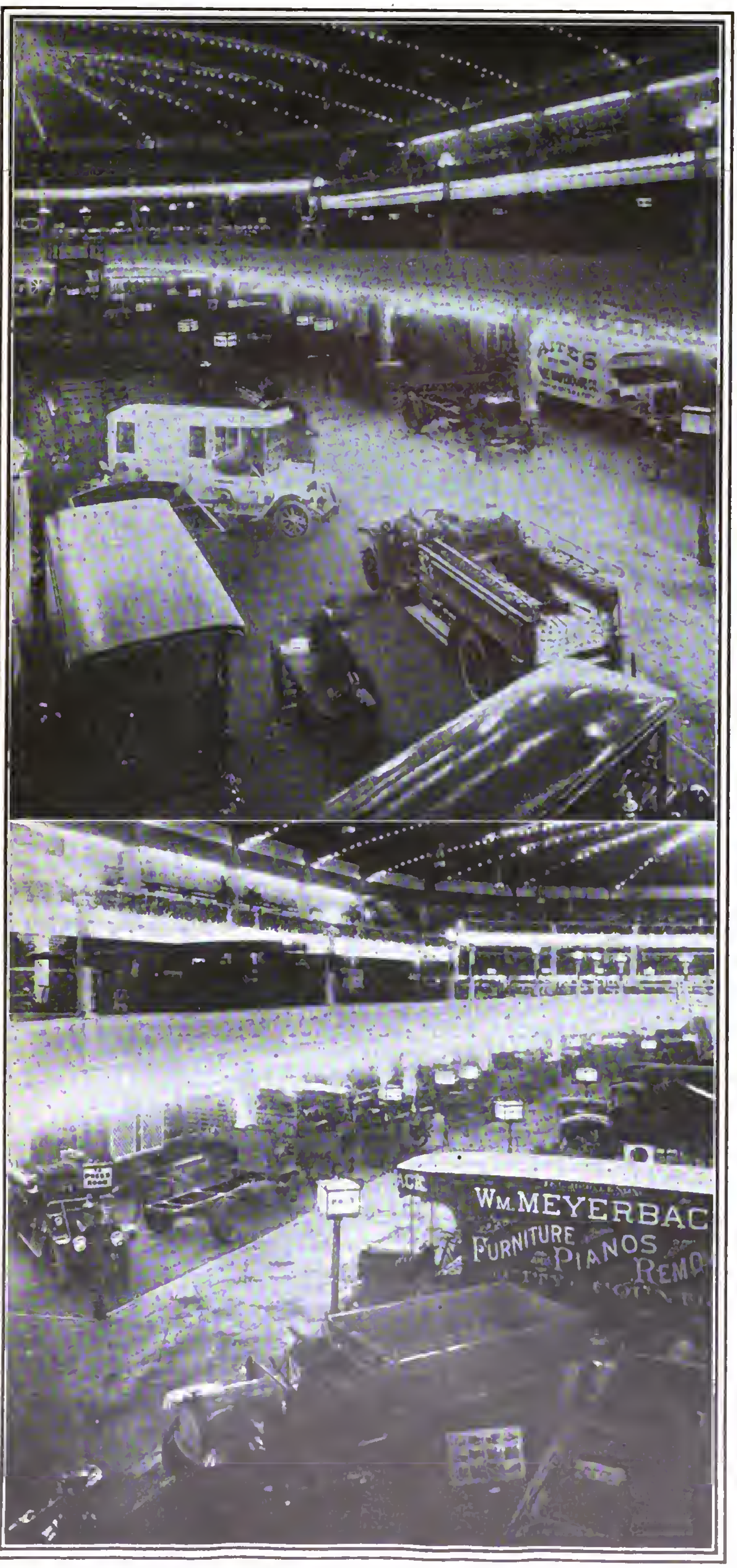
SIXTY makers of gasoline commercial vehicles and seven makers of electric vehicles comprise the truck show which is running simultaneously this week in Madison Square Garden and Grand Central Palace and constituting what history will know as Part Two of the National Automobile Show in New York City for 1913. In addition to these vehicle exhibitors are many accessories for motor trucks and also a machinery exhibit in the Garden basement by members of the National Machine Tool Builders' Association. It is the first time that such a machinery exhibit has been made at an automobile show and the interest that spectators show in the big machines manufacturing automobile parts augurs well for its continuance next season.

Since the inception of the national truck show the public has taken kindly to the exhibition partly because of the mammoth proportions of the huge freight carriers, but also because of the economic part the motor is playing in city and suburban transportation today, and the crowds on opening night gave promise of a greatly increased attendance over that of last year. The show committee has done its part to get the attendance on hand. Invitations have been sent out to all business houses rated above a certain standing within the metropolitan area and every response means a free admission to both shows. The committee can do little more than bring the business men to the Garden or Palace; it is up to the exhibitors and their selling forces to do the rest. Over 10,000 were present at the Garden on opening night.

That the truck industry has made gigantic strides during the last 12 months is apparent on every hand. The vehicles are improved; the methods of selling machines have improved, thanks to the aggression of the National Association of Automobile Manufacturers and the determination of the best makers; the old-line makers have generally increased the number of models so as to cover the entire gamut of industrial transportation; there are over a dozen new faces, and while not a few, who were present a year ago, are missing today, it is not because they have been eliminated from the field, but in some cases due to financial difficulties and in other cases to changes in policy.

The new faces in general represent a class of manufacturers building machines for light-delivery service, ostensibly of the house-to-house delivery variety, the vehicles varying in load capacity from 800 to 1,500 pounds. Some of these new faces seen at the show are Krebs, Brown, Maccar and Koehler, whereas newcomers making larger-capacity models are Hydraulic, Standard, B. A. Gramm and Studebaker.

While the advent of new concerns always adds a glamour of



Two views of New York's Motor Truck Show. Upper—Ground floor of Madison Square Garden, showing the way the trucks are arranged and giving an idea of the exhibits in the gallery. Lower—View down another aisle at the Garden

expectancy to any exhibit there is not any lack of interest with the products of the old concerns because there has been a general adding of models all along the line, and while frequently the new models are largely duplicates of the old ones, there are invariably nice points of interest by way of improved designs or original body conceptions.

Space would scarcely permit to more than suggest a few of the concerns that have added models to fill up the gaps, if the expression may be used, in the lines of last year, so that now the shrewd buyer can without difficulty equip his machines of the same make and having load capacity anywhere between 1,500 pounds and 5 or 7 tons. In this respect the truck program is directly opposite to the trend in passenger car field. A few examples will show the trend:

Packard has added a 5-ton and now has three models, 2, 3.5 and 5 ton.

The International Motors has added a 1,500-pound wagon and its line now embraces 1,500 pounds and 1, 1.5, 2, 3, 4, 5 and 7 Macks; 10-ton Hewitt, and 5 and 6.5-ton Saurer.

Knox has added a 15-20-ton tractor of the Martin-Knox type and its line includes 1.5, 2, 3, 4, 5, 6, 7 and 15-20-ton machines.

The G. M. C. has added three models 3, 3.5 and 5-ton machines to its line of 1.25 and 2-ton trucks and so now thoroughly covers the field up to 5 tons.

Lauth-Juergens has added a 5-ton model and now has 1, 2, 3 and 5-ton machines.

The Garford list of 2, 3, 5 and 6-ton machines has been increased by a 10-ton tractor which in brief is a close-coupled 6-ton truck built to carry the front end of the trailer on a fifth-wheel arrangement.

Mais has added a 3-ton model and now boasts of four models, namely, 1.5, 2, 2.5 and 3 tons capacity.

Pope-Hartford has added to its 3-ton model of last year two others, namely, 1.5 and 5 tons, giving it a wide range of load capacity.

Speedwell has added a 2-ton model to its 4 and 6-ton machines of last season.

Universal has added a worm-driven model of 1-ton capacity and now has 1, 2 and 3-ton models.

The Kissel line has another model of 1.25-ton capacity and gives a line of seven models, namely, .75, 1, 1.25, 2, 3, 4 and 5.

Sternberg has added a 7-ton model to its 1912 line of 2, 3, 4, 5 and 6-ton models.

Space will not permit to enumerate further the general broadening in the models carried; in a word, practically 90 per cent. of the makers have added new models. There are some companies who saw in advance the advantage of a wide range, and have not found it necessary to make additions. In this class are such concerns as White, Peerless, Alco. On the other hand, there are some makers who for the present are confining their efforts to a single model, such as Pierce-Arrow, Locomobile, Lippard-Stewart, Autocar, Stewart, etc.

There are not a few points of interest in the present show besides new faces, new models and new designs. Among these are the new Hydraulic truck, made without clutch or gearbox, but having instead an hydraulic pump and motor system. The gasoline engine drives an oil pump which in turn delivers the oil and drives two hydraulic motors, attached respectively to the right and left rear road wheels.

Also seen for the first time is the French Latil truck with front-wheel drive. It is in the booth of the Walter company, which concern is going to manufacture this type in America. The four-cylinder motor, clutch and gearbox are all nested between the front road wheels. The drive is by short shafts with universal joints through spur pinions into large gears on the road wheels.

Third comes the big 15-20-ton Knox-Martin tractor and also the 10-ton Garford tractor.

Reverting to the new faces at the show and the new models, perhaps the new Studebaker line of gasoline trucks, seen for the first time, is arousing as much interest as any others. This line is most complete, including 1-2, 3-4 and 5-6-ton machines, all designed on the same general lines. The trucks are conventional, using four-cylinder motors under the hood, a gearbox in unit with the motor and shaft drive to a jackshaft, which drives by inclosed spur pinion to large gears on the rear wheels. The motors are governed from the gearbox and not from the crankshaft or other motor shafts.

The Kelly line is entirely changed from last year and now consists of two four-cylinder water-cooled models with Renault type hoods, namely, radiator in rear of the motor. Both have left-hand steering with center control. The 3-ton has T-head cylinders cast in pairs; the 1-ton uses an L-type block casting. Both are shaft-driven models with the gearbox a unit with the rear axle.

The Gramm company has added a 1,500-pound wagon known as the Willys Utility wagon. It is a conventional motor-under-the-hood type using a four-cylinder motor with unit jackshaft and gearbox and with side-chain drive from the jackshaft to the rear wheels.

Reo has added a 1.5-ton four-cylinder model, made up of a motor and gearset of similar design to that used in the passenger car. Chain drive is used.

Buick is out with two new models of 1,000 and 1,500 pounds capacity. The design is a motor-under-the-hood type and uses a four-cylinder block motor, three-speed gearset and shaft drive.

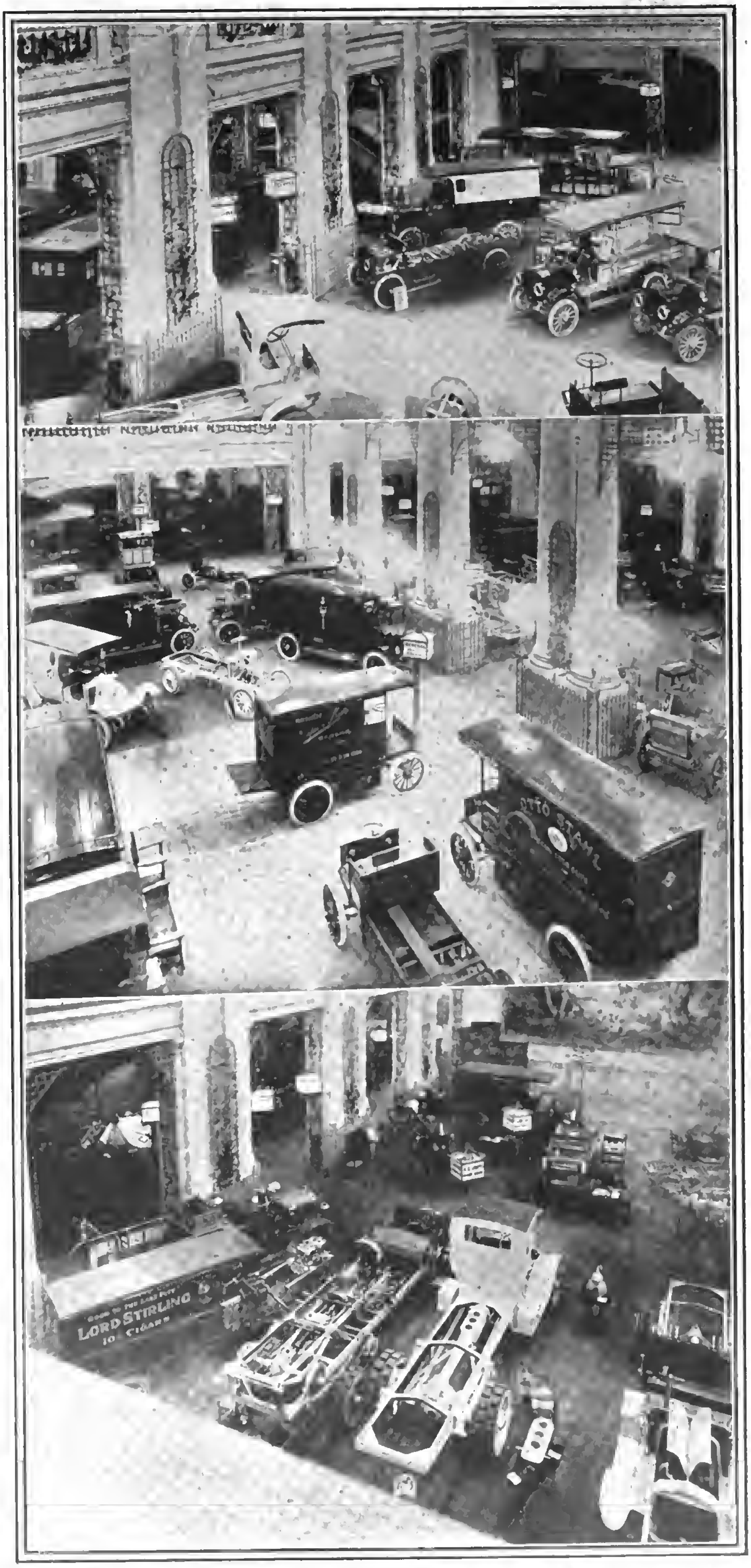
The new Brown delivery wagon of 1,500 pounds capacity has the motor under the hood, uses a block design, uses shaft drive and fits a combination stationary and live rear axle, the drive shafts of which transmit through spur gears to the road wheels.

The Krebs, a new concern, which announced two-cycle models in the early fall, is manufacturing these in 1,500 pounds and 1-ton models and has added a 1.5-ton four-cycle model built on the Renault-hood lines with the block motor accessible in front of the radiator, forms the dash. The motor has four cylinders.

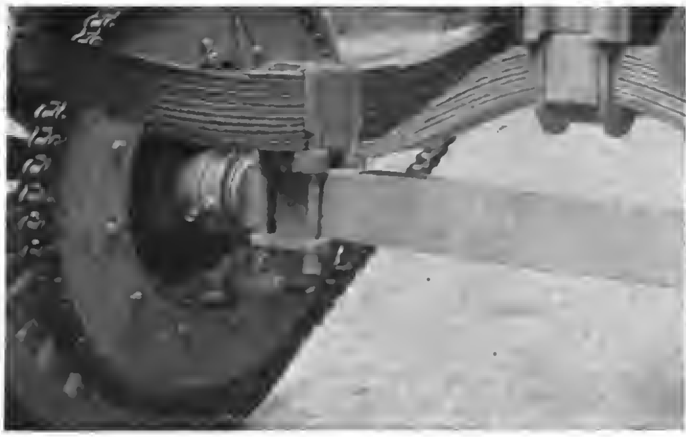
Maccar is one of the newest machines at the Palace and is the design of J. M. Mack, recently of the Mack company. It is a four-cylinder motor-under-the-hood style with gearbox in unit with the motor and shaft drive. There are two sizes, one 1,500 pounds, the other 1 ton.

The Vulcan trucks, seen for the first time at a National show and announced during the past summer, are made in 2, 3, 4, 5, 6 and 7-ton sizes. They place the four-cylinder motor under the hood, use a patented gearset which greatly simplifies gearshifting and employ chain drive.

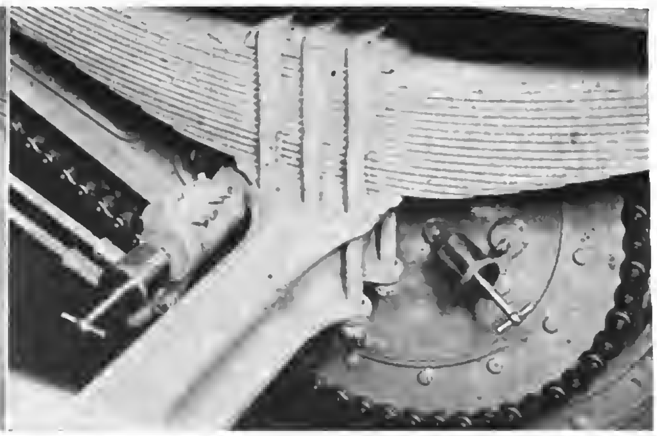
This narration of new faces and new models could be continued much longer, but



Three views of the division of the Motor Truck Show at Grand Central Palace. Top—One-quarter view of the ground floor looking toward aisle. Middle—View across central part of the main floor. Bottom—Cross-view of the back of the hall



Auxiliary spring on KisselKar which comes into play when the truck is heavily loaded



Mounting of rear springs on Kelly, showing accessible grease cups and large chain sprocket

the different types will be treated individually at a later date.

Again taking up the thread of general tendencies as exhibited by the sixty makers of gasoline machines on exhibition, it is possible to trace with fair accuracy not a few certain avenues of development, which it now appears that the truck will follow in the next few years.

Left-hand drive has gained much ground since last year's show. It is noteworthy that on the newer designs brought out by makers who have been in this field for several years or more, have left steer with center control, making for easy access on either side of the car, a small feature but nevertheless one which involves the time-saving element.

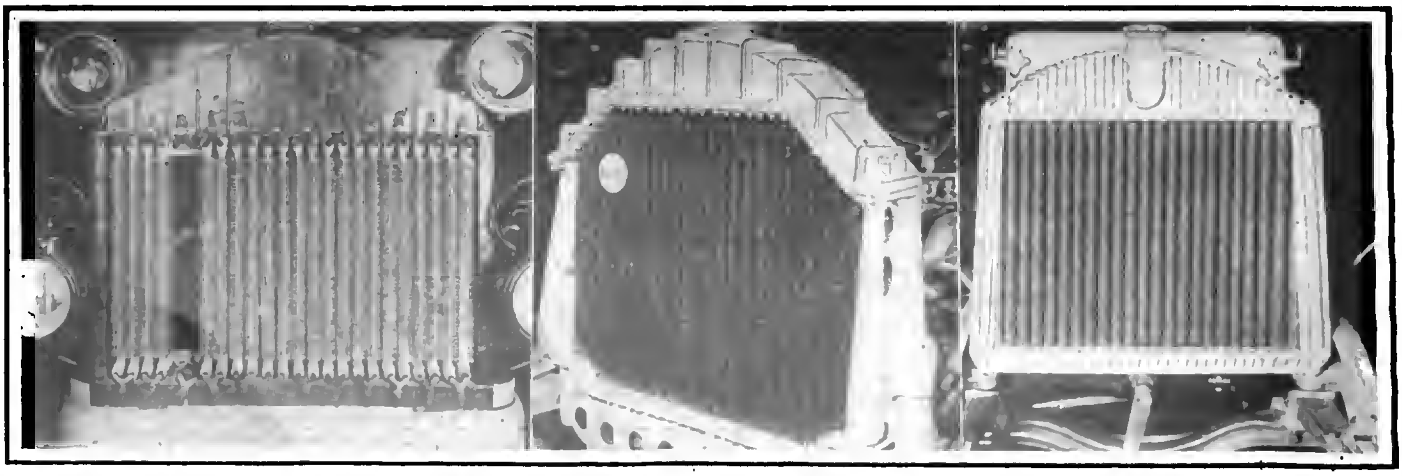
Among the new cars or new models which show this tendency toward left drive are the White 5-ton, the Kelly 1 and 3-ton machines, the Kissel 2,500-pound type, the 1.5-ton Reo, the new Mack of the same capacity, the new Universal, the Pope-Hartford new 1.5 and 5-ton creations and a number of others. On the new 5-ton Packard right drive and control are retained, these commercial vehicles being consistently opposite in driving control from their pleasure car mates, which are now all left drive.

Several machines are in evidence with hoods of the Renault type, radiators being placed at the rear of motors. Among these may be mentioned the Kelly, Walter-Latil, Lippard-Stewart, Krebs and Stewart. Two Universals, though fitted with radiators at the rear of the power plants do not use sloping hoods and should not be properly classed among the Renault types of design.

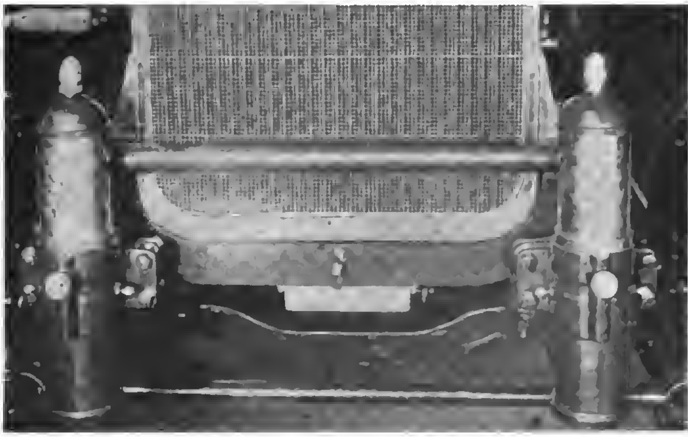
Engine starters have not gained much headway so far as commercial vehicles are concerned, their conspicuous absence on the commercial products being in striking contrast to the almost general use of some sort of cranking device on the pleasure vehicles exhibited last week. There is a general feeling among the truck makers that the starter for commercials must come if public sentiment along this line continues as it has for some time. There are a number of the exhibitors, however, who can see no use whatever for the starting device on the truck, since there is no great consideration of comfort to dictate the practice. "If the truck driver is to be set on a pedestal and humored to such an extent that he can sit back in his leather-cushioned seat and never have to crank his motor, he is too good to be a truck driver," said one exhibitor. Others advanced the argument that the increased cost to the truck buyer of putting on a starter does not pay in amount of fuel saved by shutting off the motor at each stop for the interest on the increased money invested. There are still others who do not believe there is any saving at all in stopping the gasoline motor every time a short stop is made as in package delivery service. The amount of fuel needed for starting is greater than would be that used were the engine throttled to low speed and left to run at these stops. The Krebs and the Schacht are the makes conspicuous for the use of starting devices this year.

The relative positions of the various methods of power transmission to the rear wheels remains about the same as last year. There are eleven makes which have shaft drive, that is, Studebaker, Mais, Buick, Lippard-Stewart, Brown, Maccar, Rowe (optional), Hupmobile, Autocar and smaller White models. Save for the five makes which have worm drive the remainder of the fifty-nine have jackshaft and side chains. In most instances the shaft driving through bevel gears is confined to cars of lighter capacity, the larger trucks quite generally adhering to the jackshaft construction, as heretofore.

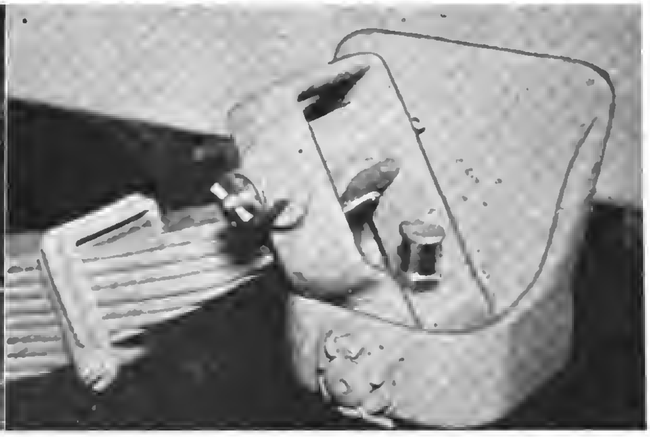
Worm drive holds its own. The Pierce models, which are exclusively 5-ton designs, have practically the same worm-drive



Three types of demountable radiator construction for truck work. Left to right—Reo, Kissel and Universal



Showing the Westinghouse shock-absorber at the front of one of the Walter models



Kelly substantial spring shackle which is provided with grease cups at both bearing points

constructional details as formerly. The new Universal 1-ton appears as a worm-driven type; four of the Blair models are so designed; two A. O. Smiths continue to carry their characteristic features; the Rowe models may be optionally supplied with worm propulsion. Most of these worms are of the overhead type, which, though open to the criticism that their oiling is somewhat less effective than that of the underneath worm design, nevertheless reduce the driveshaft angle and increase the road clearance. Schacht and Krebs are worm-driven types.

Chain covers are still somewhat in vogue, although not favored by a number of makers. The Knox and the Locomobile are examples of clean, substantial and easily removable types.

Several designs of sectional radiators have appeared. Among these are the new Reo, Kissel, the Vulcan and the Universal. The latter two employ types with separate tops, and while this is also true of the Reo, it makes use of separate tubes as well. These sections are mounted vertically, one crow's-foot clamps holding each two tubes at top and bottom.

It is a noticeable fact that the majority of the makers are equipping their cars with sealed governors, which are regulated to maximum speeds dependent upon the truck capacity as recommended by the N. A. A. M. It has been found that most makers favor these recommendations. The N. A. A. M. standard warranty plate is also much in evidence. This relates to load capacity, body weight and speed.

The National Association's recommendation that the mechanism of the truck be so arranged as not to come above the level of the frame members also appears to have been fruitful, for several makers who last year had brake rods, equalizer rods, cross pieces and grease cups above the frame level, have put them below. The object of this is so that any type of body may be accommodated.

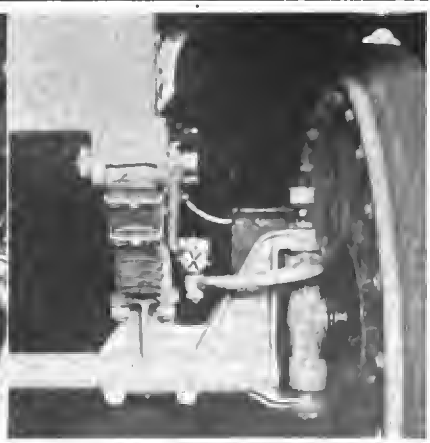
Supplementary springs are much more prominent for larger sizes of trucks than they were last year. These take several forms, the predominating designs being either cross types, which come into play only when the frame is considerably compressed, or coiled varieties fastened on the rear axle. A number of cars are fitted with rubber bumpers, which are also attached to the axles.

Steel wheels do not appear to be making much headway, only a few makes exhibiting machines so equipped. This seems rather unaccountable inasmuch as the steel wheel is somewhat lighter than the wood type of the same carrying capacity. There seems to be a general impression, however, that the metal wheel tends to greater vibration and has less shock absorbing qualities. The Locomobile trucks appear with steel wheels, as do the A. O. Smith and the Grand Rapids makes. White is exhibiting several models so equipped as well as those with wood wheels.

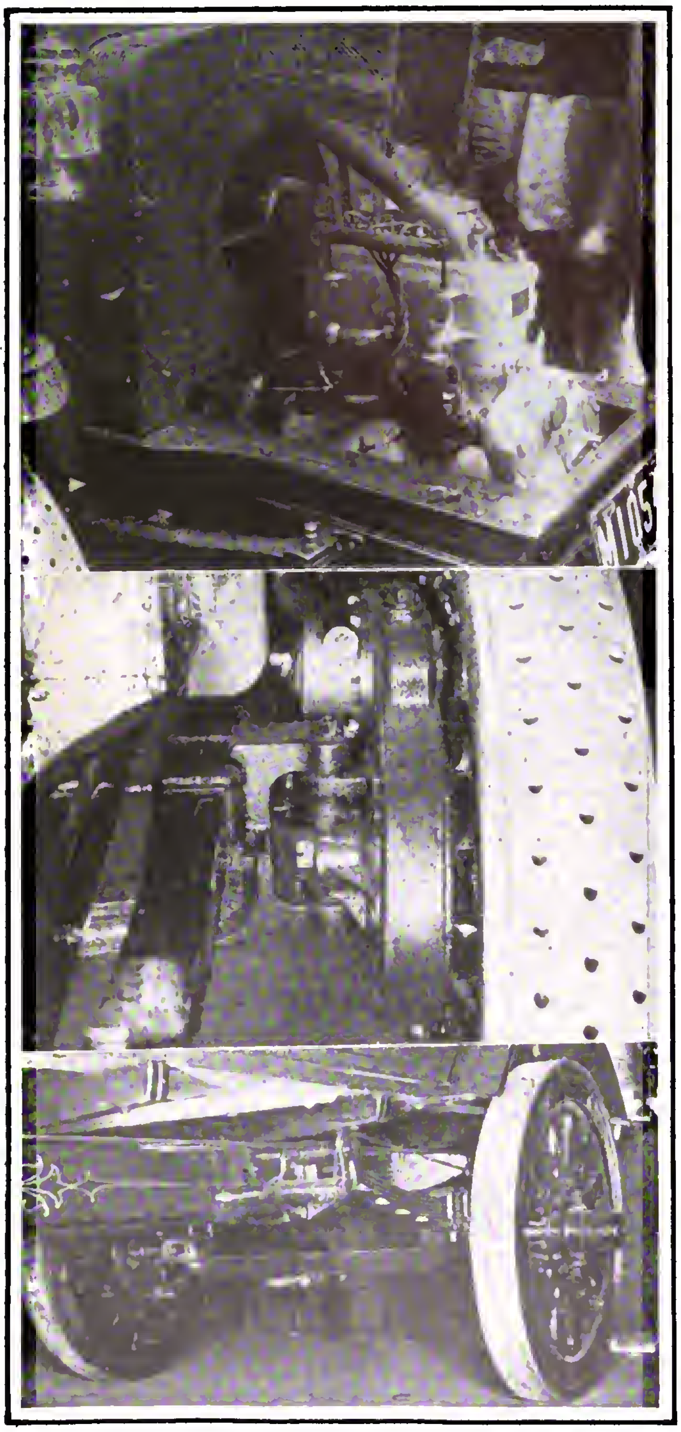
Speaking from the standpoint of cars on view the motor-under-the-hood type of design is favored as compared with the type which places the power plant under the seat. Four makers show designs of both varieties, while there are eleven of the under-seat construction and twenty-seven having the drivers position back of the motor. Notable adherents to the latter position are the Packard, Pierce-Arrow, Peerless, White, Saurer, Kissel, Selden, Velie, Atterbury, Studebaker, Smith, Service, Stegeman and a number of others. Garford, Alco, Pope-Hartford, Buick, Locomobile, Speedwell, Lauth-Juergens, Steinberg, Blair and Sanford makes use the motor under-seat design. General Motors, Knox, Mack and Universal will furnish machines of either type.

Protection for the driver has not been overlooked this year. Many cars are equipped with well-designed cabs, some completely inclosed, some with stationary tops and others with fold-

Two views of Lauth-Juergens auxiliary conically wound springs.



Reo front axle, showing integral yoke and spring seat ing tops. Windshields for these machines have not been lost sight of and take several forms. In the Garford models the glass front is hinged to the top of the cab and may be swung up and fastened out of the way when desired. Other types may be quickly removed or folded sectionally. A good arrangement for seats is shown in the Knox cab, there being a partition or arm between that portion of the seat allotted to the driver and the remainder of it which is intended for his helpers. Such a seat makes it impossible for the driver's quarters to be crowded by other occupants of the seat, and is a safety feature in that it gives the driver plenty of room for manipulation of his pedals and levers.



The Latil motor mounted in the front drive car of this name which is exhibited by the Walter Company. The design is to be manufactured by Walter under royalty. It is a French product. The radiator is mounted at the rear with the fan at its center. The center view shows the housing for the driving gears, and the shaft connection from the differential under the motor. The wheel gear bolts to the front wheel. Gears are of the spur type. Lower view—Clean-cut appearance of the underneath part of the Latil truck. Note the use of steel-tired wheels at the rear. This is a foreign tendency

Dumping bodies are also very much in evidence, a number of the foremost makers exhibiting them. These appear either as power-operated types or for hand manipulation. Noticeable among the power-operated type are the Packard, Alco, Locomobile, G. M. C., Mack, White, Pierce and Peerless, while Speedwell, Kissel, Universal, Garford and Knox favor the hand-operated body judging from their exhibits.

The A. O. Smith Company has discontinued its 3-ton chassis brought out last spring and now builds 3.5 and 6-ton models, both identical in design with their predecessor and characterized by worm-driven rear axle and a gearbox in which herringbone gears take the place of spur types and in which individual clutches are used for speed changes. The entire set of gears attaches to the cover of the gearbox, giving a readily-removable arrangement. This is one of the few companies to use steel wheels, other concerns using them being White and Locomobile. The company offers an option in wheelbases, a practise followed by a majority of the truck makers, due to the bulk of different commodities. Coal and sand call for a much shorter wheelbase than furniture. The standard wheelbase on the 3.5-ton model is 168 inches and the options are 144 and 190 inches. On the 6-ton vehicle the same measurements are used.

The question of most satisfactory wheelbases is a difficult one to solve and so not a few makers give a standard and announce maximum and minimum measurements and give any desired lengths between these extremes. In truck designs like the White, new Studebaker, etc., the different capacity bodies can be accommodated by cutting off the overhang of the frame side members. In other trucks the alteration calls for longer side members. Lauth-Juergens, on its four models, gives a standard length on each with options of 10 inches under or over this standard. For its 1, 2, 3 and 5-ton trucks the standard wheelbases measure 110, 120, 120 and 140 inches respectively.

On the 3-4 and 5-6-ton Studebakers the standard wheelbase measurement is 144 inches. The Durable-Dayton gives wheelbase options ranging from 16 to 20 inches above standard. On light delivery wagons, such as the Stewart and others in its class, it is customary not to give any wheelbase option, as the body fitted has generally capacity adequate for the different industries in which it may operate.

The majority of manufacturers have been giving careful attention to the distribution of useful load weight over rear and front wheels. These ratios vary considerably depending on whether the truck is a motor-under-the-hood type or one of the motor-under-seat type. In the motor-under-the-hood design generally 75 or 80 per cent. of the useful load is supported by the rear wheels and from 20 to 25 per cent. over the front wheels. On the other hand, where the motor is mounted under the seats, or between the seats, there is not so much overhang and the load distribution varies to 35 per cent. on front and 65 per cent. in rear. Makers are now fitting tires and springs to meet the conditions that the truck design imposes.

Makers are more conservative than ever before in the speed rating of their different machines and gear ratios between the motor and rear wheels are not only suited to the demands of the industry in which the truck operates, but also to the topography of the city or country in which it works. One maker listing four truck models gives different speds for different cities as follows and then again varies these in each city according to the nature of the work:

Truck capacity	Chicago M.P.H.	Cincinnati M.P.H.	Pittsburgh M.P.H.
1.5 tons	15	14	12
2.5 tons	14	13	11
3.5 tons	13	12	10
5 tons	12	11	8

When the entire truck industry is taken into consideration it is seen that the makers are yet far from having agreed upon any definite speed for different capacities. This is largely due to differences in design.

High Cost of Fuel Arouses Consumers

Concerted Action Contemplated in Manhattan To Cope With the Present Soaring Price of Gasoline

Statement Issued by Oil Refiners Defending Demands—New York Garage Association to Act

NEW YORK automobilists and garage owners are up in arms over the threatened increase in price of gasoline. It is probable that a campaign against the rise will be instituted when the New York Garage Association holds its annual dinner on January 28. At this dinner the proprietors of the large garages of the country will be present and ways and means for coping with the situation will be discussed. Many private citizens have signified their intention to co-operate with the garage men in the movement.

The present price of fuel in this city, Boston and other large centers is 22 cents a gallon retail for quantities less than 5 gallons, and 20 cents a gallon in amounts between 5 and 25 gallons. For quantities above 25 gallons, the wholesale figure of 17 cents prevails. This brings the price which the garage man asks somewhere in the neighborhood of 25 cents a gallon.

In a statement issued yesterday by Collins, Armstrong & Co. based on data compiled by Texas Company, the price of gasoline is discussed as follows:

"The advance in price of gasoline has brought up a great many times the question as to the reasons for it and the future supply. This question is being continually asked by motor owners, garage men, manufacturers and others interested in the motor business. It is, consequently, advisable that all salesmen should study the following items which show the conditions which pertain at the present times in respect to the motor fuel business.

"The total production of crude oil in the year 1911 was 220,000,000 barrels.

"The total production in the year 1912, as far as this can be gathered from reports at the present, will be somewhat less.

"The total production for the year 1910 was approximately 200,000,000 barrels.

"Only a certain proportion of this supply produces any commercial quantity of gasoline. The gasoline producing crudes in 1910 figured 126,000,000 barrels; in 1911, 127,000,000, and in 1912, 124,000,000 approximately.

"In 1910 there were 300,000 cars in service; in 1911, 550,000; in 1912 nearly 900,000, and it is expected that 1913 will bring this up to 1,400,000.

"In addition to the cars, there were in service in 1912 35,000 motor trucks, 75,000 motor cycles and 100,000 motor boats.

"These figures do not include the enormous number of stationary gasoline engines of small size for farm and country use which have been put in the market in the last two or three years.

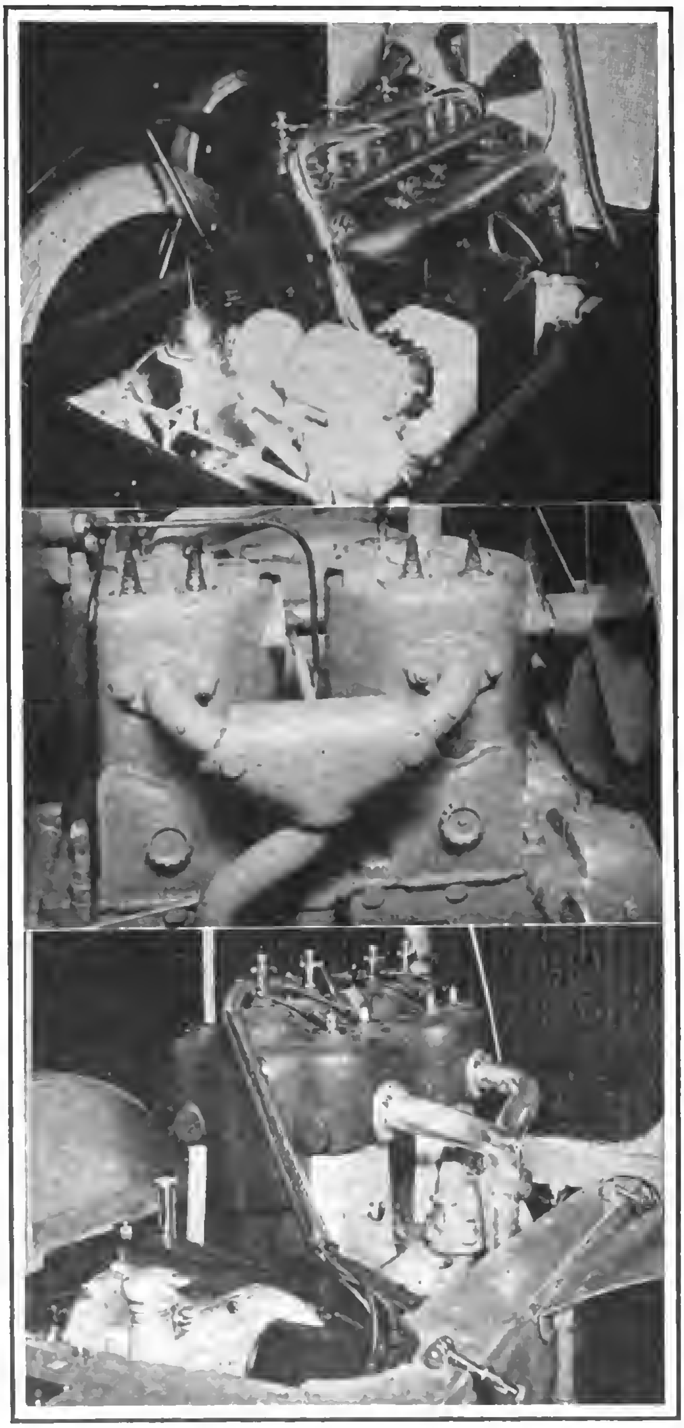
"In other words, the supply of gasoline is fixed or slightly declining, while the demand for the same is increasing with great rapidity. As a consequence of this, gasoline is increasing in value. Even at the increased price, however, the cost of gasoline is only a very small part of the cost of operating a car.

"Suppose a car runs 5,000 miles in the year and uses 500 gallons of gasoline, an increase of 5 cents per gallon would only mean $25 for the year. A small increase in the price of the tire or some of the other items which enter into the running of a car would mount up to a very much larger sum in the total operation of the year.

"Further, it might be advisable to note that the price of rubber, on account of the extensive use in the motor industry, has advanced enormously in the last few years, and there is no reason for the advance of rubber which does not apply to the advance of gasoline.

"In the production of gasoline for the market, it is necessary to drill deep wells with the certainty that at least seven out of ten of the wells which are drilled will yield nothing and be a dead loss.

"Then it must be pumped out of the well, gathered into expensive tankage, shipped through hundreds of miles of pipe lines, with expensive pumping stations every fifty or sixty miles; put through the refinery, distilled, cleaned, deodorized; shipped by tank car, tank steamer, etc., to distributing terminals, where again it must be stored in expensive tankage, rehandled, put in drums for wagon delivery or reshipped to smaller distributing stations; again tanked, rehandled and delivered by tank wagon—and for all these operations we cannot secure but a few cents a gallon more than the man does for the water, without a great deal of grumbling on the part of the consumer."



Top—View of the motor and electrical equipment of one of the new Krebs trucks. Middle—The Studebaker engine design. This motor is water cooled and the cylinders are compactly cast in pairs. Note the peculiar manifold construction. The valve springs and rods are inclosed by the easily removable covered plates provided with hand screws. Bottom—Power plant of the Kelly commercial car, showing the T-head motor construction with inclosed valves. The rear support of the motor is arched and the crankcase is slung beneath it. The wiring is carried in a tube which passes along the top of the cylinders to the back of the motor as shown

Columbus Buggy Receiver

Daniel McLarin Named—Valentine & Co. Allege Assets of $1,000,000 and Liabilities Approximating $600,000

Has Preferred Stock to the Amount of $1,300,000 and Common Stock to the Amount of $300,000

COLUMBUS, O., Jan. 20—Upon application of Valentine & Company, dealers in oils and varnishes, New York, Daniel McLarin was named receiver for the Columbus Buggy Company, of Columbus, by Judge Slater in the United States Court January 18. Mr. McLarin took charge of the large plant of the concern, located on Dublin avenue, almost immediately and announced that no let-up in operations would take place. In the petition Valentine & Company allege assets of $1,100,000 and liabilities approximating $600,000.

The Columbus Buggy Company was a reorganization of a concern of the same name which has operated a carriage factory in the Buckeye Capital for more than a quarter of a century. C. D. Firestone is president; C. E. Firestone, secretary; J. F. Firestone, vice-president, and O. H. Perry, treasurer. It has preferred stock to the amount of $1,300,000 and common stock to the amount of $300,000.

It is alleged that many of the debts of the company are overdue and threats of litigation have seriously impaired the credit of the concern. This, it is alleged, has endangered the creditors' claims and a receiver was believed necessary. It is stated that vehicles, both horse-drawn and automobiles, to the number of 100 are being built and contracted for which will amount to about $1,250,000. Stockholders are expecting a reorganization.

Automobile Securities Quotations

The week brought few developments in the automobile stocks traded at the Exchange. The most noteworthy change was the advance made by Consolidated Rubber, both common and preferred rising 5 points. Miller, Goodyear and Rubber Goods Manufacturing were likewise strong. Alco and Lozier closed slightly below last week's figures.

	1912 Bid	1912 Asked	1913 Bid	1913 Asked
Ajax-Grieb Rubber Co., com	..	..	180	200
Ajax-Grieb Rubber Co., pfd	..	..	95	101
Aluminum Castings Co., pfd	..	..	98	101
American Locomotive Co., com	34	35	38¼	39
American Locomotive Co., pfd	103	103½	103	105
Chalmers Motor Company	..	..	130	145
Consolidated Rubber Tire Co., com	5	12	19	21
Consolidated Rubber Tire Co. Co., pfd	10	25	70	75
Firestone Tire & Rubber Co., com	178	185	334	338
Firestone Tire & Rubber Co., pfd	108	110	105	107
Garford Company, preferred	..	..	100	102
General Motors Company, com	34½	35½	33	34
General Motors Company, pfd	74½	75½	76	78
B. F. Goodrich Company, com	..	..	62½	63¼
B. F. Goodrich Company, pfd	..	..	104	105
Goodyear Tire & Rubber Co., com	250	260	448	452
Goodyear Tire & Rubber Co., pfd	104	106½	104	105
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	5	10
International Motor Co., pfd	..	..	40	60
Lozier Motor Company	..	..	..	33
Miller Rubber Company	..	..	170	175
Packard Motor Company, pfd	104	107	103	105
Peerless Motor Company	..	..	120	125
Pope Manufacturing Co., com	40	44	33	35
Pope Manufacturing Co., pfd	67	70	78	80
Reo Motor Truck Company	8	10	10	11
Reo Motor Car Company	23	25	20¼	21
Studebaker Company, common	..	..	33	35
Studebaker Company, preferred	..	..	92	95
Swinehart Tire Company	..	..	110	112
Rubber Goods Mfg. Company, pfd	100	100	104	108
U. S. Motor Company, com	..	..	..	..
U. S. Motor Company, pfd	..	..	..	..
White Company, preferred	..	..	105	108
Willys-Overland Company, com	..	..	72	73
Willys-Overland Company, pfd	..	..	98	99

Michigan Magneto Company Bankrupt

DETROIT, MICH., Jan. 20—The Michigan Magneto Company, 117 Bagley avenue, has filed a voluntary petition in bankruptcy in the United States District Court at Detroit. Upon petition of the Stackpole Battery Company, of Pittsburgh, Pa., Judge Arthur J. Tuttle has appointed Charles C. Simons receiver with orders to sell the property of the company January 30 at 10 o'clock in the morning. Simons' bond as receiver has been fixed at $5,000.

In its petition to be declared bankrupt the company set up that it owes debts which it is unable to pay in full and that it is willing to surrender such property as is not exempt under the bankruptcy laws for the benefit of its creditors. Its debts include $44.73 as taxes due the city of Detroit, and $135.17 as wages due employes. The liabilities are given as $31,050.26 and the assets as $28,415.85.

In the list of unsecured creditors appears the name of the J. S. Bretz Company, of New York, $5,027.25 (notes) and the Reo Motor Car Company, of Lansing, Mich., $800 (notes). In the schedule of assets, the company lists machinery, office fixtures, dies, etc., the petition stating that the figures given in the schedule were the cost prices, that the machinery has been used a long time, that the merchandise is special material of no market value, as also are the patterns and dies. Certain of the machinery, the company sets up, is owned on title contracts on which a balance is yet unpaid. The company declares that outside of the list of assets given there are assets totaling $7,902.05, of which the greater portion is doubtful or uncollectable.

To Organize New Tire Company

AKRON, O., Jan. 18—What is to be known as the Mohawk Rubber Company, with a capitalization of $350,000 is to be organized in a few days. Of this amount $250,000 will be common stock and $100,000 7 per cent. cumulative preferred stock. Organizers of the new company are: R. M. Pillmore, J. K. Williams and S. S. Miller.

The new company will purchase the real estate, buildings, machinery and plant of the Stein Double Cushion Tire Company, located in East Akron, which consist of about 2.5 acres of land, a factory, switching facilities, etc., having a capacity of from 75 to 100 tires per day. This plant can be put in condition within 60 days to produce a daily output of from 75 to 100 automobile tires.

For this property the new company will pay the Stein Double Cushion Tire Company the sum of $7,500, three-fourths of which amount is to be paid in the stock of the new company at par and one-fourth cash.

Findlay Factory Sold for $50,000

FINDLAY, O., Jan. 18—The Findlay Motor Company plant was sold Thursday to J. G. Cleary, of Milwaukee, Wis., for $50,000. The sale was made under orders from the United States Court at Toledo, and sold for just the price the court stated should be the lowest bid that could be accepted. The company was promoted by L. E. Ewing, of Cleveland, who secured $100,000 of local capital. The company has been in the hands of John M. Barr, as receiver, since September 19, 1911.

It is the intention of Mr. Cleary to dismantle the plant and remove the machinery to Milwaukee, Wis., where it will be used in other industries.

Day Company Elects Officers

DETROIT, MICH., Jan. 18—At the annual meeting of the Day Automobile Company the following officers were elected: President, Thomas W. Day; director and factory manager, A. W. A. Bartlett; secretary, William S. Power; treasurer, John E. Murphy; director, William J. Emery.

Stewart-Warner Preferred Issued

The Stewart-Warner Speedometer Corporation which was recently formed by the combination of the Stewart and Clark Manufacturing Company and the Warner Instrument Company and which has a total capitalization of $11,000,000, has decided to offer $1,000,000 preferred stock to the public through White, Weld & Company, New York, Chicago and Boston brokers. The remaining $10,000,000 is common stock and is not being issued for the present, but it is very probable that the spring will see an offering to the public of the common stock as well.

The stock offered is a 7 per cent. preferred and the dividend is payable quarterly, on the first days of February, May, August and November, respectively. Three years after issue the stock which is offered at par is redeemable as a whole or in part at 110 and accrued dividend. In connection with the announcement of the stock, J. K. Stewart, president of the corporation, gave out a statement of the business done by the now affiliated companies during the past 4 years. The earnings of both companies aggregated $3,200,000 for this time, the net earnings for the fiscal year ending October 31, 1912 being $925,000. The annual dividend of both companies combined amounted to $70,000.

Easier Tone in the Rubber Market

The easier tone which developed in the world's leading crude rubber markets on Monday was still in evidence yesterday, and the reactionary tendency made further progress on both sides of the water. The demand from manufacturers at home and abroad failed to show any expansion, and, with prices weakening, consumers, it is contended, will be averse to purchasing in any other than a hand-to-mouth fashion. In London the trend of prices was downward throughout the session, though in the absence of any marked pressure to sell the net change in quotations was comparatively small. Aside from the easier tone which prevailed, the situation here underwent no change, the price remaining at $1.06 a pound.

Peerless Declares Stock Dividend

A substantial stock dividend, payable out of the surplus in the common stock of the company, has been declared by directors of the Peerless Motor Car Company, Cleveland, O. This action follows the announcement of an increase in capital stock which enables the Peerless company to provide for the rapid extension of the business.

The company starts the new year with a paid-in capital stock of $4,200,000 and assets, after deducting all liabilities of every kind, of between $5,000,000 and $6,000,000, exclusive of patents, trade marks and good will.

Michigan Company Changes Name

The name of the Michigan Automobile Company, Ltd., Kalamazoo, Mich., has been changed to Fuller & Sons Manufacturing Company. This change was desirable on account of the confusion existing due to the recent incorporation of the Michigan Motor Car Company of the same city which is owned by the Michigan Buggy Company.

F. D. Fuller retains the presidency of the new company, which position he has held ever since the Michigan Automobile Company was incorporated 10 years ago. L. C. Fuller is secretary and treasurer, while W. P. Fuller is sales manager. The capital stock of the concern is $100,000.

DETROIT, MICH., Jan. 20—Fire of unknown origin January 17 destroyed the brass and aluminum foundry of the Buick company, at Flint, with a loss estimated at $50,000. The foundry will be rebuilt at once and only a few men will be laid off temporarily. The loss of the foundry will not hamper the Buick plant to any extent as enough castings are on hand to run the plant until arrangements can be made for getting more.

Buy Grabowsky Property

Stockholders of Seitz Automobile Transmission Company Purchase Everything Except Buildings and Machinery

Will Begin Operations in Separate Plant at Wyandotte, Mich.—Samuel Winternitz & Company Buy Assets

DETROIT, MICH., Jan. 20—Stockholders of the Seitz Automobile Transmission Company, Wyandotte, Mich., have purchased the property of the bankrupt Grabowsky Power Wagon Company, of Detroit, with the exception of the buildings and machinery, and began operations in a separate plant at Wyandotte, January 20. The Wyandotte plant is to manufacture the Grabowsky truck. The Seitz company officers are to resign and the company is to be reorganized to become successor to the Grabowsky company.

For the present George A. Horner, who has been manager of the Grabowsky Detroit plant for the creditors, will be general manager of the Grabowsky plant at Wyandotte, in which the Grabowsky trucks will be manufactured.

The sale of the assets to the Seitz stockholders was made by Referee Lee Joslyn, of the bankruptcy department of the United States court at Detroit and the sale has been confirmed. The assets not covered in the Seitz transaction were purchased by Samuel Winternitz & Company, of Chicago.

SYRACUSE, N. Y., Jan. 18—The United States Tire Company has selected this city as the home of one of its sub-branches. It is at 696 S. Salina street and George A. Fish, heretofore connected with the Hartford branch, is in charge.

Market Changes for the Week

The gradual decline in price of tin was the most important market change of the week; starting at $51.10 on Wednesday and falling to $50.25 yesterday, a loss of $.85. Raw silk from Italy and Japan suffered and gained respectively, that from Italy $.05, and from Japan $.02 1-2. Domestic scrap rubber remained in a steady position throughout the week, collections still reported to be light and stocks are apparently small. A moderate inquiry is being received from domestic reclaimers and fairly large shipments are being made abroad.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony per lb.	.08¼	.08¼	.08¼	.08¼	.08¼	.08¼	....
Beams & Channels, per 100 lbs.	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, Pittsburgh, ton	28.50	28.50	28.50	28.50	28.50	28.50	....
Copper Elec., per lb.	.16⅛	.16 3/10	.16 3/10	.17 3/10	.16⅛	.16	—.00⅛
Copper Lake, per lb.	.16½	.16½	.16½	.16½	.16¼	.16¼	—.00¼
Cottonseed Oil, Jan., per bbl.	6.15	6.12	6.12	6.26	6.24	6.26	+.11
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	......
Fish Oil (Menhaden) Brown	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 lbs. @	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime	.90	.90	.90	.90	.90	.90	....
Lead, 100 lbs.	4.30	4.30	4.30	4.30	4.30	4.30	....
Linseed Oil, prime	.47	.47	.47	.47	.47	.47	....
Open-Hearth Steel, per ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Petroleum, bbl., Kansas crude	.83	.83	.83	.83	.83	.83	....
Petroleum, bbl., Pa. crude	2.05	2.05	2.05	2.05	2.05	2.05	....
Rapeseed Oil, Refined	.68	.68	.68	.68	.68	.68	....
Silk Raw, Italy	....	4.35	....	....	4.35	4.30	—.05
Silk, Raw, Japan	....	37½	....	....	3.72½	3.75	+.02½
Sulphuric Acid, 60 Beaumé	.90	.90	.90	.90	.90	.90	....
Tin, per 100 lb.	51.10	50.88	50.80	50.75	50.63	50.25	—.85
Tire Scrap	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	....

Complaint Discussed in Rose Patent Suit

Court Rules Design Patents on Which Infringement Was Charged Are Both Invalid

Batavia Tire Serves Notice of Infringement—Receivership for Searchlight—Petition Against Randolph

A DECISION rendered in the United States District Court for the District of New Jersey by Judge Cross in the suit of the Rose Manufacturing Company vs. the E. A. Whitehouse Manufacturing Company and the Le Compte Manufacturing Company dismissed the bill of complaint with costs. The bill alleged infringement of the Rosenbluth and Hughes patents owned by the Rose company by the defendants. The decision:

"There are four patents involved in this suit, two of which are mechanical patents and two design patents. The bill of complaint alleges that they are all owned by the complainant and have all been infringed by the defendants. The defendants not only deny this, but deny their validity. The mechanical patents are Nos. 883,973, issued April 7, 1908, to one E. M. Rosenbluth, for a lamp bracket, and No. 962,220, issued June 21, 1910, to one W. B. Hughes, for a number-plate support for vehicles. The design patents were both issued to E. M. Rosenbluth May 16, 1911, for vehicle number-plate supports and another, respectively, 41,388 and 41,389 * * *

"In behalf of the defendants, it is strenuously argued that this patent is invalid for various reasons, but especially in view of the prior art. It is quite apparent that if it discloses invention, it is of a low order. Briefly stated, the device consists of a bracket, comprising a base, by which it may be affixed to an automobile or other vehicle, and two arms, one of which carried a number plate or sign and the other a lamp, whereby the plate or sign may be illuminated when desired. These arms are made relatively adjustable with each other. * * *

"It is hard to understand why a problem of that character should have proved knotty, if it did, in the first instance; but, however, that may have been, all difficulty was resolved, when Rosenbluth undertook its solution, by the teachings of the prior art which showed similar devices of various kinds; for instance, a bracket attached to a bed, one arm of which carried a table and the other a lamp which illuminated the table. * * *

"The idea embodied in the patent under consideration, taken by itself, is of the simplest character and of questionable patent ability, but when in addition to that fact the prior art, in analogous matters, is considered, it becomes manifest that the attempt further to dilute this simple idea and then protect it by means of a patent, should not be fostered. Rosenbluth, giving him the utmost credit to which he is entitled, merely what was simple and old and common-place in analogous arts and applied it to a new use. Everything that he did had already been done in substantially the same way, although the device had not been applied to an automobile. * * *

"The patent to Hughes, claims 5 and 6 of which are in controversy, shows no patentable advance upon Rosenbluth, hence whether that patent were valid or invalid, the one to Hughes could not be upheld. Rosenbluth's patent of itself would defeat it. * * *

"The design patents are both invalid. The statute authorizes the issue of such a patent under certain conditions, to 'any person who has invented any new, original and ornamental design for an article of manufacture.'"

Batavia Serves Infringement Notices

The following notification was served by the Batavia Rubber Company, Batavia, N. Y., through its attorneys, Holmes, Rogers and Carpenter, on the Seamless Rubber Company, New York City; the Kelley-Racine Rubber Company, Racine, Wis.; United & Globe Rubber Manufacturing Companies, Trenton, N. J.; Stein Laplock Tire Company, New York City; C. H. Stoddard Rubber Tire Works, Rochester, Mass.:

"You are hereby notified that you are infringing upon the rights of the Batavia Rubber Company in the making of a non-skid tire which is so close an imitation of the 'Security' non-skid tire, which has been made by the Batavia Rubber Company for many years, as to deceive purchasers seeking Batavia tires, and you will be held accountable by suits at law for any damages.

"We will wait a reasonable time for your notification that you will cease further infringement."

Friendly Receivership for Searchlight

CHICAGO, ILL., Jan. 20—Friendly receivership has been adopted as a means of complete reorganization by the Searchlight Gas Company, Warren, O., whose general offices are in Chicago. At the petition of the Continental and Commercial National Bank of Chicago, Horace B. Pearson was appointed receiver by United States Judge William L. Day. The bank appraises the liabilities of the company at $200,000, a part of which is in notes due, and assets to the amount of $400,000, not all of which is available for immediate conversion into cash.

The present financial condition is not one of insolvency, but of temporary embarrassment, and is attributed by the receiver to the service expansion that has been carried on by the concern in such volume as to exceed the adequacy of the capital of the company. As the maintenance of service stations is one of the principal essentials of the business, this expansion is regarded as indispensable to the welfare of the business, it is thought that a general rehabilitation of the financial condition of the company will be beneficial. The receiver will continue active business.

Petition Filed Against Randolph Company

CHICAGO, ILL., Jan. 20—Proceedings in involuntary bankruptcy have been instigated, involving the Randolph Motor Car Company, Chicago, and Flint, Mich., a corporation of Delaware. The petition was filed January 3 by the Mercantile Printing Company, Charles Cramer, C. Klare, and one Robyn, the last three commission salesmen; it was recorded January 8. The Central Trust Company, of Chicago, was appointed receiver for the district of Illinois and southern Michigan.

Knox Company to Reorganize

SPRINGFIELD, MASS.—(*Special Telegram*)—The Knox Automobile Company of this city, which has been operating under a trusteeship for the past 4 months, due to technicalities caused by the death of the late A. N. Mayo, treasurer of the company, is at present on the eve of reorganization with increased capital, and when such is completed will be known as the Knox Motor Car Company. Sufficient new capital is already subscribed to make it possible for the concern to largely increase its output and to further facilitate this the number of passenger car models will be reduced and their output proportionately increased.

In order to achieve the formation of the Knox Motor Car Company it will be necessary to undergo formal bankruptcy proceedings, during which, however, it will not be necessary to cease manufacturing operations.

Chain Grip Injunctions Granted

On January 17 the United States District Court, Southern District of New York, issued an order enjoining the W. E. Pruden Hardware Company, of New York City, from selling unlicensed cross chains, cross chain hooks, side chains, side chain hooks and other parts adapted and intended for use in the manufacture and repair of tire chain grips. The suit had been brought by the Wood Chain Tire Grip Company, New York City, under the Parsons patent No. 723,299.

Judge Lacombe, of the above-mentioned court, issued an order the same day enjoining the Q. D. Hook Company, Edwin S. Holmes, Jr., Randolph T. Warwick, Charles Bauer and Leon Tobiner from making and selling the Q. D. cross chain hook, made under a patent of Edwin S. Holmes, Jr.

M. & A. M. Elects Officers

At the tenth annual meeting of the Motor and Accessory Manufacturers, held at the Waldorf-Astoria, January 15, at 5:30 p. m., there was a very representative attendance of members. In addition to the reading of the reports by the retiring president, treasurer and chairmen of the various committees, the following were elected as members of the board of directors, to serve 3 years: C. E. Thompson, of the Electric Welding Products Company; Alfred P. Sloan, Jr., of the Hyatt Roller Bearing Company; F. Hallett Lovell, Jr., of the Lovell-McConnell Manufacturing Company, and C. E. Whitney, of the Whitney Manufacturing Company.

These gentlemen succeeded the following, whose terms expired:

D. J. Post, Veeder Manufacturing Company; H. W. Chapin, Brown-Lipe-Capin Company; C. T. Byrne, Byrne, Kingston & Company, and C. E. Whitney, Whitney Manufacturing Company.

At the meeting of the board of directors, held in the headquarters on January 16, the following officers were elected to serve for the ensuing year: President, J. H. Foster, Hydraulic Pressed Steel Company; first vice-president, F. Hallett, Lovell, Jr., Lovell-McConnell Manufacturing Company; second vice-president, C. E. Whitney, Whitney Manufacturing Company; third vice-president, F. C. Billings, Billings and Spencer Company; treasurer, L. M. Wainwright, Diamond Chain & Manufacturing Company; secretary and assistant treasurer, Alfred P. Sloan, Jr., the Hyatt Roller Bearing Company. William M. Sweet continues as manager.

Maryland Owners Must Pay D. C. Fee

WASHINGTON, D. C., Jan. 18—After having contributed more than $50,000 to the coffers of Maryland for the privilege of using Maryland roads, the automobile owners of the District of Columbia have at last been abled to retaliate for the alleged bad treatment they have been subjected to for several years. The district commissioners have adopted new regulations, which will become effective February 1 next, compelling all Maryland motor car owners to pay a license fee to the district equivalent to the fee which they pay the state, in complete disregard of the fact that Virginia, Pennsylvania and, in fact all other states that grant reciprocity, can have the motor cars of the citizens of those states enter the District of Columbia without the payment of any license fee and despite the further fact that the district license is only $2 and is perpetual.

In other words, Maryland motor car owners must pay the same license fees exacted of residents of the state.

Emise Motor Car Company Formed

Several members of the old Lozier Motor Company organization and one or two who are at present connected with the concern have organized a company to manufacture a counterpart of the present Lozier light six under the name of the Emise Motor Car Company. It is understood that the company will be formed in Cleveland, O., and that the car will be made to sell at a figure below $2,000. Officers of the new company will include: C. A. Emise, former sales manager of the Lozier company; Sam Regar, former treasurer; W. S. Mead, former sales manager of the New York Lozier branch, and F. C. Chandier, former second vice-president to the Lozier company. The engineer will be T. V. Whitback. Organization plans contemplate the manufacture of about 5,000 machines for the coming year.

Alleges Sparton Infringement

The Lovell-McConnell Manufacturing Company, Newark, N. J., is suing the Jackson Eastern Distributers, Haynes Automobile Company and Garland Auto Company, all of New York City, alleging infringement of the Klaxon patents by the use of the Sparton horn. The first company has also filed suit against the Sparks-Withington Company, Jackson, Mich., maker of this horn.

N. A. A. M. Versus Tire Fillers

The National Association of Automobile Manufacturers on January 8 passed the following resolution:

"That members of this association will withdraw from their warranty all cars in whose pneumatic tires there has been any substitution for the usual air cushion."

Horn Decision Upheld By Court of Appeals

Lovell-McConnell Alleges That International Automobile League Is Selling Horns for Less Than Retail Price

Lower Court Grants Certain Prayers for Preliminary Injunction But Denies Others

JUDGE LACOMBE, of the United States Circuit Court of Appeals, Second Circuit, New York, in the suit of Lovell-McConnell Manufacturing Company, of Newark, N. J., *vs.* the International Automobile League, of Buffalo, N. Y., has rendered an opinion upholding the decision of the lower court with some modifications. The lower court granted certain of the prayers for a preliminary injunction but denied other prayers of the bill. The complainants asked for an order restraining the defendants from selling Klaxon horns for less than the retail price stated on the contract, under which the horns are sold to the distributer, as which the International Automobile League acts, so far as its members are concerned. The opinion is, in substance, as follows:

"The complainants make automobile horns (the Klaxon horn) under a patent and sell the same to dealers under a complicated form of license which, among other things, provides that the purchasers shall not resell at less than a stated price. The injunction which was issued prohibits defendants from 'selling or offering for sale, directly or indirectly, any of complainants' horns marketed and sold by complainants under their conditional licenses set forth in tags or labels upon or secured to said horns, for less than the price designated by complainants at which said horns must be sold to the public, as shown by the tags and labels secured to said horns by the complainants.'

"It is not necessary to set forth the various other preliminary injunctions which complainants now ask for, because in our opinion they are of the sort that should be considered only at final hearing, especially because complainant's theory as to this additional relief apparently is that there has been some forfeiture of license, so that the defendant is to be regarded as never having had a license and, therefore, as an infringer. Since the answer attacks the validity of the patent, which defendant may properly do if he is not a licensee, and an extensive prior art is set up, the questions raised upon this argument should be left for disposition at final hearing.

"In one particular, however, complainants are entitled to some further relief.

"The defendant is a concern operated on a membership and profit-sharing plan whereby each member is obliged to pay a membership fee of $10. It buys various automobile fittings and accessories at manufacturers' prices, and before this injunction sold these horns to its own members at a considerable abatement from the price fixed by manufacturer for sale to the public.

"After the injunction was issued it sent a circular to all its members notifying them that it could no longer sell horns to them at cut prices. The same circular included the following offer:

"'While the Klaxon people may insist upon the League charging its members the retail price, they surely cannot prevent the League giving the profits to charity. If you are insistent upon having a Klaxon send us your check for the full retail price, as given above. We will sell it at no other price. Then give us the name of two charitable institutions in your vicinity deserving of assistance, and we will select one of them and draw our check to its order for the difference between the cost to us and the retail price, forwarding the check in your care so that we may be sure it will reach its proper destination.'

"This seems to be a very flimsy device for evading obedience to the injunction against cutting prices. Most of the individuals whose condition in life is such that they can afford to own and use automobiles are presumably in the habit of making regular contributions at stated periods to one or more worthy charitable institutions. When defendant tells them that if they will buy from it Klaxon horns at the price they must pay everywhere else, it will send them a check for $8 or $9 on each horn drawn to the order of such charitable institution as they may designate, it is naturally to be expected that they will accept the offer, will take the draft, add to it sufficient to make up their usual contribution and pass the same on to the institution.

"Probably there are other persons whose charitable vision is bounded by the horizon of themselves and their individual families. It would be an easy thing for one of them to send on two fictitious titles of what seemingly are charitable institutions, but which in reality represent merely the distress produced in this family by the payment of the full list price for a Klaxon horn. Upon receiving the draft he could write the fictitious name of the payee, and then indorse, deposit and collect it in his own name. The suggestion that defendant would undertake any investigation to discover whether or not the selected 'charitable institution' is real or fictitious puts a severe strain on one's credulity. We think this devotion of the discount from list price to 'charitable institutions' is a mere evasion of the order and that the present injunction should be modified by inserting a clause which will put a stop to the practice.

"As thus modified the order is affirmed, without costs."

Grand Prix Date Fixed

On July 12 the 19-Mile Course Near Amiens Will See Fuel Consumption Contest

Indianapolis Busy Preparing Memorial Day Race—Southern Touring Course Planned

PARIS, Jan. 12—Saturday, July 12, has been fixed for the French Grand Prix fuel consumption race to be held on the 19-mile course near Amiens. It has been decided that the course will be covered twenty-nine times, which will give an approximate total distance of 563 miles. For this distance, the fuel allowance will be 40 gallons, the rules stipulating that cars shall not consume more than 1 gallon per 14.1 miles. The whole of the fuel must be on the car at the start of the race. The exact length of the course will not be known until it has been decided how the hairpin turn at the Amiens end will be treated. It is probable that instead of taking the cars around the present bend a special semi-circular banked track will be built uniting the two parallel roads. This bend will be so designed that cars can pass from the first to the second leg of the course at high speed, and as the main grandstands will be built around the outside of the banked turn, true autodrome conditions will be secured. Probably the pits will be on the straightaway just after the banked turn.

It is probable that Mercedes cars will come into the race. The English agent of the German Mercedes Company has made an entry, but this has been temporarily refused by the racing board, on the ground that only manufacturers can take part in the race. If, however, the parent company makes no objection to the agent running these cars, they will be admitted by the French Club. It is also probable that one or two Turcat-Mery cars will be entered for the Grand Prix.

Very few of the drivers have yet been selected for the race. The Peugeot team will consist of Georges Boillot, Jules Goux, and Zuccarelli. Sunbeam has decided to have two English and two French drivers. The former will be W. Lee Guinness and D. Resta, and the latter Victor Rigal and M. Caillois. Delage has selected Albert Guyot as one of his drivers; the second has not yet been appointed. Two of the Schneider drivers will be Champoiseau and Croquet, who drove for this firm last year; the third man has not been selected. Arthur Duray will probably be at the wheel of the Turcat-Mery car about to be entered. Christiaens will drive the six-cylinder Excelsior. The old time cracks Wagner and Hemery will probably sign on with some of the foreign firms.

It is now practically decided that the Grand Prix will be followed by a motorcycle and cyclecar race on the same course. The conditions for this have not yet been decided on, and no official announcement regarding the race has yet been made.

Columbus To Have 200-Mile Race

COLUMBUS, O., Jan. 18—The Columbus Automobile Club has asked for a sanction to give a race meet at the track of the Columbus Driving Association, Labor Day and committees to have charge of the arrangements will be named in the near future. It is proposed to give a 200-mile race, like the one in 1912, which was such a huge success in every way.

Only 1 Day of Racing at Speedway

INDIANAPOLIS, IND., Jan. 20—The management of the Indianapolis Motor Speedway has decided that there shall be but 1 day of racing at the May meet to be held at the Speedway. This will be on Memorial Day—May 30—and the only vent will be the 500-mile international sweepstakes for cars of 450 cubic inches piston displacement and under.

Some time ago the management contemplated a 2-day meet, with a number of shorter events for 1 day and the 500-mile race the next. After consulting with manufacturers, it has been deemed wise to limit the meet to 1 day and one event.

The Nyberg Motor Car Company, Anderson, Ind., has entered a Nyberg car for the race and has nominated Harry Endicott as driver. This makes three entries to date with prospects bright for a large number of additional entries before many days. Endicott drove a Schacht in the race last year, finishing in fifth place. The Nyberg entered has a 4-inch bore and 5-inch stroke, with a piston displacement of 389 cubic inches.

The sale of tickets for the race has opened and it is reported that the demand for seats far exceeds last year's.

Billy Knipper, of race-driving fame, will pilot a Henderson car in the Indianapolis race on Memorial Day. He is at present the Rochester, N. Y., representative of the Henderson Motor Car Company.

Bob Burman, the speed king, has signed a contract to drive a Keeton 6-48 in the 500-mile race at Indianapolis on May 30.

L. I. A. C. Run on Washington's Birthday

Members of the Long Island Automobile Club had an enjoyable time at the first smoker of the winter season on January 16, at their clubhouse in Brooklyn, N. Y. The good roads committee, A. E. Beggs, chairman, intends to begin as early as possible to place signs in the various roads in Long Island. J. Auer, chairman of the committee, announces that the first run will be to some point within a radius of 15 miles on Washington's birthday. Fourteen trophies will be competed for this year.

South to Get Touring Course

ROCKPORT, TEX., Jan. 18—With the increase in automobile touring in the Gulf coast country of Texas and Louisiana, particularly during the winter season, the idea of providing additional facilities for this pleasure has taken shape in the proposition of establishing a beach speedway that will be more than one thousand miles long. This prospective automobile touring course will start from a point on Atchafalaya Bay, on the Louisiana coast, and will run to the mouth of the Rio Grande.

Minneapolis After A. A. A. Run

MINNEAPOLIS, MINN., Jan. 18—The trustees of the automobile club of Minneapolis have voted to make formal invitation to have the 1913 A. A. A. reliability tour start in the Twin Cities. The contest committee, Dr. H. F. Marston, chairman, has been instructed to ask the Civic and Commerce Association, the aggregation of business men, to back the invitation. The state association has already had an invitation from the Black Hills motorists and commercial clubs to tour west to the Yellowstone Park through that district.

To Abate Cayuga Ferry Nuisance

SYRACUSE, N. Y., Jan. 18—Senator J. Henry Walters has successfully taken up with the State Highway Department the matter of complaints against the private ferry across the foot of Cayuga Lake on the Auburn-Cayuga state road, much used by through tourists. For several years automobilists have been forced to pay heavy charges to cross the ferry and Syracuse and other automobilists have vigorously protested. The Highway Department announces that it will improve a road making a detour and crossing the ferry will be unnecessary until a new through route now in process, is completed.

Quakers See 300 Cars

In 30,000 Square Feet, Products of Sixty-nine Factories Are Displayed at Philadelphia

Two Shows for Providence—Davenport Will Have Big Show—Baltimore's Exhibition

PHILADELPHIA, PA., Jan. 18—With no formal ceremony beyond the turning on of the switch that loosed a flood of light throughout the building, the twelfth annual Automobile Show, conducted under the auspices of the Philadelphia Automobile Trade Association, opened tonight in the new garage of the Automobile Club of Philadelphia. The exhibition will continue for a fortnight, the first week being devoted to pleasure cars, both gasoline and electric, and accessories. The second week commercial vehicles will be on view, together with a hold-over accessories display.

Three floors, each containing approximately 30,000 square feet, are given over to the display. This is far more space than has heretofore been available in both the old armories combined, but it was needed, for in the number of exhibits, variety and completeness, it is the most comprehensive and representative show ever held in Philadelphia, and if first-night attendance is any criterion it will set a mark hitherto unapproached. Notwithstanding blustery winds and a drizzling rain enthusiasts kept pouring into the show building by the hundreds, until, at its height, large as is the structure, with two huge elevators, wide stairway and roomy aisles, all avenues of progression were literally choked.

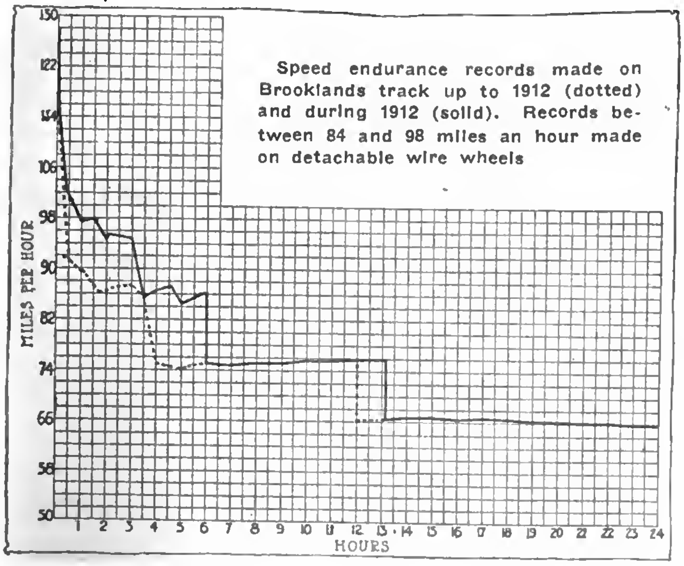
Sixty-nine separate makes of American gasoline and electric pleasure cars, showing in all about 300 automobiles, together with twenty-five accessories dealers, presenting a more varied array of motor car incidentals than has ever been assembled before in Philadelphia, comprise the exhibition.

With the exception of varying changes in body design, especially in closed car types, no radical departures in mechanical construction are apparent.

It would be difficult to conceive of a more satisfactory home for the show. Lending itself admirably to the purpose, the art of the decorator has transformed each of the three floors into bowers of beauty. Furnishing opportunities not possible in former years, advantage has been taken to make the settings of the show more elaborate. The first floor has been converted into an Italian garden, scattered about which are Venetian urns mounted with mosaic globes lined with electric lights. Overhead are streamers of leaves, caught up from pillar to pillar with ornamental wreaths. On the second floor is portrayed an autumn scene, with pergola and trellis effects, the blank wall being covered with a road scene in which the automobile occupies a conspicuous position.

On the third floor are California scenes. Overhead is sky, through which peep electric bulbs in the form of stars. Around three walls is a representation of an old Spanish wall, the fourth containing a California landscape. On each of the floors an orchestra discourses music throughout the evening. The orchestral music is varied by the interpolation of xylophone solos, vocal solos and the playing of bells, scattered around the room, from an electric keyboard.

As has been the yearly custom, one day in the week has been set apart as Society Day, on which the price of admission will be doubled, and special features will mark other days. Next Thursday will be Society Day and on Wednesday night next the 1,600 members of the Automobile Club of Philadelphia have been invited to attend the show.



Speed endurance records made on Brooklands track up to 1912 (dotted) and during 1912 (solid). Records between 84 and 98 miles an hour made on detachable wire wheels

Two Shows To Be Held at Providence

PROVIDENCE, R. I., Jan. 20—Providence, R. I., is to have two motor car shows during the week of January 25 to February 1 inclusive, according to plans that have been worked out. The one to be held by the Rhode Island Automobile Dealers' Association is to take place in the State armory.

Columbus Show Dates March 8-15

COLUMBUS, O., Jan. 18—Arrangements have been completed by the joint committee representing the Columbus Automobile Club and the Columbus Automobile Trades Association to give the annual Columbus automobile show in the Billy Sunday tabernacle, on West Goodale street for the week beginning March 8. The tabernacle, where Evangelist Sunday is holding a revival service, is one of the largest structures ever erected in the Buckeye Capital. It will give more floor space than was ever given in any previous show.

Syracuse Show in One Building

SYRACUSE, N. Y., Jan. 18—The board of directors of The Syracuse Automobile Dealers' Association has decided to confine this year's automobile show, February 25 to March 1 to the Armory, instead of holding the overflow in the Alhambra, as was done last year. There will be space for all the exhibits under one roof, owing to the fact that the part used by Troop D is to be used for the first time in addition to the portion belonging to Company C.

Davenport Show Will Be Big

DAVENPORT, IA., Jan. 18—Owing to the large demand for exhibit space the arrangements committee in charge of the annual show of the Tri-City Automobile Dealers' Association, have decided to exclude all dealers outside of the three cities. Space will be alloted this week. Preparations are being made to make the 1913 show the biggest ever held here. The Tri-City Automobile Dealers' Association was only recently incorporated for $10,000.

Forty-Nine to Show at Baltimore

BALTIMORE, MD., Jan. 20—There will be forty-nine exhibitors at the motor car show to be held in this city February 18 to 22 in Fifth Regiment Armory. These will include thirty-two pleasure car firms and seventeen commercial car dealers. The drawing for space will be held January 22.

Badgers After New Law

Signal Use, Registration and Penalties for Car Theft Among the Chief Points Proposed by State Association

Packard and Willys Give $150,000 Each for the Building of the Transcontinental Stone Road

MILWAUKEE, WIS., Jan. 17—A legislative campaign was outlined and authorized by the Wisconsin State Automobile Association at its sixth annual meeting in Milwaukee on January 15. The board of directors was directed to pursue effort to secure new laws at the hands of the Wisconsin Legislature, now sitting, on approximately the following distinct points:

a. Universal light law, requiring every vehicle in Wisconsin to carry a light at night. Now required by city of Milwaukee.

b. One registration per year per owner, instead of a registration covering the specific car owned at the time application for registration is made, so that if a man purchases a new car and disposes of his old one within any year, the old license will remain in force until January 1 next.

c. Uniform signal law, requiring all motor cars to be equipped with a distinctive warning signal peculiar to motor cars as a whole, as for instance, an electric horn with a harsh note.

d. Heavier penalities for theft of cars, for joy riders, and for chauffeurs who railroad owner's cars.

It was decided to oppose any attempt to impose a tax based on weight or horsepower; to change present laws limiting speed, or interference with any present good roads legislation which would make the movement for permanent highways less effective.

The board of directors was authorized to proceed with arrangements for the fourth annual Wisconsin reliability tour, to be conducted next July. It is intimated that the tour will be changed from an exclusively trade proposition to one for amateurs, the deed of gift of the $1,000 *Sentinel* trophy to be changed by Charles F. Pfister to make this possible.

A. B. of T. 1913 Handbook Is Out

The Handbook of Gasoline Automobiles for 1913 issued by the Automobile Board of Trade is just off the press. It is compiled in the same standard form as in previous years. The descriptions of machines therein contained are sufficiently complete for the average purpose of reference and the illustrations which accompany the specifications clearly describe the body styles of the various models. Exclusive of catalogue request blanks which are placed at the end, the book contains 187 pages of extremely useful information. There are 146 pages devoted to descriptions of pleasure cars and twenty-seven pages on gasoline trucks. In order to make comparison between different makes as simple as possible, the same form of specification is used in each case. Another point that has received attention is contained in a footnote at the bottom of each page giving the equipment that is included in the list price. In addition to the lists of officers of the A. B. of T. there are alphabetical indexes to the names of the manufacturers as well as the names of the cars. The handbook should form an invaluable *vade-mecum* for present and future reference.

First Annual Breakfast of Motor Truck Club

The first annual breakfast of the Motor Truck Club was held at George Rector's in New York City Tuesday, January 21. The attendance exceeded all expectations to such an extent that the committee was scarcely able to provide sufficient accommodation. David C. Fenner, president of the club, officiated as toastmaster, introducing the following speakers: F. F. Beall, of the Packard Motor Car Company, who spoke on Production as one who knows his subject; E. W. Curtis, Jr., of the General Vehicle Company, who read P. D. Wagoner's paper on Advertising and Selling, Mr. Wagoner being absent on account of illness; Elisha Flagg, Jr., was also absent but sent his paper, which was ably read by the club's secretary, E. L. Howland; George H. Duck, general service manager of the Alco, gave a very interesting talk on service, enlivened by bits of humor; Walter Wardrop, editor of *Power Wagon*, was the last speaker and treated his subject, Past, Present, Future, in a very interesting manner. The occasion was a great success and augurs well for the continuance of the function as an annual affair.

Packard Contributes $150,000 to Road

The Packard Motor Car Company, of Detroit, Mich., has agreed to contribute $150,000 for the construction of the transcontinental stone road. This sum represents a little less than 1 per cent. of the company's gross business done June, 1912.

It has not been decided yet whether this sum will be paid all at once or in three annual installments, but the contribution is subject to the following three conditions:

1. It is to be paid only in case of sufficient funds being subscribed for the construction of the entire road scheme.
2. The engineering of the work must be supervized by government engineers.
3. The states through which the road is to be laid contribute the labor.

The latter condition is merely for the purpose of insuring the proper use of the fund contributed.

Willys Gives $150,000 for Stone Road

John North Willys, president of the Overland company, has donated the sum of $150,000 to the fund which is being raised for the purpose of constructing a national highway from one coast to the other. This donation is to be paid in three instalments of $50,000 each, payable during 1913, 1914 and 1915.

Des Moines Dealers Elect Officers

DES MOINES, IA., Jan. 20—The Des Moines Auto Dealers' Association held its annual meeting this week and elected the following officers: President, W. E. Moyer; vice-president, Dean Schooler; secretary, C. G. Van Vliet; treasurer, C. L. Horring; directors, W. W. Sears, C. G. Van Vliet, R. J. Clemons and V. W. Reynolds. On account of the illness of President Moyer the office of vice-president was created and Mr. Schooler will take active charge of the preparations for the fourth annual show, which opens at the Coliseum March 3.

Form National Highway Branch

YUMA, ARIZ., Jan. 20—At a meeting of more than 100 delegates from Arizona and the extreme southern section of California held here on January 8 there was formed the San Diego-Arizona auxiliary of the Southern National Highway Association. The special purpose of this organization is to promote the construction of a highway bridge across the Colorado River at Yuma. The proposed structure will cost about $75,000, of which sum the new organization pledges itself to contribute $50,000.

Savannah Owners to Pay for Roads

SAVANNAH, GA., Jan. 20—There is a growing feeling, chiefly among non-automobilists, that those who own automobiles should be required to meet more of the road expenses. From current talk this feeling is going to take definite form and shape when the legislature meets again this summer.

One difficulty encountered is the proper apportionment of the receipts from such a tax. Shall it go to the state or to the counties? Or shall part of it go to the state and part to the counties? These are questions which, of course, the legislature will have to decide. The people appear quite determined, however, that since the automobilists are the chief users of the roads, they should pay more toward their upkeep and improvement.

Secretary of State, Philip Cook, in the course of his investigations has discovered in one county where there are 177 automobiles registered that only nine of them have been returned for ad valorem taxation. He has found similar situations in other counties. This matter also will be brought to the attention of the legislators.

Electric Vehicle Association Banquet Is Success

One of the most successful affairs in the history of the Electric Vehicle Association of America was the testimonial banquet tendered to Past-President William H. Blood, Jr., at Delmonico's on the evening of Thursday, January 16. There was not a dull moment from oysters to demi-tasse and after that any one present would have thought that such a thing as "dull care" never existed. It was perhaps the most representative gathering of electric vehicle and central station men that ever assembled in New York City for a jollification in honor of one of their number. Arthur Williams, who is Mr. Blood's successor as president of the Electric Vehicle Association of America, acted as toastmaster of the evening and in proposing a toast to the guest of honor referred to his splendid efforts in behalf of the Association. Mr. Blood made a brief response in way of appreciation and among other things mentioned that the Association now represents approximately $500,000,000 of capital.

Newark's Automobile Show Plans

Next Thursday night the drawings for space allotments will be made for the Newark Automobile Show, Newark, N. J., which is to be held in the First Regiment Armory during the week of February 15-22.

Governors Represented at Convention

Twenty-nine governors have named delegates to represent their states in the second Federal Aid Good Roads Convention called by the American Automobile Association to take place in Washington, D. C., March 6.

Rhode Islanders to Hold Banquet

The Rhode Island Automobile Dealers' Association, Providence, R. I., will hold its annual banquet on Wednesday, January 29, at the Crown Hotel.

Chevrolet's Kerosene Experiment

A dispatch from Flint, Mich., states that the Chevrolet car, made by the Republic Motor Car Company, that city, will be mounted with a motor designed to use kerosene exclusively, and that the car is nearly ready for the market.

Hillman Speaks on Electric Trucks

At the meeting of the Electric Vehicle Association of America on Tuesday, W. H. Hillman, of the General Vehicle Company, read a paper on the importance of the electric truck as compared with other classes of central station work. Mr. Hillman showed the importance of the truck industry to central stations, due to current consuming ability of individual trucks and the rapidly growing number of electric freight automobiles.

London Taxicab Strike

Owing to Current Price of Gasoline 5,000 Taxicabs Have Been Removed From City Streets

Up to End of December Men Were Charged 16 Cents Per Gallon—Now Fuel Costs 25 Cents

LONDON, ENG., Jan. 13—Owing to the price of gasoline, 5,000 taxicabs have been removed from the streets. The trouble between the masters and men is that terms cannot be arranged over the price at which the drivers are to receive fuel for their cabs. Up to the end of December the men were charged 16 cents per gallon for all fuel required, but owing to the general rise, the proprietors, in accordance with the award that was drawn up last March between the masters and men with the Board of Trade, now have raised the price to 25 cents per gallon. The men refuse to pay this amount, and state that they would not be able to exist on this basis. They state that the average earning for a taxicab in London is $5 per day and out of this the proprietor takes $4.26 under the old charge of 16 cents per gallon for the gasoline, but under the new increased price he would take $4.50. Three gallons of fuel is required each day.

During the past year they state that the proprietors profit amounted to $140,000 less cost of handling, and with the increased charge this would bring them in a further profit of $65,000 for 1913. Against this the proprietors state that, and have actually taken the figures from the book of one of their employees, the amount of tips received is much better.

There are a large number of drivers who have remained loyal to their agreement of last March.

With the exception of the rush of Saturday evening for the theaters and other places of amusement, the average user of the taxi has felt little effect of the strike.

Benzol Tests Running in England

LONDON, ENG.—One of the London papers is running a series of tests on benzol. The owner and driver of a taxicab with which the test is being made drove 40 miles on this fuel under working conditions on the second day of the test, the car being fitted with a new Claudel-Hobson carbureter. He states: "I was able to approximate 22 miles on a gallon of benzol today, against 19 miles, my maximum, on gasoline. This was 1 mile better than my record of 21 miles on benzol on the first day, and the car was quite as efficient in every respect as on petrol, although I did not adjust the carbureter in any way for the new fuel. When I get used to the new carbureter I believe I shall do fully 24 miles per gallon on benzol under fair running conditions."

$12,500,000 Devoted to English Roads

LONDON, ENG.—Much useful work has been done for motorists in England by way of improving the roads over which they travel. During the last quarter of the old year the road board, with the approval of the treasury, advanced $413,610, the larger portion of which is to be devoted to road crust improvements. The total grants, after deducting cancellations, for the year amount to no less than $4,447,960, while loan advances to the extent of $633,160 have also been arranged. In addition to these vast sums of money, further advances amounting in the aggregate to $7,337,520 have also been dedicated to highway authorities toward road improvements, the details of which are not yet settled. The total, therefore, available for road improvements, amounts to the fine sum of $12,560,000.

Engineers in Session

HOWARD MARMON

Howard Marmon, elected president of the Society of Automobile Engineers at their annual meeting in New York City last week, is vice-president of the Nordyke & Marmon Company, Indianapolis, Ind. Mr. Marmon has been responsible for the design of all the Marmon cars since the advent of the company into the automobile field. He is a graduate of Leland Stanford University, and has been a leading factor in engineering and contest circles in America since his association with the industry.

Motor Testing, Exhaust Gas Analysis, Electric Wiring, Wheels and Fuels Are Discussed

Engineers Argue Relative Merits of Four and Six-Cylinder Motors—Discuss Best Gearbox Locations and Listen To Numerous Papers on Motor Design

THE annual winter meeting of the Society of Automobile Engineers held at the McAlpin Hotel, this city, was brought to a close on Saturday morning, January 18. The session was notable for the great amount of interesting and useful information which was brought to light and for the large number of prominent engineers who were in attendance and who entered into the discussions.

The Society has grown; it is now looked upon as the ultimate authority upon which engineers as a whole may rely. Realizing its great importance and increasing influence in its special line of work, automobile engineers are beginning to believe in it and are bringing to it their ideas and knowledge gained, in many cases by long years of experience along certain specialized lines. This assisting the less experienced, this spirit of co-operation is doing a great work for the industry as a whole. The idea of boosting was specially noticeable at the session just closed.

The Society's deliberations were opened on Wednesday, January 15, with the meeting of the Standards Committee at the headquarters of the organization. Here a number of division reports were considered and passed to the Society, where they were acted upon later in the week.

President Opens Session

The convention proper was opened on Thursday morning at the McAlpin by an address by President H. W. Alden. In summing up the work of the society since the summer meeting, it was pointed out that the policy has been to follow out the ideas of the late President Donaldson. The work of the standards committee was especially commended as representing the best efforts of the organization as carried on by the most able men which the industry possesses.

Mr. Alden spoke particularly of the work of the local branches, commending it as being the means of keeping up interest in the activities between the two annual meetings. Many would lose interest if they did not get together, if they were not afforded an opportunity to discuss pertinent topics more than once or twice a year. Local sections should be established in all the large cities, Mr. Alden said

He also touched upon a movement which is on foot for the endowment of the Society and which would be large enough to carry it over periods of depression so that it would not have to depend entirely upon dues and initiation fees for its upkeep.

Financially the Society is in better shape than ever before and the outlook is rosy, due to the rapid growth of membership and prestige of the organization. The total cash on band and in bank at the close of the year 1912 was shown by the treasurer's report to be $11,573.10 as against $2,230.04 at the end of the previous year. Total disbursements for 1912 were $28,379.32, while for 1911 about $22,000 was expended. This increase in expenditure is justified by the increase in membership and activities. The total receipts for the last three months were $17,293.58 and the disbursements for the same period amounted to $5,720.48. This sound financial condition is all the more noteworthy when it is considered that the only indebtedness of the Society is $4,000 in notes held by prominent members of the organization. This, of course, excludes the current running expenses.

Membership Grows Rapidly

The curve of increase in membership is practically a straight line and is still going straight up. The report of the tellers of election of members shows that 501 were taken in during the year, composed of various classes as follows:

Regular members	190
Associate members	233
Junior members	62
Affiliate members (11 persons designated)	5

Officers elected for the ensuing year were as follows: President, Howard Marmon; vice-president, J. G. Perrin; vice-president, Russell Huff; treasurer, Hermann F. Cuntz; members of the council, H. L. Pope, E. F. Russell and J. A. Anglada.

In tribute to the memory of the late Henry F. Donaldson, president of the Society at the time of his death, the Society appropriated from $300 to $500 for the erection of a suitable monument over the grave of the former head of the organization. The matter was brought before the Society by H. M. Swetland after it had been considered by the council and had met with that body's full approval. Mr. Swetland stated that it was desirable to have the concentrated action of tbe Society on such an action. Mr. Donaldson was a great man and a great writer, and it is only fitting that this tribute should be paid to his memory. The Society was unanimously in favor of the suggestion.

Society's Annual Dinner

Yet the convention activities were not all sterner business, for on Friday evening a record gathering of Society members was present at the annual banquet given in the banquet hall and the grill room of the McAlpin. Five hundred and seventeen members and their invited guests assembled at 8 o'clock for the Society's reception, after which the banquet was served.

No lengthy speeches marked the entertainment following the spread. The new president, Howard Marmon, outlined briefly the policy of the Society for the coming year, saying that he proposed to make all work. Following his opening remarks, Prof. F. R. Hutton, the only speaker of the evening, gave a short address, from which the following is an extract:

The Society's True Ideals

"The activity of your society largely depends on the work of the section, and the philosophy of this sectional work is not so much along the line of deep thought as to be up-to-the-minute information. Your sectional meetings call for knowledge of up-to-date requirements. The second great work of your society is the ideal of developing the standard. It is the development of this that relieves you from the influence of the sales manager and the advertising manager.

"Growth of membership should be the third ideal of your society, and I am pleased to note that your growth is as great if not greater than that of any of the other American engineering societies.

"The fourth ideal is that the engineer can expend less time in specialty work and more in broad views. He should be released from the petty details and be free for better and larger work in the development of materials and properties in the heat engine, along which line the art needs its greatest development. Scientific research is needed, and what our engineers require is that exact knowledge which comes from such research. My hope and dream is that our society will have a testing laboratory established in Detroit or some other city, and that it will be conducted along broad lines."

Summing up the professional work of this winter meeting, it is found that the discussions on the various pertinent subjects were particularly fruitful of valuable knowledge. Eleven committees reported and in every case progress was a feature. It was shown that the newly organized motor testing division will soon rank among the star dvisions of the standards committee. One evening was devoted entirely to four papers and discussions of motor truck subjects. An afternoon was given over almost wholly to a consideration of the value to the automobile engineer of exhaust gas analyses and related subjects. Four papers and discussion of them occupied another afternoon. These dealt with the subjects of leaf springs, the stability of propeller shafts, the effect of the relation of bore and stroke in automobile engines and the determination of brake capacity.

The broaches division report was accepted as one of progress. Consideration of new methods of spline manufacture and consequent changes of spline shaft design featured it. The ball and roller bearings and the frame sections divisions did not report. The miscellaneous division's report covered the standardization of another type of plain rod end. It also combined the specifications for height, width and length of magneto space on motors so as to apply to both four and six-cylinder engines.

The electric lighting committee provided that lamps should be 7-volt types with efficiency of 1.1 watts per candle. It also stand-

H. W. Alden, retiring president of the Society of Automobile Engineers, occupied the presidency since the death of President Donaldson, last July, and since that time has worked to carry out the plans of the late President Donaldson. Mr. Alden is chief engineer of the Timken-Detroit Axle Company

Representative gathering of members who attended the meeting held on the morning of January 17

ardized side, tail and headlights as to size. It is endeavoring to standardize storage batteries, to arrive at definite recommendations for wiring as to whether the single or the double system is preferable. It also seeks to standardize fuses and fuse boxes.

The sheet-metals division has given a specification for manganese bronze for cold rolled sheets and rods. It also is trying to reduce the number of sizes of sheets and rods used. The nomenclature division has laid out a long and difficult task for itself. It will attempt to get up a mechanical dictionary for publication in all languages so that each part will be rationally and uniformly known throughout the world. Other mechanical organizations and the United States Patent Office will undoubtedly assist at this work.

A committee has been appointed to arrive at standards for rims on account of the expected breaking up of the rim association, which will precipitate many makes of rims upon the market to the bewilderment of the engineer and the buying public. The alloys division added two specifications for gear bronzes. The wheel dimensions and fastenings for tires division will co-operate with the tire makers to decide whether or not they must revise the present stringent requirements as to rim tolerance, which now necessitate the rims being machined. The truck standards division reported progress along the line of standardization of the main related parts of the truck with respect to one another. The springs division also indicated progress. It is to endeavor to get additional information as to the distances fore and aft between spring clips for overslung and underslung springs.

Light was thrown on the consideration as to whether or not the magneto should be eliminated because of combined cranking, lighting and ignition; on the causes for the decline of the 42-inch wheel; on the subject, Will the Six Displace the Four-Cylinder Motor; on the best position for the gear box.

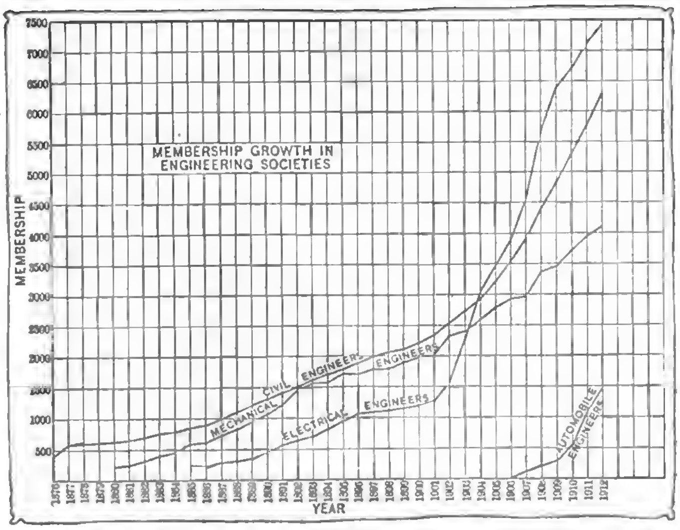


Chart illustrating growth of engineering societies, showing normal development of S. A. E. membership

Division Reports

Standards Committee Divisions and Electric Lighting Committee Reports Read and Acted Upon

S. A. E. Convention

IN addition to a business session on the opening morning of the Society's meeting, reports of several divisions of the standards committee and of the electric lighting committee were read and acted upon.

Report of the Sheet Metals Division

In addition to recommending a specification for manganese bronze for sheets and rods, the sheet metals division presented a report of its activities along the line of standardization of sizes of sheets and rods as used in motor car construction. The report was read by Division Chairman T. V. Buckwalter. According to it, the division's work divides itself into two parts. First, the presentation of specifications for sheet metals and rods, and, second, the submission of specifications for the dimensions of these materials. In order to arrive at what sizes for these to recommend, it is first necessary for the committee to know the preferred sizes as now employed by the manufacturers. Nearly every maker has his own special sizes, and at present there is no uniformity whatever.

For the purpose of ascertaining these particulars data sheets have been circulated to every maker asking that he note thereon his preferences as to sheets and rods. It is hoped that the returns on these requested data will be complete enough so that a number of definite recommendations may be submitted at next summer's meeting.

The composition of the manganese bronze as submitted follows:

Copper	.....56 to 60 per cent.	Lead impurities— not to exceed.....	0.25 per cent.
Tin	.... 0.50 to 1.50 per cent.	Zinc	Remainder
Iron	.... 0.50 to 1.50 per cent.		
Manganese	.. 0 to 0.75 per cent.		

This applies to manganese bronze in cold rolled sheets and rods and not to cast alloy. Manganese bronze is one of the strongest of the non-ferrous alloys, having a tensile strength of from 70,000 to 72,000 pounds per square inch. In thus submitting a specification for this alloy, the report states that the committee endeavored to tie it down to chemical combination only, rather than to include both chemical and physical considerations.

The report was accepted by the society as one of progress.

Report of Broaches Division

The third report of the broaches division was read by its chairman, C. W. Spicer. The report was short and was characterized as essentially one of progress. There was no discussion, no points being brought out which had not been touched upon in the general meeting of the standards committee on the day previous. There was no new data presented for consideration. The manufacture of broaches and splined shafts is still in its development stage and there is an increasing tendency toward the hobbing of splined shafts. The depth to which straight parallel sides can be cut by this hobbing method for six splined shafts seems limited and this may necessitate the changing of the tables relating to this work which have already been accepted by the society. It may be necessary to modify the form of the splines or to supersede the present tables by some dealing with a greater number of splines of a shallower cut. The depth is some function of the number of splines and the diameter of the shaft. The time during which the committee has been considering this point has been too limited to arrive at any definite conclusions as yet. The dimensions which have been adopted for squares and tapers seem to be meeting with approval by the manufacturers, Mr. Spicer said. The report was accepted as one of progress.

Nomenclature Division

The nomenclature division, of which E. J. Stoddard is chairman, has been in operation only a short time and hence has had very little opportunity to do other than make tentative plans for its line of procedure. Mr. Stoddard merely gave his views as to what was contemplated in an informal way, he having no specific report to submit at this time. The field of such a committee is great, he said, and there is much to be done. In each factory there are many words which grow up from the shops and which are not correct when applied to any particular part of the car. They are not generally received and are perhaps not understood by those in other shops.

Mr. Stoddard suggested a dictionary of terms used in the automobile business to be printed in several languages for distribution and adoption in all countries, so that the present confusion would be alleviated. For instance, there is a difference of opinion as to the correct term to apply to the transmission gears. Should they be known as the gearset or the transmission?

In fixing terms for the various components of the motor car, Mr. Stoddard pointed out that the words used should be of general application and not one which is merely satisfactory to any one small body of men or to any particular art. That is, when naming parts the society should not only be governed by its own members for the correct term, but should fix a word which is satisfactory as well to any other body of engineers when used by them.

Mr. Stoddard asked for the support of the society at large and hoped that he could be of service.

In discussing Mr. Stoddard's remarks, Howard Coffin pointed out the great advantage to the service departments if the public called parts by their proper names in ordering, so that their wants could be filled promptly and so that it would eliminate the present necessity in many cases of further correspondence to determine just what part the customer referred to. This would be a saving both to owner and manufacturer. The United States Patent Office has also asked for the assistance of the society in arriving at correct and definite names for parts of the automobile, many of which at present are referred to by several different words. Mr. Coffin suggested an illustrated dictionary, published in six languages.

No official action was taken on the report.

Miscellaneous Division

Chairman A. L. Riker's report of the proceedings of the Miscellaneous Division featured the modification of the table of magneto dimensions accepted at the 1912 annual meeting of the society so as to read as follows:

Four and Six Cylinder Magnetos

	MM	Inches
Shaft height	45	1.771
Distance from center 2 front hase-plate holes to large end of shaft taper	53	2.086
Distance from center front hase-plate holes to rear hase-plate holes	50	1.968
Distance from centers of hase-plate holes left to right	50	1.968
Large diameter	15	.590
Small diameter	12	.472
Length of taper	15	.590
Taper 1:5 (included angle) 11° 30′ approx.		
Woodruff key No. 3.		
Height of magneto space	203	8.000
Length of magneto space	254	10.000
Width of magneto space	127	5.000
Plain hole timing lever	6.35	.25
Tapped hole timing lever ¼ inch, 28 P. S.A.E.		
Base-plate holes, ⅜ inch 16 P. U.S.F.		
Thread for end of magneto shaft ⅜ inch, 16 pitch, U.S.F., length of thread .5905.		
Advance lever radius 2.125 inches.		

The first nine items of this table remain unchanged from the former table, while those referring to the heights, widths and lengths of magneto spaces have been combined so that there is only one size of space regardless of whether the design is for the accommodation of a four- or a six-cylinder magneto. The specification for base plate holes has been changed to 3-8 inch, 16 p., U.S.F. as here noted. The only added points are for the thread for the end of the magneto shaft and for the advance lever radius.

In the report the S.A.E. standard yoke and rod ends were taken up and it was recommended that certain plain yoke ends be added to the list standardized. That is, ends which are plain as differentiated from ball and socket types. It was further

Informal committee which discussed relative merits of single and double wiring systems for electric lights recommended that the specifications for the tensile strength and elastic limit of the standard screw thread material as previously fixed upon be stricken from the standards for the reason that the society should not dictate as to the quality of materials used but rather should confine its specifications as to dimensions.

In the short discussion of the paper which followed, Howard Marmon explained that the new recommended standard end is similar to the present adjustable end which has an extremely long clevice, except that it has a shorter end for use where such a long clevice is not required for adjustment.

The question of the practicability of the S.A.E. standard screw threads was brought up for discussion by the president. There seems to be some difficulty in using these standards for small sizes, some makers having to go back to the U. S. standards in these sizes. J. O. Heinze stated that in the plant with which he is coinnected the U. S. standards are used in cast iron and aluminum work while the S.A.E. threads are used for nut ends and the like. Mr. Marmon expressed substantially the same opinion on this point. It developed that in its fixing of these thread standards the division has already recognized that the S.A.E. threads are impractical for cast iron and aluminum.

Mr. Riker, in speaking of the striking out of the physical specifications for elastic limit and tensile strength, stated that there has been considerable feeling among the manufacturers of screws that this should be omitted for the reason that these working to the S.A.E. standards in other respects did not want to pay the additional price made necessary by this demand for such high-class material. It is the opinion of these screw makers that the physical properties of the material should be left to each engineer. The miscellaneous division's report was accepted as read.

Electric Lighting Committee

Alexander Churchward, chairman of the committee on electric lighting and its allied features, read a report which primarily recommended a very open discussion in the meeting of the subject of single and double wiring systems so that the views of the engineers could be incorporated in the later recommendations of the committee. These two systems differ in that the single wire system makes use of a ground for the return circuit, while the two-wire type uses a metallic return.

It was recommended that electric light bulbs be standardized and known as 7-volt lamps. These are to have an efficiency of 1.1 watts per candle at voltages ranging at from 6.5 to 7 volts. The size for headlights was standardized for the 2 1-16 inch size and capable of being focused in a reflector of 7 1-8 inches focal length or greater. Diameter of side and rear lights are fixed at 1 inch. Battery makers are to be circularized with the view of arriving at two standard overall heights and widths of storage batteries for automobiles so as to give three standard plate sizes from which batteries of any capacity can be made by simply increasing the overall battery length. Lighting system manufacturers are also to be circularized to fix standards for fuses and dimensions for boxes. The report also touched upon the consideration of dimmers for headlights as suggested by legislation now in force or under consideration.

The discussion on the subject of two-wire versus single wire installations indicated that the manufacturers or motor cars and also the makers of electrical apparatus will welcome the system of single wiring if it can be conclusively shown that its use is advantageous and not attendant with power loss and difficulty of maintaining proper grounds.

A. L. Riker stated that the electric lighting of automobiles is today in the same position as that occupied by the electric lighting industry in general 25 years ago. We should be able to adopt something as standard which will live and to profit by the experiences of the older and allied lighting industry. The single wire system eliminates many of the present troubles, he said. Its difficulties of good ground return are more theoretical than actual. In favoring the single wire system Riker further added that if it is possible to eliminate some of the elements and fixtures now called for with the present double wire systems, the modern automobile would look less like an electrical supply store and more like a real machine. The matter should be given deep consideration and not discarded without fair trial.

A. L. McMurtry stated that he has come to the conclusion that the single wire arrangement is undoubtedly the simpler especially in locating trouble. There is only one wire from the switch and only one to each of the lamps. In case of a short circuit there is only one wire to disconnect, while with the two-wire system there are two to be considered unless it so happens that the right one is struck the first time. With a first-class grounded system, there is less loss than in the poorly wired two-wire system grounded directly to the frame, said McMurtry.

R. H. Manson gave it as his opinion that any changing in systems should be done immediately rather than in the future, looking at the matter from the standpoint of the manufacturer. The single wire system requires a bulb with a different base than that of the two-wire system lamp, so that the present lamp with which snpply stores everywhere are stocked would be of no use, and it would take some time to affect the change in the dealers' stocks. In advocating the single wire system, he cited the telephone circuit as an instance of a grounded system working satisfactorily even though complicated.

Howard Coffin stated that he saw no reason for the retention of the present wiring if the other will work equally as well. Mr. McMurtry stated that half the troubles with lamps today is due to the delicate connections made necessary with bulbs for the two-wire outfits. This becomes especially frail in the smaller sizes of lamps. The single wire system would make use of very much simpler bases and sockets—the constructions would be much more substantial. Mr. Churchward brought out another point when he said that in the case of grounds, the single wire system is bound to blow out something immediately the ground defect is made, while with the present system in the case of a ground, there is only a slight leak which is not immediately noticeable and which will gradually sulphate a battery and thus drain it almost unnoticeably.

J. O. Heinze was practically the only engineer who was somewhat opposed to the new system, stating that in the great office building for instance we would not think of using one side of the building for a ground return. The two-wire arrangement he said gives twice the reliability.

E. T. Birdsall cited the example of the steel battleships which ground all their electric lighting circuits on the steel hulls. Mr. Manson advanced the counter argument that in the steel building there are so many different kinds of circuits that insulating them is necessary. Such installations are not analagous to the much simpler car wiring systems, he said.

In closing the discussion, Mr. Churchward stated also that the steel building illustration does not apply to automobile electric practice. All circuits in such cases are fed from the same mains, while in the car there are separate circuits for each unit.

The report was finally adopted as read.

Rim Standardization Action

Action was taken regarding the present situation caused by the internal dissension within the rim association. This matter was discussed in connection with the meeting of the standards committee as reported last week. There is a likelihood that the rim association will soon be disrupted with the result that the market will be flooded with many types of demountable and detachable rims. There are at present about five types of demountables and as many detachables. With this situation in view it is now high time for the society to step in and seek to standardize this part of the industry so that there will be one standard type of each class of rim—including the straight-side type.

Accordingly, the following resolutions were adopted by the society at the meeting of January 17:

RESOLVED, That, there are too many pneumatic tire rims in the market;

That this society believes that a much smaller number of rims will satisfy the needs of the industry and at the same time will bring about a great saving;

That the committee appointed to consider and report upon this subject shall proceed at once to hold such meetings and hearings as will bring about an improvement in this situation;

That a report be submitted at the earliest possible moment;

That this committee shall co-operate with the National Association of Automobile Manufacturers and with the Automobile Board of Trade.

The committee to consider an improvement in the rim situation for pneumatic tires was appointed and has as members representatives from the several industries involved. The membership of the committee is as follows:

H. L. Barton of the General Motors Company, Detroit, Mich.
G. G. Behn of the Hudson Motor Car Company, Detroit, Mich.
C. E. Reddig of the Timken Detroit Axle Company, Detroit, Mich.
C. D. Williams of the Mott Wheel Works, Utica, New York.
J. J. Vincent, Packard Motor Car Company, Detroit, Mich.
C. B. Whittelsey of the United States Rubber Company, Hartford, Conn.
H. E. State of the Goodyear Rubber Company, Akron, Ohio.
Henry Souther, Consulting Engineer Standard Roller Bearing Company, Philadelphia, Pa.

A meeting of the committee was held and it was decided to hold a meeting in Cleveland, O., at the earliest possible moment.

At that meeting the final organization of the committee will be accomplished. Following this meeting a hearing will be given to all those interested in the situation, that is, to those having rims which they would like to have adopted as recommended by the society.

Those appearing at the hearing will be requested to produce the metal parts of a rim complete as furnished, including felloe band and all attachments.

The weight of these parts will be carefully scrutinized and will form an important consideration in the choice of any rim. No specially prepared or machined exhibits will be considered. The rims and parts must be exactly as furnished commercially.

A complete wheel with tire must also be furnished for demonstration purpose.

The standard size of all exhibits will be 36 by 4.5 inches.

Tools for attaching and detaching and means for inflation must also accompany the exhibit.

From the Maker's Standpoint

E. R. Hall discussed the situation from the standpoint of the tire manufacturer, stating that all such concerns would welcome a standard rim of low cost and easy operation which would not work a hardship upon the manufacturers as far as cost was concerned. H. B. Bannister, a wheel manufacturer, stated that both the wire and the wood wheel makers would welcome the society efforts along this line. S. W. Alden pointed out that the committee would give a full hearing to all concerned since it is made up of men whose activities cover every branch of the trade. F. A. Bower gave it as his opinion that the action was a most excellent thing on account of the greater economy which it would work for all manufacturers. H. L. Pope said that the move is the proper one. There should be a single rim and the committee is capable of adopting one. This may not be the best possible, but it will be the one which the committee finds to be best adapted to all classes of work as far as it can determine at this time. In any case the right one will be settled upon eventually as a result of the committee's deliberations.

Mr. Souther took up the intended action at the Cleveland meeting in details and stated that no favorites will be played. The object is to arrive at a standard type which will work for the greatest good of the greatest number. Any arrangement which this committee makes will include compettition, he said. The action of the committee was approved by the society.

J. C. Heinze, in his report on motor testing methods, outlined by charts the various testing apparatus used by him at the Northway motor plant, and as chairman of the committee recommended that the society should collect data on how motor testing is done at the different factories. The first sheet exhibited was that of a standard form for recording results of motor tests. It should, according to Mr. Heinze, contain the following information: 1—Name of company; 2—Name of report; 3—What test consists of; 4—Date; 5—Where report is recorded in the office bulletin; 6—Such facts as specific gravity of gasoline, temperature of gasoline, temperature of room, temperature of water, barometric reading, and relative humidity; 7—Model number of motor, and motor features; 8—Kind of dynamometer used; 9—Name of carbureter and type, name of magneto and type, name of spark-plugs and type; 10—Weight of motor, weight of pistons and connecting rods, amount of cylinder offset from center line of crankshaft; 11—Name of engineer making test; name of assistant engineer; 12—Space for standard curve on regulation section paper (the vertical should indicate horsepower from 1 to 100, and the horizontal crankshaft revolutions from 2,000 to 3,000, and piston speeds in feet per minute; this should also show the horsepower output per cubic inch of piston displacement, and if a 63-inch beam, or shorter was used); 13—This particular chart shows six curves: A—Curve of motor; B—Torque curve at different speeds; C—Air consumption in cubic feet per minute, without carbureter; D—Air consumption in cubic feet per minute with carbureter; E—Gasoline consumption in pounds per hour, and F—Gasoline consumption in pounds per minute per horsepower, or per horsepower-hour.

Plotting the Air Curve

It is necessary to plot the motor's air curve when a carbureter is not attached in order to get accurate volumetric efficiency. By doing this you can also show the losses due to the carbureter, which often amount to 10 per cent., and which fact is an important one for consideration when selecting the different carbureters to be used.

Accurate record of gasoline consumption is taken in order that the efficiency of different carbureters can be gauged, and it is impossible to get this without plotting the air curve. Taking the air curve also enables one to obtain the mechanical losses in the engine, due to connecting rods, pistons, etc. By plotting the mechanical losses in the same motor, with off-set cylinders, and then with the cylinder centers in line with the center of the crankshaft, you are enabled to obtain the best percentage of offset.

The air consumption curve also aids in the design of the camshaft as it shows one when one has the maximum volumetric efficiency. To readily determine this a long sliding cam is used which is practically V-shaped at one end, and nearly rectangular at the other, and with every gradation between these extremes intermediate of the ends. By sliding this cam it is possible to get the design that will give the maximum volumetric efficiency. The type of cam selected depends upon what the manufacturer desires by way of a motor. If the design is for a touring car, one type of cam will be used, but if for a racing machine another type can be used.

The various testing apparatus used by Mr. Heinze, and reproduced on charts, will be published in a later issue of The Automobile. They consist of an air meter placed in series with the carbureter; water tank arrangements for measuring heat losses through the jackets; radiator testing apparatus; apparatus to show period of ignition instead of depending upon magneto breaker box; device for measuring the temperature of the spark; apparatus for measuring carbureter acceleration; apparatus for measuring motor vibration between different ranges of speeds; electrical device for measuring waves in primary and secondary transformers; and other apparatus for measuring cylinder compression.

Christian Girl in presenting the report of the spring division which was to have been submitted at the June session, stated that the work of his committee was rather to simplify the spring situation, so far as the manufacturer was concerned, than to standardize parts. The report was accepted as a progressed one. The committee has before it the collection of information on the best length of spring pads or seats for overslung and underslung springs, and also the accepted distances fore and aft between spring clips, for springs of different lengths.

T. V. Buckwalter in presenting the report on aluminum and copper alloys recommended an alloy for general utility of:

Copper	87 to 89	per cent.
Tin	9.5 to 10.5	per cent.
Zinc	1.5 to 2.5	per cent.

In the United States standards the divisions are: Copper, 88 per cent.; tin, 10 per cent.; and zinc, 2 per cent. The recommended specifications give an alloy with reasonable working limitations, and with a tensile strength of 35,000 pounds.

The copper alloy recommended for gears, worms, etc., is:

Copper	88 to 89	per cent.
Tin	11 to 12	per cent.
Phosphorus	.15 to .30	per cent.

and can be manufactured by any good metallurgist. The report was accepted.

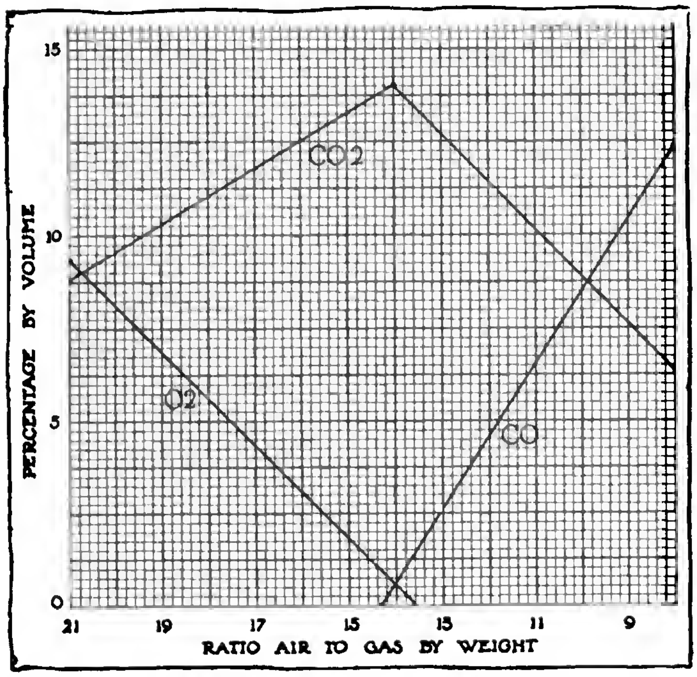
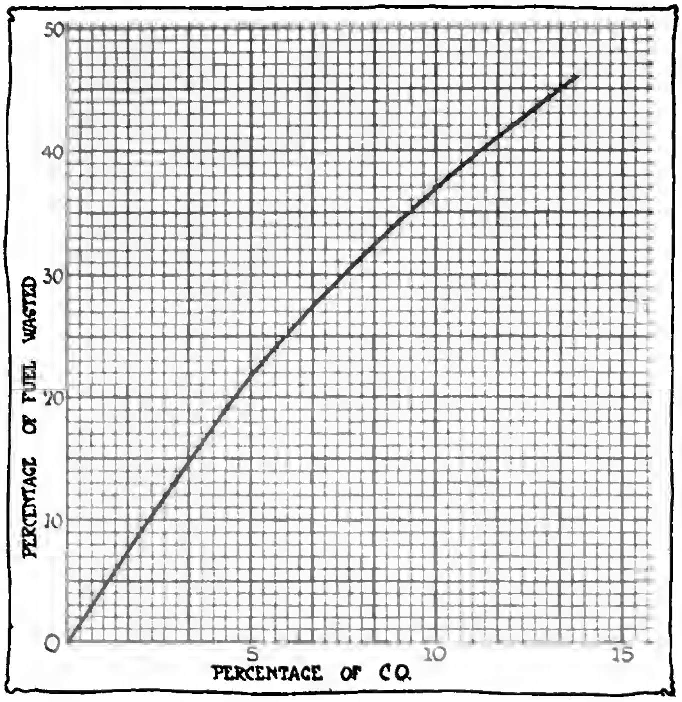


Diagram for determining the approximate proportion of air to gas when direct measurements of the quantity of both cannot conveniently be taken



Curve showing fuel wasted in proportion to carbon monoxide in exhaust

Exhaust Gas Analysis

Measurement of Air and Gasoline Makes It Possible to Determine Whether Proportion of Each Remains Constant

S. A. E. Convention

THE topic of exhaust gas analysis discussed during the Friday afternoon session was one of the best attended and most interesting of the week. A number of authorities on the subject were on hand to expound their ideas and experience which in several instances has extended over a long period of years. Dr. Arthur H. Elliott was scheduled to present a paper on the analysis of exhaust gases but owing to illness was both unable to prepare any material and also to be present to aid in the discussion.

The analysis of the exhaust gas of an automobile motor is becoming to be looked upon as necessary to the proper determination of the efficiency of the engine under test by many engineers of long experience in testing work. By means of data as to constituents of the waste gases the engineer is able to determine whether or not the motor is getting all of the useful energy and power out of the mixture.

In the absence of Dr. Elliott several notes on the subject were hastily prepared by Herbert Chase, laboratory engineer of the Automobile Club of America, who dealt with the subject in its relation to carbureter and engine testing. Mr. Chase said:

"Some of you will doubtless recall that I gave you in the paper which I read before the society at its last summer meeting some data which I had obtained along this line in testing a six-cylinder Pierce motor. Since that time I have conducted a considerable number of tests in which samples of the exhaust gas were taken and analyzed. I am now convinced that I was correct in the impression stated in this paper that a much more satisfactory method of taking the samples of exhaust gas could be employed than the one there outlined. We now use a method which gives much more consistent and satisfactory results for reasons which I will shortly point out.

"It has been our practice to make tests along very much the same lines as indicated by Mr. Heinze in his discussion of motor testing, although the methods which we employ differ somewhat in detail. In addition to measuring the air and the gasoline which enter the motor, we also analyzed samples of the exhaust gas for the following reasons:

"Measurement of the air and the gasoline makes it possible to determine whether or not the proportion of each remains constant. Aside from this, one very important factor remains to be determined, namely, Is the gasoline properly mixed with the air in such manner that each molecule of oxygen and hydrogen will come into contact with a molecule of oxygen during the very short period of time when effective combustion takes place? It may be argued that this question will be answered by measuring the horsepower at the same time that the air and gasoline are measured and concluding that a better diffusion of the gasoline in the air is obtained, when, as a result of some change in the method of spraying without changing the proportion of air to gas the power increases. This process can be followed with reasonable satisfaction up to a certain point, but when is the investigator to know whether or not still better results could be obtained until he has determined the completeness of combustion?

"There are other arguments in favor of analyzing the exhaust gases. One is the convenience and simplicity of the determination but means for measuring the air are not at hand. In road testing it is quite easy to make samples of exhaust gas for later analysis, whereas air measurements would be exceedingly difficult, if not impossible.

Prominent Engineers Discuss Exhaust Gas Analysis
Howard Coffin W. C. Marshall A. L. Riker

"Professor Watson, an English investigator of considerable prominence, has obtained the curves given herewith. These provide a means of determining what the approximate proportion of air to gas is when direct measurements of the quantity of both cannot be conveniently taken. They, of course, apply only when the combustion is complete, in so far as it can be complete with the quantity of oxygen present.

"With the price of fuel rapidly increasing it now becomes more important than ever to get the greatest possible amount of power out of the given amount of fuel. I am very decidedly of the opinion that this object could be obtained more readily if engineers would give more consideration to exhaust gas analysis.

"Chart two is also taken from one of Professor Watson's papers. It shows the per cent of fuel wasted with the given per cent of carbon monoxide in the exhaust. I may say also that Professor Watson has found in some of his investigations that the maximum power of a motor is obtained with a ratio of air to gas from 12 to 1 to 13 to 1 by weight. He has determined that the maximum thermal efficiency corresponds to about 17 parts of air to 1 of gasoline. Other investigators state that about 14 parts of air to 1 of gas, which is approximately the theoretical amount necessary for complete combustion, gives the best thermal efficiency."

The discussion of the subject was opened by E. R. Hewitt who has had wide and varied experience along this line. He outlined the apparatus which he uses in making exhaust gas analysis tests on the road and explained the method of attachment to the car. The necessity for rapid collection of the sample of gas to be tested was emphasized. It was also brought out that results obtained by road tests are not the same as those under brake test conditions. The reasons which Mr. Hewitt gave for this difference are that the jar of the motor on the road affects the carbureter float level and also the variation in temperature under the hood has a bearing on the results obtained. He stated that there was a difference of 15 per cent. to 100 degrees Fahrenheit variation in temperature. For greatest efficiency on the brake as well as on the road Mr. Hewitt has determined the following exhaust analysis:

13.5 per cent.......... CO_2
0.1 per cent.......... O
0.2 to 0.3 per cent.......... CO

Whenever an analysis of the exhaust gases does not check up as would be naturally expected, the deviation from the normal conditions may be ascribed to poor carburetion. The normal analysis would show intimate mixture and complete combustion.

Mr. Hewitt touched upon tendencies for condensation within the manifold. With any carbureter whatever with velocities in this carbureter below 5,000 feet per minute, it is impossible to get away from condensation within the manifold. We get best results at 15,000 feet per minute.

Mr. Hewitt has determined that the maximum efficiency mixture has approximately the following composition:

12.5 per cent.......... CO_2
2.0 per cent.......... O
0.0 per cent.......... O

Mr. Hewitt has made a number of tests with the view of determning the effect of the action in the intake both on the power developed and on the mixture and has found that 1 inch mercury suction defects the power about 10 per cent., which relation holds up to 3 inches of mercury, so that if it were possible to reduce the suction to zero, we would get an increase in power of about 30 per cent.

J. M. Breitenbach gave his opinion that another reason for power loss in motors designed according to American practice is that the explosion chambers are too large and that another is on account of incorrect timing.

Prof. W. C. Marshall, Sheffield Scientific School, Yale University, added some most interesting points to the information already given out, his ideas coming as a result of a number of road tests made under varying conditions of speed and with different types of motors, during the past summer. In his experience he has found that under road conditions the analysis compare very closely with those given by Mr. Hewitt. He pointed out that from the amount of CO_2 which is present in the waste gases is a very correct indication of the fuel consumption of the motor. For instance when from 5 to 6 per cent CO_2 is found, the car averages from 4 to 5 miles on a gallon of fuel, while when the exhaust shows 12 to 13 per cent. CO_2 the economy runs up to three or four times as much.

Looking at the practical side of the problem Professor Marshall stated that an exhaust gas analyses as applicable to automobile engineering are not so difficult as to cause any engineering department to hesitate to make them. Determination of the composition of the waste gases not only affords a means of gauging the economy of the motor but also makes it possible to arrive at the relative efficiency of the carbureter.

Mr. Hewitt in reply to a question as to what engines he used for his tests stated that he had employed two machines for the purpose, one a four- and the other a six-cylinder model. The cylinder dimensions of these two motors are the same, being 4 by 4.75 inches. He averages from 21 to 24 miles per gallon with the four-cylinder type and 14.5 to 15 miles per gallon with the six.

W. G. Wall, chief engineer of the National company stated that he has made a number of exhaust analysis tests during the last 2 years, and that due to the many variables such as the size of the intake, the shape of the ports and so on, he has come to the conclusion that gas analyses are of very little value. When very best theoretical results are obtained they are of little use from the practical side. He has been unable to arrive at any definite conclusions by this method of motor testing due to the many contradictory results.

Leaders in Exhaust Gas Analysis Discussion
Herbert Chase Edward R. Hewitt

E. J. Stoddard touched upon the chemical manipulation in connection to accurate analyses. Engineers are somewhat weak on this phase of the subject, he said. He inquired as to whether the absorption of oxygen is liable to produce CO in itself. The reply was negative.

Mr. Hewitt was requested to outline briefly his method of procedure in making exhaust analyses. The CO_2 is absorbed first after which the oxygen is removed which leaves only the CO. In discussing carbureters in this connection he stated that he has tested in all about thirty types, and that the analysis does not depend upon this feature. One carbureter will work well at one particular range of speed and may be very poor at a lower or higher range. There is no carbureter at present which works equally well at all speeds. In the average case the carbureter is adjusted for too rich a mixture at all times. This is due to the fact that it is impossible to compensate for differences in temperature under the bonnet so that if an instrument is adjusted for best running at a good speed, it is very poor for starting purposes. Dash carbureter adjustment for manually changing the mixture in accordance with these varying conditions is therefore necessary.

T. S. Kemble believes that horsepower and other block tests are equally as good for arriving at the efficiency of motors and for deductions as are an analysis of the exhaust.

In closing the discussion Mr. Chase mentioned the point of dissociation and recombination which has been brought up earlier as a possible theory as to the action of the gases in burning. He stated that the society would be authoritatively informed on this point later. The great amount of trouble which some have with analyses may be ascribed to the methods of collecting the samples. It is important to get these samples without admitting any outside air and also to attain them under average conditions.

Closely allied with the discussion on the analyses of the burnt gases in the automobile motor, was the paper presented by G. T. Briggs and prepared by C. P. Grimes on the subject of motor testing. The paper follows:

This paper presents in a general way points which have been observed through the aid of our testing laboratory to be most influential in attaining a perfected power unit. The nature of our work is such that we seldom have time to enter into a detailed analysis of any one motor, but by careful observance and record of the general performance of each motor that passes through our dynamometer test, we are able to give what we believe to be a comprehensive idea of the predominating features that produce results.

The general running balance of a motor, though generally conceded to be a matter of design and manufacture, has been found to be affected greatly by carburetion. A case in point was a long-stroke L-head motor of standard make equipped with a stock carbureter. At 22 miles per hour the motor would vibrate so violently as to shake the whole car. By changing to a different type of carbureter the point of vibration was eliminated almost entirely and could be detected but slightly at a speed of 32 miles per hour.

The requirements of ignition are in general very well known. We have found, however, that a material percentage of ignition trouble can be traced to a lack of symmetry in timing. Our special instrument for the purpose has often shown one of the sparks to pass out of synchronism with the others as much as 5

Snapshot of Gas Analysis Controversy
H. L. Pope Coker F. Clarkson W. G. Wall L. B. Brown

Engineers Discuss Dynamometer Testing
R. W. Funk A. L. McMurtry D. Beecroft G. T. Briggs

degree which would be quite noticeable under idling conditions and be indicated on a dynamometer test. Motors with a set spark will not show the best range of action in power or throttling. We have found it impossible to put as much snap or getaway into motors that are equipped with an automatic spark advance as into those with mechanical advance. Further, the rate of flame propagation in a gaseous mixture, other things being equal, is near its maximum at a 12-to-1 ration. The rate decreases with departure from this value in either direction, so that at any given speed there are a number of different best settings for the spark advance.

The number of cases brought to our attention have assured us that carburetion has far more to do with ignition than is generally recognized; depending upon how well the carbureter can be made to do its work of producing a homogeneous gas.

The question of manifolds is one of not alone great source of error, but is often a very delicate subject, especially in the case of a pet design. Experience gained from building a number of different designs leads me to say that in the final analysis the problem is purely and simply a matter of aerodynamics, not to be guessed at. The mixture traveling in the intake manifold may be likened to perfect dry steam or when filled with particles of liquid, wet steam. The designer of a manifold should bear in mind that steam separators are built with rough surfaces and sharp turns in order to accomplish separation. The function of the manifold is to distribute the mixture in exactly the same proportion as received from the carbureter without separation and with the minimum loss of head by friction.

Any device to improve the condition of the gas should be welcomed, such as a heat jacket or passing the gas through cored passages in the cylinder block casting. Before adding the best device the ultimate result on the power of the motor should be considered. If the jacket involves no increase in suction in the manifold, 2 per cent. in volumetric efficiency and power will be lost for each rise in temperature of 10 degrees, Fahrenheit, of the gas. If the heat device causes added suction in the manifold, about 4 per cent. in volumetric efficiency and power will be lost for each inch of mercury that the suction may have been increased. These statements may appeal to you as explaining increased power of a car on a cool evening and the decrease of power with ascent into a higher altitude.

If designers gave a little more consideration to the fact that the gases traveling in the manifold weigh about three times as much as air and move at the rate of from 300 to 400 feet per second with considerable momentum, I believe we would see far more consistent results, and that much of the uneven running due to oscillatory surges could be avoided.

The most effective manifold is not always the shortest that can be built. But of two things I feel positive, namely, that a long vertical lift of the carburetted gases is not only unnecessary but vicious practice that does rank injustice to both the motor and the carbureter. Furthermore, smooth streamline passages should always be adapted in manifold construction. The lack of these requisites has often been the means of discounting an otherwise well-designed motor.

As an aid to investigation I suggest that in the event of a newly designed motor running unevenly, the exhaust manifold be removed, giving each cylinder an equal chance to scavenge. The color of the flame from the ports may be taken as a criterion of the distribution from the inlet manifold. It is not uncommon to find that the injector action of the gases will tend to scavenge some cylinders and foul others.

Carburetion is a subject upon which very few have definite and reliable information. Before a new model carbureter is adopted, we test it in our dynamometer room to determine torque, horsepower, economy, volumetric efficiency and richness of mixture at every speed. By a specially designed instrument records of revolutions passed through, gasoline consumed and air consumed are made electrically, a split-second timepiece without any chance for human error to enter being used.

A thorough road test is then made, after which the whole car is placed in a refrigerating plant and the temperature reduced to 5 degrees, Fahrenheit, above zero, so that we may study the conditions of starting, running and power delivered at the wheels in winter.

We feel prompted to make the assertion that the American public will not accept a carbureter that gives a uniform mixture under all conditions, but demands a quick getaway, economical running and a powerful mixture at maximum speed.

I submit herewith some data taken from a test made in our laboratory on a four-cylinder block motor 3 3-16 inches by 5 inches, of the water-cooled poppet-valve type.

R.P.M.	Lbs. at 36"	H.P.	R.P.M.	Lbs. at 36"	H.P.
600	48.7	16.70	1400	49.6	39.75
800	53.0	24.22	1600	48.0	43.95
1000	54.7	31.25	1800	46.6	48.30
1200	52.5	35.95	2000	44.9	51.20

Exhaust valve diameter = 1.875". Inlet = 1.8125". Lift = 0.3125".

The valves, eight in number, were placed in a row on the top of the block casting.

The secret of the whole performance may be found, we believe, in the fact that the designer of this motor recognized the laws of aerodynamics and handled the gases accordingly.

Before closing, we wish to state that consumption of fuel is, to a very great extent, a personal equation, to be solved by each individual motorist. Our records show that the best economy per brake-horsepower-hour was obtained with a 14-to-1 air ratio and that with this setting no *CO* could be detected in the exhaust. We admit that this ratio would not please those who are always in a hurry to get started or delight in darting around slower vehicles, but for each percentage of *CO* permitted in the exhaust, from an overly rich or snappy mixture, a net loss in fuel of 4 per cent. will be suffered. I wish to add that the majority of cars delivered to owners by salesmen and testers emit as high as 10 per cent. of *CO*, which represents a waste of nearly 40 per cent. of the fuel fed to the motor.

Mr. Hewitt was again requested to open the discussion, bringing up the point of smooth versus rough inlet passages. His tests favor the rough cast metal type so that the fuel may be broken up by the surface with which it comes in contact. Although advocating rough passages, he pointed out that the corner should not be so sharp as to offer resistance to the flow of the gas. He was asked if the rough surface would not materially tend to cause condensation on the rough edges and replied that he has always jacketed these inner passages and hence has had no such trouble.

Mr. Chase held that proper ignition is important to get best results. In comparing two carbureters it is necessary to insure constant ignition which is equally as efficient when one carbureter is used as when the other is under test. It is unfair to make comparisons relatively when these conditions are not the same. Comprehensive tests should also take into consideration atmospheric conditions such as a barometer pressure, humidity and so on. Touching upon manifold construction, he advocated the use of the straight type with branches to the cylinders.

J. O. Heinze discussed the point of manifold construction and stated that if possible the intake pipe should vary in length in proportion to the speed of the engine. Inasmuch as this is impossible the length used should be the best possible medium between the very long and the very short, so as to efficiently take care of the greatest range of speed. To bear out this assertion he outlined a number of tests which he has made with glass tubes in which the action of the mixture in combining could be witnessed. In order to mix the air and gasoline a certain constant time is necessary, hence, the greater the engine speed the longer should be the passage for the gas so that it may have sufficient time for combination.

Prof. F. R. Hutton made an appeal for greater definiteness for the term carburetion in view of the present tendency toward the use of heavier fuels such as kerosene which when combined with air to make an explosive mixture cannot properly be classed as strictly carburetion. While the manifold has a very important function with gasoline, it is still more so with less volatile fuels, such as kerosene.

Speaking of Prof. Hutton's talk on the misuse of the word carburetion and his ideas of the applying of a term such as atomizer or vaporizer to the device which mixes kerosene with air, Howard Coffin was of the opinion that the engineers are interested more in the results obtained through the use of these newer mixing devices than they are in the nomenclature. Mr. Coffin spoke further of a number of tests which have been made at the Hudson factory which have led him to come to the conclusion that if it were possible to so construct the motor that at the end of the suction stroke after the cylinder had been filled with all the charge which would be taken through the carbureter, were possible to inject fresh air immediately over the top of the piston and in proper proportion the mixture would be entirely consumed. In these tests it was found that carbureter troubles were eliminated, the cylinder oil even being entirely burned so that there was no semblance of carbon. This burning with excess air if developed means the production of much greater power than now obtained from motors of given dimensions and would mean that bearings and other parts would have to be strengthened and redesigned for the greater forces exerted. It is now possible to get greater power out of a motor than present practice can take care of.

Mr. Hewitt stated his belief in this idea also although he pointed out that maximum practical compression pressures have been determined of from 72 to 78 pounds per square inch. In the average case 72 pounds per square inch is about the maximum which can be carried. Mr. Hewitt has found that ordinarily an engine will completely fill its explosion chambers with the combustible mixture up to 1,000 revolutions per minute but not above this speed.

F. S. Dusenberg stated that cam setting effects compression and that he has obtained in motors of his design as high compression at 1,500 as at 1,000 revolutions per minute.

Mr. Heinze outlined some experiments which he has made by heating of the intake passages. These experiments contemplated the winding of wire around the pipe and then passing a current through it thus obtaining a greater heat than could be obtained by hot water jacketing. He found no advantage of heating these manifold pipes although very beneficial results were obtained when the fuel in the bowl of the carbureter itself was heated. Large increase in power was thus obtained.

Road and Dynamometer Testing

At Friday afternoon's session a discussion of the relation of road testing to dynamometer testing brought forth some good points. According to E. R. Hewitt, both are essential. Herbert Chase advocated more accurate road tests than those now performed. Much can be gained from such determinations, he said. These tests should be standardized just as much as should those relating to the laboratory or block. It is exceedingly difficult at present to compare results of tests by different persons as apparatus used, methods, and data are widely at variance. An instrument is needed for accurately obtaining horsepower and torque readings on the road, said Chase. H. L. Pope suggested that the motor testing division of the Standards Committee have its scope broaden so as to include road tests in its standardization work.

Prof. W. C. Marshall said that road tests are neglected by many manufacturers. Just as valuable information and the same information may be obtained on road tests provided an accelerometer is carried. To prove this as certain Prof. Marshall showed torque curves could be plotted from readings taken from such an instrument. Torque curves thus obtained are more valuable than the laboratory kind, in that they are taken under real road conditions.

Although there were some who were not in favor with the road tests and could not see their advantage the majority of those present are awake to the advantages to such methods of obtaining data.

Ignition, Motors and Gearsets Discussed

S. A. E. Members Argue Pro and Con on Six-Cylinder Motors, Rear Axle Gearsets and Electric Starting Systems

WILL the magneto as at present fitted be discarded owing to the adoption in some quarters of the cranking motor, lighting plant and ignition being contained in one unit?

A. L. McMurtry opened the discussion on the subject by stating that the high-tension magneto as at present used was a most reliable instrument. When the question of a combined system of starting, lighting and ignition system was considered, the element of security was not so great as with the present magneto, as it only requires a short circuit anywhere in the various leads, to render the ignition system useless.

Question of Weight and Cost

A. L. Riker thought that it was a question to determine whether the same result could be obtained with the one unit as well as with the three unit? Further, if the result were the same, what the relation would be in point of view of first cost? He thought that a combined unit would cost less, but the relative weights and space occupied were also points that would have to be considered.

Mr. Hartford agreed with Mr. McMurtry that it was better to continue to use the high-tension in addition to the other electrical equipment employed for starting and lighting.

Professor Hutton said that he had had some experience with this situation and had experimented with two batteries, but owing to the lack of standardization in wiring he was continually troubled with short circuits. Until the methods of wiring are improved, he thought that the present plan was the better. A possible solution was the motor and generator combined and the outcome of experiments along this line might be satisfactory. In the speaker's mind there was a doubt, and the question resolved itself as to whether it was desirable to attack the effectiveness of the motor in any way?

V. G. Apple believed that for commercial reasons that it was better to continue to use the magneto for ignition purposes. He advocated taking the current from the battery for starting purposes only.

Mr. McMurtry pointed out that the Bosch company has brought out a small magneto to be fitted on the dash for starting purposes, thereby doing away with the battery. He thought that there must have been a reason for this and went on to state that it simplified the system considerably as the batteries had other duties to perform.

H. L. Pope stated that it was best to leave the magneto alone for the present. He thought that the time would soon come, however, when the various systems would be combined. There would be a saving of weight and less initial expense also.

Howard Marmon stated that it has taken a number of years to develop the magneto to its present reliable state, and one advantage of the magneto is that as the speed of the motor increases the intensity of the spark increases also. This fact simplified control.

Mr. Alden said that no doubt it would be the survival of the fittest in the long run.

"Why has the 42-inch wheel been discarded?

Mr. Alden said that it was not so much a question of the 42-inch wheel being discarded as that it had failed to grow in favor and he called upon the several members present to give their opinions upon the matter.

Mr. Riker pointed out that the majority of Americans wanted to carry three people on the rear seat and to do this it was necessary to have an overall width of 57 to 58 inches. The public also wanted to be as near the ground as possible. With a 42-inch wheel, 57-inch tread and a body width of 57 inches the tendency of the larger wheel design was to perch people high up in the air. Then there was the question of the additional cost of the tires and he did not think that the advantages gained by the large wheels were in proportion with the extra cost entailed. To hang the body low and use large wheels is not feasible without increasing the tread and he did not think that this was a move in the right direction.

Mr. McMurty said that he had built a horseless carriage in 1897 to which he fitted large wheels and experienced considerable trouble from broken axles and broken steering spindles. The size of the wheels was originally 40 inches and upon reducing the size of the wheel to 30 inches the axle trouble disappeared.

Professor Hutton pointed out that the increased diameter of the wheels gave a longer lever arm to the body and that heavier brakes would be necessary. It was a question in his mind whether the better riding qualities was imaginary or not.

Mr. Alden stated that he had ridden in several cars with large diameter wheels and with smaller ones under the same conditions and he had experienced more comfort with the large wheels.

War of Fours and Sixes

"Will the six-cylinder motor eventually displace the four-cylinder for passenger cars?"

Several members expressed the opinion that the four-cylinder would remain the logical motor for automobiles the purchasers of which had to study economy either from the point of view of low cost of purchase as well as low operating costs; but for those who were willing to pay the price, the six-cylinder would prevail. Mr. McMurtry stated that while in Europe he had ridden many miles in several of the small four-cylinder cars which are invariably fitted with four-speed gearsets and provided one did not want to continually drive on high gear the efficiency of these little machines left nothing to be desired.

Professor Carpenter said that 12 years ago prophecies were made that the single-cylinder would be the ultimate type, and in some years to come they might find that any of the prognostications made at this date might equally fall short of the mark as those made in the last century. He thought that the four-cylinder would always be in demand. It met the requirements for the light vehicle and in this field he did not think that it would ever be displaced.

Mr. Alden said that he had a town car with a very small motor and a final gear reduction of 4.25 to 1 and that it was entirely satisfactory. While it only had three speeds it was only used for town work, but in the case where the type of car was used for country driving it was fitted with four speeds.

Mr. Pope remarked that one item to be considered was the manufacturing cost and also the question of weight. Despite the fact that some of the builders of small cars were fitting six-cylinder motors at present he thought that they would come back to the four-cylinder type.

Mr. Heinze said hat it was common knowledge that the thermal efficiency of the four-cylinder engine was superior to that of the six. By fitting a heavier flywheel to the four it was possible to make it run as smoothly as six, although this reduced the accelerating properties. Owing to the more constant torque the six accelerates better than the four. If the purchaser did not consider economy undoubtedly the six-cylinder was preferable. The advantages of the four-cylinder are power with economy and a minimum of weight.

Mr. Kemble stated that for a matter of economy the four is undoubtedly the better, but for those who want luxury the six is preferable. He thought that there would always be a demand for both four and six-cylinder motors.

Mr. Riker said the four is more economical to build and also to run. The reason why six cylinders have in many cases supplanted the four is due to the lesser vibration of the six. He noticed that customers who have ridden in fours and sixes express a preference for the six and when asked the reason cannot explain. He gave the matter some thought and stated that the reason came to him while he was making some bench tests. While a four-cylinder motor is running at from 1200 to 1300 r.p.m., the stand carrying the motor being bolted to the factory floor, it is almost impossible to keep the heels on the ground due to the vibration set up, but in testing a six-cylinder motor at the same engine speed he did not notice any inconvenience. The sensation experienced after driving continually behind a four-cylinder car for 200 miles at a stretch is one of fatigue, while after driving the same number of miles behind a six-cylinder motor he did not feel at all tired. He was of opinion that the absence of vibration in the six-cylinder motor is a determining factor. There is a tendency to decrease horsepower and he thought that this would bring with it a reversion to four-cylinder motors in some cases. Undoubtedly the six had come to stay. The public wants a six in the same manner that it wants electrical starters and will not take any other kind and it is just the same with the six-cylinder motor.

President Marmon Favors Both

Mr. Marmon thought that the word pleasure car was a misnomer; there were two classes—pleasure cars and work cars. For those that wanted the greatest mileage for the least number of dollars the small four-cylinder filled the bill. But when the car was used for purely pleasure purposes undoubtedly the six-cylinder would remain.

Mr. Coffin thought that there was a perceptible difference in the noise of the four and six car and in the smoothness in running. It was possible to drive a six faster in traffic than a four without creating the impression of speed in the minds of others, even police officers. Undoubtedly the four-cylinder four-speed car performed wonderfully and would do as much rough work as any other. There would always be a demand for a small four, but the speaker thought that the big four would disappear. It was rather a pocket-book need than sentimentality. As far as fitting a heavy flywheel to a four-cylinder, as one of the speakers suggested, Mr. Coffin said that he did not think that this combination gave the same result as a six-cylinder motor.

Mr. Pope suggested that it would be interesting to hear members' opinions upon the advisability of fitting six-cylinder motors in trucks.

Mr. Trask stated that as the six-cylinder was a luxury he did not see that it was necessary to fit them in trucks. Further the decrease of horsepower in truck motors may also have an influence on the matter.

Mr. Riker said that with regard to the question of six-cylinder motors for trucks there were the items of economy and original cost to be taken into consideration. The matter of vibration was not so vital. In many cases in trucks enormous masses had to be accelerated and it was not a question of high gear drive all the time.

Gearbox Location Arguments

The final topic dealt with at the meeting related to the position of the gearbox. **The members were asked to express their views as to the best method; whether the gearbox forming a unit with the motor was better than when coupled up with the rear axle or was the individual unit type with the gearbox amidships better than either.**

Mr. Coffin started the discussion, stating that in his various connections in the last 5 years he had had occasion to observe the performance of cars with all the above mentioned types. In cases where the motor was coupled with the gearbox, forming a single unit, he had used both single and double universal joints and as there would be lost motion in any case he thought it was better to have as few joints as possible. When placed amidships the alignment of the gearbox is subjected to distortion through frame deflections. making numerous joints necessary, and for this reason the unit motor or unit axle types were preferable. When placed on the rear axle in the form of a unit with it there is an additional amount of uncushioned weight on the tires. He found in experience that a gearbox of this class makes it difficult to drive the car through sand and rough roads. Another objection is that it is necessary to fit both brakes on the rear wheels. When the motor and gearbox are a unit, the latter is entirely independent of any frame action. It simplifies manufacture and assembly and further reduces the number of joints and consequently eliminates lost motion as much as possible.

Mr. Marmon stated that the gearbox being placed on the rear axle does not increase the uncushioned weight any more than the addition of a demountable rim would. By placing the gearbox back a quieter drive is obtained. He thought that it was more accessible for making repairs, and further that on low gears there is less torque and it is possible to fit a long drive shaft of small diameter.

Mr. Dennison said that he built a car 2 years ago with the gearbox and rear axle in a unit and found that the car held the road better.

Mr. Riker thought that for the small power plant that the unit-motor or unit-axle types were good; but the position of the gearbox largely depended upon the power. On large cars it was better to place the gearbox amidships as it gives better distribution of weight. The reason that double chain drive cars held the road best of all was the method of weight distribution.

Mr. Brockman said that the company he was connected with has made both types and has found that when the motor and gearbox are in a unit and when any repairs are necessary it means tearing the unit to pieces.

Breaks Philadelphia-New York Record

New York, Jan. 16—The Philadelphia to New York record by motor truck of 8 hours and 45 minutes was lowered by 14 minutes today when the transcontinental Alco truck bettered its own previous best mark despite muddy going, heavy rains and thick fog.

Carrying a cargo of thirty boxes of soap, consigned by its owners, Charles W. Young & Company, of Philadelphia, to Schwarzenbach, Huber & Company, a large silk manufacturing concern in West Hoboken, the big freighter made the journey in 8 hours and 31 minutes. The load transported by the truck weighed 8,247 pounds.

Low-Grade Fuel For Motor Trucks

By N. B. Pope

Paper Read at the Winter Meeting of the Society of Automobile Engineers in New York City, January 16

¶ One truck consumes in the course of 1 year about three times as much gasoline as one pleasure car. In a broad way, therefore, the introduction of cheaper fuels for commercial vehicles should afford immediate and progressively increasing relief for the fuel market.

¶ Using gasoline, the fuel cost represents 10 per cent. of the total cost of operation. As immediate substitutes for gasoline, there are available kerosene, distillate and naphtha. There is little question of thermal equivalents in comparing these fuels with gasoline, what little difference there is being in favor of the heavier products.

¶ The bondage of the automobile industry to petroleum is largely traditional. Petroleum products must be employed exclusively as fuel only so long as they are cheaper than other fuels and both truck users and manufacturers should be brought to realize this fact.

WE are approaching a point where the stringency of the fuel market must become painfully evident to the motor vehicle user and indirectly to the motor vehicle manufacturer as well. Premonitory symptoms are: 1—continued degradation of the gasoline of commerce; 2—increased prices for gasoline, which at present are trending in a mysterious manner toward a fairly uniform advance of nearly 100 per cent. over the ruling wholesale rates of 1 year ago; and, 3—advances in the price of fuel oil east of the Rocky mountains, indicating in some measure the effect of rapidly increasing consumption for all petroleum products.

There is good reason to hope that the fuel difficulty may be relieved in large degree by cooperation between the automobile maker and the refiner, but the result of such coöperation cannot under the circumstances be realized for a period of months, possibly of several years. Its logical outcome would at best be an agreement on one or more standard grades of fuel of lower gravity and volatility than are common at present.

Meanwhile the commercial vehicle is rapidly becoming an important factor in increasing the total consumption of gasoline. **Taking a rough average of all motor vehicles in use, one truck may be said to consume in the course of a year about three times as much gasoline as one pleasure car.** Hence the great increase in commercial vehicle production must cause the motor truck to exert a preponderating influence on the fuel market as soon as the number of trucks in use exceeds one third of the number of active pleasure cars. **In a broad way, therefore, the introduction of low-grade and cheaper fuels for commercial vehicles should afford immediate and progressively increasing relief for the fuel market.**

From the user's point of view the possible reduction in the cost of fuel is far from negligible. **Using gasoline, the fuel cost represents at least 10 per cent. of the total cost of operation.** [illegible] Assuming that by the employment of low-grade fuels a saving of from 30 to 40 per cent. [illegible] could be effected and assuming the same consumption [illegible] of the low grade fuel as for gasoline, the [illegible] of the cheaper fuel would insure a minimum saving of 3 to 4 per cent. in the total cost of operation. Unquestionably the overall saving should be even greater, and by careful development of special carbureters and slow-speed motors for the purpose it is probable that the inducement to the user can be considerably increased. Indeed, one maker on the Pacific Coast, using engine distillate as fuel, claims a saving of 50 per cent. on the fuel bill and a 20 per cent. increase in power by doing away with gasoline.

PRESENT AVAILABLE FUELS

As immediate substitutes for gasoline there are available: kerosene, distillate and naphtha.

Kerosene is exceedingly plentiful, low in cost, uniform in quality, promises to continue in abundance and, if demanded in large quantities for motor fuel, could be disposed of in the domestic market with greater profit to the refiner than when marketed abroad, as is so largely done at present.

Engine distillate is a product obtained from the western crude oils after the lighter fractions have been distilled off, and, in a way, is analogous to kerosene in respect to its position in the scale of petroleum derivatives. It is less thoroughly refined, however, and at present is to be considered principally as a local product. That its practical equivalent could be produced from other asphaltic oils, such as those of Texas and Mexico, I believe to be the case.

Naphtha is as indefinite a term as gasoline. In its present use it is intended to embrace not only the heavier fractions that commonly are included with the gasoline distillation, but also the fractions between gasoline and kerosene, which are at present lost to the automobile fuel market. Being slightly more volatile than kerosene and moreover free from the doubtful reputation that kerosene enjoys as a fuel, it should prove easier to introduce, first, because the user is in no wise prejudiced against it, and second, because its employment entails less experimental development.

FUEL VALUES

In considering the comparative utility of different fuels, particularly as between gasoline and the lower-grade petroleum distillates, there is little question of thermal equivalents. **Whatever difference exists is, if anything, in favor of the heavier products.** Volatility, however, as expressing the ease with which the mixture may be generated, is of paramount importance. Volatility, viscosity and gravity together indicate the comparative facility with which a fuel can be reduced to the condition of a dry or wet mixture and so delivered to the engine.

CARBURETION

In considering the lower-grade fuels it is necessary thus to distinguish between the carburetability and combustibility. That a liquid cannot be carbureted by ordinary methods need not condemn it for use in the internal combustion engine, but it does exclude it from consideration as a fuel for automobiles of present construction. In this way it is perfectly true that the carbureter is really the determining factor in fuel selection. As the values of volatility, viscosity and gravity are lowered the fuel becomes, respectively, harder to vaporize, more difficult to force through small orifices (having a higher coefficient of discharge) and requires a greater lifting effect (suction) to overcome its superior mass per unit of volume. With the heavier fuels, therefore, different proportions must be employed in the carbureter in order to obtain results corresponding to those obtained in successful instruments designed for gasoline.

The quantitative expression for the relation of these all-important area and velocity relations is still locked in the designer's breast, but it is evident at least that a carbureter designed for heavy fuel may be more satisfactorily operated with gasoline than a gasoline carbureter with heavier fuel. To assist in the vaporization of the lower-grade fuels more heat is necessary than for gasoline. This is due largely to the fact that the latent heat of the heavier fuels is greater than that of gasoline. With the lighter fuels, such, for example, as 70-degree gasoline, a larger proportion of the fuel may be vaporized completely before the mixture reaches the cylinders. With the heavier fuels, on the other hand, most of the fuel reaches the cylinders in atomized liquid form.

The application of heat to assist the vaporizing action may be continued profitably only up to the point where volumetric efficiency is affected adversely. So long as the heat supplied to the mixture is absorbed in raising the temperature of the liquid particles, or in vaporizing the fuel, the volumetric efficiency will not be reduced, since the temperature of the mixture will not be raised; but the partial insulation of the liquid by the surrounding medium of air and fuel vapor prevents a free interchange of heat, particularly in view of the high velocities involved. For this reason the quantity of heat than can be supplied is less than that required to bring even the lighter fractions to the boiling point and convert them into vapor.

That a certain loss of volumetric efficiency can be employed profitably as an offset to the non-homogeneous and consequently slow-burning mixtures that otherwise would result is, however, probable. The law of compromise will stand considerable investigation in this respect.

High velocities likewise, while tending to promote evaporation by mechanical action on the liquid particles, can be employed only to the limiting point where the volume of the charge is reduced by excessive fluid friction. Practically speaking, both methods must be used in combination. In any case, however, it must be borne in mind that the bulk of the vaporizing process with the heavier fuels must be carried on within the cylinder during the compression period.

The design of the heavy-fuel instrument, therefore, must be postulated on the theory that it will handle at all times a wet mixture, and due provision must be made against the separation of the liquid component by baffling surfaces. Furthermore, since a certain amount of separation must occur from this cause, with consequent tendency to "loading" of the mixture under certain running conditions, its effect must be minimized as far as possible by providing ample heating for all critical points in the manifolds and ports.

STARTING

However successfully a carbureter for low-grade fuels may be made to function under normal running conditions, starting will be rendered difficult in just the degree that normal operation is dependent on heat supplied. Of the two available methods of counteracting this difficulty—one the supplying of artificial heat prior to starting and the other the use of a more volatile fuel for the first few charges—the latter is by far the simpler and easier to accomplish. Where normal carburetion is dependent largely on high velocities to convey the mixture to the cylinders, starting the motor when cold is accomplished more easily. Ease of starting thus becomes, as it were, inversely proportional to the normal heating-effect and directly proportional to the normal velocity-effect under running conditions. Hence it is reasonable to conclude that a mechanical starting device will always be required for low-grade fuel motors, and that in addition either the use of a high-grade fuel for the first few moments of operation will be necessary, or else a method of priming. In many respects the latter method is preferable, especially if acetylene be used, since it permits starting without special carbureter adjustment (other than choking of the air), simplifies bi-fuel tank and piping complication, and further introduces into the primary charges a high-velocity combustible which serves as kindling material for what is practically a normal charge.

There is every reason to believe that in the natural course of events engine-starting appliances will soon become a practical necessity on all motor vehicles, so that the development of such devices for commercial vehicles in connection with the adoption of low-grade fuels need not be viewed in the light of a special and purely incidental burden. Practically speaking, starters are more necessary on commercial vehicles than on pleasure cars, through their economic advantage in conserving the driver's energy and because they permit the shutting down of the engine for all loading stops.

COMBUSTION

On combustion the lower-grade fuels, containing as they do larger proportions of unsaturated hydrocarbons, give rise to more complex reactions than the higher-grade fuels, with consequent tendencies to the deposition of free carbon. Due to the complicated nature of the process, and on the hypothesis that certain of the reactions must proceed in sequence, flame propagation is less rapid with the heavier hydrocarbon, even with homogeneous mixtures that are properly proportioned. With incompletely vaporized mixtures, or those which are not agitated during the compression stroke and which in consequence may be described as in a "lumpy" condition, combustion will be further delayed by the completion of the mixing process as a result of the agitation of the flame waves. Because of this double retarding influence, slow combustion almost invariably accompanies the use of the lower-grade fuels, which are in consequence suitable for slow-speed motors only, so long as carbureting methods approximating those at present in use are retained. As the slow-speed engine is well adapted in other respects for commercial vehicle use, however, it follows inversely that the heavier fuels are particularly adaptable to commercial vehicle purposes.

DEVELOPMENT

As a large proportion of commercial vehicle types may be said more truly to be in the early stages of evolution than are pleasure vehicles, it follows that the adaptation of special apparatus for handling low-grade fuels will work less hardship on the truck manufacturer than it would if forced on the builder of established types of pleasure vehicle. Further, the higher valuation placed on operating economy by the commercial vehicle purchaser must tend to render the kerosene or naphtha-burning machine a more acceptable offering in that field than a pleasure car possessing the same feature would be in its field. Indeed, were it possible to offer almost any large truck user a carbureter that would handle a low-grade fuel as efficiently as his present carbureter handles gasoline, there is little question that he would accept the substitute immediately, on the basis of a not unreasonable performance guarantee.

NEED OF POPULAR EDUCATION

It will be objected that so long as the commercial vehicle user sees countless pleasure cars operated on gasoline, he will continue to be skeptical about the need or advantage of changing to a substitute fuel—even in the face of high and continually rising prices for gasoline; which is largely true. Above all things, there is need that motor vehicle users of every class be taught to discriminate in the matter of fuels—that they be taught that it is possible to offset rising gasoline prices by the adoption of lower-grade substitutes, and not improbably in the future by the adoption of manufactured fuels derived from various sources. The bondage of the automobile industry to petroleum is largely traditional. Petroleum products must be employed exclusively as fuel only so long as they are cheaper than other fuels. As a matter of self-protection the automobile manufacturer should assist in spreading this truth.

Granted the possibility of adopting a fair working standard for motor fuels, introducing one or more low-cost substitutes for gasoline, such an educational program could be readily put under way. Otherwise the process must be slower and more difficult. Let one or two successful manufacturers exploit models specifically intended for low-grade fuels, however, and the movement will be well inaugurated. What one small concern in its isolated territory west of the Rockies has done from the very beginning of its career, other and better equipped makers can do without fear of failure, and without risking a staggering capital investment. Once the movement is really started and the truck user learns that he can reduce materially his outlay for fuel without sacrifice of serviceability, the battle will be more than half won. And when the pregnancy of the present fuel situation is fully understood, the strategic advantage of such a development can be well appreciated.

Harking Back a Decade

FROM THE AUTOMOBILE of January 24, 1903:

The surprise of the 1903 show is the revelation of willingness of the American public to pay several thousand dollars each for large and powerful gasoline wagons fitted with the tonneau, either detachable or built in. Freedom of observation and display are combined in this form of self-driven carriage, and this possibility of seeing and being seen, and the sense of power and mastery which come from the control of a large and powerful and showy structure, is the secret of the popularity of the tonneau form of carriage body.

For elegance of translation and freedom from all contingencies of delay, the electric vehicle is beyond criticism.

The water-cooled hand brake on the differential, and occasionally on the countershaft as well, shows no alteration. Neither of these positions are commendable.

The committee of the Chicago Automobile Club on entertainment at the coming automobile show is busily at work. Handsome quarters will be fitted up at the Coliseum, where good cheer and other things will be on tap, with the genial Frank X. Mudd in charge. Open house will be the order of the day at the clubhouse also.

Digest of the Leading Foreign Journals

Continued Discussion of Mechanical Means To Be Adopted To Operate Automobiles With Diesel Motor Fuels—Keeping Lubricating Oil Out of the Combustion Chamber—Help for Poor Tourists—Twin Tires for Runabouts

PROSPECTS of Diesel Motors for Automobiles, II.—In last week's issue an excerpt of an article by Otto Malms of Mannheim was presented in which it was explained why and how two of the principal difficulties in applying the Diesel motor and fuel system to small high-speed automobile motors could be overcome, although they have not been overcome in practice as yet. It was shown that the problem of reducing the weight of the Diesel motor was solving itself through the lessons learned in building aviation motors and that the introduction of very small and accurately measured amounts of heavy oil in the fuel nozzle of each cylinder at a speed rate up to 12 to 15 times per second, as required for automobile motors, could be managed and, more particularly, could be managed so as to make the amount introduced for each combustion independent of the motor speed. The method proposed was that of driving two pumps, by reduction gearing from the crankshaft, in a special manner producing a continuous and constant stream of fuel from a reservoir into a pressure channel—the flow and therefore the pressure created in the channel being subject to regulation by variation of the pump piston strokes—and the method also involved taking the fuel from the presssure channel to the cylinder nozzles by means of needle valves with a cam-operated stroke on a plan shown in an accompanying illustration (Fig. 3 last week).

The author shows that with such a system the practical troubles encountered in trying to measure separately and individually the infinitesimal dose for each combustion are effectually obviated. For example, a 4-cylinder motor with a 100-millimeter stroke, giving 40 horsepowers at 1,400 revolutions per minute, requires for each power stroke in each cylinder 0.06 cubic centimeter of fuel, and a twin pressure pump of the kind proposed, which rotates 35 times slower than the motor shaft, would have to have a 35 times larger piston displacement for each pump. That is, each piston must at each stroke furnish 2.1 cubic centimeters of fuel. Accordingly, the pumps should make 40 revolutions per minute and, with a stroke of 15 millimeters should have a diameter of 13.3 millimeters—all of which comes within practicable working limits, so far as the dimensions are concerned, while the very low rotation-speeds of the cams which operate the pistons guarantees minimum wear and safe working of the suction and pressure valves. [Since in automobile practice it is not the object to produce automatically a strictly constant speed with a variable load, it is perhaps unimportant that the opening of the needle valves under the author's plan still depends for its duration upon the motor speed—in inverse proportion—and that the adjustment of the fuel pump and the resulting pressures in the fuel channel therefore cannot coincide exactly with the variations of the load. It seems to be the author's idea that the pressures will automatically take care of the feed to the cylinder nozzles through the needle valves, and this may indeed be the case if the dimensions of the needle valves are chosen so large as to admit a maximum dose of fuel in the minimum time of valve opening (corresponding to the maximum motor speed) without any larger back-pressures than are admissible in the pump mechanism. A complicated question relating to the balancing of pressures seems, however, to be involved.—Ed.]

In a later instalment of his article Mr. Malms discusses the third important difficulty in adapting the Diesel system, with its very important advantages, to automobile conditions. It relates to the atomizing of the fuel and its forcible injection in this form into the cylinder against a very high compression—a compression high enough to cause immediate ignition. So far, this has in all successful Diesel motor constructions been done by means of a compound air compressor with intermediate water cooling, the air being sent from this compressor at a pressure of 50 to 60 atmospheres to a steel storage bottle from which some of it is let loose at the beginning of each working stroke of each cylinder, thereby carrying the fuel charge before it and atomizing it by forcing it through a more or less obstructed channel. All other methods have proved faulty in practice and would prove still less available at the speed of automobile motors. [The author here enumerates the faulty methods which have been tried out and gives the reasons for their failure.—Ed.]

In a general way it may be said that the main requirement under the Diesel system is that every particle of fuel, when it is blown into the cylinder, shall find at once all the oxygen needed for its combustion, and only the injection by a stream of compressed air complies with this requirement. The important question is therefore whether the air compressor can be adapted to automobile conditions, and this is so much more decisive as a Diesel motor with its 30 atmospheres of compression cannot be started by cranking, so that the compressed air will be needed for starting purposes anyway.

COMPOUND COMPRESSOR THE SIMPLEST FOR THE WORK.

An arrangement for getting along with a simple compressor instead of a compound one takes the form of using the motor cylinder itself for the first compression, as may be done by proportioning the combustion chamber for a higher compression than is wanted and then tapping air from it to the single compressor during the compression stroke in the motor cylinder. In this manner air can be fed to the compressor at about 10 atmospheres, but this system becomes more complicated than a compound separate compressor in the case of a 4-cylinder motor, as air must be taken from all of them to make them operate alike. The number of conduits and cams required for this would seriously encumber the engine. In addition, this system, which is not much used, even in stationary single-cylinder motors, involves a loss of efficiency, as the air taken from the cylinder is at a high temperature and consequently considerably expanded.

The difficulties in designing a compound compressor to run at high speed are numerous however, and the compressor cannot be geared down, as it would become too heavy and large. They relate largely to finding room for valves of sufficient dimensions for the high-speed work and to certain troubles with the lubricating oil which finds its way under the piston rings into the partial vacuum created in the compressor.

A construction intended to overcome these troubles and meet the needs for an air-compressor in an automobile motor operated at high speed on the Diesel system, and with heavy oil as fuel, is shown diagrammatically in Fig. 1.

To get room for large valves, especially in the low-pressure portion, the two pistons are separated and are driven individually. This releases the whole top of the low-pressure cylinder for valve purposes. In other cases both pressure and suction valves are located here, but in this construction the size of the pressure valve is doubled by replacing the suction valve with slits in the cylinder wall which are uncovered by the piston toward the end of the suction stroke.

The low-pressure piston a is driven from the crank b. The knuckle c of the connecting-rod carries an arm d which, by means of a pair of rods e actuates the high-pressure piston f. Instead of this arrangement two cranks could be provided and the high-pressure cylinder could be placed in front of the low-pressure cylinder. This would make the whole engine longer, but, on the other hand, it would make it possible to balance the moving masses in the two cylinders by offsetting the cranks 180 degrees.

The high-pressure cylinder has a guide g which is incorporated in the cylinder body by means of the flange h and has a slit i in which the bolt k, projecting on both sides and secured to the ends of rods e, can slide with the piston f. The group of piston rings l is, in the highest position of the piston, underneath the slit m, so that in no position of the piston the compressed air which enters at m, coming from the intermediate water-cooling chamber, can escape along the lower portion of the piston into the crankchamber.

In the low-pressure cylinder, air enters at n at the lowest position of the piston a. It is compressed to about 10 atmospheres by the upstroke and is pushed through a group of ball valves o, whose motion is limited by a perforated plate y, into a conduit leading to the cooling device. Taken thence to the high-pressure cylinder by way of slit m it is compressed to 50 to 60 atmospheres and is pushed through the pressure valve q into a steel bottle. The unmentioned features may be as customary in the construction of Diesel motors.

Considering that the problem of adapting the Diesel system to automobile conditions is of far greater ultimate practical importance than other current motor problems and that, for example the question of the superiority of sleeve-valve and rotary valve motors over poppet valve motor dwindles to insignificance in comparison, unless it is discussed with reference to the different adaptability of these types for being operated with any and all of the fuels which can be burned in a Diesel motor, it may be of interest to look into the merits of the proposed air-compressor a little closer.

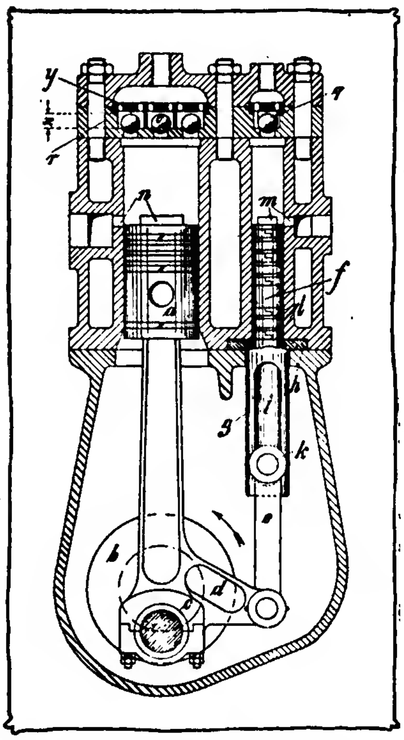


Fig. 1—Proposed compound air-compressor for automobile Diesel motors

The use of slits to take the place of suction valves has the disadvantage that a sharp depression is produced temporarily in the compressor cylinders during the suction stroke, to be relieved only toward the end of the stroke when the slit is uncovered. While experience has proved that the slit can be made large enough to assure the complete filling of the compressor cylinders with air, even at the highest speeds, it is undeniable that the tendency to vacuum formation means a small loss of efficiency, as a mean back pressure of about one-half of an atmosphere —7 pounds—has to be overcome during the suction stroke. As however the power consumption of the compressor amounts to only about 6 per cent. of the maximum power output of the motor, the loss caused by using slits instead of valves is in reality negligible. The possibility that lubricating oil may be drawn past the piston during the temporary vacuum, and that this oil may find its way into the cooling device and finally into the high pressure steel bottle, is more serious, as it may give rise to explosions in the high-pressure portions of the compressor, especially as the cooling water in an automobile motor cannot be kept at as low a temperature as in a stationary motor of low speed.

It is this possibility which is obviated in the construction shown in Fig. 1, by lengthening of the pistons and the use of piston rings at the lower ends.

WHY PISTON RINGS FAIL UNDER SUCTION

The need of this provision may not be apparent to all, as the causes which lead to leakage of lubricating oil around the pistons are not generally understood. That even in an ordinary automobile motor oil is drawn into the combustion chamber during the suction stroke seems at first blush inexplicable. A piston which remains tight under a high pressure of 25 atmospheres, as is produced an instant after the ignition of a charge, should apparently be expected to remain tight also under a depression amounting to not more than one-tenth of an atmosphere during the suction stroke of an automobile motor and to not more than one-half of an atmosphere in the proposed compressor. But the fact is that piston rings employed in the customary manner are adapted for tightening against compression only. During the compression and working strokes a small portion of the compressed air and of the explosion gases is forced into the grooves of the upper piston rings and assists in expanding the latter against the cylinder wall, so that no oil or gas can escape there. Otherwise at the suction stroke; the depression which also finds its way to the grooves back of the upper rings contracts the rings instead of expanding them, and the oil coating the cylinder wall therefore passes freely into the combustion chamber.

With the proposed compressor construction, on the other hand, the depression which may pass the upper rings is neutralized by the air entering at the intake slit, while the lower ring is protected against the effects of depression through the existence of the slit and, on the contrary, scrapes the oil on the cylinder wall back into the crankcasing. In the case of the high-pressure piston, several lower rings are provided, so that the air taken in at the suction slit at about 10 atmospheric pressures shall not escape around the piston downward to the crankcase when the piston is at the top of its stroke.

STARTING BY BY-PASSING AIR TO CYLINDER

The manner in which an automobile Diesel motor with open fuel nozzle should be arranged to facilitate starting remains to be explained. Parallel with the main channel of the nozzle another channel is provided which at its lower end opens into the motor cylinder and at its upper end can be connected, by means of a special valve, with the nozzle cavity immediately below the air-injection valve. The latter is so dimensioned and operated as to admit more air than the narrow nozzle channel will pass into the cylinder. When starting, one opens the valve to this bypass channel, with the result that a quantity of air corresponding to the full capacity of the air-injection valve enters the cylinder, filling it with air of the required compression. Such starting valves should thus be provided for each of the motor cylinders and may be opened simultaneously with a lever. If, before the compressed air is admitted, the piston in one of the cylinders is turned to a little past dead center, this cylinder will be started at once when the air is admitted, as the normal injection in that case is also timed right for the starting. After the first few turns the bypass valves should be closed, so that the pressure air will pass through the nozzle only.

Summarizing, it seems that beyond a doubt the question of whether the Diesel system can be adapted to automobile motors must be answered in the affirmative. That the work leading to this eventually inevitable result has not yet been done may perhaps be ascribed to the fact that engineers who are familiar with Diesel motors as a rule do not appreciate what the requirements of an automobile motor are, and that automobile motor engineers, on the other hand, have not had time to familiarize themselves with the history and workings of Diesel motors.—From *Allgemeine Automobil-Zeitung*, December 20 and 27.

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COMMON Carrier Automobile Lines.—In France, as well as in other countries, it has been observed that enterprises organized for the purpose of offering the general public transportation by means of motor vehicles are usually launched without much knowledge of either the technical or the commercial requirements and that the average result is poor and expensive service. This applies to livery work in minor cities and country districts and especially to stage lines and touring route service.

With a view to remedying this situation the Automobile Club of France held during the recent Paris automobile salon a convention which was designated as the First Congress of Common Carrier Transportation by Automobiles and which was numerously attended at all of its meetings by persons prominent in public and business life, showing that the interest in the question was widespread.

It appeared from the information offered on this occasion that the habit of automobile owners to make frequent tours to the scenic portions of France has developed a popular desire for similar automobile touring among those portions of the public to whom the individual ownership of an automobile is either financially out of the question or does not seem advisable until some experience in the advantages of automobile travel has been gained by them. To meet this new want many touring routes have been established, while many of the motor stage lines subsidized by the state or community have derived an additional income from the new tendency and in some cases have made additions to their stock of vehicles and have extended and modified their routes. It was stated that subsidized stage service exists in 16 of the departments (counties) and received a subsidy in 1912 of 500,000 francs. The number of lines reaches at present 300, covering a mileage of 8,000 kilometers, and these are served by 450 automobiles. The service is partly all the year round and partly only for the summer season.

In Italy the subsidy plan has been taken up with considerable vim, as the premiums in 1912 amounted to 2,848,511 francs, while the lines number only 162, covering a mileage of 6,600 kilometers.

At all sight-seeing centers, it appears, the number of visitors has been increased very notably by virtue of the facilities now offered for making rapid one-day round-trips in automobile Alpen-cars or omnibuses and for connecting from one railway to another. In certain formerly inaccessible places winter sports have become fashionable through the same means.

It was a subject for comment at the congress that the vehicles placed in service are unsuited for carrying either the amount of baggage or the bicycles which the passengers wish to take along, and a resolution was adopted providing for a competition for baggage-carrying devices for common-carrier automobiles. The same resolution also expressed a desire for a contest of motor sleighs, especially with a view to developing a high-power sleigh capable of making its way under the most unfavorable conditions of the roads and of the snow.

A comparison of the expense in running three routes in the French Alps, all served with Alpen-cars seating 18 passengers each, revealed the peculiar condition that the smallest of these routes, with five vehicles, cost only 0.90 franc per kilometer to operate, while the second one, operating from 5 to 8 vehicles, cost 1.30 franc and the most important enterprise of the three, with 8 to 18 vehicles in commission, cost 1.60 franc. The operating conditions were similar, but the overhead and administration expenses grew faster than the number of vehicles employed.

The congress received a large number of communications relating to the most economical construction of common-carrier automobiles—mostly with reference to touring service—and also wth regard to financial organization and road improvements. It was brought to a close with the formation of a national federation of those most competent to give counsel in the matter of establishing public automobile services.—From *Génie Civil*, December 28.

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FUTURE for Small Pneumatic Twin Tires.—"The twin construction solves the problem of the pneumatic tire for the future. At present the twin type is used only for large vehicles and it does wonders for it, speaking from my own experience. I have a car with a 4-cylinder motor, 100 by 160 millimeters bore and stroke. It is fast and weighs 1,950 kilograms without load. Single rear tires, 120 millimeters (nearly 5 inches) broad, lasted for 1,200 to 1,500 kilometers. I had it fitted with twin tires of 120 millimeters each, and these tires have made so far 5,000 kilometers. I am convinced they will make 5,000 kilometers more.

"It is said that the twin tire drags. That is true for the large widths, but what is to hinder twinning in small widths for light vehicles? Why not twin with 105, 90 and even down to 75 millimeter sizes?

"I am convinced that in a few years twin tires will be used on down to 12-horsepower cars, in 75 and 85 sizes. That will compel the use of two sizes for one car, with single 90 or 105 sizes on the front wheels, but it will involve such a saving and such a security that the inconvenience will be eclipsed by the enormous advantages.

"The twin tire is the one great improvement realized in pneumatics for some years back and it is a duty to give credit to the two firms—Kapferer and Michélin—who made its use possible by providing wheels for it.

"The only objection raised against the twin tire refers to its looks. Some people find it clumsy. As soon as it is generally used they will find it pretty."—Mortimer-Mégret in *La Pratique Automobile*, December 25.

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FLUX for Autogenous Welding.—The employment of flux for cleansing and de-oxidizing the joint of an autogeneous weld was considered a useless precaution when the new art was first taken up. It was an expedient reserved for beginners and unskilled workmen. But it has now been generally adopted even for the welding of iron and extra-mild steel. As it has become recognized that the best weld is one which has been effected in the shortest posssible time, the new work methods, involving the use of fluxing powders which promote the intimate union of the metal fused by the heat of the oxy-acetylene burner, are evidently most to be recommended. Unfortunately, however, the fluxing powders are utilized in a haphazard manner at most shops, while certain precautions are necessary to obtain the maximum useful effect with a minimum waste of flux and weld-metal material.

The best way of using a flux powder consists in dipping the end of the weld-metal bar from time to time into the can with the flux and then placing the weld-metal on the line of the weld.

If the powder is suitable, the quantity of it which is applied to the fused metal by this method is sufficient to assure a sound joint. Hence it is useless to sprinkle the powder along the line of fusion, a process which nearly always results in the formation of blowholes and involves an enormous waste of the auxiliary materials.—From *Revue de la Soudure Autogène*, December.

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Easy on the Hand.—Every speed lever now has a ball at the top and their manipulation is considerably facilitated thereby.—From Paris Show notes in *Omnia*, December 21.

Communications from The Manufacturer

V. A. Longaker Outlines the Advantages of Large-Diameter Wheels and The Underslung Frame

INDIANAPOLIS, IND.—The advantages of large diameter wheels are self-evident. Strange as it may seem, the only question ever raised is the one as to tire cost. The advantages of large diameter tires are so fully appreciated by the tire manufacturers that they are encouraging the use of large diameter tires by making a concession in the price. By referring to a price list of any of the large tire manufacturers, it will be found that the price of a 41 by 4.5-inch casing is less than the price of a 36 by 5. This hardly seems reasonable to the casual observer. The 41 by 4.5-inch casing must contain a greater amount of rubber and canvas, and certainly it takes a greater length of time to build the body of the tire, owing to the larger diameter. The fact that the difference in the list price is in favor of 41-inch tires can only be explained in that the tire manufacturer is endeavoring to encourage the use of large diameter tires, no doubt reasoning with his own mind that the large wheel is the only solution of the tire problem.

The perfecting of the pneumatic tire has not progressed with the rapid development of the automobile. In fact, the pneumatic tire is the weak point in the construction of the car. Anything which the car manufacturer can do to help overcome the one weak point which has had the greatest retarding effect and the one thing which has been the source of the greatest expense in the maintenance of a car, certainly deserves the attention of the progressive designer.

The theoretical reason why the 41-inch tire has a much longer life than tires of a smaller diameter is that the angle formed by that portion of the circumference of the tire where it makes contact with the road is smaller. As a result, an obstruction in the road of a given height being passed over by the larger wheel, does not cause the wheel to rise so abruptly. In other words, the greater this angle, the more quickly the wheel is called upon to rise. The blow of the contact of this obstruction is consequently greater. Owing to the increased radius of the arc at that portion of the tire which is in contact with the ground, a great many small depressions in the road can be bridged. If the wheel was to drop into these depressions, the fall would result in practically the same kind of a blow being applied to the tire as if it were passing over an obstruction which stands above the surface of the road. The greater number of these small, but nevertheless telling, blows that can be overcome will not only prolong the life of the tires, but will also result in the entire mechanism of the car being greatly protected.

Vibration Must Be Minimized

Vibration in itself can in a way be compared to a great many blows of greater or less magnitude being applied with greater or less rapidity. The blow of a hammer, for instance, no matter how small it may be, if kept up sufficiently long will destroy the best piece of armor plate. Vibration is the greatest enemy the motor car of today has to contend with. The large wheels not only lengthen the life of the tires, but prolong the life of the rest of the car as well. In early automobile construction this important factor of vibration was not as fully appreciated as it is at the present time. The early builder found that certain parts of his car were failing. In his early calculations the part may have been designed with the factor of safety in view; however, the all-important question of vibration was overlooked. This problem of vibration has created the demand for the alloyed steels which enter into the construction of the automobile of today to such an extent.

Another reason why the large diameter tire will give a greater mileage is that the length of the cord which is formed by the surface of the road depressing the periphery of the tire is much greater; for instance a 36-inch tire having a 5-inch section, properly inflated (89 pounds), will have a contact surface in the form of an ellipse approximately 1.75 inches in width by 7.5 inches in length. The area of contact of the 41-inch tire, properly inflated and carrying the same load, is approximately 8.5 by 1 15-16 inches. The area of the first contact surface is 10.3 square inches, and the second 12.3 square inches, or a gain of 20 per cent.

The increased length of the contact with the road not only has its advantage in the surface wear of the tire, but also plays an important part in the ability of the tire to withstand the enormous strains which are applied in the driving and the retarding of the car to that portion of the tire which is in contact with the ground. The reason for this is that there is a greater per cent. of the periphery of the tire which is carrying the load, and owing to the load being applied over a greater portion of the tire, the strain is more equally distributed.

Keeping the Car Low a Problem

The ideal condition as far as the load being applied to tires is concerned, would be to distribute the load throughout the whole circumference. This, however, is absolutely impossible, consequently anything that can be done to increase the amount of the surface of the tire which is carrying the load will certainly tend to improve its wearing quality. The most important reason why automobile manufacturers have been averse to the application of the large diameter wheels is that when these wheels are used in the construction of a car having an overslung frame, owing to the assembly problems which are encountered, the car by necessity is decidedly higher. From the viewpoint of safety as well as the idea the buying public has today, a car must be low in order to be acceptable. The thing which determines how low a car can be built is the road clearance. In the construction of our underslung cars we have four all-important advantages: large wheels; a maximum road clearance, 12.25 inches, which is from 2 to 3 inches more than the ordinary car of today has; and although the maximum prevails as to these two important questions, the total assembly of the mass of the car is well down, for instance, the greatest vertical height of our Traveler is 4.5 feet; the center of gravity of the mass being decidedly low, approximately 23 to 24 inches. The combination of these four very important details results in a car having the greatest possible amount of stability. Where else is it possible for the prospective buyer to find these four important features embodied in the construction of one car?

In traveling around a corner at a high rate of speed in the ordinary overslung car, the driver experiences a sensation as though the car was trying to turn over. The reason for this is that the center of gravity of the car is so high that the springs are called on to carry a much greater additional vertical load, owing to the fact that the mass of this load is so much higher than the horizontal plane in which the springs lie. As a result, the outside springs deflect or flatten out and the frame of the chassis is thrown on a decided angle with the wheel centers.

In our underslung construction, although the corner might be turned at a much higher rate of speed, there is not the faintest indication of this sensation of the car turning over. The reason for this is that in the construction of the car we have overcome the causes as outlined above. The springs, being so nearly in the center of the mass of the car that the effort applied by the centrifugal force caused by the change in the direction of the car, are so near in line with the horizontal center of the mass, that instead of being deflected vertically, the load is applied to the side of the springs. As it is impossible to bend a spring sidewise, the frame of the car is held in an absolutely horizontal position, entirely relieving any sensation of overturning.—V. A. Longaker, *American Motors Company.*

Carburetion

by Robert W. A. Brewer

Part VI

Subject Digest

Inertia is one of the most important factors in the function of the carbureter for the reason that conditions of rest and motion of the gases are continually changing.

The inertia of a body varies directly as its mass and therefore the inertia of a cubic foot of gasoline is nearly 600 times that of a cubic foot of air. The smaller the quantity of gas which is operated on by a change of throttle position, the less will be the total inertia of the gas in question. A small orifice is therefore a factor in reducing total inertia.

High jet friction is another means of reducing the inertia of the fuel. This condition can be obtained by making the full orifices many in number.

Unless there is a considerable negative pressure at the time of the inlet valve opening the explosive mixture hesitates before entering the cylinder and follows the piston only when the latter is in the quicker part of the stroke.

Surging within the intake pipe occurs at low engine speeds giving rise to irregularities in the action of the carbureter and causing the gasoline at times to blow out of the carbureter air orifice.

WE will first set down the definition of the word inertia so that we may be quite clear upon this point.

Inertia is that property of a body by virtue of which it tends to continue in a state of rest or motion in which it may be placed, until acted on by some force. **Of all the details of an automobile engine the carbureter and the carbureting system is most sensitive to the question of inertia,** for the reason that conditions are continually and rapidly changing, and that the masses of air and gasoline which are dealt with are subject to inertia all the time the engine is working. Were an engine working at a constant load and speed throughout the whole time, the question of inertia would not come in, but as this is not the case we will briefly consider the effect of inertia, both of the air and gasoline, and of the moving parts where an automatic carbureter is concerned.

First let us consider what occurs when the throttle valve is opened and we shall see that, whereas both the air and the gasoline were previously in a state of comparative rest, we immediately impress a force upon them by reason of the engine suction, and the forces which are required to accelerate a given mass in a given time to any different velocity are in proportion to the velocity.

Repeating Newton's second law, "uniform acceleration is produced by any constant force, the latter being measured by the increase of momentum it produces," the force producing an acceleration is equal to $\frac{W}{G} \times F$, where W is the weight of the body G is gravity and F the acceleration, and the final velocity of the body, say V, equals $F \times T$, that is, the velocity V is equal to the acceleration multiplied by the time during which the acceleration acts. Now every body has an inherent quality or inertia by which it tends to resist a change of velocity, and we have, in the case of air and gasoline, two bodies whose inertia is widely different, as the mass of air is nearly 1/600th of the mass of gasoline, or, in other words, **a cubic foot of gasoline weighs nearly 600 times as much as a cubic foot of air.**

In a carbureter system, however, only small quantities of gasoline or air are set in motion by any change of throttle position and engine speed. The smaller the quantity of gasoline which is immediately operated on by a change of engine suction, the less will be the total inertia of the gasoline in question. For this reason **it is advisable to have the gasoline passage between the float chamber and the jet orifice as small as possible,** so that there will not be more appreciable lag than possible when the engine demands an increase in gasoline supply. On the air side, however, the inertia experienced is very slight by reason of the magnitude of the air aperture compared with the fuel aperture, and the immediate result of throttle opening is ordinarily a poor mixture, as the air enters the mixing chamber more readily than does the fuel. Conversely, when the throttle is quickly shut down there is always the tendency of the fuel to continue flowing by reason of the inertia of the fuel in its passage, the result being that a loading up is likely to occur.

It is, nevertheless, possible to design the passages of such small dimensions, and to arrange the friction of the orifices to be so high, that inertia can almost be damped out. **High jet friction is therefore one of the means of counteracting the inertia of the fuel.** This can be obtained by making fuel orifices many in number, as in the Polyrhoe carbureter by giving either a very small unobstructed hole for the fuel supply or a hole of larger dimensions in which some medium is interposed for producing high jet friction.

The question of jet friction plays an important part, as may be supposed, in the question of the inertia, but this may also be complicated by the phenomenon of capillarity, being the tendency for a liquid to creep up a small orifice in a contrary direction to that which it would normally take under the action of gravity. **Capillarity often causes a carbureter to leak** by reason of the liquid either creeping up through the jet or up the stem of the valve which at its lower end dips into a fuel reservoir. This action has caused considerable trouble in certain types of carbureters.

Passing from the carbureter now to the inlet pipe, inertia is an important factor in the design of inlet pipes for all types of engine, whether they be of the single-cylinder or of the multi-cylinder pattern. When we consider a four-cylinder engine firing on the usual system, namely, 1, 3, 4, 2, turbulence is set up in the inlet manifold and this turbulence is further aggravated by the inertia of the explosive mixture passing through that manifold. In such a type of pipe, particularly if the ends terminate abruptly, there is always the tendency for the fuel to load up the outer ends of the pipe, by reason of the two cylinders in one pipe firing in sequence and then the two cylinders of the other pipe. The gas feeds rapidly, first toward one end of the pipe and then toward the other, and the gas flow lags behind the cylinder demand, so that when the inlet valve of either end cylinder is suddenly closed the gas continues to flow down the pipe and banks up with increased richness at the ends. Considerable difficulty has been experienced, particularly in the older patterns of engines, by reason of **the end cylinders getting a different consistency of charge from that which is supplied to the**

middle pair of cylinders. In special designs of inlet pipes for racing cars, great care is often taken to overcome the inertia of the mixture in the pipe, and a continuous flow path is given to the bases by means of either figure-of-eight inlet pipes or circular pipes, so that the gas flow is constant and uni-directional the whole time.

Another effect of the inertia of the incoming mixture is that at the moment of inlet valve opening, unless there is a considerable negative pressure, or pressure below that of the atmosphere, in the cylinder at the time of valve opening, the explosive mixture hesitates before entering the cylinders, and it is only when the acceleration of the piston puts a more or less sudden increase of suction upon the mixture that the mixture itself follows in behind the piston.

It may occur in some engines that a negative pressure of as much as 5 pounds per square inch is momentarily produced somewhere about half-piston stroke, or rather later, before the inertia of the explosive mixture is overcome. After this time the mixture rapidly follows up, and advantage can then be taken of the inertia by retaining the inlet valve open for some considerable time after the outer dead center has been reached.

American practice generally keeps the inlet valve open later than European, as in American design this valve is often held open for some 40 degrees after the outer dead center has been reached. In European practice, however, such a late closing of the inlet valve is seldom found, and this is probably due to the fact that in Europe the valves are of larger diameter.

From the figures previously given it will be evident that **the inertia has a considerable effect upon the carbureter action by reason of pulsations being set up in the inlet pipe,** due to the suction which is necessary to overcome the tendency to lag, but in a high-speed engine these variations usually balance out. Whether they do or do not depends on the length and design of the inlet pipe.

A theory has been propounded that there is a considerable surging effect in the inlet pipe of the majority of engines. This surging undoubtedly occurs at low speed, as has been observed in certain types of carbureters where it has been shown that at certain periods the suction decreases altogether, and the inertia of the gases in the reverse direction after the moment of valve closing causes the gasoline to blow back out of the air orifice of the carbureter.

There is one other point which might be briefly referred to in passing, and that is the inertia of the exhaust gases. We are not, however, dealing with the design of exhaust pipes, but it is interesting to note that **an exhaust pipe can be so designed that the inertia of the gases passing from one cylinder helps to accelerate the exhaustion of the next** by reason of the inertia effect of these gases leaving the end of the exhaust pipe and causing a partial vacuum in the pipe itself. One has sometimes observed a certain amount of suction during the pulsation at the end of an exhaust pipe, and this is entirely due to the scavenging effect due to the inertia of the exhaust gases themselves as they pass out of the exhaust pipe.

Finally, we will, for a moment, touch upon the inertia of moving parts in a constant suction type of instrument, and it will be obvious that when these moving parts depend for their weight upon the depression they produce in the mixing chamber of a carbureter, **the weight of these parts themselves must give them a certain amount of inertia.** The quality termed pick-up, which is often mentioned as a feature of certain carbureters, is also a function of the inertia of the moving parts, for it is obvious that if a throttle be suddenly opened, and a moving part which actuates the fuel and air supply lags and does not immediately respond, the engine does not get away so rapidly as it otherwise might. In the first place, **the engine revolutions must increase to a certain extent before they can produce the necessary suction in the mixing chamber, and then this suction has to operate for some appreciable time upon the moving part before it overcomes this inertia.**

In cases where a spring or other means is employed, in which the question of gravity does not come in to so great an extent, one might think that the inertia of the moving parts would be less, but, as previously explained, a spring is not a desirable feature to perform any definite function in a carbureter system, and should, if possible, be avoided.

Prize of $10,500 Offered for an English Home-Produced Fuel

LONDON, Jan. 2—A prize of $10,500 has been offered by the Society of Motor Manufacturers & Traders for a home-produced fuel, obtainable in sufficient quantities and which can be put on the market and sold at a commercial price. Much has appeared in the press of late concerning the prohibitive prices that have long prevailed for gasoline and there is talk of still higher prices.

The Royal Automobile Club will conduct trials and tests of any new fuel produced, but at the present time, owing to the heavy expenses that it has incurred since taking over its magnicent clubhouse, it is not in a position to bear any financial responsibilities. The chairman therefore suggested that the Society of Motor Manufacturers & Traders might gainfully devote a portion of the profits reaped from the Olympia Automobile show to encourage research and experiments. The Society has announced that it is prepared to offer a prize of $10,500 for a fuel that is produced in Britain. It will, therefore, be interesting to note that at the present time there is in England, apart from the shale industry, which is being pursued with success in Scotland, two separate plants which are producing a suitable spirit from coal mines and which will, in the near future, place on the market a fuel not only suitable for pleasure cars, but also for commercial vehicles at a much cheaper rate than gasoline.

Tests have been made with a paraffin carbureter with a view of ascertaining what results would be achieved when running on the heavier, but cheaper, fuel. A run of 2,000 miles was made with this carbureter fitted to a pleasure car, which covered a great portion of the distance on the road under ordinary conditions, and also a part was run off on the Brooklands track at high speeds, and the results were entirely satisfactory, the spark-plugs being quite clean. In addition to this test, accompanied with bench and speed tests, it was fitted to a 3.5-ton commercial vehicle of 18 horsepower equipped with solid tires for a distance of 1,000 miles, in the course of which neither spark-plugs nor engine were cleaned in any way nor were the valves touched; but all were in perfect order at the end of the test, and the exhaust vaporizer was found to be entirely free from carbon deposit. The great drawback, however, when paraffin is used in the motor, is the unpleasant smell that it creates, and but for this there is no reason why it should not be universally utilized for internal combustion engines.

Then there is benzol. There are many who advocate the use of benzol for cars, but in England there are no more than 2 or 3 firms at most which produce benzol, and what they do produce is mostly sent abroad. When mixed with alcohol not only does it make a fine fuel, from which many declare a greater mileage is obtained, but it is also a very cheap one, for, compared with gasoline, it costs only 24 cents per gallon against 37 cents per gallon now asked for gasoline.

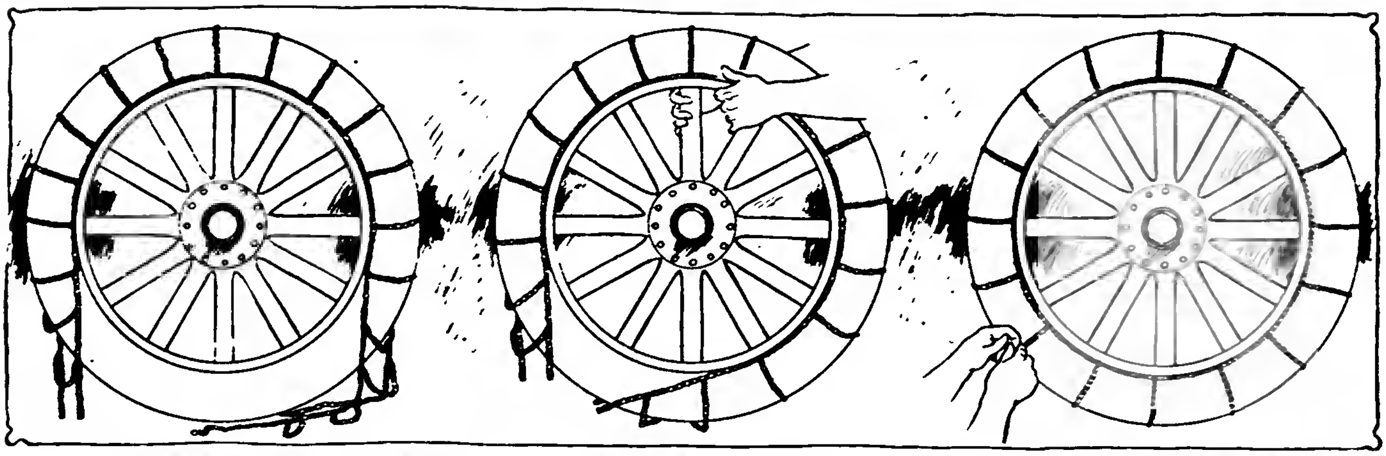


Fig. 1—Three steps in putting on a chain: First, lay chain over tire; second, pull car back over chain; third, fasten catches. This avoids use of jack

Tour from Columbus to Mammoth Cave; Carbonic Gas in Tires; Rating Six-Cylinder Cars; Making Magneto Change; Piston Displacement vs. Horsepower; Leak at Spark-Plugs Cured; Correct Oil for Winter Use

From Columbus to Mammoth Cave

EDITOR THE AUTOMOBILE:—I, with possibly forty to fifty people, expect to go by machine to Mammoth Cave, Ky., from Columbus, O. Could you give me the best route?

Baltimore, O. E. E. HANSBERGER.

· THE AUTOMOBILE suggests that you go through the following cities: Indianapolis, Ind., Louisville, Ky., and thence to Mammoth Cave. Starting out from Columbus to Indianapolis via the National Road, you will find a very level country, mostly excellent gravel pikes. The first city between these two points will be Springfield, O., a distance of 43.4 miles. By following the Blue Book route you will pass through the following towns to that city: Alton, 9.4 miles; West Jefferson, 14.4 miles; Lafayette, 21.8 miles; Somerford, 26.5 miles; Vienna, 32.9 miles, and Harmony, 37.5 miles, thence to Springfield. From this point to Donnelsville, 51 miles, crossing the railroad tracks at Forgy station, thence direct through covered bridge, 55.7 miles, through Brandt and Fountaine, Tadmor into Vandalia. From here continue straight ahead through covered bridge to Englewood. Cross the railroad tracks at grade immediately beyond and follow telegraph poles through Arlington, cross railroad track again at National Crossing and second railroad crossing to Lewisburg, 84.4 miles. Keep on the National Road through several prominent four-corners to Gettysburg, 93.3 miles, and straight ahead to Richmond. From here the following towns will be passed through: Cambridge City, Knightstown, Greenfield, thence into Indianapolis. The distance between Indianapolis and Louisville is 123.4 miles. The most direct route is via Seymour, Uniontown, Scottsburg, Vienna, Underwood, Henryville, Memphis, Sellersburg, New Albany into Louisville. From here the first part of the route is over macadam road; the last part being the old State Road, which is rocky and rather poor, a distance of 116.2 miles. Then proceed through Mount Washington, Bardstown, Buffalo, Bear Wallow and thence into Mammoth Cave.

Carbonic Acid for Tires

Editor THE AUTOMOBILE:—I wrote you some time ago in reference to the effects upon tires that are inflated from tank carbonic-acid gas. I am looking for a suitable tank to place in a private garage and the above was recommended to me. Kindly give your views on same.

New York City. A SUBSCRIBER.

—Carbonic-acid gas is very convenient and is cheap. It has the drawback, however, that it escapes from the tire through the pores of the rubber much more quickly than does air. Even air, when it is put in a new tire, will pass through the pores of the rubber much more quickly than it will after several refillings. The reason for this is that the air is made up of a combination of several gases. Those having the largest percentages are oxygen and nitrogen. Oxygen passes through the rubber pores much more rapidly than does nitrogen. As a result, after a time the air remaining in the tire contains a larger and larger percentage of nitrogen and hence remains in the tire for a greater length of time without passing through the pores. Every tire is really a small nitrogen factory. As far as harming the structure of the rubber is concerned, the carbonic-acid gas will do no harm.

Horsepower Rating of Sixes

Editor THE AUTOMOBILE:—A six-cylinder motor, bore 4 inches, stroke 5 inches, with valves in the cylinder heads, is installed in a certain car. The following questions are involved in its installation:

1. What is the A. L. A. M. horsepower rating of a six-cylinder motor of 4-inch bore and 5-inch stroke, it being an L or T-head motor, at 800 revolutions per minute, at 1,000 revolutions per minute, at 1,200 revolutions per minute, at 1,400 revolutions per minute, at 1,500 revolutions per minute, at 1,600 revolutions per minute, at 1,700 revolutions per minute and at 1,800 revolutions per minute?

2. Does a motor with valves in the head of the cylinders, everything otherwise being equal, develop more power than a L or T-head motor, and if so, how much per cent. more?

3. In rating the horsepower of a motor, does the A. L. A. M. take into consideration the stroke of the motor?

4. Does a motor having 1 inch more stroke than bore (4-inch bore) develop more horsepower at certain specified speeds than a motor having no more stroke than bore, everything otherwise being equal, and if so, how much more?

Chicago, Ill. JULIUS STRAPONIUS.

—1. The horsepower rating of six-cylinder motors is shown in the curve at Fig. 2. The A. L. A. M. or S. A. E. horsepower formula is $\frac{D^2N}{2.5}$, where D is the cylinder diameter, N the number of cylinders and 2.5 a constant. With the motor you mention, the formula would work out as 38.4. The actual horsepower developed by such a motor would be greatly in excess of this. The number of revolutions per minute does not enter into the A. L. A. M. formula, which takes a piston speed of 1,000 feet per minute as a basis.

2. This is a mooted question. With the valve in the head, a very advantageous shape of combustion chamber can be secured, and a gain in power has been claimed on this account. This gain has never been reduced to figures.

3. Indirectly. THE AUTOMOBILE has previously published the derivation of this formula, but since it is a matter of common interest, as many states use the formula as a basis of the calculation of horsepower in deciding the license fee, it will bear repetition.

The indicated horsepower of a four-cycle single-cylinder motor is equal to the mean effective pressure P times the area of the piston A, in square inches, times 1-4 the piston speed S in feet per minute and the result is divided by 33,000. The factor 1-4 holds good for the four-cycle motor since the power is only exerted on every fourth stroke or once for every two revolutions. This is expressed in equation form thus: $I.H.P. = \frac{P \times A \times S}{4 \times 33{,}000}$. Multiplying this by the number of cylinders N of the motor and further taking into consideration E, the mechanical efficiency of the motor, the formula for B.H.P. becomes: $B.H.P. = \frac{P \times A \times S \times N \times E}{33{,}000 \times 4}$. The A. L. A. M. assumed that the motor will deliver its rated horsepower at a piston speed of 1,000 feet per minute and that the mean effective pressure in the cylinder of the automobile motor will be 90 pounds to the square inch. It also assumed that the mechanical efficiency of the motor will be somewhat in the neighborhood of 75 per cent. and will average that figure. Substituting these values in the formula for brake horsepower and also substituting for A its equivalent, .7854 D^2, the equation reads: $B.H.P. = \frac{90 \times .7854D^2 \times 1{,}000 \times N \times .75}{33{,}000 \times 4}$. Performing the indicated operations, the formula is simplified to its final form $B.H.P. = \frac{D^2N}{2.489}$, or, in round numbers, the denominator may be called 2.5.

4. A motor with 1 inch more stroke than bore will develop more power at all speeds than a motor having the same stroke as bore. In the case of a motor with a 4-inch bore this ratio would theoretically be about 20 per cent. greater.

Making Magneto Change

Editor THE AUTOMOBILE:—I wish to put a Bosch magneto DR4 on my car, which is equipped with a Remy type S. Could Bosch be connected to Remy coil, so I could use batteries for cranking? If not, how would you suggest to do the work? There is no timer on the car and I can use but one set spark-plugs.

Birmingham, Ala. READER.

—The Remy S magneto is of the low-tension type and conducts a current to a non-vibrating coil which creates the high-tension current necessary for the ignition. This magneto has a stationary winding which simplifies the construction, eliminating revolving wires, carbon brushes and all moving contacts—common objectionable features of construction in other magnetos. A single winding of coarse magnet wire is imbedded in the pole pieces of the magneto. The rotative part or inductor is a solid steel shaft upon which are mounted two simple forgings or inductor wings, one on either side of the winding. At each half turn of the inductor, the direction of the flow of the lines of magnetic force through the winding is alternately reversed, inducing in the winding two electrical current waves or impulses for each complete revolution.

The stationary winding is directly connected through the magneto circuit breaker with the primary of the non-vibrating step-up transformer coil used with the magneto. The circuit is mechanically broken during the current wave which is of considerable duration (over 45 degrees of the inductor's revolution). The nature of the wave, due to careful design, is an almost abrupt rise and fall with a flat top, making possible the large timing range for advance and retard of spark at practically the same heat of spark. The timing of the spark is accomplished by shifting the circuit breaker around the inductor shaft, to which is attached the circuit-breaker cam.

The distributer of the magneto and its 2:1 driving gear for the four-cylinder motor is for the purpose of distributing the current after it has been sent to the coil and transformed to the high voltage which it is necessary to use at the spark-plugs. It will be noted that the one high-tension cable leads from the coil to the distributer. For each revolution of the magneto inductor, this cable carries two high-voltage current impulses to the distributer, and as the fan-shaped distributer segment is making one revolution to two of the magneto inductor, it can in turn deliver a

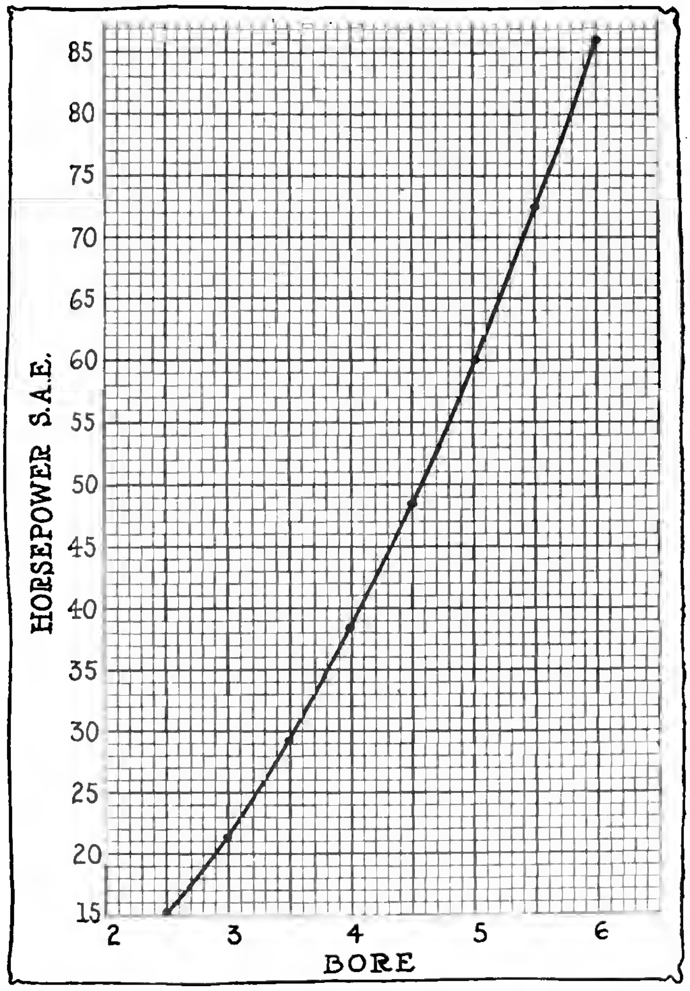


Fig. 2—S. A. E. horsepower curve for six-cylinder motors of bores between 2.5 and 6 inches

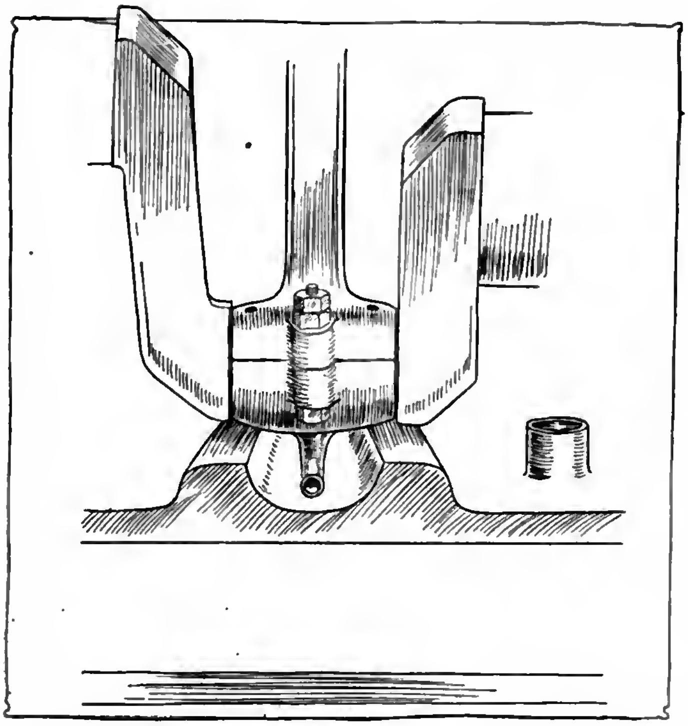


Fig. 3—Scoop on bottom of connecting-rod, illustrating splash system

spark to each of the four cables leading from the distributer to the spark-plugs each time the magneto inductor makes two complete revolutions.

The magneto inductor must, therefore, with the four-cylinder, four-cycle engine, always be driven at twice the speed of the engine camshaft or the same speed as the crankshaft. With the six-cylinder, four-cycle engine the magneto distributer is back geared with a ratio of 1:3 and the magneto must be driven at three times the speed of the camshaft or one and one-half times the speed of the crankshaft.

With the two-cylinder, four-cycle opposed engine the magneto does not have a distributer and a single cam is furnished on the magneto, causing but one electrical impulse for each revolution of the magneto inductor. The magneto must then be driven at the same speed as the crankshaft of engine.

The special step-up transformer coil furnished with the magneto is fitted with a two-point switch used to switch from battery to the magneto or *vice versa*, or disconnect from either to stop the motor. The switch is also provided with a push button for the purpose of starting the four-cylinder or six-cylinder motor from the spark by pushing the button when the switch lever is turned to the battery side. This system makes starting without

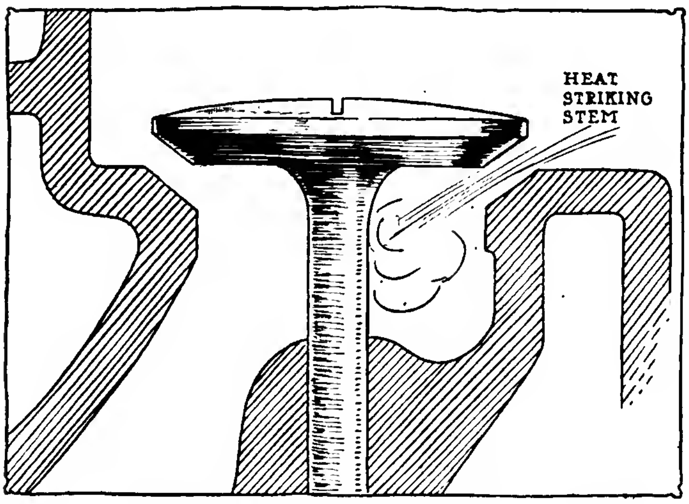


Fig. 4—Where the heat strikes the valve stem in exhausting

cranking most reliable, for the reason that the coil is particularly suited to the magneto which is not injured by large current consumption, as would be the case were batteries regularly used. When the battery is in use with the coil, it furnishes then an exceptionally hot spark. When the battery is used, it will be understood that the battery current is simply turned through the coil and distributer of magneto instead of the magneto current. It is intended that batteries be used for starting and relay, although the magneto is regularly used for starting.

The Bosch DR4 magneto is of the high-tension type and therefore it is not necessary to use a high-tension coil. The connections between the two units of the Remy system are such that the Remy coil would not even be applicable to the low-tension magneto. This is true of any of the low-tension magnetos which has been specially designed for a certain coil. No other coil would be suitably substituted.

Piston Displacement Vs. Horsepower

Editor THE AUTOMOBILE:—Will you kindly advise me if a square cylinder and one with a small bore and long stroke, both having the same amount of cubic inches, would have any difference in power.

Syracuse, N. Y. HOWARD K. BROWN.

—The motor having the greater number of cubic inches of piston displacement per minute would have the greater horsepower. In other words, it would largely be a matter of rotative speed. So many factors enter in which qualify this statement, however, that it cannot be given as any more than a general rule. The valve sizes affect the power to a large extent and the stroke-bore ratio must not be extreme. It would be possible to have a long cylinder of a stroke-bore ratio of such size that it would be impossible to secure good efficiency. For every bore and every piston displacement there is one stroke-bore ratio which would develop the greatest power when all other conditions are the same and hence it is impossible to give a fixed and definite answer to your question.

Has Leaky Spark-Plug

Editor THE AUTOMOBILE:—How can I stop a leak from my pet-cock on the engine of an Oakland 30? One of my spark-plugs leaks also.

2. When I put my machine in garage for the winter I dropped kerosene and cylinder oil in the engine. Will it be dangerous to start the motor in the spring?

Portland, Maine. P. E. BALDWIN.

—1. If you will dip the threads of the pet-cock in shellac of a fairly thick consistency and place a copper-asbestos gasket beneath the shoulder of the cock and screw it in, the leak will be stopped. If there is no shoulder leave out the gasket. Leaky spark-plugs often occur because a plug with sufficient shoulder width is not purchased. The standard A. L. A. M. spark-plug thread is a straight thread and needs a shoulder and a gasket to hold it against leakage. The other threads were taper fits and did not need the gasket. The effect of the gasket and shoulder is brought out in Fig. 6.

2. No, it will be difficult.

Connecting-Rods in Oiling Systems

Editor THE AUTOMOBILE:—On my care I have a force-feed oil system which I wish to change to the splash system. I can secure a crankcase which will adapt itself to my motor perfectly and I would like to know if it is necessary to redesign any of the bearings or the connecting-rods in order to take care of the change. Would you kindly explain to me the difference in the internal features of a splash and force-feed system in Letters Answered and Discussed?

2. What is the best way to put on tire chains quickly, without jacking the car?

New York City. CHARLES PEINE.

—Differences between the connecting-rods and crankshafts in the splash and force-feed systems are shown in Figs. 3 and 5. A small part of the crankcase is also shown. It would not be advisable to fit a splash feed on a car that is already equipped with force feed. The force feed should give satisfaction as long as the oil pump is in working order, and these are so simple that it is hardly possible that the pump on your car is out of order permanently. The only difference between the connecting-rods in the splash and the force-feed systems is that the splash connecting-rods generally have scoops to take up the oil.

2. The three steps necessary in putting on a tire chain without jacking up the wheels are shown in Fig. 1. It is important to straighten out the chain thoroughly.

Where Heat Strikes Valve Stem

Editor THE AUTOMOBILE:—Would you kindly tell me why it is necessary to select a particular material for a valve stem, when the head is the only part exposed to the heat?

Boston, Mass. H. W. PERRY.

—The heat strikes the valve stem even more effectively than the head, because it strikes it in one particular point. Therefore it is necessary to select a material that will stand up under heat which is more severe at one point than another.

Stopping Leaks in Spark-Plugs

Editor THE AUTOMOBILE:—Will you kindly inform me as to how I can stop an air leak in one of my spark-plugs? I have a Ford machine and the defect must be at the thread of the spark-plug hole in cylinder head, because of having tried a half dozen new plugs already, screwed down as close as possible, without getting any better results whatever. Is there anything that can be used on the threads to stop this leakage without causing trouble whenever it becomes necessary to take the plug out again? Would it be an advantage to have the spark-plug gaps opened less than .03 inch with the Ford magneto?

Easton, Pa. WILLIAM F. BECK.

—Referring to Fig. 6 it will be seen that a plug with a shoulder will often stop a leak. If the plug is dipped in thick white shellac before being screwed to the cylinder it will probabaly hold against leakage. The spark-plug used on the Ford car is the .5 inch. straight-thread type. Where the taper-thread spark-plug is used the threads are jammed together on account of the wedge action. Where the straight thread is used it is necessary to guard against leakage by the use of shellac or adequate gasket protection. The maximum a spark-plug gap should be open is .03 inch with the Ford magneto. It would be of no advantage to make it less and it would be bad to make it greater.

Increasing the Motor Power

Editor THE AUTOMOBILE:—In your issue of January 2, page 45, there is an article on a compressed-air motor booster, and in reading this, I thought it might be possible to increase the power of a two-cylinder, opposed motor by admitting the gas mixture into the crankcase and discharging the gas mixture into the cylinder when greater power is desired.

It seems to me that this could be accomplished by having a three-way valve arranged in the intake so that for ordinary running the engine would receive its gas in the ordinary way by suction, and when increased power is desired, the gas could be admitted into the crankcase, which would super-charge the cylinder to a considerable degree since we have the displacement of both cylinders for one charge of gas to each cylinder.

I have a two-cylinder Maxwell, and for some time have thought of making such a change in the intake as an experiment, but have feared that it might interfere with the proper working of the engine and for that reason have hesitated to do so.

Grafton, W. Va. R. H. P.

—It must be remembered that the compression of the crankcase on an average motor is only about 3 or 4 pounds. The expansion required to bring the gas from the crankcase into the cylinder would be enough to reduce the compression to a large extent and would therefore result in a very slight increase of power. There is no doubt but that the use of a fuel compressor which would inject the mixture under high pressure into the cylinder would increase the power. The only trouble is the greatly increased complication in the high cost of manufacturing a system which would contain the high pressures without leakage. In other words, it would be cheaper to increase the power by buying a larger engine.

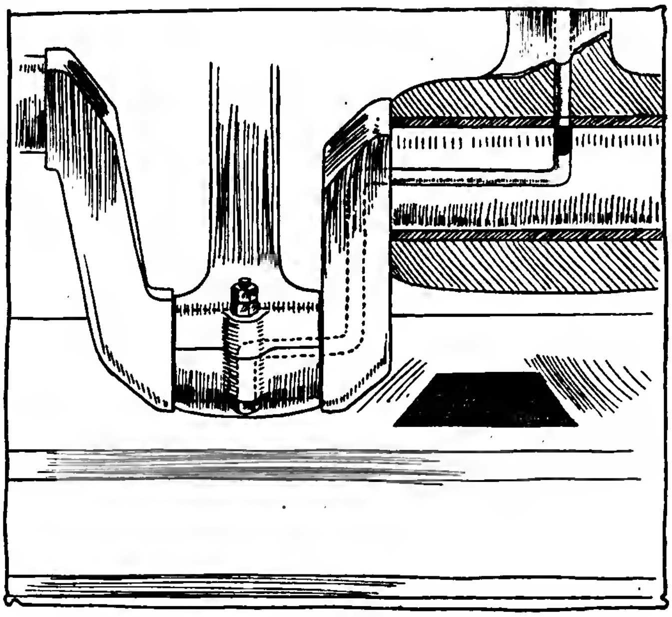


Fig. 5—Non-splash system with screen through which oil may drain

Correct Oil for Winter Use

Editor THE AUTOMOBILE:—Would you please write and let me know what is the best oil to use in cold weather in the Continental motor. It does not seem to have the full strength after running for a half day. Would you blame it on the upper gasoline tank? It runs fine for a half day and then loses its power.

Philadelphia, Pa. WALTER SCHOEN.

—Use a light medium cylinder oil and keep the front of the radiator covered. The motor cannot work efficiently if it is cooled to too great an extent. The cooling system is designed to take care of the car on warm summer days. When the cold winds strike the radiator, they cool the water to such an extent that the motor runs much cooler. The heat which should be turned into power is allowed to escape through the radiator. It may seem strange that power losses should occur from such a cause, but it is nevertheless strictly true. The radiator area necessary on a cold winter day will probably be one-half that required in warmer weather.

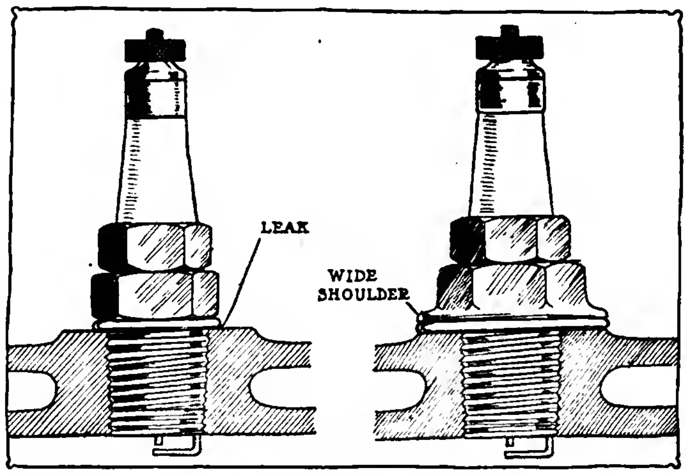


Fig. 6—How leaks may occur around narrow-shouldered plugs

European Patents

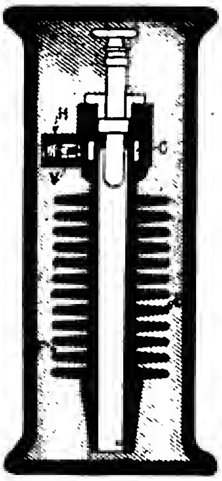


Fig. 1—Harpst plug and intake valve

INTERESTING inventions of various natures have been granted European patents during the last few months, and among these the number of engine designs embodying noteworthy ideas is striking. The invention along this line has concentrated largely as before in the production of silent motors, and, while the means for obtaining silence are in many cases akin to the principles involved in present designs, some meritorious improvements have been made, which bid fair to increase silence of operation and general efficiency of the mechanisms.

The prominence of sleeve valves is shown by the designs illustrated in Figs. 2 and 3. Fig. 2 illustrates a Renault design, covered by British patent No. 15,825. This patent involves the use of a reciprocating sleeve inside the cylinder and among the noteworthy features is the manner of obtaining a gas-tight joint between the valve, the cylinder and the dead space in the head. The sleeve-valve S which fits into the engine cylinder is shaped at its upper end with a flange seating on the beveled face H of the cylinder head. The sleeve valve is formed with horizontal ports operating in the conventional manner. The valve itself is actuated by the reciprocation of a walking beam one end of which is pivoted at P to the crankcase, while the other end is lifted periodically by the eccentric portion of the cam C. The follower always remains in contact with the cam, due to the tension of a spring S2.

Fig. 3 shows the engine design of Johnson, Hurley and Martin, covered by patent No. 15,298. The sleeve idea has been combined with that of the piston valve by fitting the sleeve to the periphery of the working face of the piston P1. This has been done to fill the requirements of the two-cycle engine here shown. The mixture compressed in the crankcase travels thence through a passage to the inlet port I which opens into the combustion chamber when the port P1 on the sleeve extension of the piston registers with it. Likewise, port P in the piston is provided to register with the exhaust port E in the engine cylinder.

Another Renault design is shown in Fig. 10, illustrating the subject matter of patent No. 15,907. The principal difference between this design and that shown in Fig. 2 is that the valve seats against a vertically inclined face formed on the cylinder head. The valve is shown at S and its seat at S1. This provides possibility of scavenging the combustion chamber almost perfectly, by placing the exhaust port E of the cylinder at the level shown in Fig. 10. The exhaust port in the sleeve is formed in its top section, and to provide perfect seating of the valve S, it is formed with a shoulder S2 subject to the pressure in the cylinder whereby it is held against the wall of the latter. Fresh gas is admitted through a pocket valve in the center of the head.

A rotary valve described in the British patent No. 14,944 is shown in Fig. 11. This valve design is the invention of G. Fornaca, of Turin, Italy. The rotary valve R is made with closed ends and its interior is kept in communication with the combustion chamber to a central port C, or through a pair of ports P and P1 which are formed near the valve ends. The valve is supported by a spindle S carried on bearings in partitions Q between adjacent cylinders. The valves serving various cylinders are not in communication but are carried on the same spindle. The explosion pressure holds the valve tightly against its casing.

A peculiar valve idea is shown in Fig. 6 which illustrates the Behrend patent No. 11,643. The valve V is held in position in the horizontal face of the piston which is equipped with such extensions that an upper and a lower seat for respective faces on the valve V are provided. The valve is weighted and if lifted off the seat S provides a passage between the crank or compression chamber and the combustion chamber. Operation of the valve is by the combined effects of the pressure in the crankcase and the cylinder, and the momentum of the valve itself.

Fig. 17 shows the engine described in Harveng's patent No. 13,565. This patent provides an annular reservoir around the inner port and close to the charging pump. The reservoir R is divided by a horizontal plate and is charged with air from the pump space P. Part of the charge enters the cylinder through the valve V, passing into C, while the rest of the charge passes through P1 to the chamber C1. The distribution of the charge in the cylinder is controlled by a sleeve formed as a vertical extension on the face of the piston. The mixture enters the cylinder after having been compressed in the crankcase, and after the combustion chamber has been scavenged by air entering through P2. The mixture is formed in the chamber C whence it is sprayed through jets J.

The two-cycle engine design shown in Fig. 9 includes the use of a rotary valve and a system of passages for conveying the gases to the cylinder and out of the same. In the case of fresh gases the mixture is drawn into the front end of the cylinder C at the end of each upstroke. It enters through a passage P in the piston through inlets passages I and I1 and a pipe P1 in which a rotary valve V is formed. This valve pro-

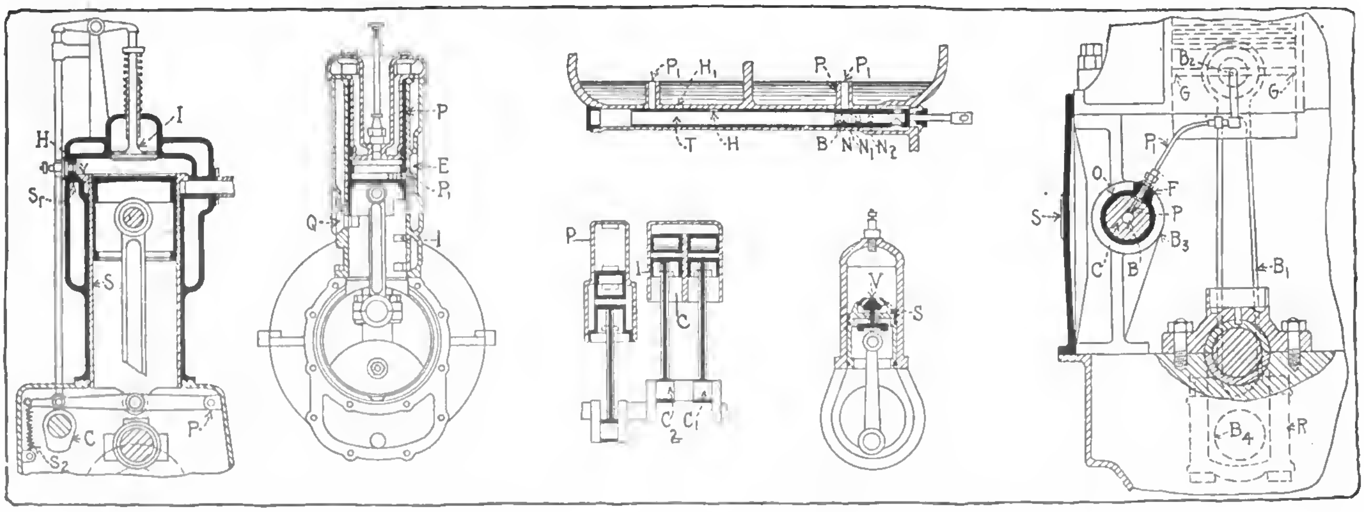


Fig. 2—Renault sleeve-valve motor. Fig. 3—Johnson two-cycle sleeve motor. Fig. 4—Peugeot lubricating system. Fig. 5—Albion twin-cylinder engine. Fig. 6—Behrend piston-carried valve scheme. Fig. 7—Russett lubrication

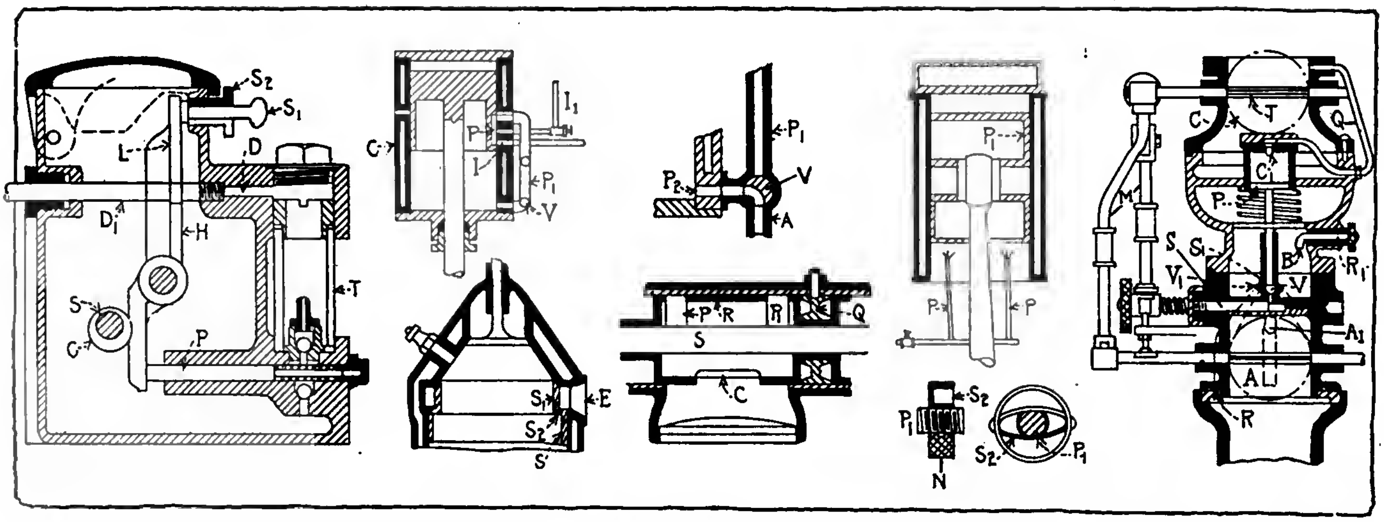


Fig. 8—Morris & Bunch oiling system. Fig. 9—Two-cycle engine va.ve. Fig. 10—Renault sleeve-valve improvement. Fig. 11—Fornaca rotary valve. Fig. 12—Daimler-Diesel motor improvement. Fig. 13—Weiss carbureter

vides a communication through pipes P1 and P2 when suitably positioned and also makes possible the admission of compressed air for starting the engine.

The German Daimler Company is interested in the Diesel principle, as is evidenced by the design shown in Fig. 12, which illustrates the British patent No. 14,598. In this patent the surplus of the compressed air which is used for injecting liquid fuel into the cylinders is utilized for cooling the piston P1 instead of blowing to waste, the air issuing from pipes P.

British patent No. 13,915 describes a two-cycle design patented by the Albion Motor Car Company. The idea which has been put into practice in this design is the use of one combustion chamber in common by two cylinders, the pistons of which are formed independent of one another but work on the throws C1 and C2 a common crank pin. The charge enters the combustion chamber of the double cylinder C through the inlet port I, Fig. 5, after having been compressed by the pump P which is accurated by a plunger set at an angle of 180 degrees to the connecting rods of the engine. No mention is made of special valves or valve gears in this patent.

Fig. 4 illustrates a patent taken out by the Peugeot company on a system of engine lubrication; the number of the patent is 12,487. The patent refers to a device for draining the oil from the crankcase either entirely or to the level of an overflow pipe. This object is realized by the use of the horizontal tube T sliding in another tube O, which is formed at the bottom of the crankcase. The tube B is formed with holes H registering either with holes H1 in the crankcase casting or with overflow pipes P which divides the crankcase into compartments, being formed on partitions P1. In the position shown in Fig. 4 H1 and P are shut and the oil flows through T to a chamber C provided with a stopper conduit whence the oil may be drained. The tube T is actuated by a lever and is prevented from rotation, being locked in any one of its three positions by a spring-pressed ball B which engages the notches N, N1 and N2.

Another patent referring to lubrication is shown in Fig. 8, being No. 13,382 granted to Morris & Bunch. This force-feed lubricator is composed of a number of pumps P formed in an oil reservoir, which force oil through sight-tubes T to delivery passages D. Tubes T contain water. Delivery pipes D1 pass through the reservoir emerging at the opposite side. The pumps are actuated by levers H driven by cams C on a shaft S. A variable stroke is provided by stops S1 adjustable by sleeves S2 which engage the extensions of levers L; the latter are hooked at H so that they may be placed over the delivery pipes D1.

In Fig. 7 the Russett system of crankshaft lubrication is shown, being the subject matter of patent No. 12,874. The oil is supplied to the various bearings by way of passages communicating with a bore in a rotating shaft other than a crankshaft; the camshaft may be used for this purpose. This is the case in the design shown in Fig. 7, camshaft C having a central bore B and a radial passage P communicating with a feed pipe P1 through which the oil is forced to the bearings. A flat F connects the bore B and the passage P1. Oils flows through O in the bearing B3 to an oil-box on the crankshaft bearing B1 as well as through a pipe P1 to an annular groove G in the cylinder wall, whereby the piston is lubricated. This groove communicates with the bore B2 in the gudgeon pin. From other orifices the oil is sprayed to a sight window S and into a cup formed on a connecting rod R, which communicates with a bearing B4.

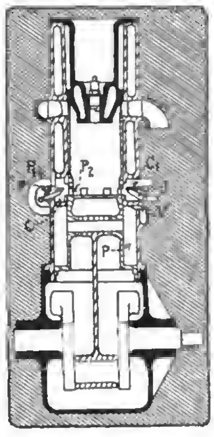


Fig. 17—Harveng engine

The patents referring to carburetion are likewise numerous. Fig. 13 shows a carbureter, described in patent No. 15,419, in which the inlet ports of fuel and of air are so connected as to work simultaneously. The primary air valve A, the butterfly T and the fuel valve spindle S are connected by the mechanism M. When the butterfly T is closed there is an annular space between it and the casing C. The passage of fuel is regulated by a valve V seating at V1 and connected through a piston P which is actuated by the engine suction. The suction is transmitted from the space above the butterfly through a pipe Q in which a check valve C1 is in place, which protects the valve V against backfiring. Shots S1 and V1 are provided to form fuel jets which carburet the air emerging from nozzles A1. The supply of air to the latter is regulated

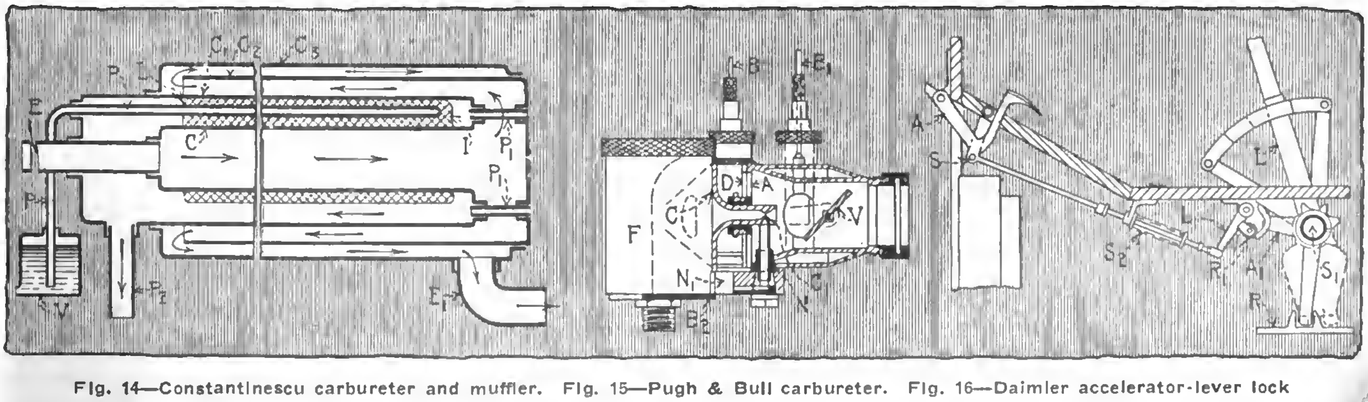
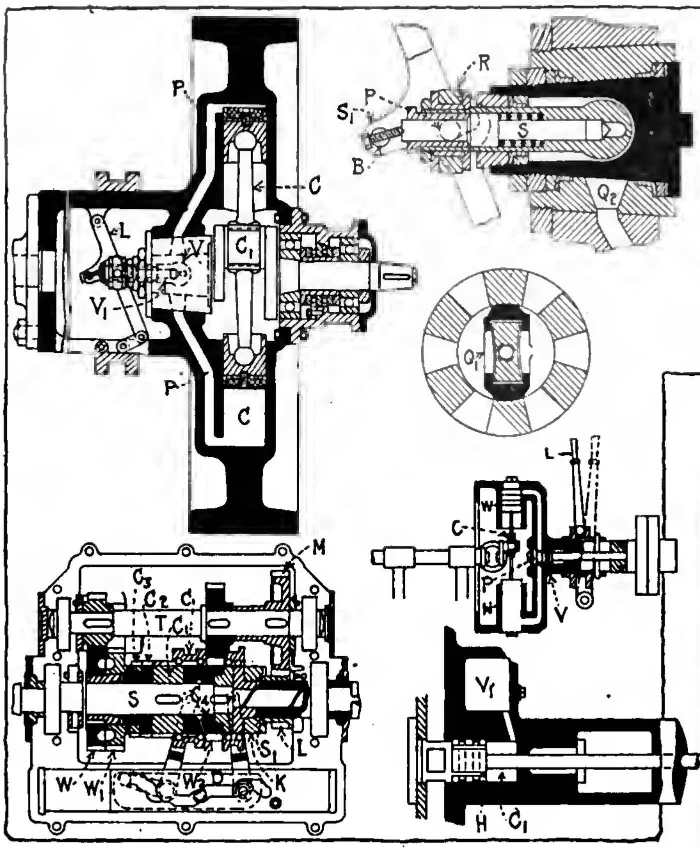


Fig. 14—Constantinescu carbureter and muffler. Fig. 15—Pugh & Bull carbureter. Fig. 16—Daimler accelerator-lever lock



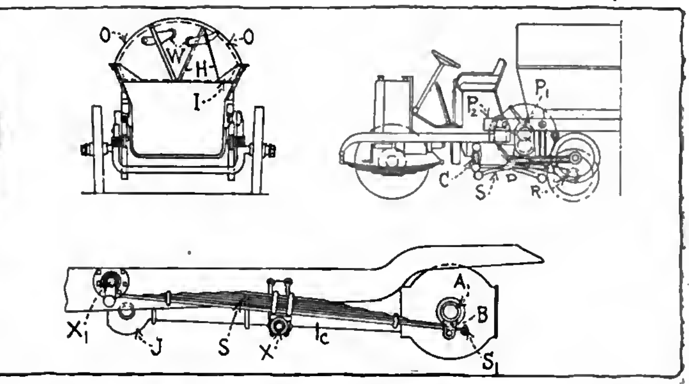


Fig. 18—Stokes hydraulic clutch. Fig. 19—Bond gearset. Fig. 20—Jones hydraulic clutch. Fig. 21—Fouchee refuse cart. Fig. 22—Rolls-Royce rear axle unit

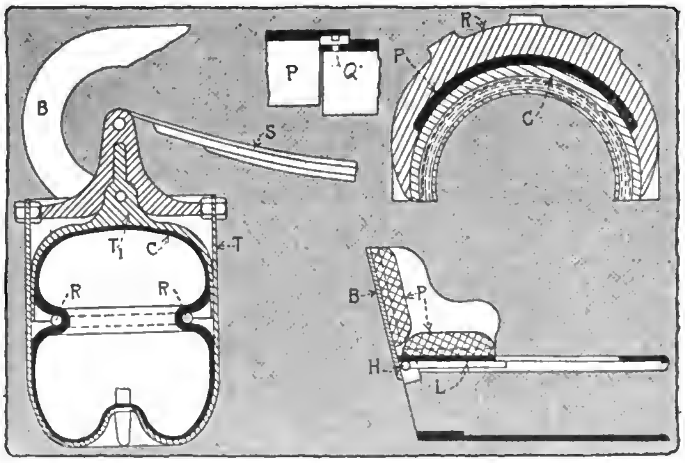


Fig. 23—Spyker pneumatic shackle. Fig. 24—Harris tire reinforced by metal plates. Fig. 25—Radford automobile seat

by air valve A. Priming is effected by turning the nut formed on the end of the rod R_1, whereby a spring-pressed plate which holds V to its seat is raised.

The carbureter shown in Fig. 15 is the subject matter of British patent No. 14,805. The nozzle end extends into a contracted portion C_1 of the cone C through which air is drawn into a chamber formed between a flow chamber F and the enclosing walls of the carbureter casing. This air serves only for spraying of the fuel whereas the air used for combustion enters through openings O; the latter is controlled by a ported diaphragm D actuated by a Bowden mechanism B. A throttle valve V and Bowden mechanism B_1 control the admission of mixture to the motor. The flow of fuel is regulated by a float positioned in a float-chamber F which is carried on a slotted bracket B_2 and is fitted with a block N_1 supporting the nozzle N.

The Daimler Motoren Gesellschaft, in patent No. 12,645, describes a device for locking the accclerator lever automatically, when certain higher speeds are engaged. This is accomplished by the arrangement of the accelerator lever A, Fig. 16, and the stop S which latter comes in operation only when the speed-changing lever L actually puts the gears mentioned in operating position. When L is moved along the spindle to select the operating rod R for the third or fourth speed, arm A_1 comes into alignment with roller R_1; the latter is carried by a lever L_1 connected to the stop S. The end of A_1 forces S into its operative position when the lever L is turned about its axis S_1 to engage either of the speeds above mentioned. Ordinarily the stop is held inoperatively by a spring S_2.

A carbureter which at the same time acts as a muffler is the design of G Constantinescu, described in patent No. 12,759. The construction involves four concentric cylinders C, C_1, C_2 and C_3, which serve as a passage for the hot exhaust gases entering at E and leaving at E_1, the flow of these gases being indicated by arrows. The fuel is carried in a vessel V from which a pipe P leads to a higher portion contained within the exhaust heated carbureter, being supplied to a layer I of incombustible, heat-conducting material. There it meets air entering through P_1 and after having been mixed with it leaves through P_2. On its way to the engine the mixture may be diluted with further air.

Combining the office of a spark-plug with that of an intake valve the subject matter of Fig. 1 deserves special mention. The invention is that of F. E. Harpst and is described in the British patent No. 11,811. The spark-plug proper is shaped with a shell ending in a conical extension lifting into the cylinder head. This shell is formed with cooling ribs or fins R and inside of the shell a chamber C is provided which surrounds the insulated sparking electrode. This chamber has a lateral pipe extension P which serves as an intake opening and communicates with the cylinder space through the central ball of the plug. Fitted into this pipe is a check-valve opening into the chamber C through which fresh gases are omitted when the piston is on its suction stroke and which is closed by the compression in the cylinder as the piston returns on its upward travel. The incoming charge passes over the inner walls of the shell and cools it, thereby assisting the action of the fins R.

A hydraulic clutch idea which is rather interesting is illustrated in Fig. 18. The clutch is the invention of R. O. Stokes, and is described in detail in patent No. 11,561. Fig. 18 shows the details of construction including the cylinders C which are formed in the flywheel and through which the fluid is pumped, which is circulated to form a connecting unit between power plant and driving set. A system of ports and valves is used to control the flow of the fluid throughout the system; the ports P lead to the central valve chamber formed in alignment with the center around which the crank C_1 revolves, which chamber is divided by a plate secured to the crank. In this plate works the outer valve member V which controls the flow of fluid through the port Q_1. The inner valve member V_1 controls the passage Q_2 through the member V. It is operated by a lever L and the spring S which tends to hold it in a certain normal position. A pin P connects the lever to the member V, this pin being carried by a trunnion ring R. The pin works in a slot affording sufficient lost motion to permit of independent movement of the inner valve member V_1.

Fig. 20 shows another hydraulic clutch construction invented by T. G. Jones and described in patent No. 12,707. Attached to the shaft of the motor is a crank on which bear the oppositely mounted connecting rods of two pistons adapted to work in cylinders W. The interiors of the latter communicate through a passage P, the cross section of which is variable of a valve V operable by a lever L. The casting of which the two cylinders are parts is mounted on the driven shaft which actuates the differential. The method in which this mechanism operates is as follows: If the valve is in such a position that it closes the passage entirely, the pistons are locked in their relative positions and the driven shaft on which the cylinders are mounted is in direct gear with the driving shaft. If the valve is fully open the crank C revolves around the crankshaft and actuates the two pump cylinders W passing the actuating fluid alternately from one to the other so that the driven member which is mounted on a driven shaft remains stationary. Partial opening of the valve gives a variety of speeds.

Fig. 19 shows a transmission idea described in patent No. 15,911 being the invention of E. S. Bond. A clutch member C carries several circles of balls and is adapted to engage a tooth wheel. These balls may be brought into engagement with parallel grooves in cylinders C1, C2, C3 and C4 surrounding the driven shaft S of the gearset. C1 is secured to S while the other members are fastened to the bosses of gear wheels W, W1 and W2, respectively. Positive engagement between the member C1 and any of the other three may be obtained.

In Fig. 21 a refuse cart construction is illustrated which is described in patent No. 14,117. The airtight cart is coupled to the tractor by a set of double pins. The rear wheels are supported on stud axles which are carried by the arms A pivoted at P. Springs S are attached below the arms A and at their other ends by screw connectors C. To connect the tractor to a two-wheeled cart the latter is brought close to it and coupled by pins P1 or P 2, after which connectors C are unscrewed until the second set of pins may be put in place, while further unlifting raises the wheels of the cart off the ground. Charging openings O are provided in the top of the cart and a hopper is formed by an inclined plate I and a hinged panel H which is normally kept closed by a counterweight W.

An interesting form of spring suspension is shown in Fig. 22. The live axle casing A is rigidly connected to a casing C pivoted to the chassis frame on a joint J and acting as a radius rod. The side spring S is pivoted at X and X1, having its rear end sliding in a bracket B on the casing A. The stop S1 keeps the spring end from leaving the chassis frame in case of rupture of the casing C. Patent No. 13,516 describes this invention in detail, the patentees being F. H. Royce and Rolls-Royce Ltd.

Another invention referring to the subject of suspension is described in patent No. 14,757 of J. Spyker. The subject matter is a compensating shackle, Fig. 23, consisting in principle of a pneumatic bag inclosed in a casing which consists of two telescoping members T and T1, one of which is fixed to the master leaf of the spring S and the other to the end of the spring reach B. The pneumatic casing C1 is held together in the middle by a ring R which may be supplanted by an annular projection of the internal diameter of the casing part T.

Among the many interesting inventions pertaining to tire design and manufacture is the tire shown in Fig. 24. The outer casing is reinforced by the insertion of metal plates extending transversely through it, being laid over the fabric and under the rubber tread. Individual metal plates P thus form a ring over the tire fabric, being attached to one another by means of studs and holes shown at Q. This puncture-proof tire is the invention of A. R. Harris and the patent is No. 15,353.

Improved automobile seats are the subject matter of patent No. 15,735, granted to W. Radford. The seat described in this patent is really a rumble seat which is formed by the cover of a box carried behind the runabout seats. The member B, Fig. 25, is hinged at H and forms the back of the seat, a loose member L forming the seat proper. These two parts are padded at P and each is formed with an arm rest A. Fastening members engage the rear portion of B when the seat is not in use, whereas otherwise the front end of L is held by them.

Fig. 26 shows a constructional detail of the tire described in patent No. 11,666, the invention being that of T. Gare. The rubber body R of the tire is vulcanized to the metal base M, a layer of vulcanite being in place between R and M. To increase the adhesion between R and M the vulcanite is formed with a serrated or similarly irregular surface S.

British patent No. 15,019 deals with a spring tire construction shown in Fig. 27. The tread T is secured by latteral bands B to outer rims O which are in turn connected to the inner rim I fitting around the wheel felloe. A web W projects from the rim I into the space formed between tire tread and bands B, and between this web and the bands a series of helical springs H are in place which tend to hold the bands in properly spaced relation from the web and are adapted to absorb shocks, etc., imparted to the tire rolling over the road. G. Racca and G. Dall'Oglio are the inventors of this tire.

M. Wolff, in patent No. 15,144, describes a detachable rim attachment shown in Fig. 28. Each rim is formed with a projecting flange F protecting securing bolts and similar member if a single rim is used on the wheel, while in case of dual rims the flanges serve as facing rims as in the illustration here shown. Interengaging lugs are arranged on the fixed and detachable rim members and, in the dual form of rim the valve stems V are arranged at the side of the felloe and not through the same as in ordinary practice.

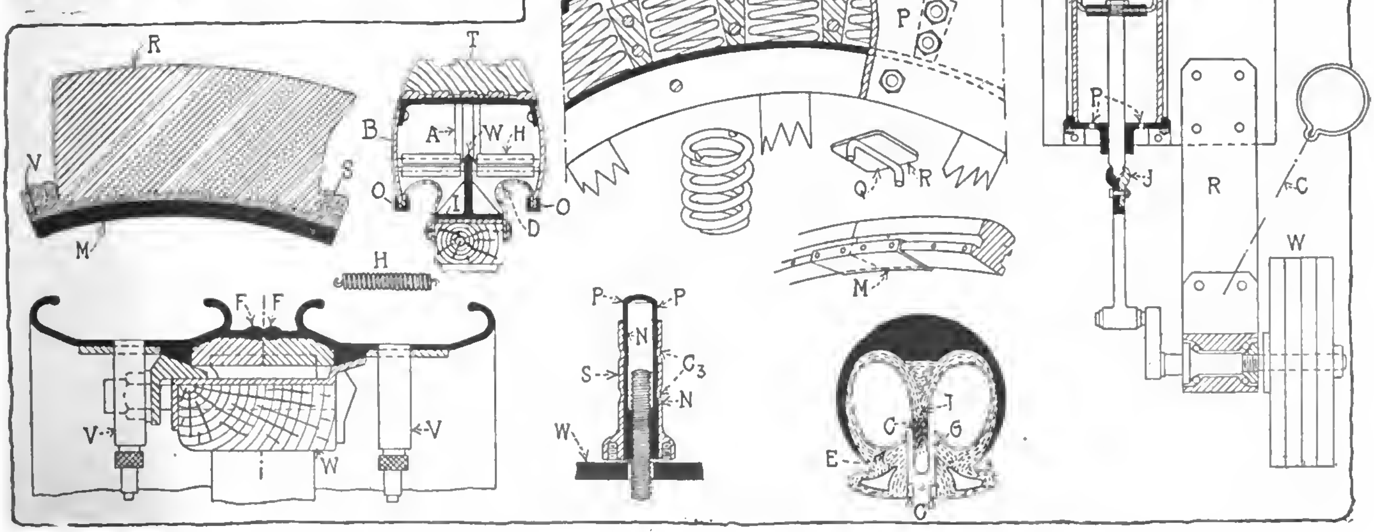
A spring tire which offers possibilities is described in patent No. 15,319, having been granted to R. Rhone. It comprises a continuous tire T having beaded edges, with ends joined by a metal shoe M, Fig. 29. The latter is guided by a side-plate P supported by helical springs which are contained in recesses formed by transverse webs W. A plate Q forms a bearing between each spring and the tire, and a rod R on each plate Q engages notches in the helical spring above which it is in place.

A tire valve cover, Fig. 30, is the subject matter of patent No. 12,943, the inventor being W. G. Nelson. The covers for the security bolt and valve stems comprise a hollow, close-ended nut N which carries a rotatable sleeve S fitted with a rubber washer W. Movement of the sleeve on the nut is prevented by a collar on the nut which engages ribs and grooves G on sleeve and nut. The formation of the part P is such as to permit of easy application of a spanner.

British patent No. 15,415 deals with the peculiar tire design shown in Fig. 31. The casing is formed with a centrally and internally extending tongue T which fits between the sides of a groove G.

Engine-worked tire inflation is the object of the invention illustrated in Fig. 32 which is described in patent No. 12,085. The Beorchia scheme provides a friction wheel W actuated by the flywheel and suspended on an arm R. The shaft on which the wheel is mounted has an eccentric carrying a connecting rod bearing, and the connecting rod is connected by a joint J to the plunger which carries the pump piston.

Fig. 26—Gare tire vulcanized to metal rim. Fig. 27—Racca-Dall'Oglio spring tire construction. Fig. 28—Detachable rim design. Fig. 29—Rhone helical-spring tire. Fig. 30—Nelson tire-valve cover. Fig. 31—Driscoll automobile tire. Fig. 32—Beorchia tire pump



Electric Cranking and Lighting

Part II

Taking Up the Electric Systems Now on the Market. In Studying These Systems the Physical Layout Adopted by Each Maker Should Be Noted Along with Details of Design

Subject Digest

¶ Makers of Electric cranking and lighting systems have had a sudden demand thrust upon them. The big question of the New York shows, asked by every intending purchaser of a car priced at more than $1,000 was: "Have you an electric starter?" This demand has caused a flood of designs.

¶ The youth of the electric cranking and lighting industry is shown by the great number of varying designs placed on the market. No two are alike in even the essential details, although making use of the same principles.

¶ Two-unit and three-unit systems are leading the way, although the single-unit system with the ignition and lighting generator and the cranking motor all in one casing are coming into prominence along with the increase in 6-volt systems.

¶ Most of the starters now on the market have been fitted to the car after the car itself was designed. They have been put on as an afterthought. The results in a number of cases, as far as appearance goes, show this. Six months later, the cranking motors will not be as clumsily mounted as many of them are now.

LAST week THE AUTOMOBILE gave in as simple a form as possible the main features of an electric system on an automobile. It was pointed out that there must be three main units. A battery, a generator and a cranking motor to make up a complete ignition, lighting and starting system. These units must possess certain relations to one another and must perform certain functions. The requirements of the units and their relations were fully discussed in that issue and it remains now to touch on the systems which are at present in use.

The youth of the manufacture of electric cranking instruments cannot be better shown than by the great variety of types now on the market, although the same basic principles can be seen in each application. Since this is the first year that the electric cranking motor can be said to have come into its own, it is manifestly impossible to state that there is any trend in the manufacture of these instruments. The equal division between the 6, 12 and 24-volt systems show that the opinion of the designing engineers is at great variance on this subject.

An equal division also may be noted between those who are using the motor and the generator in two separate and distinct units and those who are putting them together in one housing. The advantages of simplicity are argued by both sides as their reason for either making the system in a single or double unit.

One of the noticeable points in the installation of the electric cranking systems is the clumsiness with which they are mounted on the chassis. The reason for it is apparent after a moment's consideration. The starter is the result of a sudden demand and the result has been that they have been installed after the design of the engine and chassis was complete. They have simply been added. The result of this has been in many cases a bad engineering job. The drive has been defective, the appearance anything but satisfying and the result on the whole bad. Even on these installations, however, credit must be given for the ingenuity displayed in applying cranking motors to engines and chassis which were designed and built without the slightest idea of any such installation. There are many which are so designed that they can be applied even after the car is in use.

Gray & Davis—Three-Unit System

The Gray & Davis electric lighting and cranking system belongs to the three-unit class. Two units are furnished by the company, namely, an electric generator and a cranking motor. The third, or ignition unit, is optional with the purchaser and is not supplied by this company.

Both the electric generator and the motor of this system operate at 6 volts. A 6-volt battery is therefore used with this system, its capacity varying with the size of the motor which has to be started and the number of lamps used.

The generator is driven either through gears or by means of a silent chain. The speed of the generator is regulated by means of a centrifugal governor. This governor permits the generator to be driven positively up to 750 revolutions per minute in the case of one size of generator and 1,000 revolutions per minute in the case of another. Above these definite speeds the governor causes the driving clutch to slip, thus maintaining the armature speed very nearly constant.

These critical speeds are reached at a low car speed, so that the generator gives its full output when the car is traveling from 10 to 15 miles per hour, this variation being determined by the gear ratio and size of tires on any machine. The generators are geared 2:1 or 1.5:1 depending on the size used. They are driven either by silent chains or gears.

The regulation of the amperes output is accomplished in two ways on the Gray & Davis generator. The machine is compound-wound, namely, with a shunt field, SHF, and a series field, SEF, Fig. 1. Unlike most compound-wound machines used for electric lighting, the two field windings assist one another instead of oppose. For this reason this is called by the electrical engineer a cumulative compound instead of differential compound machine.

The regulation of maximum output is effected by the centrifugal governor, which keeps the speed of the machine constant. For that reason this may be placed in the class of mechanically regulated machines.

The purpose of the additional field, SEF, is to increase the output of the generator as the lights are turned on, without increasing the speed of the generator. For example, with all lights out, the generator will deliver about 6 amperes, while with all the lights burning it will develop 12 amperes. In between these two points it will deliver additional amperes in proportion to the candlepower of the lamps burning, that is, with half the total candlepower, 9 instead of 12 amperes will be the output.

An over-running clutch is always applied to the train of gears in the Gray & Davis system in order to prevent the gasoline motor from driving the cranking motor when the former starts up.

A starter switch connects the battery with the motor when cranking. This circuit is separate from the lighting and is direct from the battery to the motor.

A circuit independent from the lighting is used for the starter. Wires connect direct from battery to motor and are of No. 0 size in most installations, although in some No. 000 has been used to insure maximum efficiency. The starting switch, SS, is placed in this line. This switch is interconnected with the cranking gear train so that when the starting gear is shifted into mesh with the flywheel gear the current will be turned on.

The starting switch has two points; the first permits only a small current to flow to the motor, while the second allows the full battery current to rush through the motor. The first condition is obtained by imposing resistance in the line. Its purpose is to permit easy meshing of the gears without throwing on full power before the gears are meshed their full width. This is the usual practice with all types of flywheel geared starter switches.

This is the only machine with mechanical regulation which provides for an additional regulation in proportion to the output of the generator, Figs. 2 and 3.

The two generators which Gray & Davis make both have the distance from the base to the center of the armature the same, namely, 2.68 inches. In over-all length one of the machines is 12.11 inches long, the other 11.34 inches. In over-all width they are both 5.5 inches. The larger one weighs 32 pounds and the smaller one 25 pounds.

For cranking, two electric motors are provided by Gray & Davis. One weighing 38 pounds and capable of cranking motors up to 36 horsepower and the other weighing 66 pounds and suitable for 75-horsepower motors. In both cases these motors are designed for a working speed of 1,500 revolutions per minute using 6-volt current. Both motors are cylindrical, one 8 inches in diameter, the other 6.63 inches.

The gear ratio used between the motor and the crankshaft naturally varies with the size of the motor to be cranked. It varies from fifteen to one in the case of a small motor to twenty to one in the case of a large motor. Assuming a cranking motor speed of 1,500 revolutions per minute the gasoline motor will turn over at the rate of 100 revolutions per minute with the first gear ratio and 75 revolutions per minute with the second ratio.

The current drawn in each case will vary with the size of the motor, the temperature conditions existing at the time of starting, the speed at which the motor is rotated and the condition of the battery. These are fundamental considerations and must be taken into account whenever comparing starters.

The Gray & Davis cranking motor takes current at the rate of 80 to 120 amperes under normal conditions. These are only relative values and not specific.

On account of the comparatively large reduction between the cranking motor and the crankshaft it is particularly convenient to apply the power from the Gray & Davis cranking motor through a train of reduction gears one of which meshes with a gear on the flywheel. The size of the flywheel makes it possible to get a large reduction very conveniently and for that reason is very popular with this type of starter. This system is applied in other ways with equal success, as, for example, through a worm and gear attached to the transmission gearcase.

Ward Leonard—Three-Unit System

Another 6-volt system of lighting and cranking is furnished by the Ward Leonard Electric Company. The system is placed in the three-unit subdivision as a separate motor and generator are used. The ignition system which may be used is optional with the purchaser. Either magneto or magneto ignition can be used.

The output of the generator depends upon the size of the battery to be charged. It is usually fixed at the charging rate recommended by the battery makers for initial charging. Inasmuch as the user drives his car only for short periods at a speed which would cause the generator to give its maximum output, it is claimed that it insures a full charge all the time. As the battery makers claim that overcharging is more desirable than undercharging it is evident this is erring on the safe side.

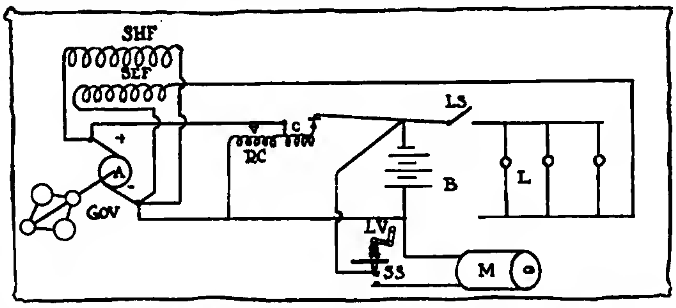


Fig. 1—Wiring diagram of the Gray & Davis system for lighting and cranking

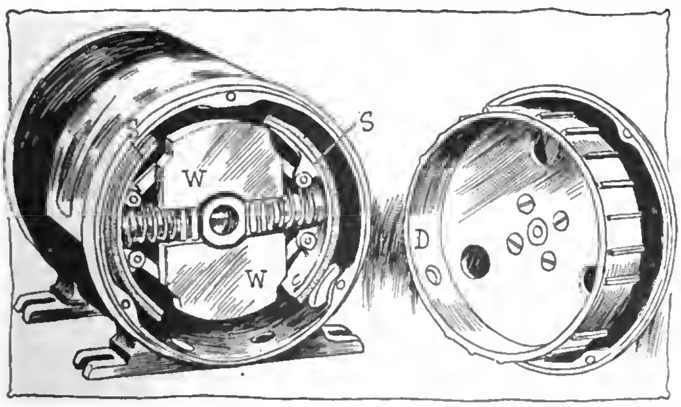


Fig. 2—Gray & Davis governor regulator; S, friction surface; W, weights. Springs hold S against drum D until centrifugal force separates weights W and compress springs

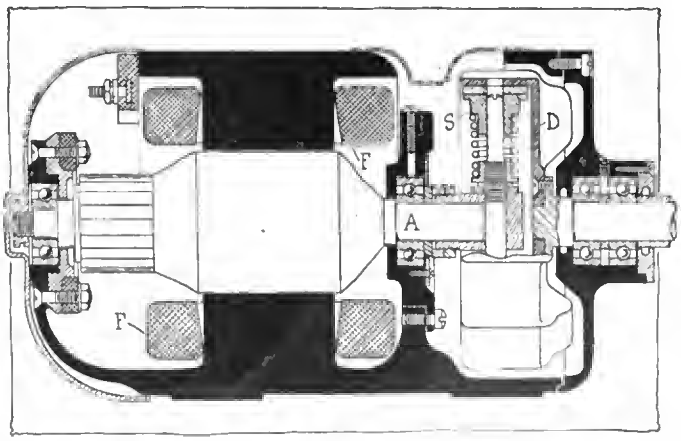


Fig. 3—Sectional view of Gray & Davis dynamo. This view shows the regulator illustrated in Fig. 2, mounted in the right end of generator casing

At the New York Shows—Electric Starters and Cars to Which They Were Applied

Name of Starter	Name of Car	Name of Starter	Name of Car
Gray & Davis	Columbia	Ward Leonard	Henderson
	Davis		King
	Firestone-Columbus		Moline
	Flanders		Renault
	Lenox	Westinghouse	Case
	Lozier		Herreshoff
	National		Matheson
	Norwalk		Marion
	Paige	Adlake	Locomobile
	Pathfinder		Pierce-Arrow
	Peerless		Stevens-Duryea
	Pope-Hartford	Auto-Lite	Abbott-Detroit
	Reo		Jackson
	Selden		Patterson
	Stearns	Electro	American
	Stoddard-Dayton		Auburn
	Velie		Westcott
North East	Cunningham	Esterline	Knox
	Firestone-Columbus		Kissel
	Havers		Mitchell
	Imperial	Jesco	CarterCar
	Marmon		Cutting
	Michigan		Keeton
	Pullman	Wagner	Moon
Delco	Cadillac		Speedwell
	Cole		Studebaker
	Hudson	Aplco	Interstate
	Oakland		Marathon
	Packard	Entz	Franklin
U. S. L.	Edwards-Knight		White
	Garford	Rushmore	Kline
	Overland		Mercer
	Rambler	Dean	Schacht
		Leece-Neville	Haynes
		Nelson	American

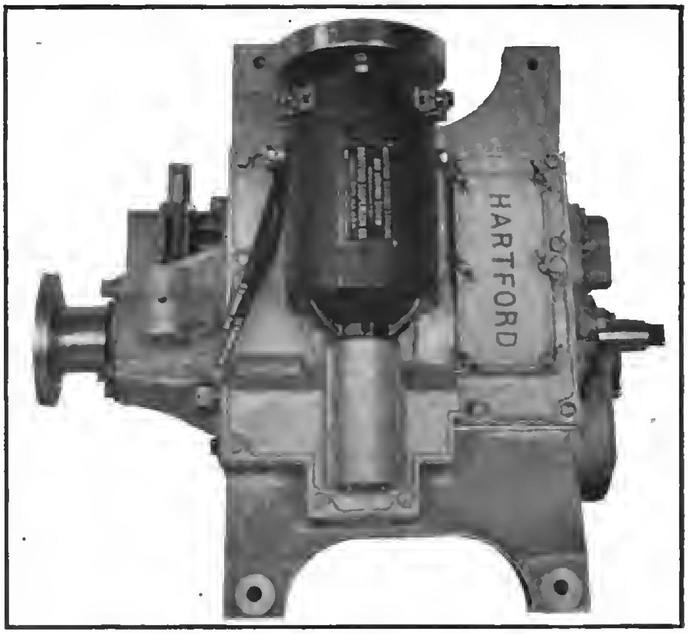


Fig. 4—Mounting the Hartford motor generator on gearset

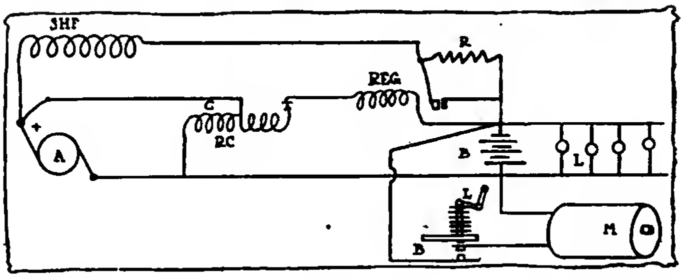


Fig. 5—Ward-Leonard wiring diagram for electric cranking system

The generator meets the maximum load from 300 to 350 revolutions per minute, depending on the gear ratio of the car upon which it is mounted. Above this speed it charges the battery. The generator may be driven at crankshaft speed or at one and one-half to one. The company also builds a lighting generator which operates at two to one. The weight of the generator is about 30 pounds.

The system consists of three units: a generator, motor and regulator. The regulating devices are contained in a small box which may be mounted either at some convenient place on the chassis or on top of the generator. The latter position greatly simplifies the wiring of the car.

The regulator contains two devices, a reverse current cut-out and the output regulator. The reverse current cut-out, RC, consists of two coils, the potential or voltage coil closing the relay and the current coil holding the relay closed until a reverse current opens it up. The regulator merely consists of a current coil in the main line. This inserts resistance in the field circuit when the output reaches a predetermined point. The controller is in constant vibration whenever the generator comes up to a speed where it delivers or exceeds the maximum output allowed. It will be seen from this that the entire control is accomplished by this regulator and that the generator is a simple shunt-wound machine.

The Ward Leonard cranking motor weighs about 38 pounds for a 45-horsepower motor and the company builds in addition a smaller cranking motor for engines of less than 25 horsepower. The characteristics of these motors differ somewhat from the general run of 6-volt apparatus in that they are designed for high speed. When under load they run at from 2,500 to 3,500 revolutions per minute. As a result the gear ratio necessary varies from thirty to one to forty to one.

The current required for continuous cranking varies from eighty to 100 amperes at 6 volts. This will crank a motor from sixty to 100 revolutions per minute depending upon its size. The most usual method of connecting the motor to the engine with this system is through the flywheel. On account of the large gear ratio necessary with this cranking motor it is almost necessary to include the flywheel in the gear train in order to reduce the size of the gears.

A special switch is also used for cranking. It consists of laminated copper strips about 1.25 inches wide and 5 inches long. They are fastened to a copper block forming one of the terminals of the switch at one end and are brought into contact with another block when it is desired to start the cranking motor. An eccentric is used to force the contacts together. There are two points on the switch, one for permitting the motor to turn over slowly to facilitate meshing the gears and, second, the running position.

Hartford—High Speed Motor

The Hartford electric system has three units, the motor, generator and magneto being separate and distinct units. The system is so arranged that the generator is controlled by a governor which operates at a car speed of 14 miles per hour and by a cutout which operates in the neighborhood of 6 miles an hour. The storage battery floats on the line. The generator is geared constantly to the transmission gears or timing gears at the option of the purchaser.

Taking up the units independently, it may be stated that the generator is of the permanent magnet type with auxiliary electromagnetic fields, the latter being wound around the pole shoe extension. The pole shoes of malleable iron are fitted to a cylindrical housing provided with threaded ends to which are attached the end covers. The covers have knurled edges, making it easy to remove the parts desired. The armature is drum-wound and has the wires insulated by a baked-on substance which renders them impervious to moisture. The commutator segments are separated by insulating material wound directly on the chrome-nickel steel armature shaft. The armature shaft is carried on ball bearings designed to take both radial and thrust loads.

In order to protect the battery from the high voltages which would be created if the generator were driven at excessive speeds a centrifugal governor of the friction type is employed and comes into operation at 14 miles an hour car speed.

The brushes employed to take the current from the commutator of the generator are of the carbo-metallic type. They may be reached by lifting a spring-retained cover mounted on the end casing. The brushes and holder may be removed as a unit. In

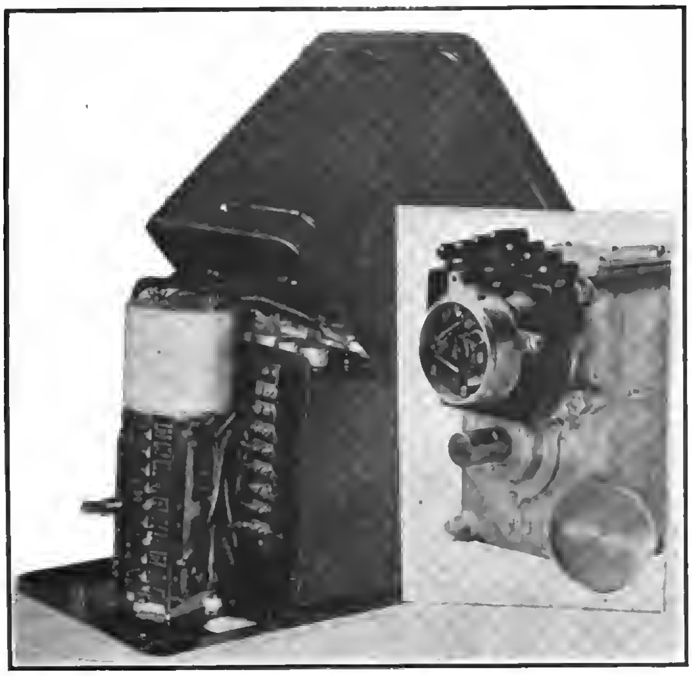


Fig. 6—View of Electro generator, showing interior and mounting of distributor on casing

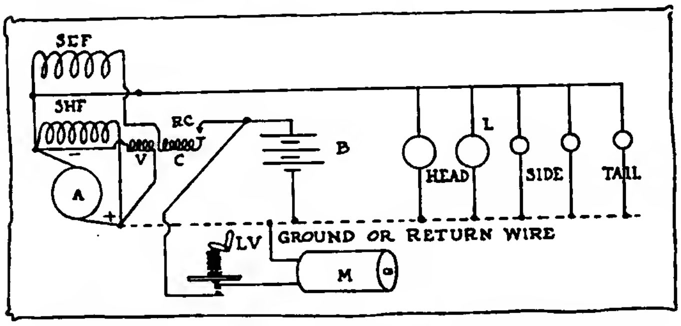


Fig. 7—Wiring diagram of Westinghouse six-volt system, showing grounded return wire

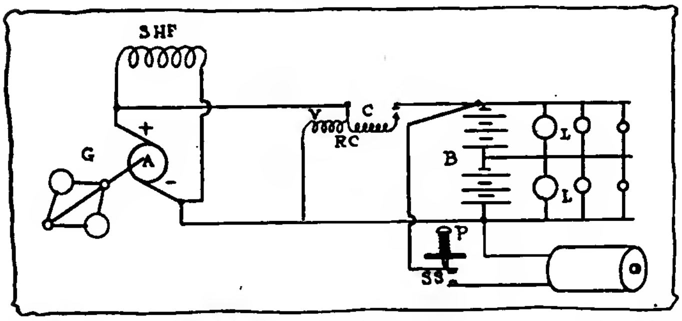


Fig. 8—Wiring diagram of the Hartford system for lighting and cranking

systems where the battery is floated on the line it is necessary that the generator be cut out when the voltage developed falls below that of the battery or else the battery will be discharged through the commutator. In the Hartford system a magnetic reverse current cut-out, R C, is used. The generator is cut in when the automobile is traveling at 8 miles an hour and is not cut out until the speed of the car falls to 6 miles an hour. It is entirely automatic in its action. At a car speed of 8 miles an hour the generator is developing approximately 7 amperes. As the car is speeded up the rise in the amperage is gradual until a speed of 15 miles an hour is obtained, at which point a little over 11 amperes is developed. From this point the curve declines to 8.5 amperes, which is held at 25 miles an hour and over. The

Manufacturers of Electric Cranking, Lighting and Igniting Apparatus

Name	Address	Light.	Start.	Ign.
A. B. Mfg. Co	Poughkeepsie, N. Y.	•		
Adams & Westlake	Chicago, Ill.	•	•	
Aplco (Apple Electric Co.)	Dayton, Ohio	•	•	
Autolite (Elect. Autolite Co.)	Toledo, Ohio	•	•	
Bailey Electric Starter Co	Grand Rapids, Mich.	•	•	
Bijur Motor Lighting Co	New York	•	•	
Deaco (Detroit Elec. Appliance Co.)	Detroit, Mich	•	•	•
Dean Elec. Co., Otho	Elyria, Ohio	•	•	
Elyria		•	•	
Dynalux		•		
Delco (Dayton Elec. Lab. Co.)	Dayton, Ohio	•	•	•
Disco (Ignition Starter Co.)	Detroit, Mich	•	•	
Economy Mfg. Co	Economy, Pa	•		
Electro (Electro Light & Starter Co.)	Indianapolis, Ind	•	•	•
Entz (Dyneto Electric Co.)	Syracuse, N. Y.	•	•	
Emmerson Electric Co	St. Louis		•	
Esterline Co.	Lafayette, Ind	•	•	
Gray & Davis	Boston, Mass	•	•	
Gould Storage Battery Co	New York	•		•
Hartford (Hartford Suspension Co.)	Jersey City, N. J.	•	•	
Hartman Electric Mfg. Co	Mansfield, Ohio	•		
Holtzer-Cabot Elec. Co	Brookline, Mass	•		
Jenney Electric Starter Co	Indianapolis, Ind	•	•	
Jesco (Jones Electric Starter Co.)	Chicago, Ill	•	•	
Leece-Neville Co.	Cleveland, Ohio	•	•	
Nelson (Peru Auto Parts Co.)	Peru, Ind	•	•	
North-East Elec. Co	Rochester, N. Y.	•	•	
Northwestern Mfg. Co	Milwaukee, Wis	•	•	
Remy (Remy Electric Co.)	Anderson, Ind	•	•	•
Rushmore Dynamo Works	Plainfield, N. J.	•	•	
Spindler & Derringer	Jersey City, N. J.	•		
Splitdorf Electric Co	Newark, N. J.	•		
Sprague-Waldo Mfg. Co	Detroit, Mich	•	•	
Strong Electric Co	Des Moines, Iowa	•		
U. S. L. (U. S. Light & Heating Co.)	Niagara Falls, N. Y.	•	•	
Vesta Accumulator Co	Chicago, Ill	•	•	
Vivax Storage Battery Co	Chicago, Ill	•		
Wagner Electric Mfg. Co	St. Louis, Mo	•	•	
Ward Leonard Elec. Co	Bronxville, N. Y.	•	•	
Warner Arc Light Co	Davenport, Iowa	•		
Wells (R. C. Wells Mfg. Co)	Fond du Lac, Wis	•		
Westinghouse Elec. & Mfg. Co	E. Pittsburg, Pa	•	•	•
Total		41	30	6
Percentage, based on 42 manufacturers		98	71	14

voltage curve starts at 13 at a car speed of 7 miles an hour and rises gradually to a maximum of 14 volts. The generator is driven from the crankshaft, on the recommendation of the manufacturers, by silent chain at the ratio of three to one, although gear drive may be employed if desired. The battery is of 12-volt, 60-ampere-hour capacity. The headlights are connected to one-half the battery and the dash side of the tail lamps to the other half, hence all lights operate at 6 volts.

The electric cranking motor is of somewhat unusual type in that it is designed to operate at about 7,000 revolutions a minute. The gear reduction between the motor and the crankshaft of the gasoline engine varying from 100 to 1 to 125 to 1, the reduction being obtained by a combination worm and spur gear having an efficiency of 85 per cent. In other words, the crankshaft is revolved at a rate of from forty to seventy turns a minute, depending on the engine size, compression, stiffness, temperature and other conditions. To further describe the motor, it may be said it is of cylindrical shape, 7.5 inches long and 4.5 inches in diameter. Its weight, including gears, etc., is 35 pounds, and without the gears, 20 pounds. The extension of the armature shaft is provided with a worm which meshes with a large gear giving a reduction of twenty-five to one. A further reduction of five to one is secured by spur gears. The efficiency of the small motor is secured by the use of a small flywheel weighing 4.5 pounds, which, turning over at 7,000 revolutions per minute stores up considerable kinetic energy between the times when the motor is acting against the compression of the gas engine, thus enabling it to carry its load at a very nearly constant speed. The gears between the motor and the engine crankshaft are always in mesh, but since the worm gear is not keyed to the shaft of the motor but is secured by a friction over running disk all danger of harm to the electric motor, should a backfire occur, is eliminated. The starter consumes on an average between 200 and 225 watts. The motor is series-wound, the torque increasing with the load.

U. S. L.—Flywheel Installation

The U. S. L. is a two-unit system. In installing this system the armature of the motor-generator supplants the flywheel and performs its functions as well as those of the electric lighting

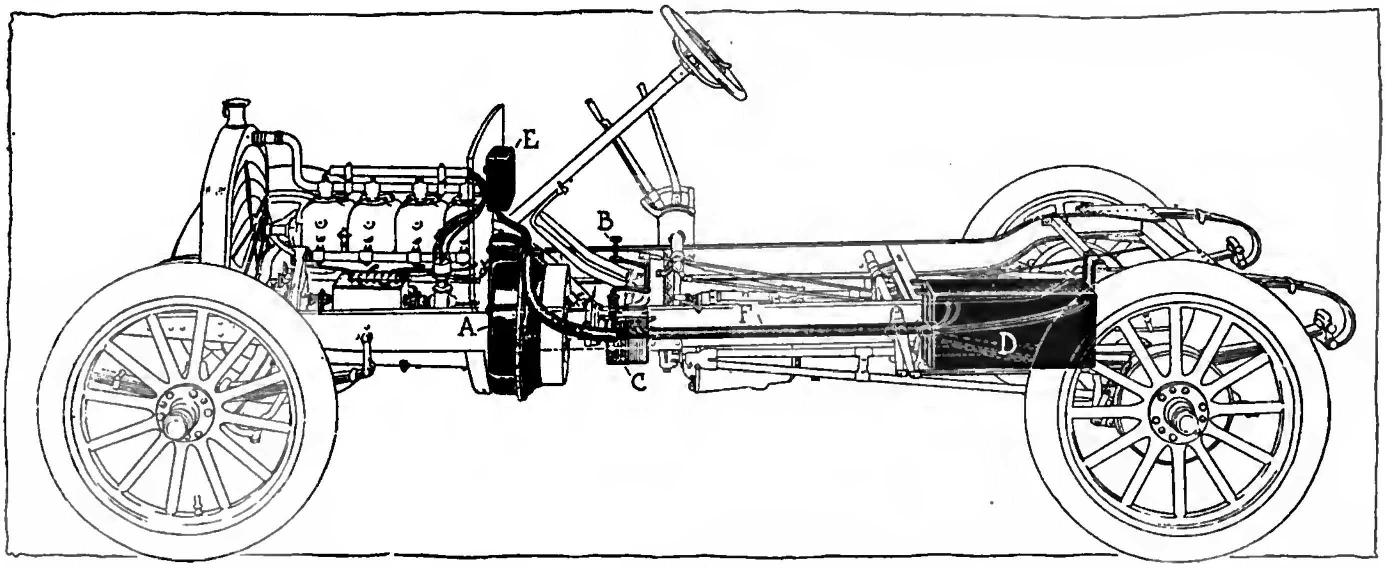


Fig. 9—Mounting of U.S.L. system on Rambler Car; A, motor-generator; B, starting pedal; C, switchbox; D, battery; E, regulator

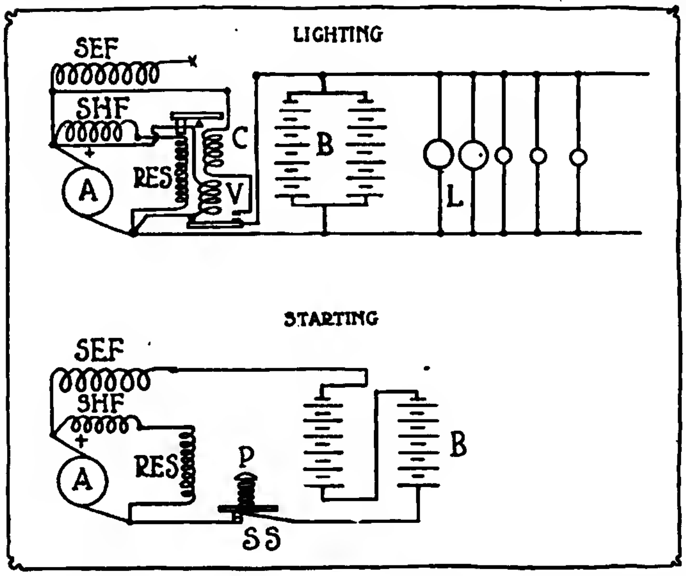


Fig. 10—Wiring diagrams of U.S.L. lighting and starting systems

and cranking systems. There are two independent windings on the field, one for the motor and one for the generator. The voltage of the motor is 24, while the charging voltage of the generator is 12.

The preferred disposition of the units is that shown in Fig. 9. As will be seen, the added weight will be only that of the battery, fields, switches and controller as the flywheel is removed and replaced by the armature of equal weight. When a foot switch is pressed the battery is connected to the motor and this turns over the gasoline engine at the rate of from 200 to 300 revolutions per minute. The speed at which the motor is turned over and the amperage drawn in turning it over are functions of the stiffness of the motor and its size, or, in other words, the amperage drawn by the same voltage rises in proportion to the resistance. The field is in series with the armature and is assisted by the shunt field, Fig. 10. With series motors the field excitation is greater as the motor speed falls and the torque of the motor increases. The amperage drawn by the motor in spinning the engine in the average case will jump to 150 and then will fall back to a running amperage of approximately 75.

As soon as the motor picks up to a speed giving 8 miles an hour, the motor generator becomes a shunt-wound generator and starts to charge the battery, restoring the current used at a 30-ampere rate. In order that the output of the generator shall be uniform a carbon pile regulator operated by a series coil C, is used. This keeps the output through the working range of from 600 to 1,200 revolutions per minute practically constant. At higher speeds than the latter the output drops off and thus a dangerous overcharge to the battery is prevented. In order that it will be impossible for the battery to discharge back through the motor generator at speeds below charging or while the car is standing at rest a reverse current cut-out opens the line between the battery and the motor generator.

On account of the small added weight, the motor generator parts in this system are made larger than if it were necessary to cut them down to the minimum. The commutator, for instance, is 10 inches across and the carbon brush contact is .75 square inch on the average installation. The storage battery used with the system has a capacity of 130 ampere-hours at 12 volts.

Westinghouse—Grounded Return Wires

The Westinghouse combined lighting, cranking and ignition system has two units. First, a cranking motor which may be located in the most convenient position, and, second, a generator which takes care of the lighting circuit and also of the ignition. The entire system is operated at 6 volts and is grounded at one point. This greatly reduces the wiring, and since every part of the system is at the same voltage permits of the use of single contact lamp sockets, etc.

The generator in the Westinghouse system takes care of ignition as well as lighting. It is of low speed, turning over at crankshaft speed on four-cylinder motors and at 1.5 crankshaft speed on sixes. It can be driven from the crankshaft or installed in any convenient place. There are no permanent magnets used in the generator, which is of the compound differential-wound type. The output of the generator is controlled electrically due to the compound winding. A reverse current cut-out is provided and is so adjusted that on the average four-cylinder car the battery circuit is cut in above 10 miles an hour and cut out below 7 miles an hour. This difference prevents the switch from cutting in and out continuously when the car is running at one particular speed. When the generator is connected to the battery by the automatic switch the current rises rapidly with the speed until a value of from 5 to 7 amperes is obtained if the lamps are not burning. Above this the output rises very gradually, the curve being nearly flat for all motor speeds so that the danger of an excessive charging rate in day touring is eliminated. This is accomplished by the reversed compound field winding on the generator.

When the lights are turned on the output of the generator increases proportionately. This is accomplished in the following manner: Assume that the load is 6 amperes, that the generator output is 3 amperes, then 3 amperes will be taken from the battery. The battery current must go through the series field SEF on its way to the lights, thus assisting instead of bucking the shunt field SHF.

Now assume the condition of 7 amperes output from the generator and a lamp load of 6 amperes. This leaves 1 ampere for charging. That 1 ampere goes to the battery through the series field SEF, and in the reverse direction which causes that field to oppose the shunt field instead of assisting it as in the above case. The figures are merely for explanation.

The preferred installation of the cranking motor is by gear to the flywheel or to the front end of the crankshaft. The reduction from the cranking motor to the engine varies from 10 to 1 up to 22 to 1. The amperage on the jump or when the starting switch is first thrown in is 200. The storage battery capacity is 100 ampere-hours. The starting motor is series wound and is made in three sizes of different torque rating to take care of gasoline motors of different ratings. The switch which operates the starting motor has two points. The first movement causes the electric motor to turn over very slowly to facilitate engagement of the gears, between the motor and the flywheel, and the second point causes the cranking motor to spin the engine.

Aplco—Two-Unit System

The Aplco is a two-unit system. The electric cranking motor and the generator are contained in one unit and the magneto forms the second unit. The make of the magneto is optional and is separate and distinct from the lighting and cranking systems. The system operates at about 6.5 volts as far as the lamps and generator are concerned. The cranking motor, however, operates at 24 volts except in the case of installation on the Interstate motor, where the cranking motor operates at 30 volts. The generator is the low-speed type working at crankshaft speed. The generator may be driven by chain, gears or by any other means compatible with the crankshaft speed at which it is designed to run.

The weight of the motor-generator is 70 pounds. The generator furnishes current for the lighting system, however, and therefore its weight is less than the weight of two units, which it replaces.

The regulation of the current from the generator at high speeds is governed inherently by the compound differential winding on the motor-generator. **Besides this, when the battery has become fully charged there is a device which automatically stops the generator from charging.** The generator will not again start to charge the battery until the current in the battery drops to a definite point. This gives a protection against overcharging. A magnetic reverse current cut-out prevents the battery from discharging through the generator when the car is not in motion.

The motor is geared through a differential planetary set at a reduction of forty to one to the motor. It is fitted with a roller type of overrunning clutch and a centrifugally operated slipping clutch. The starting switch is of the two-point type. A non-grounded system is used and if battery ignition is used it is essential that this have a non-grounded primary also.

Some of the features of the control used in this system are worthy of note. The cranking, lighting and igniting systems can be locked in any position. The lights may be left on or off or any lights desired may be left burning. This control is in the terminal board, where all electric control is located. Another feature is the tell-tale light which glows when the generator is not charging and the engine is running. The battery may be tested also by this lamp. When fully charged the lamp will light up brightly when a button is pressed.

Electro—Single Unit System

The Electro system has a unit starting motor and lighting and ignition generator, the dimensions of the instrument are 16 5-16 inches base length, 5 3-8 inches wide and 8 5-8 inches body height. The weight of the motor-generator is 100 pounds. It is necessary to arrange the motor with a short driving shaft integral with the motor case, driven either through the timing gears or silent chain and connecting to the starter with an Oldham coupling. The motor-generator is always in operation. When turning below 380 revolutions per minute it is a motor and when turning above that rate it is a dynamo or generator. The compound differential winding takes care of the output from the generator. No reverse cut-out is provided to disconnect the battery from the motor-generator entirely at very low speeds. Instead of this the ignition switch breaks the line between the battery and generator when the motor is stopped by cutting off the ignition.

The system operates on 24 volts, but charges the battery at 6 volts. The amperage drawn by the 24-volt motor when turning over the gasoline engine varies with the size of the motor as in all systems. In the case of a 4.125 by 5.25, six-cylinder motor at a speed of approximately 55 revolutions per minute the running current was 90 amperes on a test. The compression on this motor was 70 pounds. It was shown on this same test that it was possible to turn the gasoline motor over for 1 hour and 23 minutes. The gear reduction between the motor-generator and the gasoline engine is twenty-five to one when starting and change automatically to a direct drive when the gasoline engine starts running.

(To be continued)

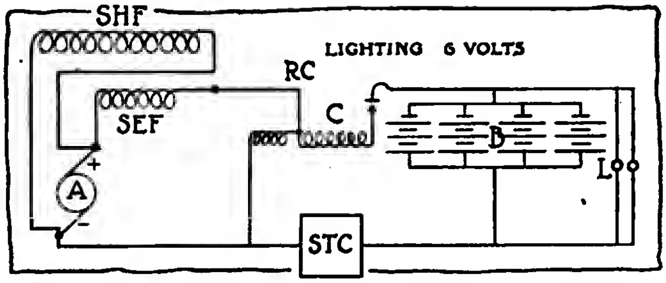


Fig. 12—Wiring diagram for lighting on Aplco system

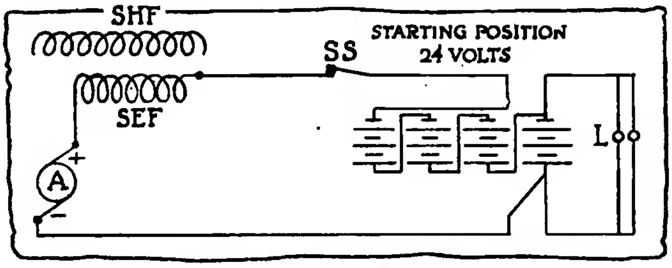


Fig. 13—Wiring diagram for cranking on Aplco system

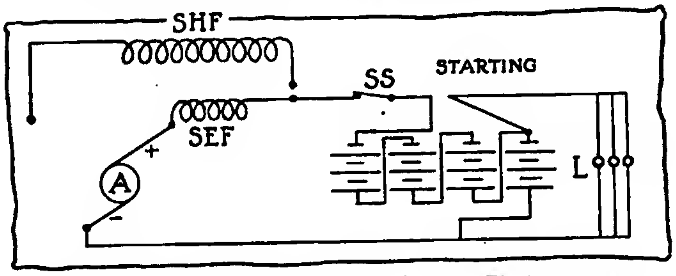


Fig. 14—Wiring diagram for cranking on Electro system

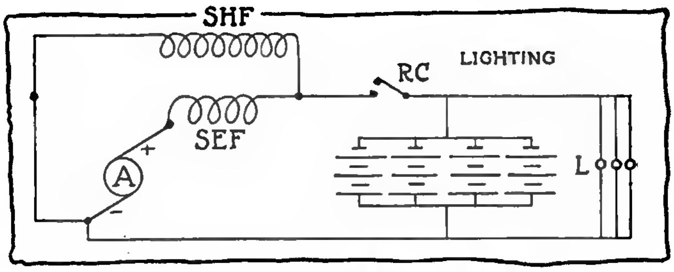


Fig. 15—Wiring diagram for lighting on Electro system

The AUTOMOBILE

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THE CLASS JOURNAL COMPANY

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Vehicles of Labor

THE dual motor truck exhibition in progress in this city this week is one of the best in the history of the motor truck industry in that evidences of conservatism, and building for a purpose, are seen on every hand; and there are general indications which show that the manufacturer is not trying to market trucks on a radical basis, but rather to sanely meet the requirements of individual transportation as they exist today.

The buying public of passenger cars has during the last 10 years become accustomed to seeking for the changes the same as the public looks for the varying fashions from season to season. This is but natural in the passenger car field, but it has not a place in the business transportation field. The buyer purchases a truck as a business proposition, and not as a social issue, consequently he is not interested in whether this year's product is the same as last year's, providing it does the work and gives the satisfaction that he demands.

Because of this condition the majority of the truck models on exhibition are little altered from a year ago, **the biggest changes consisting of bringing out additional models to supplement those of last season, to make the line comprehensive enough to meet all requirements.** This is a commendable move as it makes it possible for a large industrial house requiring trucks bearing from 1,500 pounds to 6 tons to equip throughout with the same make of vehicle, thereby greatly simplifying its service relations with the maker. Industrial concerns have already realized the additional complications necessary when operating half a dozen trucks of different makes in that it calls for so much greater knowledge in repair work, and so much greater complexity in carrying stocks of repair parts, etc.

That manufacturers are realizing more and more the necessity of conserving time is proven by the **numbers of rapid-unloading devices exhibited.** These in general assume one of two forms; first, the demountable body with the wheel stand on which the body can be slid instead of unloading, and second the trailer design in which the load-carrying part is supported on two wheels and at its forward end rests on the tractor. There has been general improvement in the tractor field during the year.

The influence of the National Association of Automobile Manufacturers and also the Society of Automobile Engineers on motor truck design shows itself in nearly every exhibit. The uniform guarantee plate is coming into general use, and should prove a constant reminder to the truck owner or driver that the truck is capable of carrying a limited load and that its speed should not exceed a certain maximum. The influence of these two organizations is also shown in reduced body weights and further in the fact that some manufacturers selling chassis without bodies state the chassis capacity inclusive of body weight, so that whenever a body exceeding a stated weight is put on there is a corresponding number of pounds cut off the useful load that the vehicle can carry. The more headway a movement of this nature can gain and the sooner it can get under way the better for the industry.

The truck buyer is being better provided for by way of tires than ever before. The dual rear is now almost universal in vehicles of over 1-ton capacity, and manufacturers of tires are apparently sufficiently satisfied with the situation to issue 10,000-mile tire guarantees. This has a double meaning: First, the tires have been improved, and, second, they are more adequately fitted for the service they have to perform.

The influence of the N. A. A. M. and S. A. E. and also the body builder is seen in the neater housing of brake connections, etc., beneath the frame level, making it possible to install standard bodies without interfering with any of the operating parts.

There are many other minor improvements: Brakes are larger and more accessible to adjustments; frame sections are generally wider, deeper, and of heavier gauge; not infrequently springs have wider leaves and more of them; axles are heavier in the majority of cases; there are many more governors fitted than heretofore and quite a few of them are inter-connected with the speed of the car rather than being controlled by the speed of the motor crankshaft; there is a gradual turning to left-side steering wheels, a movement which is slow but up to the present fairly certain; and in a résumé of the many other parts of the truck many detailed improvements may be found, such as fitting supplementary springs, larger grease cups, better cab protection for the driver, more robust radiators, and quicker demountability of component parts.

Eastern States Greatest Users of Electric Truck

One-Third of 10,000 Electric Commercials Now Used Produced Last Year

From an address by Arthur Williams, president of Electric Vehicle Association of America, before a Boston meeting of the New England section of the association on January 10.

WITH an encouraging and formidable array of figures witnessing the vitality of this comparatively new industry, it may prove interesting to consider its beginnings, its growth, and the means by which the latter has been brought about. Then, having reviewed events and facts accomplished, we may turn to the future which has already been predicted for electric vehicles, and consider methods by which today's great expectations may become the actualities of tomorrow.

Electric pleasure cars were built as early as 1893, and current-propelled trucks came into existence in 1897. That these forefathers of our present machines possessed disadvantages, we all know. They were clumsy, expensive, and not always dependable. Their storage batteries were heavy and useful only for short distances, besides requiring expert handling. Then, too, central station authorities looked with such indifference upon those horseless carriages that they set the price of current for charging purposes at almost prohibitive figures. But, in spite of all these difficulties, early electric trucks were by no means the utter failures which their opposers pictured them. They were the first commercial cars ever used and today several 1899 models—made by a firm in Hartford, Connecticut,—are still running. The original truck of the Central Brewing Company is still making regular trips through New York's streets, with a total cost of less than $100 a year for repairs.

Setting this fallacy aside, then, reasons for former public unbelief in the advantages of electrics may be summed up as: misrepresentation of the characteristics of such cars; general ignorance of their good points; lack of charging facilities; and—as I have already remarked—such deficiencies in the vehicles themselves, as clumsiness, inadequacy of batteries, and complexity of mechanism. Misrepresentation consisted largely of assertions that the electric was the rival of the gasoline car for any and all uses. The fact that charging stations were few and current very expensive served, also, as a deterring influence. Finally, people in general knew nothing about the special excellencies of current-fed vehicles for city and suburban needs.

Today, nearly all of these conditions have been changed, and this transformation has been wrought, for the most part, within the last 2 years. First of all, the electric motor car itself has been very considerably improved. Its imperfections have been wiped out; it has been made simple of operation, reliable, dependable. The average distance which a pleasure vehicle can now travel upon a single charge has been increased to about 65 miles, while, in certain instances, records of 100 have been made.

Everywhere electric vehicles are rapidly gaining popularity. **In New York, between July 1, 1911, and July 1, 1912, the number of such cars in use grew 45 per cent.,** while an authority on electrical affairs in Chicago estimates that **this method of trucking has increased 400 per cent. during the last 2 years.** At St. Louis, for the first 6 months of 1912, one central station reported a gain of about 37 per cent. in income from charging cars.

The Public Service Corporation of New Jersey has kept a most interesting and careful record concerning the adoption of power-driven vehicles in its territory during the past two years. At the beginning of 1911, only about eighty pleasure cars were discovered, many of these being old models seldom used. The total number of electrics in the territory was about 139, the price of current for charging them being a little more than four cents per kilowatt hour.

Since the Public Service Corporation entered upon its campaign of pushing electric vehicles, **the total number of them in its neighborhood has risen from 139 to 440, and the cost of current has dropped from slightly more than 4 cents per kilowatt hour to an average of a trifle over 3.5 cents.**

The foregoing instances, illustrating conditions in various parts of the country, serve to show that, very generally, the power wagon has made tremendous strides during the last 2 years. Today some 30,000 of them are in operation in the United States, about 20,000 of these being for passengers, and about 10,000 serving commercial purposes. **One-third of this entire number were produced and marketed during the past year.** Oddly enough, perhaps 80 per cent. of all electric trucks and delivery wagons are being used east of the Alleghanies, **while by far the heaviest demand for pleasure vehicles comes from the Middle West.**

Having thus presented to you indications of the recent spurt in the electric vehicle industry, I should like to turn your attention to the question: **What causes have brought about this change?** As president of the Electric Vehicle Association of America, I am happy to say that I believe our society has had a large share in accomplishing these happy results. When the Association was formed, 2 years ago, current-propelled cars suffered from lack of concentrated effort to push them into public notice. Their makers found the cost of production high, owing to comparatively small sales; storage battery concerns had, accordingly, only a limited market for their output; and central station managers, seeing but little demand for current for charging, kept the price of such supply at discouragingly high figures.

Special attention should perhaps be called to an indirect result of the work of our organization. This is the steady decrease in the cost of current, owing to greater interest taken by central stations in electric vehicles and to the greater number of such cars in use. The price of current for charging 10 years ago averaged about 23 cents per kilowatt hour throughout the United States, while today it costs a little less than 7 cents with a reduction to about 4 cents for large consumers. Meanwhile the price of gasoline has risen steadily.

So much for the electric vehicle as it is today. Let us now turn our attention to its future, for the storage battery car has come to stay. Already, authorities are predicting an output of some 15,000 during 1913. They are, undoubtedly, desirable cars for city needs owing to their ease of operation in crowded streets, their low cost of maintenance, as well as their special adaptation for many stops, starts and waits. This is an important point, especially in delivery service.

An estimate has placed the amount of trackless hauling throughout this country at sixteen times as much as that carried on by railways. Of this, 80 per cent. is done in cities. Now, if electric propulsion were to be adopted for this work, it could be performed more quickly, safely and economically than by horse power, and this ought to result in reducing prices of many commodities.

Russian Trade Growing

In 1901 Only Forty Automobiles Were Imported But in 1911 the Total Jumped to 2717 Machines

There Are Only 5,392 Cars Registered in the Whole Country—90 Per Cent. Are in Cities

IN Russia the use of automobiles is growing, though slowly. In 1901 only forty automobiles were imported into Russia, and in 1902 still less, thirty-seven, but by 1906 the imports jumped to 245 automobiles and steadily rose from year to year, until in 1911 they reached the number of 2,717. The distribution of the importing countries may be seen from the following table for the year 1910:

Imported from	Automobiles
Germany	1,247
France	388
Great Britain	86
Austria	69
United States	49
Italy	20

This table tells us a very interesting thing. It is, of course, clear why Germany, with its proximity to the Russian market, should be able to market over 70 per cent. of the total yearly import, but for the United States export there is no reason to be particularly elated, notwithstanding the fact that as far as design and price go, the American product is at least as good as the German.

90 Per Cent. Are in Cities

The Russo-Baltic Car Company, Riga, Russia, has lately made an investigation as to the distribution of power vehicles in that country, and found that nearly 90 per cent. of all the automobiles in the country are registered in the large cities. Out of a total of 5,492 cars there are registered in St. Petersburg 2,654, in Moscow, 1,608, in Odessa, 377, and in Kieff, 190, or 88 per cent. in these four cities alone. A very large majority of these cars belong to private persons, and only 191 cars to the Government, out of this number 119 cars being registered in St. Petersburg. This figure is of considerable interest because, like most of the foreigners, American manufacturers spend a good deal of money and time in endeavoring to obtain government orders for automobiles, while the same amount of attention devoted to the general market would probably bring much better results.

As regards the kinds of automobiles used, there were found to be 306 motor trucks, and 4,040 passenger cars, including 641 taxicabs. The majority of the passenger cars are very low-powered, from 1 to 10 horsepower. In Moscow, 42 per cent., and in St. Petersburg as much as 48 per cent. of the cars are rated below 10 horsepower. The motor trucks are, on the contrary, comparatively high-powered, 48 per cent. being rated at between 21 and 40 horsepower, with an average horsepower capacity of 18.3. The reason for the low power of the passenger cars is partly the state of the roads and partly the Russian system of taxing automobiles. The cars cannot be practically used outside of the cities, at least not regularly, and even in the cities there are plenty of streets on the outskirts where an automobile will not venture during the rainy season. On the other hand, in all the large cities automobile owners have to pay a municipal tax of 1 to 3 roubles (50 cents to $1.50) per horsepower per year. Trucks pay in many places a lower tax than passenger cars.

The Russian army has a special Automobile Department and Automobile Corps, the latter consisting of about 400 men with an adequate number of officers.

As a matter of fact, what the Russian government would like to do is to buy automobiles of Russian make, and it is quite likely that ere long it will be able to do so. As early as 1899 a Russian concern, Leitner & Company, in Riga, started to build automobiles, but had to discontinue the manufacture partly owing to the small purchasing capacity of the market, but mainly because the cost of manufacture proved to be absolutely prohibitive, and it was very hard to find the highly skilled labor required in this class of work. Since then, however, a good deal of progress was done in the same city by the Russo-Baltic Car Company which began automobile manufacture in 1908, and is said to be fully capable now to build good cars. It builds two models: one with a four-cylinder, 24-horsepower engine, and the other with a 12-horsepower engine. Both models are of very rugged construction, and in this respect peculiarly adapted to runs on the bad Russian roads. The plant can build 200 cars now, but expects to have its facilities increased for the season of 1913.

The import duties on automobiles in Russia are 220 roubles ($116) for cars having four seats and more, 140 roubles ($74) for cars having less than four seats, and 75 roubles ($38) for automobile frames.

In general it appears that there is a market for the cheapest class of American cars in Russia; this market is not very large, but by no means negligible. What the manufacturers should go after, however, is not government orders, but the public. A good deal may be done in trucks and automobile supplies, the latter being now mainly imported from Germany.

Plantation Rubber in 1912

Auction sales of plantation rubber at London during the past year, with one series missing, amounted to 16,789 long tons. Estimating the final offering at 800 tons, the year's total would be 17,589 tons. This is considerably under the estimates made last fall when it was freely predicted that the total offerings of the year would amount to 20,000 tons.

In 1911 the total sales at auction were under 10,000 tons.

The course of prices has been generally downward since last January although the highest level was reached at $1.32 1-4 in March and the low average was 96 cents, established in November. Since then the market has been gradually rising in response to the check in offerings as the promised increases of large size failed to materialize.

The average price brought in 1911 was just over 5 shillings and in 1912 it was 4 pence less.

The plantation predictions for 1913 are for 40,000 long tons which would mean an average auction sale of 1,480 tons at each of the twenty-seven periods covered. The average of 1912 was 620 tons and in 1911 about 340.

No Automobiles in Odder

One of the oddest sights in Europe may be witnessed any day in the little city of Odder, Denmark. There are four thousand people dwelling here, but they have never relaxed from their earliest declaration, namely, never to permit the driving of an automobile through the streets. Consequently, a man in a business suit and a soft hat rides astride a black horse, which draws the motor car through the town. The operation affords great fun for the children, who pile into the automobile, even sitting on the laps of the chauffeur and occupants. A heavy fine attaches to any person attempting to violate the ordinance.

The roads of France, on the whole, do not compare in excellence with those of England. But it is an acknowledged fact that the condition of the roads of France has been growing worse during the last 10 years. Some charge it to steel-studded automobile tires, while others hint that the Government is lax in its duty of keeping the roads up to the mark.

Makers Mulcted by French Decision

PARIS, Jan. 10—In the case of the breakage of an important part of an automobile, involving personal injury, the manufacturer is responsible, and not the person from whom the car was hired, according to a decision just handed down by the Paris Court of Appeals. The decision arose out of a claim made by Mr. Strowbridge, of Philadelphia, for $100,000 damages for injuries received in a car rented from the Société Routiere.

Three years ago Mr. Strowbridge was touring through the Pyrenees in a car hired at the rate of $35 a day, when, on passing through Moret-de-Marsan he was thrown out of the car and seriously injured owing to the jamming of the steering gear. As a consequence of the accident Mr. Strowbridge had to have both legs amputated. The Court of First Instance awarded Mr. Strowbridge $14,000 damages against the hiring company, refusing to admit the plea that the manufacturer was responsible. In the judgment it was stated that it was the chauffeur's duty to constantly supervise the steering gear.

At the Court of Appeals this decision was amended, the judgment being given that the manufacturer was responsible for any constructional defect, and that the chauffeur, not being an engineer, must rely on the proper initial construction of the automobile. Therefore the manufacturer of the automobile, and not the hiring company, was ordered to pay $14,000 to Mr. Strowbridge. This decision is one of considerable importance to automobile manufacturers for they have always claimed that their responsibility was limited to the changing of any provedly defective part. Such a clause is incorporated in practically every sales contract drawn up in Europe. The automobile having been hired in this case, the client had not signed any document releasing the maker from responsibility for personal injury.

Ascertaining Loss of Weights by Heating

Conradson determines the water content of heavy oils by the loss in weight on heating. However, he recognizes the fact that whenever a heavy oil is heated to a temperature of 100 degrees Centigrade some oil is volatilized and lost. Wright heats to 105 degrees Centigrade, Hurst to 220 degrees Fahrenheit, and Archbutt and Deeley to from 105 degrees to 110 degrees Centigrade. Davis saturates a tarred filter paper and heats to 110 degrees Centigrade, Patrick heats the oil until slight decomposition takes place and assumes the loss in weight to be a loss of water. Gavolovski has improved the evaporation method by using duplicate samples in tarred flasks. He leaves one flask open in the usual manner and attaches to the other a sulphuric-acid drying tube, which he states absorbs the water and allows the oil vapors to pass through unabsorbed. The difference in loss of weight on heating he assumes to be a water loss. Lowenstein dilutes with 95 per cent. alcohol and dries repeatedly on a water bath and then at a temperature of 105 degrees Centigrade to constant weight. The evaporation method, varied as described above, is approximate and applicable only to heavy oils and greases. Its accuracy even with heavy greases is questionable.

Iron and Steel Made in Sweden

The production of iron ore in Sweden in 1911 was 6,153,778 metric tons, of which 5,769,528 tons was directly usable ore, 3,060 tons bog ore and 381,190 tons concentrates. The concentrates resulted from the treatment of 813,973 tons of low-grade ore. Pig iron production was 634,392 tons from 112 furnaces, against 603,939 tons in 1910. Foundry and special pig iron amounted to 32,992 tons, Bessemer and basic to 408,591 tons, forge to 181,525 tons and blast furnace castings to 11,284 tons. One electric ore reducing furnace produced 10,065 tons. The output of puddled iron blooms and bars was 146,722 tons, and of steel ingots and castings, 470,867 tons. The total of crucible and electric furnace ingots was 4,195 tons. The total of manufactured iron and steel was 456,353 tons, against 465,062 tons in 1910.—*Iron Age.*

Comparing the goosequill with the steel pen and holder, the steel pen with the fountain pen and the fountain pen with the typewriting machine, it is readily realized that simplicity of construction does not always win out in practice.

Credit Extended to Club

Physician's Automobile Club of Vienna Adopts Course By Which Physician May Receive Car Before Payment

Car Is Maintained By the Credit Company at a Monthly Flat Rate of $110

A COURSE which will of necessity result in a considerable increase of automobiles used by physicians of that city has been adopted by the Physicians' Automobile Club, of Vienna, Austria. This club has undertaken to form an agreement with the General Automobile Credit Company, of the same city, whereby the latter concern acts as vendor for a machine bought by doctors and credits him to the extent of the price of the car, which he pays off in monthly instalments of moderate volume. Besides, the club offers to operate the cars for their owners at a very low monthly rate, fixed at a certain price.

The latter point meets with the ideals of many physicians who have had no experience with chauffeurs, the purchase of supplies, and so forth. While the club does not seek to influence the prospective buyers in any way, it acquaints them with the various makes suitable for their purposes. The automobile type ranging between 12 and 20 horsepower is being recommended to prospectives, the price of which varies in Austria between $2,000 and $2,375. When ordering the car, the physicians pay $600, and after delivery from $70 to $80 a month, including 1.5 per cent. on the money yet unpaid.

Flat Rate for Maintenance

The maintenance of the cars, as detailed below, is taken care of by the credit company at a monthly flat rate of $110, which is paid at the end of the month. The maintenance comprises efficient tire equipment at all times, supply of all necessary fuel and lubricants, regular wages, illness and accident insurance for the chauffeur, fire and liability insurance, garage and washing cost, charging of batteries to keep the electric lighting systems in operative condition at all times.

On the other hand, the physician closing a contract has to agree to the following: The automobile must not be used to travel more than 1,000 kilometers (621 miles) a month, as controlled by a reliable odometer. Every kilometer traveled in excess of the 1,000 mark must be paid for at the rate of 5 cents per. Only 150 kilometers (93.15 miles) out of the 621 miles a month must be made outside of the city limits. A price of 5 cents additional must be paid for every kilometer made outside of Vienna. This rule is founded upon the logical conclusion that the benefit of the low rates offered by the credit company should accrue to the medical profession and to physicians in their specific capacity as such, rather than to private individuals. [Note: How is the number of kilometers traveled outside the city limits to be controlled? Unless the doubtful process of relying on the statements of the car owners is adopted, success of this part of the scheme is hardly conceivable. We remember that Vienna has a very great number of exits impossible to control.—Ed.]

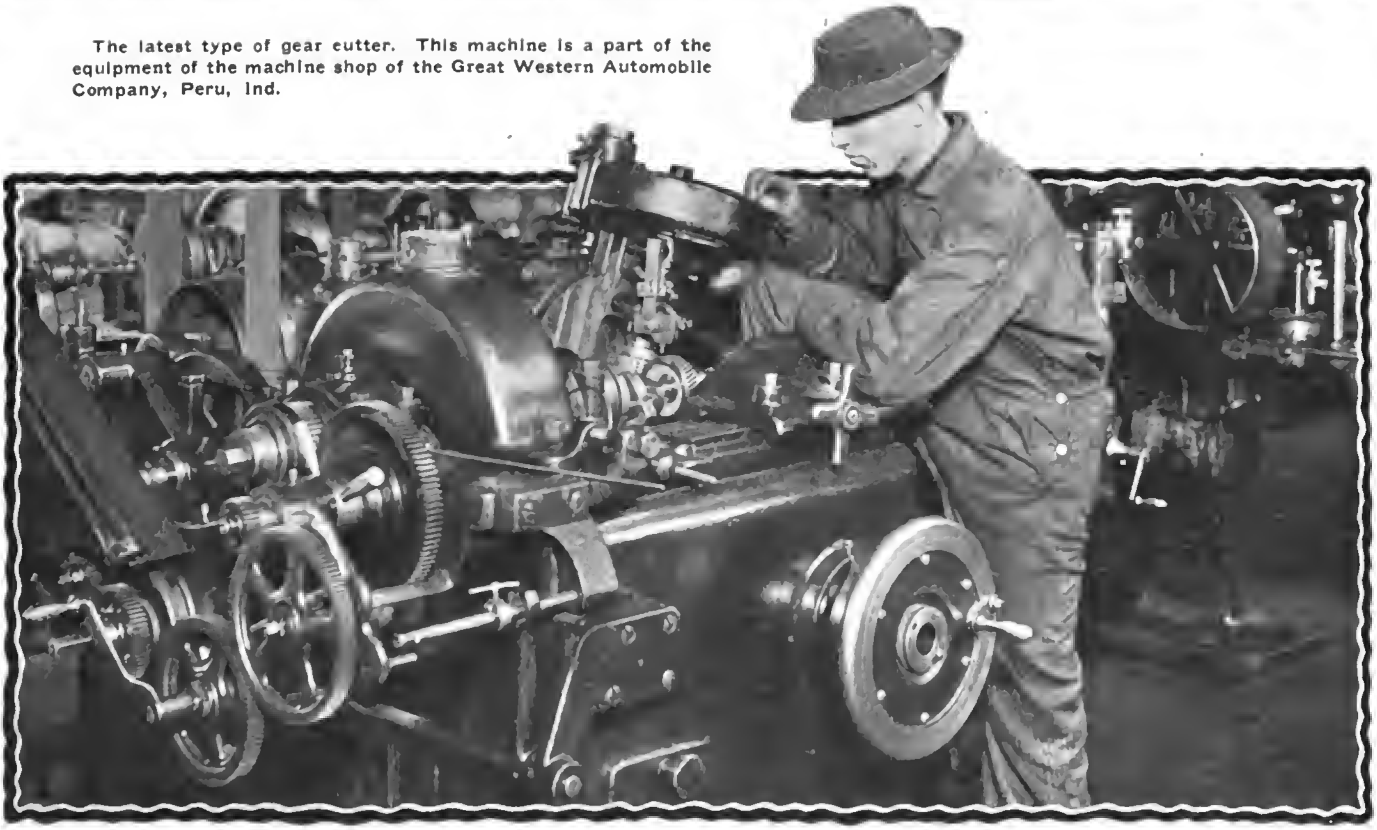
The Austrian regulations do not permit a Viennese doctor to work outside of the city precincts.

Another rule is that all repairs must be made in the shop of the credit company, where a moderate rate is charged for the work. If a car has to be laid up more than 3 days in the shop without the repair work being finished, an indemnity of $1.60 a day is paid to the owner by the credit company. Furthermore, if tire prices fall or rise more than 10 per cent. of the present rates, such an occurrence is to be sufficient ground for a proportionate change of the flat rate of monthly maintenance.

The physicians' club naturally believes that these easy conditions will cause many doctors to become users of automobiles.

Factory Miscellany

The latest type of gear cutter. This machine is a part of the equipment of the machine shop of the Great Western Automobile Company, Peru, Ind.



THIS machine will cut either spiral or spur gears and can turn out twenty finished gears a day, if they are put in the machine singly. If they are put into the machine in pairs, thirty-five may be turned out in one day. It takes but one man to run the machine and to take care of it. This machine will save time, because it turns out from three to five times as many gears as the older type of machine. The machine is automatic in its action and will stop as soon as the gear is finished. Besides the saving in time the machine saves space when considered in proportion to the number of pieces of work turned out. This is extremely important in factory work, where the amount of finished work turned out per square foot of floor space is to the highest degree important in the economical management of the factory.

JEFFERY-DEWITT Adds Plant—The Jeffery-Dewitt Company, Detroit, Mich., manufacturer of spark-plugs, will add a new factory, which will give that company 6,000 additional feet of floor space. The original plant will hereafter be devoted solely to the manufacture of porcelains and the machining of metal parts.

Waukesha in New Building—The Waukesha, Wis., Foundry Company, manufacturing brass and aluminum castings, has started operations in the building formerly owned by the Waukesha Canning Company.

Brown Sells Foundry—The Brown Commercial Company, of Peru, Ind., has sold its unoccupied foundry building there to the Peru Machine & Castings Company, and this concern will make all of the castings for that company.

Future Expansion in Beloit—The future expansion of the Stewart-Warner Speedometer Corporation's manufacturing facilities will take place at Beloit, Wis., rather than at Chicago, Ill., the site of the former Stewart Speedometer Company's works.

Oakland Plant Stops Work—Plant No. 1 of the Oakland Motor Car Company, Flint, Mich., was forced to suspend operations for a short time, due to high water. Pontiac Creek overflowed its banks and flooded the basement to a depth of 3 feet.

Calumet's Fire Loss—The Calumet Automobile Company, Appleton, Wis., sustained a loss of about $1,000 by fire, and eight cars and trucks were damaged by fire of unknown origin. The fire started near a work bench and communicated to the building.

Marathon Employees' Clubhouse—The Marathon Motor Works, Nashville, Tenn., has plans under way for one of the finest club buildings in the South. This club will be expressly for the employees of that company, and will have all the conveniences of the best clubrooms in that city.

Oliver Occupies Carhartt Plant—The Oliver Motor Truck Company, Detroit, Mich., has moved into the former Carhartt plant on Jefferson avenue and will continue the manufacture of the 1,500-pound, two-cylinder light truck and the 3,000-pound truck, which has been given a four-cylinder motor.

National Gauge to Build—The National Gauge & Register Company, LaCrosse, Wis., which makes gasoline and air gauges, is contemplating the erection of a new plant to cost $50,000. The present works are entirely inadequate to take care of the orders. The company is employing 80 men, and proposes to increase the force to 300.

Pennsylvania Rubber Enlarges—The Pennsylvania Rubber Company, Jeannette, Pa., is planning an immediate extension of its factory. At a recent meeting of the board of directors it was decided to erect a three-story addition to the plant. The new building will cover an area of 8,000 square feet, and will cost approximately $100,000.

Valkenburgh's Plant—C. J. Van Valkenburgh, of Chicago, Ill., is negotiating with the Commercial Club, of Sturgeon Bay, Wis., for the establishment of a works for the production of motor trucks designed by him. The city offers exceptional advantages for commercial propositions, due to its location on Green Bay and Lake Michigan.

Sprinkler System Efficient—The efficiency of the sprinkler system of fire protection for factories was well proven at the Kissel Motor Car Company's works in Hartford, Wis., recently, when an incipient blaze which might have caused great damage was effectually extinguished by the system which is carried throughout the big works.

The Automobile Calendar

Shows, Conventions, Etc.

Jan. 11-18.........Milwaukee, Wis., Annual Show, Auditorium, Milwaukee Autmobile Dealers' Association.

Jan. 11-25.........New York City, Thirteenth Annual Show, Madison Square Garden and Grand Central Palace, Automobile Board of Trade.

Jan. 18-25.........Philadelphia, Pa., Annual Automobile Show.

Jan. 21-26.........Toledo, O., Annual Show, Exposition Building, Toledo Automobile Shows Company.

Jan. 25-Feb. 1.....Montreal, Que., Montreal Automobile and Truck Show, R. M. Jaffray, Manager.

Jan. 25-Feb. 1.....Providence, R. I., Annual Show, State Armory, Rhode Island Automobile Dealers' Association, Inc.

Jan. 27-Feb. 1.....Philadelphia, Pa., Truck Show.

Jan. 27-Feb. 1.....Buffalo, N. Y., Annual Automobile Show.

Jan. 27-Feb. 1.....Detroit, Mich., Annual Antomobile Show.

Jan. 27-Feb. 1.....Rochester, N. Y. Annual Show, Exposition Park, Dealers' Association.

Jan. 27-Feb. 1..... Scranton, Pa., Annual Automobile Show, Hugh B. Andrews.

Jan. 27-Feb. 13....Troy, N. Y., Annual Show, State Armory, Troy Automobile Club.

Jan. 27-Feb. 1..... Waterbury, Conn., Annual Show.

Feb. 1-8...........Chicago, Ill., Annual Automobile Show, Coliseum and 7th Regiment Armory.

Feb. 3-8...........Washington, D. C., Annual Show.

Feb. 8-15..........Hartford, Conn., Annual Show, State Armory, Hartford Automobile Dealers' Association.

Feb. 8-15..........Minneapolis, Minn., Annual Automobile Show.

Feb. 10-15.........Chicago, Ill., Truck Show.

Feb. 10-15.........Winnipeg, Man., Show, A. C. Emmett.

Feb. 10-15.........Ottawa, Ont., Ottawa Motor Show, Howick Hall, Louis Blumenstein.

Feb. 11-15.........Binghamton, N. Y., Annual Show, State Armory. Dealers' Association, R. W. Whipple.

Feb. 15-22.........Albany, N. Y., Annual Show, State Armory, Dealers' Association.

Feb. 15-22.........Newark, N. J., Annual Automobile Show, First Regiment Armory, New Jersey Automobile Exhibition Company.

Feb. 16-23.........Richmond, Va., Annual Show.

Feb. 17-22.........Kansas City, Kan., Annual Automobile Show.

Feb. 18-19.........Madison, Wis., Annual Show, City Market Building, Dealers' Association.

Feb. 18-21.........Grand Forks, N. D., Annual Show, Auditorium, Dealers' Association.

Feb. 18-22.........Baltimore, Md., Annual Show, B. A. D. A.

Feb. 19-22.........Bloomington, Ill., Annual Show, Coliseum, McLean County Automobile Club.

Feb. 19-22.........Geneva, N. Y., Automobile Show, Armory, Louis Blumenstein.

Feb. 19-23.........New Orleans, La., Annual Show.

Feb. 19-27.........Topeka, Kan., Annual Show.

Feb. 20-22.........Canandaigua, N. Y.. Automobile Show, Louis Blumenstein.

Feb. 22-Mar. 1....Brooklyn, N. Y., Annual Show, 23rd Regiment Armory.

Feb. 24-27.........Kansas City, Mo., Truck Show.

Feb. 24-Mar. 1....St. Louis, Mo., Annual Show.

Feb. 24-Mar. 1....Memphis, Tenn., Annual Show.

Feb. 24-Mar. 1....Omaha, Neb., Annual Automobile Show.

Feb. 24-Mar. 1....Paterson, N. J., Annual Show, Paterson Automobile Trade Association.

Feb. 24-Mar. 5....Cincinnati, O., Annual Show, Music Hall, Cincinnati Automobile Dealers' Association.

Feb. 25-28.........Eau Claire, Wis., Annual Show, Armory, Dealers' Association.

Feb. 25-Mar. 1....Syracuse, N. Y., Annual Show, Syracuse A. D. A.

Feb. 26-Mar. 1....Fort Dodge, Ia., Annual Show.

Feb. 26-Mar. 1....Glens Falls, N. Y., Automobile Show, Louis Blumenstein, Manager.

Feb. 27-Mar. 1....Toronto, Ont., Annual Show, Toronto Automobile Trade Association.

March 3-8.........Bridgeport, Conn., Show, Park City Rink, B. B. Steiber.

March 3-8.........Pittsburgh, Pa., Annual Automobile Show.

March 3-8.........Springfield, Mass., Automobile Show, New Auditorium Building, United Amusement Company.

March 3-18........Des Moines, Ia., Annual Show, Pleasure Car Section, Coliseum, Dealers' Association.

March 5-8.........Tiffin, O., Annual Show, Tiffin *Daily Advertiser.*

March 5-8.........Louisville, Ky., Annual Show, Dealers' Association.

Mar. 5-8...........London, Ont., Annual Show, Drill Hall, Louis Blumenstein.

March 8-15........Boston, Mass., Annual Automobile Show.

Mar. 8-15..........Columbus, O., Annual Show, Billy Sunday Tabernacle, Automobile Club and Trades' Association.

March 12-15.......Ogdensburg, N. Y., Automobile Show, Louis Blumenstein, Manager.

March 19-26.......Boston, Mass., Annual Truck Show.

March 20-24.......New Orleans, La., Annual Show, N. O. A. D. A.

March 24-29.......Indianapolis, Ind., Annual Automobile Show.

Race Meets, Runs, Hill Climbs, Etc.

May 30............Indianapolis, Ind., 500-Mile Race, Speedway.

Foreign

Jan. 11-22.........Brussels, Belgium, Annual Belgian Automobile Show, Centenary Palace.

March ....France, Sealed Bonnet 3000-Mile Run.

March 31..........Montevidio, Uruguay, International Competition of Agricultural Motor Vehicles.

April..............Barcelona, Spain, International Exhibition.

Wants Free Site—An automobile factory with a $100,000 capital wants a free site in New Martinsburg, W. Va., for a factory.

Auburn Erects Factory—The Auburn Automobile Company, Auburn, Ind., will erect a factory 60 feet by 80 feet, two stories high.

Allen Company Formed—The Allen Motor Car Company has been formed at Fostoria, O., and will manufacture cars ready for delivery in March.

Patterson Factory Progressing—Progress is being made in the construction of the Patterson Rubber Company's building, 250 feet long by 63 feet in width.

Beaver Erects Vancouver Plant—The Beaver Automobile Company, Portland, Ore., recently incorporated with a capital of $150,000, will erect a plant at Vancouver, B. C., to manufacture automobiles.

Quincy Plant Builds—The Machinery & Motor Company, Quincy, Ill., has been incorporated with $25,000 capital stock by Benner Kinsey, Fred H. Wilms and Harry V. C. Tingley, and will equip a plant at once.

Louisville Tire Factory Started—An automobile tire factory is to be started in Louisville, Ky., which will be conducted on a large scale. Mr. H. L. Lewman, of that city, has been elected president of the company.

Pilot Builds Addition—The construction of the addition to the plant of the Pilot Motor Car Company, Richmond, Ind., was connected recently, and ground for the new 120-foot building was broken. The new building will be two stories high.

Dayton Seeking Location—The Dayton Motor Truck Company, Dayton, O., is seeking a location in the South for a manufacturing plant, and it is probable an invitation will be extended the company to come to Gadsden, Ala., and look over the field.

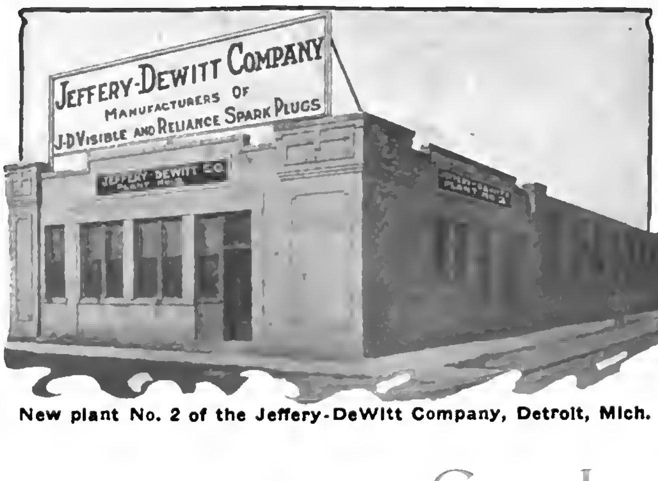
Moreland Plant Grows—The plant of the Moreland Motor Truck Company, Los Angeles, Cal., started in business but 18 months ago with modest dimensions. The factory is now enlarged to spread over 3 acres of floor space. January's output will be 60 trucks. The factory employs 250 men.

Klaxon for Factory Signal—The Critchley Machine Company, Worcester, Mass., has installed in its factory a Klaxon warning signal, which serves as the factory whistle. Similar uses of that signal have been found as adjuncts to the fire alarm systems of a number of other manufacturing institutions.

Bigger White Factory—Plans have been submitted to the White Company, of Cleveland, O., for the construction of a new factory building. They call for a one-story steel and brick structure, 160 feet by 240 feet. The new building is to be erected at the corner of St. Clair avenue and East Seventy-ninth street.

Bethlehem's Two New Buildings—Bethlehem, Pa., is to have two new industries that will give employment to many hands. The Packard Motor Car Company, Detroit, Mich., has decided to establish a storage house, paint shop and warehouse on the site of the old fair grounds, and with a capital of $100,000 the Bernston Steel Wheel Company has been organized, to locate there.

Michigan Factory Addition—New factory buildings now nearing completion at the plant of the Michigan Motor Car Company, Kalamazoo, Mich., will add a million square feet of floor space to the factories. When completed the Michigan plant will be among the six largest automobile factories in America. The new buildings are of three-story reinforced concrete construction, and will greatly increase the output of the cars.



New plant No. 2 of the Jeffery-DeWitt Company, Detroit, Mich.

News of the Week Condensed

Annual banquet of the Society of Automobile Engineers at the new Hotel McAlpin, New York City, January 17

SOUTH-AMERICAN Trade $100,000,000—Remarkable growth in the United States exports to South America from $38,500,000 in 1902 to approximately $138,000,000 in 1912 is shown in a statement issued recently by the Bureau of Statistics. The percentage of gain in the exports to that continent, the statement shows, is much greater than in the exports to any other grand division of the world. In Europe the exports in 1912 were $986,000,000, and 1912 approximately $1,490,000,000; to North America in 1902, $204,000,000, and in 1912, about $578,000,000; to Asia and Oceanica in 1902, $96,000,000, and in 1912 about $212,000,000.

Jenkins with MacManus—W. Haddon Jenkins has resigned as advertising manager of Motor Print to become merchandising expert for the MacManus Company, Detroit, Mich.

Schaefer Resigns—W. E. Schaefer, president of the Schaefer Manufacturing Company, Berlin, Wis., has retired as manager of that company to remove to his old home at Ripon, Wis.

Lee Heads Meet in Frisco—The heads of the different departments of the Don Lee Organization in California will meet for a general conference in San Francisco, Cal., on January 13, 14 and 15.

Thompson Resigns—J. Royden Thompson, a member of the William Thompson & Company, St. John, N. B., has resigned to accept the position of managing director for the Maritime Motor Car Corporation, whose factory is now nearing completion.

Drum Keeton Production Manager—Charles Drum, connected with the production department of the Packard Motor Car Company, Detroit, Mich., resigned recently to accept the position of production manager for the Keeton Motor Company of that city.

Eau Claire's Show—The first annual automobile show for Eau Claire, Wis., will be held from February 25 to 28 in the armory. It will be under the auspices of the Eau Claire Automobile Dealers' Association and thirty-five makes of cars will be represented.

Tiffin's Show on March 5—The third annual automobile show to be given under the auspices of the Tiffin Daily Advertiser, of Tiffin, Ohio, will be held March 5 to 8, inclusive. Sufficient floor space has been procured to show many lines of pleasure cars and trucks.

Frisco's Commercial Show—The San Francisco automobile dealers during the last few years have been opposed to yearly exhibits of pleasure cars, but it is now announced by the Motor Car Dealers' Association of that city that they will hold a commercial vehicle show early in April. Mr. C. A. Blanchard is manager.

Car's Novel Use—W. T. Campbell, who owns a 1,000-acre ranch near Lexington, Ore., besides using his Michigan car for business and pleasure, has rigged up an equipment whereby he pumps water to four large tanks. He simply blocks the car, jacks up the back wheels and connects a belt to the pump with one of them.

Awards in Klaxon Competition—The $250 recently offered by the makers of the Klaxon, the Lovell-McConnell Manufacturing Company, Newark, N. J., for the twelve best letters explaining why the bulb horn should be discontinued as the customary signal in the equipment of the modern automobile, has been awarded as follows: First prize of $100 to F. A. Sears, Rome, N. Y.; second prize of $50 to Dr. A. C. Smith, Elberton, Ga.; and ten prizes of $10 each to ten other contestants.

Automobile Growth in Kentucky—The growth of the use of the automobile in Kentucky is reflected in the semi-annual report of Secretary of State C. F. Crecelius made January 1, 1913, to the State Auditor, H. M. Bosworth. The automobile clerk has collected in the year ending December 31, 1912, within $8,065.20 as much for licenses as was collected during the preceding 18 months, from June 13, 1910, when the law went into effect, until December 31, 1911. The total collected for automobile licenses in 1913 was $37,260.30. For the first year under the law, from June 13, 1910, to June 14, 1911, collections amounted to $23,340.50, and for the 18 months until December 31, 1911, they were $65,325.50.

Automobiles in Buenos Aires—A correspondent in Buenos Aires states that the latest obtainable statistics show that 4,150 automobiles are in use in that city. Of these 3,200 are private cars, 700 are taxis, 200 are used as delivery vans and fifty belong to the public authorities. As regards the countries of origin of these cars, it is computed that 50 per cent. are French, 20 per cent. Italian, 10 per cent. English and a similar percentage German, while Belgium and the United States divide the remaining 10 per cent. In the matter of horsepower, 40 per cent. are over 30 horsepower, 30 per cent. are from 20 to 30 horsepower, 20 per cent. from 10 to 20 horsepower and 10 per cent. unclassified.

New Agencies Established During the Week

PLEASURE CARS

Place	Car	Agent
Beaver Dam, Wis.	Enger	E. H. Peshak
Boston, Mass.	Bergdoll	Clifton Edwards
Broken Bow, Neb.	CarterCar	Custer County CarterCar Co.
Buffalo, N. Y.	Moon	Miller & Schulman M. C. Co.
Carroll, Ia.	CarterCar	Carroll CarterCar Co.
Columbus, O.	Moon	Murnan Taxicab Co.
Des Moines, Ia.	Moon	Van Vliet-Bradt M. C. Co.
Hartford, Conn.	Chalmers	Skinner Bros.
Hartford, Conn.	Lozier	H. D. Graves
Hartford, Conn.	Paige-Detroit	Edward S. Clark
Holyrod, Kans.	Moon	G. L. Baker
Houston, Tex.	Moon	Northrup & Clark Co.
Kenosha, Wis.	Rambler	Milton Kent
Marion, Ind.	Havers	Marion Garage & Auto Co.
Milwaukee, Wis.	CarterCar	CarterCar Wis. Co.
Milwaukee, Wis.	Davis Flyer	First Ave. Garage
Milwaukee, Wis.	Pathfinder	Geo. Grede & Bro. Co.
Mitchell, S. D.	Moon	Central Auto. Co.
New Orleans, La.	Chase	B. C. McClellan
New Orleans, La.	Moon	A. N. Kinch
Norfolk, Neb.	CarterCar	Kennedy & Caldwell
Osborn, Kans.	CarterCar	Osborn County CarterCar Co.
Philadelphia, Pa.	Garford	Eldredge Co.
Queenstown, Ont.	Franklin	H. St. Clair Fisher
Rochester, N. Y.	Havers	F. R. Luescher, Inc.
Syracuse, N. Y.	Havers	C. Arthur Benjamin, Inc.
Toledo, O.	Moon	Moon Sales Co.
Toronto, Can.	Nyberg	Nyberg Auto Sales Co., Ltd.
Washington, D. C.	Hupmobile	C. H. Kloppmeyer
Washington, D. C.	Hupmobile	Washington Auto Service Co.
Washington, Pa.	Moon	Washington Auto. Co.
Waukesha, Wis.	Apperson	Frank Thompson
Winnipeg, Man.	Havers	Winnipeg Garage Co.
Yankton, S. D.	Moon	F. J. Nyberg

ELECTRIC VEHICLES

Place	Car	Agent
Boston, Mass.	Woods	Whitten-Gilmore Company
Milwaukee, Wis.	Waverley	Eshenshade & Teague
Toronto, Can.	Rauch & Lang	Death & Watson
Washington	Rauch & Lang	Bartram Garage Co.

COMMERCIAL VEHICLES

Place	Car	Agent
Boston, Mass.	Brown	F. F. Wentworth
Bridgeport, Conn.	Brown	Fairfield Auto Co.
Derby, Conn.	Brown	Lombardi Motor Car Co.
Indianapolis, Ind.	Brown	Archey-Atkins Co.
Los Angeles, Cal.	Brown	Renton Motor Car Co.
Milwaukee, Wis.	Little Giant	Little Giant Sales Co.
Newark, N. J.	Brown	Jersey Motor Car Co.
Providence, R. I.	Brown	U. S. Mill Sup. Co.
St. Louis, Mo.	Brown	Meyer-Busch Auto Co.

Smith Transferred—A. H. Smith, formerly manager of the Cleveland, O., branch of the Ford Motor Company, has been transferred to Indianapolis, Ind., as manager of the company's branch in that city.

A Penitentiary Offense—The United States Senate recently passed an amendment to the District of Columbia code making it a penitentiary offense to remove an automobile without the consent of the owner.

Bonde Company Building—The Bonde Motor Car Company, of Fargo, Minn., is to build a two-story and basement automobile house, including storage, showrooms and repair plant. The building will be 25 by 125 feet.

Oakland Agents to Move.—John H. Earle & Co., Washington, D. C., Oakland agents, have leased 817 Seventeenth street, N. W., and after extensive improvements will remove from the present quarters at 1018 Connecticut avenue.

Laurance Closes Contract—L. E. Laurance, Stites, Idaho, has closed a contract with the Mill City Manufacturing Company, Minneapolis, Minn., to make the electric lighted and heated steering wheel which he has patented. The effect is produced by electric globes manipulated by push buttons.

Milford's Club—The owners of the greater number of the automobiles at Milford, Mass., met recently and decided to form an organization to be known as the Milford Automobile Club. A committee was appointed to draw up a set of by-laws and nominate officers.

Camp Resigns—H. B. Camp, director of sales promotion for William C. Robinson & Son Company, of Baltimore, Md., refiners of Autoline, has resigned his position to accept the managership of a Western banking and security house making a specialty of underwriting and financing automobile manufacturers.

Lee Tire Declares Dividends—At the meeting held at Conshohocken, Pa., on January 15, the directors of the J. Elwood Lee Company declared a semi-annual dividend of 4 per cent., and the directors of the Lee Tire & Rubber Company declared a semi-annual dividend of 3 1-2 per cent. on the preferred stock of that company.

Waterbury's Show Plans—Preparations are nearly completed for the second annual Waterbury, Conn., automobile show, which is to be held the week of January 27. Thursday is to be society day. More attention will be given the accessories and motorcycles this year. Several of the Hartford dealers are booked for space.

Mansfield Tire Elections—At the annual meeting of the stockholders of the Mansfield Tire & Rubber Company at Mansfield, O., the following officers were elected: Judge C. T. Grant, of Akron, president; G. W. Henne, vice-president and general manager; Jesse E. LaDow, secretary; W. F. Henne, treasurer. These, with Dimon Herring, William Isaly, Charles Hoffman and John Schauer, of Troy, will comprise the board for the ensuing year.

New Models in Summer—A pertinent suggestion which if carried out may change conditions in general in the automobile sales, was made by J. I. Handley, president of the Marion Motor Car Company, Indianapolis, Ind., at a banquet tendered him in Dallas, Tex., recently. He suggested that the manufacturers of automobiles change the dates of changing models from the summer to the winter months. This, he believes, will stimulate trade during the winter months.

Fifth annual banquet of the motor and accessory manufacturers, held at the Waldorf-Astoria, Wednesday, January 15

Standard Moves—The Standard Motor Car Company, Philadelphia, Pa., has removed to 662 North Broad street.

Dallas Has Two Trucks—Since the inauguration of the parcel post service two automobile trucks have been put to work in Dallas, Tex.

Tire Filling Company Moves—The Automobile Tire Filling Company, Philadelphia, Pa., has secured new quarters at 1422 Fairmount avenue.

Cincinnati Has Fire—The Fisher and Kruse Automobile companies, Cincinnati, O., suffered from fire recently. About $10,000 in damages was done.

Rambler Home Enlarged—The Philadelphia, Pa., home of the Rambler has been enlarged by the acquisition of the building adjoining it on the south.

Lester Transferred.—Tom E. Lester, for the past year manager of the Buick Company's house in San Antonió, Tex., has been transferred to Dallas.

Nichols Sales Manager—J. A. Nichols, Jr., has been appointed sales manager for the northwest territory for the Franklin Automobile Company, Syracuse, N. Y.

Overland's $8,000 Loss—Nine automobiles and six freight cars were included in the $8,000 loss incurred when fire destroyed a big loading dock at the Willys-Overland factory recently, in Toledo, O.

Wharton Manager—J. O. Wharton, formerly with the Studebaker Corporation, South Bend, Ind., has accepted the managership of the John Deere Plow Company retail automobile house in Dallas, Tex.

Schmidt Kelly Manager—The Kelly-Springfield Motor Truck Company, Springfield, O., announces the appointment of Henry Schmidt as manager of its new Seattle, Wash., branch, located at 511 East Pike street.

Planning Dallas Tour—Plans are already under way for the Farmers' and Ranchmen's tour to be conducted next summer by the *Farm and Ranch*, of Dallas, Tex. The tour will probably take place next July or August.

Erickson Superintendent—F. E. Erickson, who has been in the employ of the Universal Truck Company, Detroit, Mich., for a number of years, has become superintendent of the plant to succeed E. W. Dobson, who recently resigned.

Halff Company Moves—The Halff Automobile Company, Dallas, Tex., has moved into new headquarters on automobile row. President Halff has offices on the second floor and will transact the business in Texas from his Dallas headquarters.

Physicians Elect—The following officers were elected at the annual meeting of the Physicians' Motor Club, held in the Hotel Walton, Philadelphia: President, Dr. J. J. Robrecht; secretary, Dr. H. A. Sutton; treasurer, Dr. L. A. Adler.

Omaha's $750,000 Show—Three-quarters of a million dollars' worth of automobiles will be exhibited in the Omaha, Neb., automobile show at the Auditorium, February 24 to March 1. This announcement was made by Manager C. G. Powell, of the show. At the show last year $500,000 worth of cars were shown.

Rural Residents in Majority—According to figures compiled by Theodore B. Roach, president of the Copeland-Roach Motor Car Company, Watertown, Wis., 80 per cent. of the 236 cars sold by his company in the company's territory, comprising parts of three counties in south central Wisconsin, were purchased by rural residents.

Seven-eighths elliptic underslung spring on the Mitchell six chassis

Toledo Firms Combine—An event of considerable importance in Toledo, O., automobile circles took place recently when the United Motor Company and the Landman-Griffith Motor Sales Company merged under the company name of Landman-Griffith-McIntyre Company. Mr. McIntyre will assume the general management of the concern.

Hutcheson Buys Land—J. A. Hutcheson, president of the General Motor Car Company, of St. Louis, Mo., has purchased a plot of ground at 3116 Locust street in the heart of automobile row, and will improve it with three modern automobile stores. The buildings will be of reinforced concrete and fireproof, each with a frontage of 31 feet by a depth of 105 feet.

Michigan's Road Statistics—According to figures furnished by State Highway Commissioner Ely, Michigan has built 463 miles of roads in the last 6 months. The state has paid rewards on all but 100 miles, but all of the road has been accepted by the state. The amount of road built in the last 6 months is larger than the amount build during the first 4 years of existence of the state highway department.

Automobile Incorporations

AUTOMOBILES AND PARTS

Albany, N. Y.—Kupke Auto Renting Company; capital, $1,000; to rent automobiles. Incorporators: E. C. Kupke, R. E. Male, W. C. McCune.

Bridgeport, Conn.—Jones Pneumatic Tire Spring Company; capital, $100,000; to manufacture automobile parts.

Buffalo, N. Y.—Buffalo Automobile Sales Corporation; capital, $15,000; to manufacture and sell engines, machines, etc. Incorporators: W. J. Harris, W. U. Heverly, Maud MacDonald.

Boston, Mass.—The Norwalk Motor Car Company; capital, $75,000; Boston automobiles, etc. Incorporators: C. C. Smith, J. W. Briggs, M. A. Beaudet.

Brooklyn, N. Y.—Jack Rabbitt Auto Company; capital, $500; to deal in automobiles. Incorporators: Frank Dunn, Donato Cella, Phillip Roth.

Brooklyn, N. Y.—Pratt-Hendricks Company; capital, $1,000; to deal in automobiles. Incorporators: W. H. Pratt, W. J. Hendricks, G. L. Robinson.

Buffalo, N. Y.—F. A. M. Auto Supply Company; capital, $20,000; to deal in automobiles. Incorporators: F. A. Marburg, J. B. Green, R. H. Templeton.

Chattanooga, Tenn.—Chaplin-Dille Motor Car Company; capital, $25,000; to manufacture and deal in automobiles and trucks, aeroplanes and other kinds of conveyances. Incorporators: B. M. Chaplin, M. C. Wildman and Jas. E. Dille.

Chicago, Ill.—American Motor League; capital, $2,500; to deal in automobiles and accessories. Incorporators: J. C. Garriott, Jr., G. T. Carver, M. L. Felkey.

Cincinnati, O.—The Hermes Motor Car Company; capital, $30,000. Incorporator: Albert Kleybolte.

Cincinnati, O.—Automobile Clearing House Company; capital, $2,500; to deal in new and second hand automobiles. Incorporators: T. A. Reilly, E. P. Bernardi, S. F. Bromley, A. M. Hirsch, J. B. Bromley.

Cleveland, O.—Alco Motor Company; capital, $10,000; to deal in automobiles. Incorporators: M. Kluger, C. K. Halie, Frank Butler.

Columbus, O.—Park Motors Company; capital, $30,000; to deal in automobiles. Incorporators: Scott Van Etteff, Charles Parkison, Amelia Van Etten.

Detroit, Mich.—Fuller & Son Company; capital, $100,000; to produce automobile parts.

Elyria, O.—The J. & H. Taxicab Company; capital, $2,500. Incorporators: A. L. Jackson, M. F. Harrison, Catherine Jackson, M. B. Harrison, L. B. Fauver.

Indianapolis, Ind.—The Wizard Motor Company; capital, $50,000; to manufacture motors adaptable to cycle cars. Incorporators: Orlando C. Forbes, Edward H. Habig and Park S. Florea.

Logansport, Ind.—Logan Auto Supply Company; capital, $25,000; to deal in automobiles. Incorporators: C. D. Billman, C. D. Pettigrew, O. A. Cummins.

Louisville, Ky.—The Standard Auto Company; capital, $25,000; to buy and sell machines. Incorporators: Geo. A. Dunham, Clifford L. Alderson and J. H. Alderson.

Madison, Wis.—Madison Gasoline Engine Company; capital, $15,000; to manufacture engines. Incorporators: W. C. Boutly, J. W. Proctor, A. C. Ledford, H. L. Wittiver.

Newark, N. J.—Universal Motor Truck Company of New Jersey; capital, $50,000; to deal in motor trucks, etc. Incorporators: John Kramer, Grace Cleveland and Pasquale Mauan.

New Haven, Conn.—Motor Truck Sales Company; capital, $10,000; to deal in motor trucks. Incorporators: J. F. Denison, H. F. Mabry, Howard Beach.

New York City.—Gildale Motor Corporation; capital, $30,000; to deal in automobiles. Incorporators: F. W. Strauch, T. P. Gilman, E. S. Peck.

New York City.—Duplex Gasoline Motor Company; capital, $200,000; to manufacture engines. Incorporators: G. W. Woodruff, A. P. Nevin, T. U. Parker.

New York City.—Bell & Waring Steam Vehicle Company; capital, $25,000; to deal in automobiles.

New York City.—S. J. Wise & Company, Incorporated; capital, $20,000; to manufacture automobiles. Incorporators: S. J. Wise, C. E. Van Vleck, Jr., E. M. Dalley, C. M. Kohn.

New York City.—Delivery Supervision Company; capital, $1,000,000; to manufacture and sell automobiles. Incorporators: Kenneth Groesbeck, Eben Luther, Hillman B. Hunnewell.

Borowitz Resigns—Joseph Borowitz has severed connection with the Durant-Dort Carriage Company, Flint, Mich.

By Way of Correction—In the January 9 issue of THE AUTOMOBILE, page 95, the Pilot roadster listed at $500 should have been $2,000.

Swords Hawkeye Manager—L. W. Swords has accepted the position of general manager with the Hawkeye Motor Car Company, Burlington, Ia.

Jacobson Opens Warehouse—I. M. Jacobson & Sons, metal merchants in Detroit, Mich., have opened a metal warehouse and works, located at 70 Catherine street.

Brouster White Manager—H. G. Brouster has become manager of the White Motor Car Company, the St. Louis, Mo., agents for the White line of gasoline cars.

Garrison Kelly Manager—The Kelly-Springfield Motor Truck Company, Springfield, O., announces the appointment of L. B. Garrison as manager of its Chicago, Ill., branch.

Shotguns Instead of Police—In the absence of any speed regulation in Montgomery, Ala., the citizens have adopted a shotgun policy to discourage speeding where pedestrians are endangered.

Gettysburg Roads Oiled—The Pennsylvania highway department is making preparations for the oiling of all the roads leading to Gettysburg in time for the unusual travel next summer.

Miller and Mills Take Miller—H. C. Mills and H. C. Miller, who were for years in the Diamond Rubber Company's sales organization, have taken the sales of Miller tires in New York territory.

Road Improvements in Caracas—Street improvements in Caracas, Venezuela, and the improvement of many of the country roads radiating from the capital, have opened a promising field for automobiles.

Stonewall Club Destroyed—The Stonewall Automobile Club building, country headquarters of the Winnipeg, Ont., Automobile Club, was totally destroyed by fire recently. The loss is estimated at $12,000.

Waterloo's New Club—Waterloo, N. Y., has a new automobile club, of which the first officers are: President, G. F. Bodine; vice-president, W. B. Lawrence; treasurer, F. G. Stewart, and secretary, S. C. Post.

Critchley Opens Engineering Department—J. Sidney Critchley, Carlton House, Lower Regent street, London, S. W., has opened a department for the introduction of engineering specialties into Great Britain.

Superior Club Elects—The Superior, Wis., Automobile Club elected new officers at its meeting recently: President, C. A. Erhart; vice-president, Dr. C. H. Mason; secretary, H. R. Corey, and treasurer, Dr. A. J. O'Brien.

Hartford Club Annual—Mayor L. R. Cheney was elected president of the Automobile Club of Hartford, Conn., at the annual meeting held recently. H. D. Maxim was chosen vice-president; Arthur Fifoot, secretary, and Albert M. Kohn, treasurer.

Louisville Show Date Changed—It has been decided to hold the sixth annual exhibition of the Louisville, Ky., Automobile Dealers' Association one week earlier than was announced at first. The dates have been changed from March 12 to March 5.

Shank's Crusade Against Speeders—Lew Shank, mayor of Indianapolis, Ind., has begun a personal crusade against violators of the speed laws. The mayor has twenty arrests to his credit in 2 nights, and he says the squad of motorcycle police will be reorganized.

Milwaukee Fisk Moves—The Fisk Rubber Company, of Chicopee Falls, Mass., has moved its Milwaukee, Wis., branch from 456 Milwaukee street to new and larger quarters at 450-452 Milwaukee street, several doors south. The change gives the company increased repair and stock facilities.

Kelly Moves—The New York City branch of the Kelly-Springfield Motor Truck Company, Springfield, O., has been moved to 239 West Fifty-sixth street. The major portion of this building will be devoted to company showrooms and service station. This branch will be in charge of A. S. Holly.

Good Roads in Texas—Financial provision has been made for the construction of an extensive system of good roads in El Paso County of Texas and a number of counties in New Mexico. The bond issue for good roads in El Paso County amounts to $390,000. In the adjoining county of Dona Ana, New Mexico, $100,000 have been issued for the purpose.

Automobile Incorporations

NEW YOAK CITY.—Webster-MaeGowan; capital, $50,000; to deal in engines. Incorporators: G. P. MacGowan, W. H. Webster, F. N. Dyer.

NAW YORK CITY.—Gas Saver Sales Company; capital, $25,000; to deal in automobiles. Incorporators: H. C. Fisher, J. H. Miller, Eugene Cable.

NAW YOAK CITY.—Pneumatic Hub Wheel Company; capital, $10,00; to manufacture pneumatic rubber cushion hub wheels. Incorporators: Kasiel Blau, George Dorfman, Walter Primoff.

NAW YOAK CITY.—Packard Lyric Renting Company; capital, $1,000; to rent automobiles. Incorporators: John Collins, Mary Collins, W. P. Schmuck.

NEW YORK CITY.—Co-Operative Sud Car Company; capital, $3,000; to deal in automohiles. Incorporators: J. B. Bauer, Louis Ezeehlel, John Curtis.

NAW YORK CITY.—F. M. Randall Manufacturing Corporation; capital, $5,000; to manufacture motors. Incorporators: F. M. Randall, L. B. Rosenberg, J. C. Weschler.

NIAGARA FALLS, N. Y.—Power City Auto Company; capital, $5,000; to deal in automobiles. Incorporators: Eugene A. Kinsey, James M. Donohue, Augustus G. Porter.

PINEVILLE, KY.—The Cumberland Motor Company; capital, $50,000; to manufacture spring motors.

QUEENSAORO, N. Y.—Elite Auto Wagon Company; capital, $5,000; to manufacture motor trucks. Incorporators: S. A. Hartogensis, Leo Loek, R. S. Hartogensis.

QUINCY, O.—Machinery & Motor Company; capital, $35,000; to repair automobiles. Incorporators: W. Gottleib, C. L. Cohns, H. Waldman.

RACINE, WIS.—The Perfex Radiator Company; capital, $15,000; to manufacture automobile and international eomhustible engine radiators.

ROCHESTER, N. Y.—The Ball Washburne Motor Company; capital, $25,000. Incorporators: Ward H. Ball, Charles H. Washburne and Asa R. Ball.

SHELBYVILLE, INO.—Hoosier Novelty Company; capital, $10,000; to deal in automobiles. Ineorporators: R. E. Baker, R. J. Patterson, J. F. Tierney.

SOUTH BENO, INO.—South Bend Auto Body Company; to manufacture automobile bodies. Ineorporators: Samuel Nicbolson, Stanley Nicholson, V. E. Paxson, J. C. Paxson.

TOLEDO, O.—Gauntlett Auto Sales Company; capital, $50,000; to deal in automobiles.

TOLADO, O.—Toledo Electric Company; capital, $25,000; to manufacture automobiles. Incorporators: G. A. Lay, J. B. Lay, J. Baerachi, E. X. Schaeffhold.

UTICA, N. Y.—F. P. Miller Motors Corporation; capital, $5,000; to deal in automobiles. Incorporators: H. R. Beebe, W. T. Cantwell, F. P. Miller.

WILMINGTON, DEL.—Pullman Taxicab Company; eapital, $100,000; to manufacture and sell and deal in and witb automobiles of all kinds.

GARAGES AND ACCESSORIES

CHICAGO, ILL.—Broc Electric Vehicle Company; capital, $12,000; to carry on a general garage and automobile business. Incorporators: S. N. Gotterman, Thomas C. Lyons, S. M. Corbett.

CLEVELANO, O.—The Forest City Garage Company; capital, $5,000. Incorporators: Christian Hertz, Edward T. Hertz and Emil C. Hertz.

INOIANA HAASOA, INO.—Harbor Garage and Machine Company; capital, $7,500: to carry on a general garage business. Incorporators: Gustave and August Jernherg, Charles F. Saluski.

JAMESTOWN, N. Y.—Peterman Garage Company; capital, $5,000: to do a general garage business. Incorporators: August Peterman, Otto G. Peterman, M. S. Peterman.

LINCOLN, NEB.—Omaha Automobile Club; capital, $10,000; to carry on an automobile club. Incorporators: S. A. Searle, Gould Dietz, B. V. Jewell, C. S. Gould, W. B. Cheek, P. A. Wells.

NAW YORK CITY.—Miller Tire Sales Company; capital, $5,000: to deal in automobile tires. Incorporators: H. C. Miller, Harrison C. Mills, W. A. Schenck.

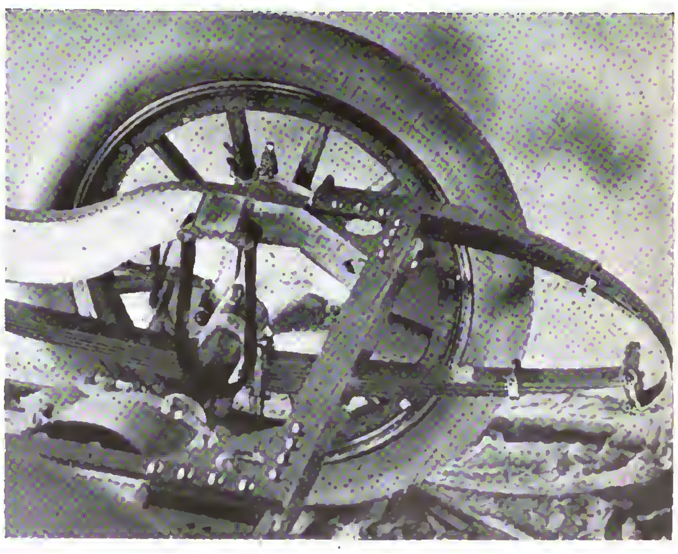
TOLEDO, O.—Sbriver Rubher Company; capital, $50,000; to operate a manufacturing and wholesale business. Incorporators: C. A. Shriver, L. H. Shriver, A. G. Florian, E. A. Florian, C. G. Goeltzenleuchter.

CHANGES OF NAME AND CAPITAL

CHICAGO, ILL.—Garfield Automobile Company; change of name to J. C. & S. Company.

DETAOIT, MICH.—Nortbern Auto and Machine Company; cbange of name to the Northern Auto Company.

SYAACUSA, N. Y.—H. H. Franklin Manufacturing Company; increase of capital from $300,000 to $1,5C0,000.



Three-quarters elliptic rear spring on the 1913 Stevens-Duryea C-6

AUTOMOBILE **Heater**—In which the waste heat carried by the exhaust gases is utilized for warming the interior of the car.

The subject matter of this patent, an automobile heater, is shown in Fig. 1. It consists of a valve casing which has a port communicating with the atmosphere and which is connected with the exhaust pipe of the motor of the automobile. This valve is operated by a pedal controlled by the driver. A heater adapted for the passage of exhaust gas through it is connected to the casing by a pipe; another pipe connects the heater with the muffler and another pipe the casing of the muffler. A rotatable piston inside the casing forms the valve mentioned above and is adapted to open or close the atmospheric port of the casing and control a passageway to either the muffler or the heater while the atmospheric port is closed.

No. 1,050,230—to Lundy L. Peters, Tiro, O. Granted January 14, 1913; filed November 15, 1911.

Motor Car Top—Consisting of four vertical and six inclined supports to which the fabric is attached.

This patent describes a top construction illustrated in Fig. 1. In this top the fabric or material is held by ten supports, four of which are vertical when the top is in use and are directly attached to the body of the car, the two rear supports being attached permanently and hinged to the body, while the two front supports have hook ends which engage a bolt on the car. The rear vertical supports carry four auxiliary members or supports which form angles of approximately 60 degrees with the vertical support and lie in a plane with them, the connection between vertical and inclined members being such as to permit folding of the members over each other when the top is put down. The front vertical support has one auxiliary member extending forwardly and supporting a bow to which the front end of the top material is attached. The front unit is equipped with so-called keepers which serve for attaching it to the rear unit when the top is not in use.

No. 1,050,167—to Rudolf H. Pfaff, Ashtabula, O. Granted January 14, 1913; filed November 15, 1911.

Automobile Wheel Rim—Which is formed of a number of accurate sections having notches engaged by tongues of the adjoining sections.

This patent describes the tire rim illustrated in Fig. 3, which is used in combination with a wheel, its felloe and a tire supporter on the same, the rim connecting the supporter and the felloe. This rim consists of a main and an auxiliary section, a flange extending from the main section to the auxiliary and between the wheel felloe and the tire supporter. The rim is formed of a number of arc-shaped sections, the end of each section having its flange formed with an inwardly extending notch and the adjacent section with a tongue engaging that notch. Means are provided for holding the main and auxiliary sections of the rim together and to hold the tongue in engagement with the notch.

No. 1,050,624—to George A. Distelhorst, Leshara, Neb. Granted January 14, 1913; filed November 13, 1911.

Multiple-Tube Tire—In which the number of inflatable tubes fill the interior of the casing and are so conducted as to remain in definite relative positions.

In this tire a number of inflatable tubes are contained inside the circular casing which is fitted with beaded edges. The inflatable members are so formed that they bear on each other with their contact planes forming right angles to each other. To prevent relative displacement of these inflatable members corresponding points of the abutting faces of the members are connected by ball and socket joints.

No. 1,050,581—to Benjamin Walter, Livermore, Pa. Granted January 14, 1913; filed April 17, 1912.

Auxiliary Air Inlet—Consisting of a ball valve ordinarily closed by gravity and opening when the engine suction rises to a certain degree.

This patent refers to an auxiliary air admission valve admitting air at high speeds when the air entering the engine through the carbureter is not sufficient to give efficient combustion. This device consists of a valve casing secured to the intake pipe of the motor and communicating with a valve chamber which has an air inlet at its bottom. This inlet is normally closed by a ball valve resting on it, but which is lifted when the engine suction is materially increased. The connection between the valve casing and the intake pipe consists of an air-inlet nipple which extends from the casing into the intake pipe and is formed with staggered perforations.

No. 1,050,200—to James Madison Aubrey, Los Angeles, Cal. Granted January 14, 1913; filed October 28, 1911.

Automobile Ignition Magneto—Which includes a housing terminating in bearings for the armature shaft of the magneto.

This patent deals with the construction of a magneto frame, comprising a single casting, consisting of a base plate, a pair of end plates with axially aligned openings and a top plate connecting the end plates. A commutator housing is formed on one of the end plates, which housing has a top opening and a pair of openings for the brushes, in its side walls. The commutator housing terminates in a rectangular bearing portion designed to support the shaft of the magneto armature.

No. 1,050,503—to Bert Whelchel, Indianapolis, Ind., assignor to A. C. Ayres, Indianapolis, Ind. Granted January 14, 1913; filed May 12, 1911.

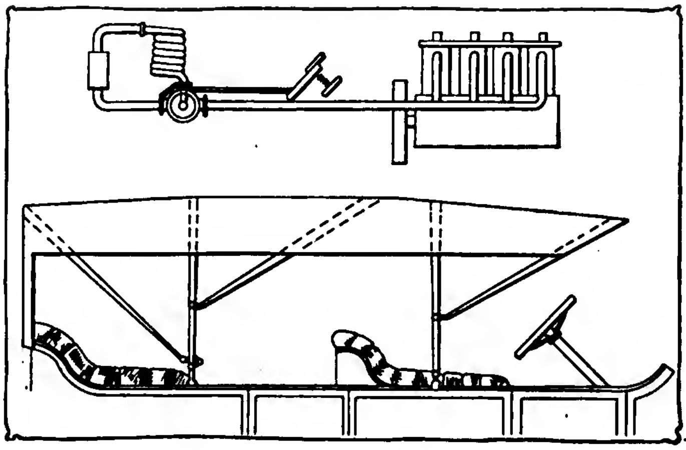


Fig. 1—Peters heater. Fig. 2—Pfaff automobile top

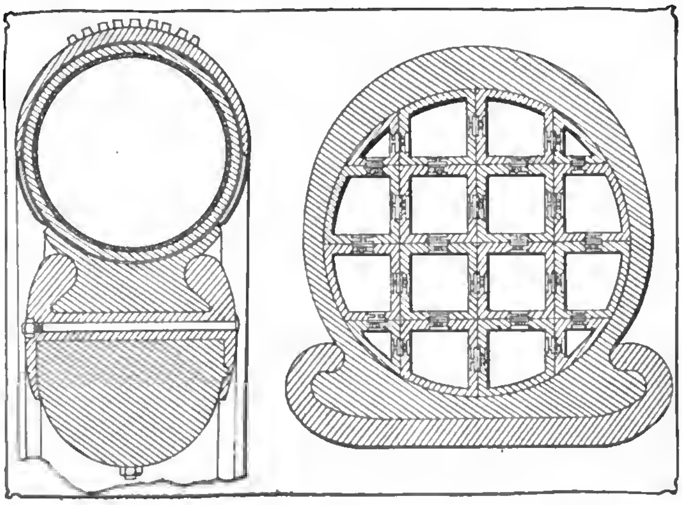


Fig. 3—Distelhorst rim. Fig. 4—Walter Multi-tube tire

VOL. XXVIII NEW YORK—THURSDAY, JANUARY 30, 1913—CHICAGO No. 5

The AUTOMOBILE

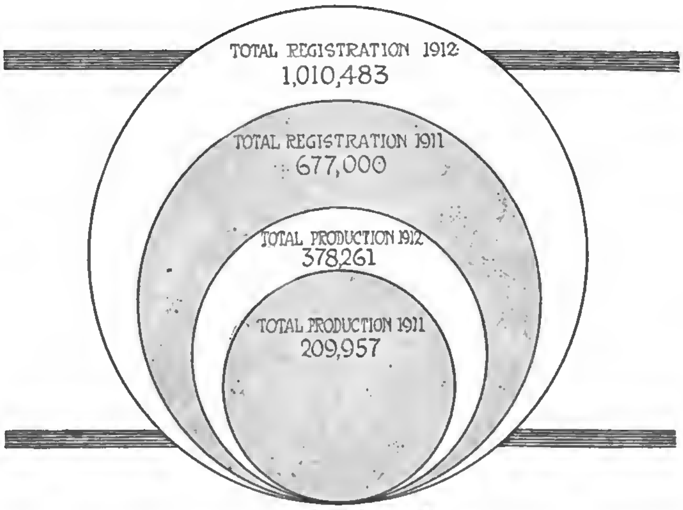
Car Registrations Now 1,010,483

This Figure Includes Duplicate Registration of 15,345
Makers' Statements Show Total Production of 378,261

By Donald McLeod Lay

GREAT as was the year 1911 in the annals of the automobile industry, the records established in registration and production of cars in the United States during that period have been surpassed by those created in 1912. The increasing interest which is manifested in the statistical reviews of the industry published from time to time in THE AUTOMOBILE rendered us especially desirous of securing as accurate figures as possible for our account of the progress made during the past year. For this reason, as well as because of the advantage of covering the entire year from January 1 to December 31 the annual article appears somewhat later than last year.

According to the figures given by the respective automobile registration officials of the various states the grand total of registrations this year, including pleasure cars and commercial vehicles of every description is 1,025,828. For the first time, however, THE AUTOMOBILE has been able to secure the number of duplicate registrations in each state, that is, the number of cars registered by non-residents. This amounts to 15,345, bringing the actual registration down to 1,010,483. The distribution of the cars throughout the union may be readily seen by referring to the table of registrations on page 329, in which the states are arranged alphabetically.



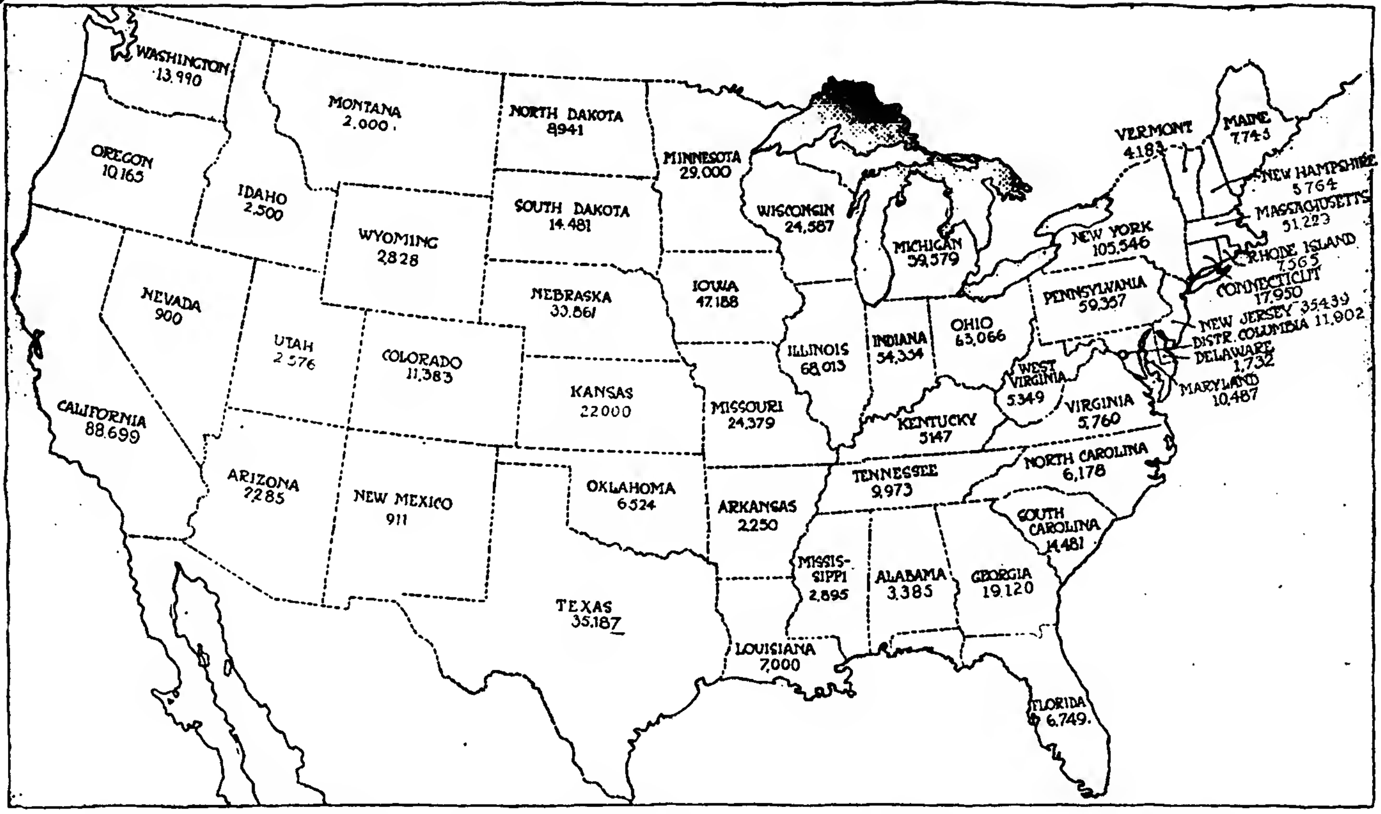
REGISTRATION IN EACH STATE

New York	105,546	Tennessee	9.973
California	88,599	North Dakota	8,975
Illinois	68,073	Colorado	8,950
Ohio	63,065	Maine	7,743
Pennsylvania	59,357	Rhode Island	7,565
Indiana	54,334	Louisiana	7,000
Massachusetts	51,229	Florida	5,749
Iowa	47,188	Oklahoma	6,524
Michigan	39,579	North Carolina	5,178
New Jersey	35,439	New Hampshire	5,754
Texas	35,187	Virginia	5,750
Nebraska	33,861	West Virginia	5,349
Minnesota	29,000	Kansas	5,147
Wisconsin	24,578	Vermont	4,183
Missouri	24,379	Alabama	3,385
Kansas	22,000	Wyoming	3,300
Georgia	19,120	Mississippi	2,895
Connecticut	17,950	Utah	2,575
South Dakota	14,481	Idaho	2,500
Washington	13,990	Arkansas	2,250
District of Columbia	11,902	Montana	2,000
Maryland	10,487	Delaware	1,732
Oregon	10,155	Arizona	1,524
South Carolina	10,000	New Mexico	911
Nevada	900		

The table shows the total registration of motor vehicles in the various states. Allowance is made for duplicate registration

Securing figures on production is by no means an easy task, but this year THE AUTOMOBILE was much more successful than last year in getting statements from the manufacturers as to the number of cars they built in 1912. Out of all the companies in business only nine refused to give the information and in these cases the figures were readily obtained in an unofficial manner. The total production during 1912, according to the sums given by the makers was 378,261, including all types of both pleasure and commercial cars. While these figures may seem very high to the uninitiated, the fact that the companies located in the city of Detroit alone produced over 200,000 cars will serve to show that the total for the country are fairly reasonable.

In answer to a request for an estimate of the number of cars which each manufacturer expects to produce during the year 1913. the figures given by the makers indicate an extremely sanguine state of mind, the total being over 600,000. THE AUTOMOBILE,



Map showing actual registration of automobiles in 1912 in the various states, excluding duplicate registrations

Distribution of Dealers, Garages, Repair Shops and Supply Houses

State	Dealers	Garages	Supplies	Repairs	Total
Alabama	73	37	1	5	96
Arizona	45	22	2	1	58
Arkansas	45	22	....	2	55
California	853	515	26	54	1,133
Colorado	126	98	15	5	294
Connecticut	298	255	17	29	424
Delaware	33	22	....	3	37
District of Columbia	70	32	6	11	107
Florida	137	85	....	4	165
Georgia	188	99	6	7	238
Idaho	51	28	1	....	55
Illinois	851	677	34	61	1,309
Indiana	504	344	10	33	655
Iowa	773	483	1	21	974
Kansas	431	255	5	14	429
Kentucky	106	66	4	5	127
Louisiana	87	41	1	7	102
Maine	148	124	2	9	100
Maryland	120	70	6	6	146
Massachusetts	592	540	41	77	1,005
Michigan	485	321	20	28	523
Minneosta	471	235	14	22	567
Mississippi	50	35	1	4	68
Missouri	459	219	18	59	617
Montana	105	59	1	1	123
Nebraska	399	196	6	8	329
Nevada	32	12	....	4	40
New Hampshire	105	94	1	7	147
New Jersey	503	551	29	35	831
New Mexico	28	24	....	1	35
New York	1,355	1,287	107	120	2,174
North Carolina	118	64	1	9	92
North Dakota	159	116	....	5	242
Ohio	794	508	27	47	1,029
Oklahoma	121	69	2	5	161
Oregon	125	85	9	7	168
Pennsylvania	812	557	34	66	1,160
Rhode Island	85	85	5	17	149
South Carolina	92	65	2	5	127
South Dakota	176	94	1	6	207
Tennessee	130	52	4	8	148
Texas	335	140	6	17	411
Utah	36	15	2	8	50
Vermont	84	64	....	7	108
Virginia	147	77	3	7	178
Washington	199	86	9	14	250
West Virginia	82	37	....	1	93
Wisconsin	397	294	24	30	527
Wyoming	29	17	....	2	35
West Indies	1	1	....	....	2
Canada	301	227	10	7	358
Mexico	11	7	....	1	14
Total	13,408	9,299	559	779	18,547

however, regards this estimate as considerably in excess of the probable actual production which may reasonably be expected to amount to something between 400,000 and 450,000 cars. This figure is practically assured by the fact that one of the large companies has announced that it will increase its production by over 100,000 next year. The manufacturing facilities of this concern are such that this expansion is readily practicable.

In the statistical review of the industry published in THE AUTOMOBILE for July 25 it was predicted on page 165 that the value of the exports for 1912 would reach $25,000,000. This prediction was amply fulfilled. The total up to December amounted to the tremendous sum of $28,239,112, including automobiles and parts. This is an increase of $9,060,528. The imports of automobiles and parts, on the other hand, show a decrease in value of $147,275, the total for 1912 being $2,298,973. This indicates in a striking manner the increased appreciation of the American car by the American public.

In compiling the registration table on page 329 the figures given are those furnished by the registration officials of the various states excepting in Colorado, Idaho, Louisiana, Montana, Nevada and South Carolina, which have no provision for state registration of motor vehicles. The estimates for these states are based on population with reference to location and sectional registration and to estimates furnished by local authorities. The figures for Kansas, which also has no state registration, were obtained from the State Tax Commission, while those for Wyoming, also in the non-registrating class, came from the State Immigration Commissioner.

As before, New York leads the states in the number of automobiles registered, this time with a total of 105,546, none of which belong to non-residents. California is second with 92,199, but 3,500 of these are registrations of non-residents, which leaves only 88,699 actual registration. California has shown a big gain over last year, the difference being 29,497. This increase is greater than that of New York during the past year by 8,940. The great number of non-resident registration in California is readily explained by the large floating population due to so many residents of other states visiting the Golden State.

The states of New York and California, which have led all the others in automobile registration for several years are now not far apart in total registration. The growth of registration in the two states is graphically portrayed by the curve in the chart on page 331. The figures for New York state have been obtainable since 1901, but the chief point of interest in the curve is the sudden upward slant at 1903, which takes a more pronounced angle toward the vertical in 1909. The figures for California were not obtainable until 1910, but the curve indicates an even more rapid increase in the number of automobiles than in New York. It is interesting to note that the sharp upward slant beginning in 1910 on New York's curve is reflected in the equally positive direction of the California curve since 1911.

The number of automobiles registered in each state during the year 1912 as given in the table on page 329 is graphically illustrated in the diagram on page 332, as well as geographically in the map at the top of page 328, which shows the distribution of cars throughout the United States at the close of the year 1912.

Illinois stands third in the list with a registration of 68,073, an increase over last year of 29,969. This gain surpassed that of California for the year. Ohio is fourth with 63,066, which shows an increase of 17,327, and Pennsylvania fifth with 59,357, and a gain of 15,175. Indiana and Massachusetts are the only other states with a registration exceeding 50,000, the figures for Indiana being 54,443, or a gain of 17,508, and those for Massachusetts being 51,229, or a gain of 12,533. Massachusetts shows a non-resident registration of 858 over and above the figures given due entirely to its attractions as a touring state. Iowa is very close to 50,000 with 47,188, a gain of 19,252 over 1911. Michigan is ninth with 39,579, having increased its registration by 11,839, and New Jersey is tenth with 35,439. New Jersey shows a decrease of 12,827 over 1911 because of the fact that during 1912 it abolished the law requiring the registration of every non-resident automobilist who crossed its borders and fell into

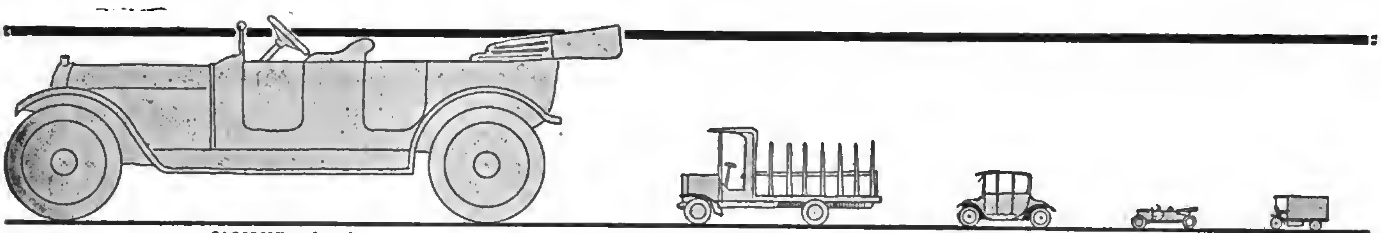
RELATION OF AUTOMOBILES TO POPULATION

State	Cars per 1000 population	Population per car
Wyoming	22.6	44
Iowa	21.3	47
Indiana	20	50
Massachusetts	17.1	[illegible]
North Dakota	15.4	65
Oregon	15.2	66
Michigan	13.9	72
Minnesota	13.9	72
Rhode Island	13.8	72
Ohio	13.2	76
New Hampshire	13.2	75.5
Kansas	13	77
Washington	12.2	82
Illinois	12	83
Vermont	12	85
New York	11.5	87
Colorado	11.2	89
Nevada	11	91
Wisconsin	10.5	95
Maine	10.4	96
South Carolina	9.5	105
Texas	9.1	110
Florida	8.9	112
Delaware	8.5	118
Maryland	8.05	124
Arizona	7.9	126
Idaho	7.7	130
Missouri	7.4	135
Georgia	7.3	136
Utah	6.9	145
Connecticut	6.7	151
Montana	5.3	188
Pennsylvania	4.6	216
West Virginia	4.4	228
Louisiana	4.2	238
Tennessee	4	249
California	3.94	254
Oklahoma	3.9	258
District of Columbia	3.6	278
New Jersey	3.4	292
Nebraska	2.8	351
New Mexico	2.8	360
North Carolina	2.8	360
Virginia	2.8	360
South Dakota	2.5	400
Kentucky	2.2	459
Alabama	2.1	495
Mississippi	1.6	622
Arkansas	1.43	700

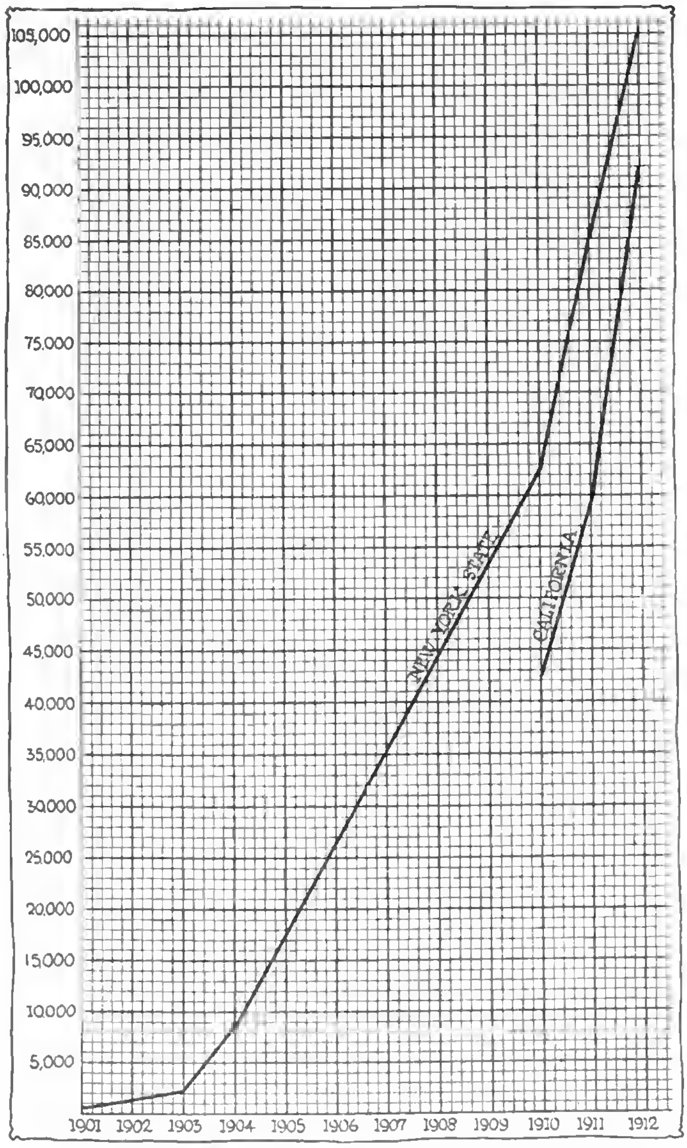
Automobile Registrations in Each State of the Union up to January 1, 1913, Together with the Number of Duplicate Registrations

State or Territory	Total Registration	New Registration 1912	Registration up to 1912	Gasoline Pleasure Cars in Use	Gasoline Trucks Cars in Use	Electric Pleasure Cars in Use**	Electric Trucks Cars in Use**	Duplicate Registrations*	Remarks
Alabama	4,400	1,554	2,856	4,200	100	100	....	15	
Arizona	1,624	139	1,485	1,539	77	8	....	....	
Arkansas	2,250	....	....	2,187	50	12	1	....	
California	92,199	32,997	59,202	81,599	7,000	3,000	600	3,500	Perennial registration
Colorado†	8,950	....	....	7,800	225	850	75	....	No state registration
Connecticut	17,950	3,956	13,994	16,750	575	525	100	....	
Delaware	1,732	341	1,393	1,607	100	20	5	....	
Dist. of Col.	12,689	4,367	8,322	11,914	250	500	25	787	Perennial registration
Florida	6,749	2,860	3,889	6,234	160	325	30	....	Perennial registration
Georgia	19,140	6,900	12,240	182,80	400	400	60	20	
Idaho†	2,500	....	....	2,385	75	40	....	....	No state registration
Illinois	68,013	29,909	38,104	61,513	4,000	2,000	500	....	
Indiana	54,334	17,508	36,826	48,484	3,900	1,800	150	....	
Iowa	47,188	19,252	27,936	43,513	2,000	1,500	175	....	
Kansas	22,000	8,000	14,000	20,900	500	500	100	....	No state registration
Kentucky	5,147	2,279	2,868	4,897	200	40	10	....	
Louisiana†	7,000	2,133	4,867	6,860	75	50	15	....	Local registration
Maine	8,143	....	....	7,915	225	3	....	400	
Maryland	10,487	3,117	7,370	9,607	700	150	30	....	
Massachusetts	52,087	13,391	38,696	46,051	3,786	2,000	250	858	
Michigan	39,579	11,839	27,740	36,829	1,800	800	150	....	
Minnesota	29,000	9,725	19,275	27,125	1,300	500	75	....	
Mississippi	2,895	1,655	1,240	2,815	40	40	....	....	
Missouri	24,379	8,213	16,166	22,579	1,000	700	100	....	
Montana†	2,000	....	....	1,950	50	20	....	....	No state registration
Nebraska	33,861	10,767	23,094	33,056	700	100	5	....	
Nevada†	900	380	520	860	30	10	....	....	No state registration
New Hampshire	6,714	2,225	4,489	6,624	60	30	....	750	
New Jersey	43,056	Decrease	48,266	41,406	1,000	400	250	7,617	
New Mexico	911	....	....	871	30	10	....	....	
New York	105,546	20,557	84,989	89,740	7,606	6,000	2,200	....	
North Carolina	6,178	2,450	3,728	5,923	150	100	5	....	
North Dakota	9,000	1,780	7,220	8,844	150	5	1	25	
Ohio	63,129	17,390	45,739	56,879	3,000	3,000	250	63	
Oklahoma	6,524	3,065	3,459	6,359	90	75	....	....	
Oregon	101,66	4,158	6,007	9,651	389	100	25	....	
Pennsylvania	59,357	15,175	44,182	54,157	3,000	2,000	200	....	
Rhode Island	8,565	2,548	6,017	7,516	759	250	40	1,000	
S. Carolina†	10,000	2,934	7,066	9,620	300	75	5	....	Local registration
South Dakota	14,481	3,239	11,242	14,176	250	50	5	....	
Tennessee	9,973	3,509	6,464	9,686	200	75	12	....	
Texas	35.187	....	....	33,123	1,514	500	50	....	
Utah	2,576	769	1,807	2,416	100	50	10	....	
Vermont	4,283	1,036	3,247	4,141	100	40	2	100	
Virginia	5,760	1,844	3,916	5,573	125	50	12	....	
Washington	14,000	5,411	8,589	13,445	400	125	30	10	
W. Virginia	5,349	3,258	2,091	5,195	100	50	4	....	
Wisconsin	24,578	8,747	15,831	23,458	850	200	70	....	
Wyoming	3,300	1,572	1,728	3,000	200	90	10	....	Local registration (figures from State Immigration Commission)
Total	1,025,828	292,949	678,158	941,232	49,691	29,268	5,637	15,345	

NOTE.—800 steam pleasure cars are included among the gasoline pleasure cars. Dots indicate that previous figures were doubtful. *The number of cars registered belonging to residents of another state. **Some figures from state registration officials, balance from estimates given by local authorities. †Estimated on basis of population with reference to location and sectional registration.



Proportional diagrams showing production of various classes of motor vehicles during the year 1912



Graphs showing the sharp upward trend of registration in New York and California, the two leading states in this respect

line with the other states granting non-residents touring privileges for a limited time. At the present time the non-resident registration in New Jersey is 7,617 over and above the registration figures given.

The other states follow in order as given in the table on the first page of this article. It will be noted that there are only seven states with a registration of over 50,000; only nine with a registration of over 20,000, and eight with a registration of 10,000 or over.

With regard to the other states having non-resident registration, that in the States of Alabama, Georgia, North Dakota, Ohio and Washington is a practically negligible figure, as may be seen from the table on page 329. That in the District of Columbia, 787, is readily explained by the number of non-resident statesmen residing temporarily in the District, while the 1,000 in Rhode Island, the 950 in New Hampshire, the 858 in Massachusetts, the 400 in Maine, and the 100 in Vermont are due to the great number of non-residents spending their summers or making extensive tours in those sections of the country.

In considering the registration figures, it must be remembered that there are a great many cars sold as second hand each year, the change of ownership requiring the issuance of another license. Thus the same car may be licensed twice in the same year. It is impossible to secure figures on this, but it is some consolation to know that this is balanced to some extent by the many manufacturers and dealers who have several cars registered on a single license.

According to such figures as are obtainable and the estimates of registrating officials in the various states the total registration, 1,025,828, is made up of approximately the following: Gasoline pleasure cars, 941,232; gasoline trucks, 49,691; electric pleasure, 29,268; electric trucks, 5,637. The total non-resident registration amounts to 15,345.

With regard to the relation of the number of automobiles in each state to the population, as may be seen in the table on page 329, the figures given by the State Commissioner of Immigration place that state at the head of the list with one car to every forty-four of the population, or 22.6 cars for every thousand people. In view of this fact and considering the comparatively small population of the state it would indicate that either the citizens of Wyoming are very prosperous or else that the figures given are somewhat high. Iowa stands second in car-population ratio with a car to each forty-seven people, or 21.3 cars per thousand population, and Indiana third with an automobile to every fifty persons, or twenty cars per thousand. The other states all have less than twenty cars to each thousand of the population. In this connection it is interesting to note that some of the states with large registration are very far down on the list, Illinois being fourteenth, New York sixteenth, Pennsylvania thirty-third and California thirty-seventh. The state having the fewest cars per population is Arkansas, which has one automobile to every 700 people, or 1.43 cars per thousand population. The states having over eleven cars per thousand of the population are shown in the illustration on page 331. Three of these have over twenty cars per thousand; Massachusetts over seventeen cars per thousand; North Dakota and Oregon over fifteen cars per thousand; Michigan, Minnesota and Rhode Island over fourteen cars per thousand; Ohio, New Hampshire and Kansas over thirteen cars per thousand; Washington, Illinois and Vermont over twelve cars per thousand; and New York, Colorado and Nevada over eleven cars per thousand.

In securing the output figures of the automobile manufacturers of the United States for the year 1912 letters were sent to every manufacturer throughout the country requesting the total number of cars produced, the numbers of each type, and estimate on the probable number of cars to be built in his plant during 1913. Most of the makers answered at once, giving the figures desired, and a second letter or an interview sufficed to obtain practically all the information.

When we totaled the figures given by the various companies as their output for 1912 we found that the automobile manufacturers of the United States, according to their own statements, produced a grand total of 378,261 cars and that they estimated

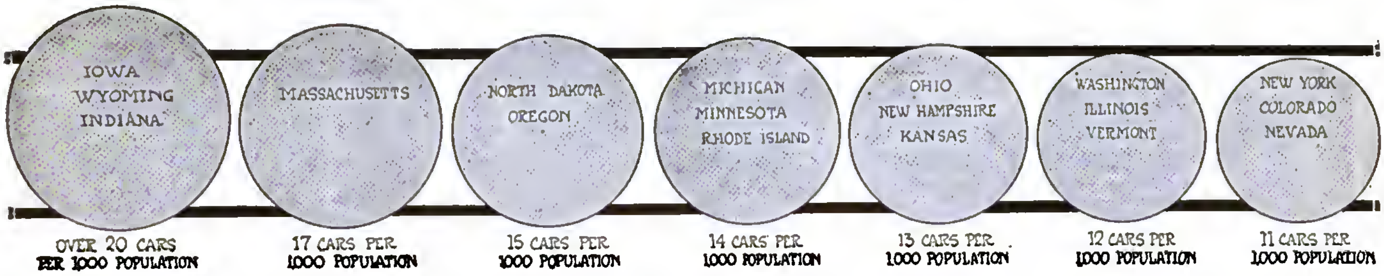


Diagram illustrating the popularity of the automobile in states having more than ten cars per thousand population

their output for next year at over 600,000, which, as has already been remarked, is probably at least 150,000 in excess of the number which will actually be turned out.

The grand total of 378,261 motor vehicles manufactured in 1912, according to the makers, is composed of 340,746 gasoline pleasure cars, 27,909 gasoline commercial motor vehicles, including some 200 fire department vehicles, 8,013 electric pleasure cars, 743 electric trucks and 850 steam pleasure cars. These compare with last year's figures as follows:

Types of cars built	1911	1912	Increase	Per cent. Increase
Gasoline pleasure	194,565	340,746	146 181	75
Gasoline trucks	8,500	27,909	19,409	224
Gasoline fire wagons....	105	200	95	90
Electric pleasure	5,634	8,013	2,379	42
Electric trucks	553	743	190	34
Steam pleasure	600	850	250	42
Total	209,957	378,261	168,304	80

If the manufacturers' figures are correct, and it is reasonable to suppose that they are not very far off the track, the biggest features in the way of increased class production are the gasoline pleasure car and truck classes, the first showing a gain of 75 per cent. and the second, the more remarkable of the two, a gain of 224 per cent. The growing partiality of the merchants and business men of America to the motor truck is evidently already having a strong influence on the production of the factories, which must increase their output in proportion to the increasing demand. This, of course, necessitates the enlargement of manufacturing facilities, a great deal of which has been in evidence for the past year. The percentage gains in production during the past year have also been noteworthy in each of the other classes.

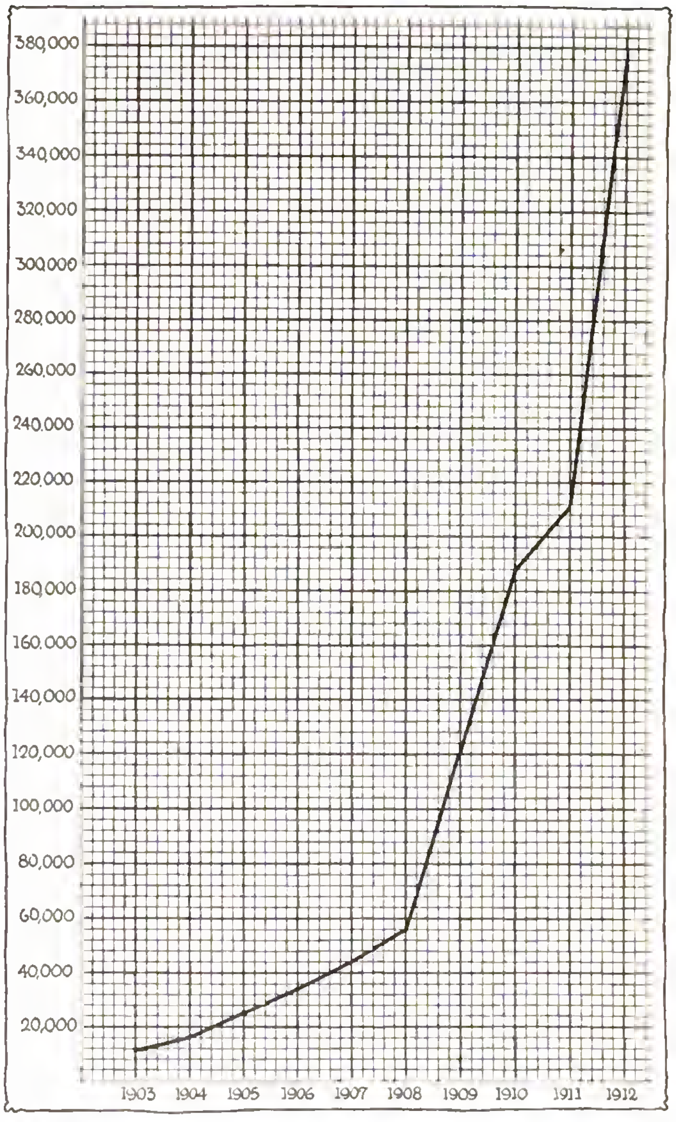
This year, for the first time, The Automobile was able to estimate the number of cars of various types produced selling at different prices during 1912, and has made an estimate of the number to be produced in 1913 in the same classifications. These are given in the table on page 332.

Disregarding the prediction for 1913 and dealing only with 1912, for which the figures are more reliable, we find that there were 164,678 gasoline pleasure cars produced to sell at $1,250 and under, the total amounting to $2,058,475. In the $1,250 to $2,000 class, 91,159 machines of this description were turned out, their sale netting the manufacturers $148,133,375. The $2,000 to $3,000 class was still more remunerative to the makers, the total of 61,179 cars amounting to $152,948,500. In the $3,000 and over class the sales of 23,730 cars brought the sum of $7,119,000.

Gasoline trucks selling at $1,250 and under were built during 1912 to the number of 12,885, which brought the manufacturers $12,885,000. In the second class, $1,250 to $2,000, 7,594 machines sold for $11,391,000 during the year. In the $2,000 to $3,000 class, 2,725 vehicles brought $6,812,500, while in the $3,000 and over class, 4,705 trucks sold for $14,115,000.

In the electric pleasure car field as well as in that of the electric trucks and steam cars, no machines were made to sell under $1,250. Taking the classification $1,250 to $2,000, 800 electric pleasure cars brought $160,000. In the $2,000 to $3,000 class, 4,487 cars sold for $11,217,500, while in the $3,000 and over class, 2,726 cars brought $8,178,000.

Electric trucks to the number of 292 were manufactured in 1912 to sell at $1,250 to $2,000, totaling $584,000. Those selling between $2,000 and $3,000 numbered 250, worth $625,000. There were only 201 electric trucks made to sell at $3,000 and over, but they brought $6[illegible]

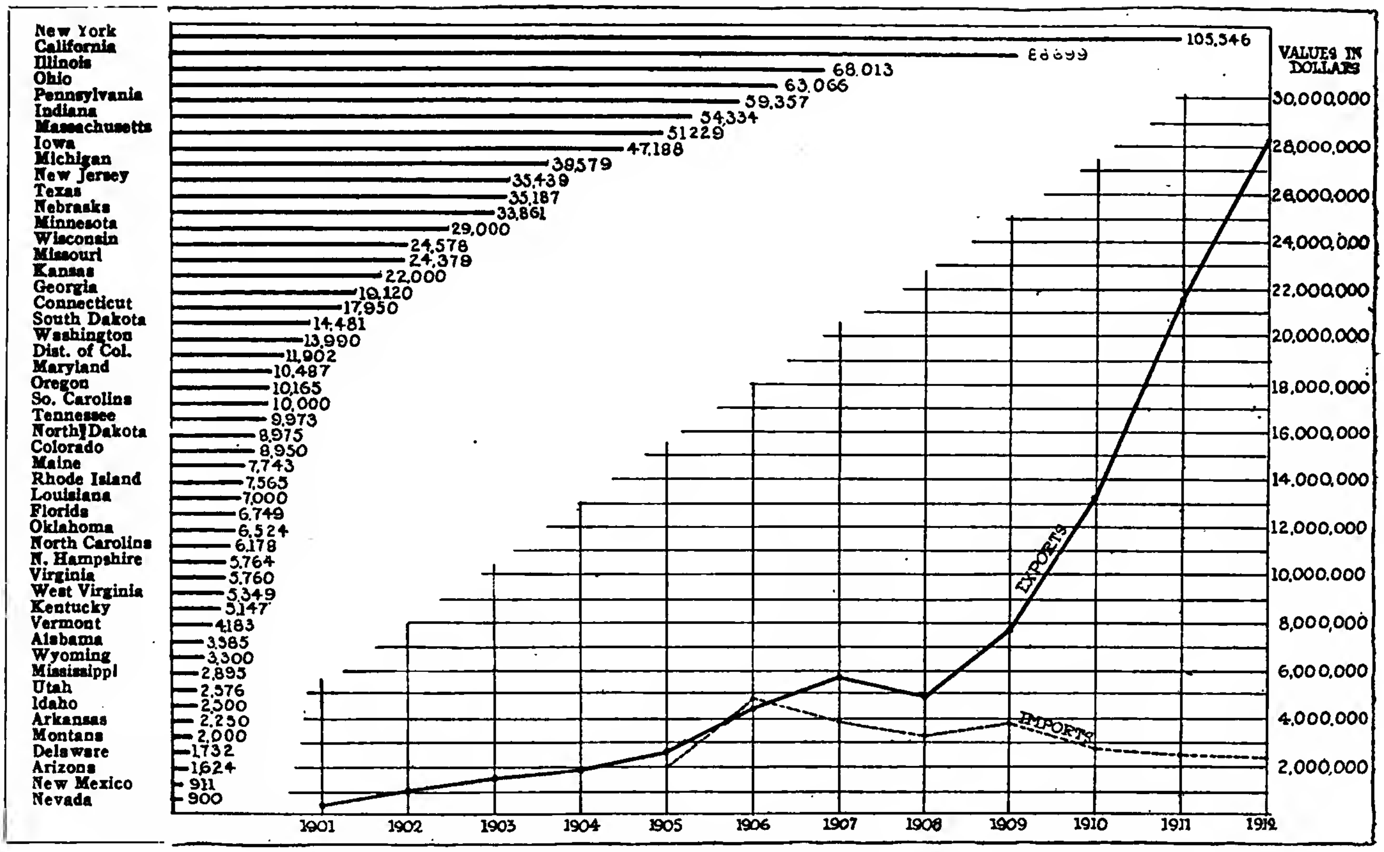


Annual production of automobiles for the past 10 years, shown graphically. The enormous increase during 1912 is clearly brought out

There were 600 steam pleasure vehicles manufactured in 1912 selling between $1,250 and $2,000, the proceeds being $975,000, while in the $2,000 to $3,000 class, 250 steam-propelled vehicles brought 625,000.

The total number of cars produced in 1912 to sell at $1,250 and under was 177,563, representing a value of $195,000,000. Those made to sell from $1,250 to $2,000 numbered 100,445 and sold for $163,000,000. Cars made to sell between $2,000 and $3,000 amounted to 68,891 and had a selling value of $172,000,000, while those commanding more than $3,000 totaled 31,362 and represented an approximate aggregate sum of $12,500,000.

At the present time there is some hesitation on the part of



Upper diagram shows registration in the various states, arranged in numerical order. Lower curve shows values of exports and imports during the past 12 years

NUMBER OF MOTOR VEHICLES OF VARIOUS CLASSES PRODUCED IN 1912 AND ESTIMATED FOR 1913 CLASSIFIED ACCORDING TO PRICE—MANUFACTURERS' FIGURES

Price	Gasoline Pleasure		Gasoline Trucks		Electric Pleasure		Electric Trucks		Steam Pleasure		Total	
	1912	1913	1912	1913	1912	1913	1912	1913	1912	1913	1912	1913
$1,250 and under	164,678	313,899	12,885	28,275	......	......	......	......	......	......	177,563	342,174
$1,250 to $2,000	91,159	113,035	7,594	18,321	800	2,080	292	510	600	635	100,445	134,581
$2,000 to $3,000	61,179	109,579	2,725	5,488	4,487	6,879	250	480	250	265	68,891	122,691
$3,000 and over	23,730	32,002	4,705	11,630	2,726	3,276	201	455	......	......	31,362	47,363
Total	340,746	568,515	27,909	63,714	8,013	12,235	743	1,445	850	900	378,261	686,807

the makers as to their immediate plans looking toward the 1914 season, largely on account of the uncertainty on their part as to what will be the policy of the new presidential administration. If the new president comes out emphatically in favor of good roads work throughout the country, the improvement of existing highways and the extension of cross-country routes, besides giving what the makers deem a reasonable tariff protection, the production of automobiles in the United States will be far greater than if the administration's policy should not coincide with these ideas. Just now the manufacturers are holding off somewhat, waiting to see what is going to happen.

In the export field, the makers of America acknowledge no superior in the number of cars shipped to foreign countries, although the automobile exports of France exceed those of the United States in value at the present time. It is expected, however, that within a year or two, the American manufacturers

IMPORTS OF AUTOMOBILES AND PARTS FOR 1909, 1910 AND 1911, AND FOR 11 MONTHS IN 1912

	1909		1910		1911		1912 to December	
	Number	Values	Number	Values	Number	Values	Number	Values
AUTOMOBILES	1,645	$3,071,002	1,024	$2,080,555	972	$2,098,481	1,795	$1,974,496
Imported from—								
United Knigdom	101	233,383	94	212,969	173	403,506	164	139,222
France	928	1,670,900	556	1,066,356	341	770,643	83	62,727
Germany	127	321,033	129	314,577	160	350,239	46	32,197
Italy	418	689,454	169	312,478	131	203,733	13	16,279
Other countries	71	156,232	76	174,175	167	370,360	1,489	1,724,071
Parts of (except tires)	....	865,506	....	656,653	....	347,767	....	324,477
Total	....	$3,936,508	....	$2,737,208	....	$2,446,248	....	$2,298,973

EXPORTS OF AUTOMOBILES AND PARTS FOR 1909, 1910 AND 1911, AND FOR 11 MONTHS IN 1912

	1909		1910		1911		1912 to December	
	Number	Values	Number	Values	Number	Values	Number	Values
AUTOMOBILES	4,686	$6,889,031	8,443	$11,210,295	15,807	$15,924,361	23,089	$23,998,351
Exported to—								
United Kingdom	....	2,059,210	....	2,755,592	4,021	3,380,266	4,371	3,302,918
France	....	846,136	....	753,204	420	449,757	668	502,040
Germany	....	181,087	....	331,754	115	124,615	438	348,398
Italy	....	224,068	....	377,750	176	199,986	267	240,715
Other Europe	....	335,675	....	764,463	795	718,360	1,439	1,178,847
Canada	....	2,437,042	....	5,021,043	4,987	5,549,998	6,864	8,255,134
Mexico	....	494,238	....	689,903	298	492,974	233	372,086
West Indies and Bermuda	....	337,414	....	412,588	300	343,281	316	331,230
South America	....	240,453	....	519,160	1,116	1,356,445	1,859	2,164,983
British Oceania	....	303,452	....	748,983	2,476	2,217,762	3,112	2,852,002
Asia and other Oceania	....	191,448	....	599,756	813	795,576	1,469	1,464,358
Other countries	....	136,394	....	216,150	280	295,341	2,053	2,985,637
Parts of (except tires)	....	897,586	....	1,980,001	....	3,254,123	....	4,240,771
Total	....	$7,786,617	....	$13,190,296	....	$19,178,484	....	$28,239,112

will lead the world in value of exports as well as in the number of cars shipped to foreign shores.

Glancing over the table on page 333, showing the exports of automobiles and parts from 1909 to December, 1912, the steady increase in the number of automobiles exported to the leading foreign countries serves to bring out the fact that the American manufacturer, with any representation across the water, is by no means entirely dependent upon his domestic sales. Canada ranks first as the greatest user of our cars, having imported 6,864 machines from the United States valued at $8,255,134 during the first 11 months of 1912. This represents an increase of about 3,000 automobiles as compared with the previous year and an increased valuation of nearly $3,000,000. Ranking next to Canada is her mother country, the United Kingdom, which, during the past 11 months, received 4,371 American-made cars, valued at over $3,000,000. The valuation of the machines exported to the United Kingdom appears to have fallen off slightly when compared with the figures for 1911, although the number of cars has somewhat increased. South America received 1,859 automobiles in the first 11 months of 1912, while the comparatively large number of 3,112 went to British Oceania.

The import statistics for the first 11 months of 1912 show a decreasing number of cars of foreign make coming to this country. England appears to be in the lead in exports of cars to the United States, having disposed of 164 cars valued at $139,222.

An interesting graphic representation of the variation in exports and imports of automobiles from 1901 to 1912 is shown on page 332. The phenomenal increase in exports is clearly indicated, and, except for the slight decline for the year 1908, the curve has a steady rise. On the other hand, the imports curve is gradually off, the peak having been reached in the year 1906, and, while there appears to have been some slight rejuvenation in 1909, the decline, on the whole has been steady.

Distribution of Automobile, Truck and Motor Manufacturers

	Automobiles	Trucks	Motors	Total
Alabama	1	....	....	1
California	6	6	....	11
Colorado	2	3	....	4
Connecticut	4	4	....	5
District of Columbia	1	2	....	3
Georgia	1	1	....	2
Illinois	19	29	15	57
Indiana	38	17	9	58
Iowa	4	5	1	9
Kansas	1	....	....	1
Kentucky	1	3	....	4
Maine	....	1	....	1
Maryland	4	3	....	4
Massachusetts	13	12	....	22
Michigan	56	58	11	104
Minnesota	5	10	1	14
Missouri	7	8	....	11
Nebraska	3	2	....	4
New Jersey	6	16	1	23
New York	25	47	16	81
North Carolina	1	....	....	1
Ohio	34	48	11	75
Oklahoma	1	1	....	2
Pennsylvania	17	25	9	44
Rhode Island	2	3	1	5
South Dakota	1	1	....	1
Tennessee	2	1	....	2
Texas	1	2	....	2
Virginia	1	2	....	2
West Virginia	1	3	....	4
Wisconsin	11	20	11	35
Canada	13	10	4	22
	282	335	77	604

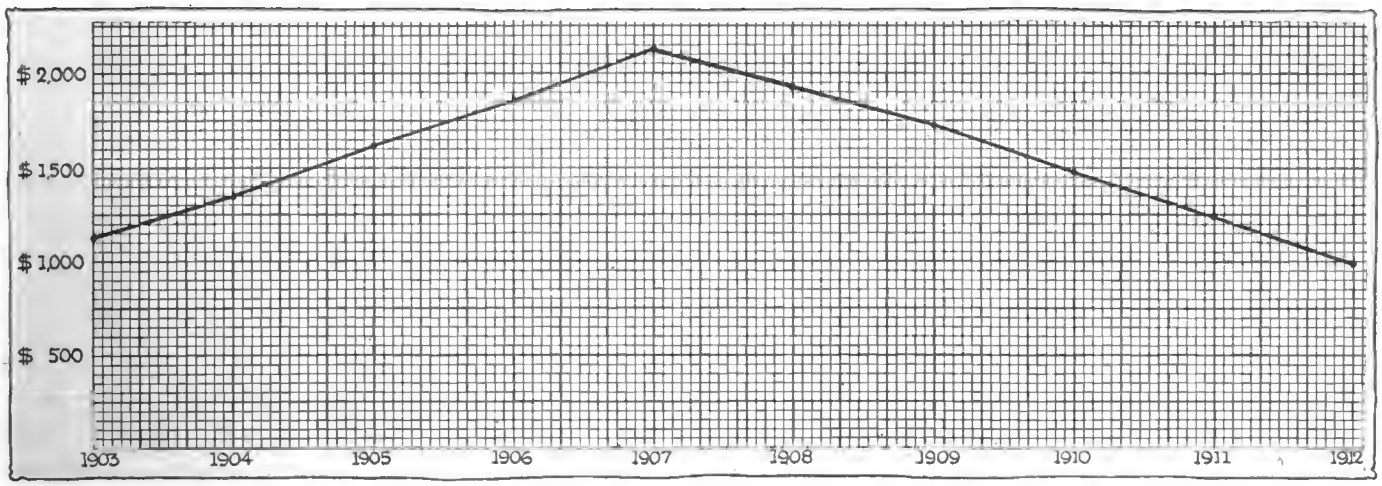


Diagram showing fluctuation in average price of American built cars from 1902 to date

Receivers for Knox

Involuntary Petition in Bankruptcy Filed Against Company by Three Creditors—Each Gave Bonds in $15,000

Under New Policy Company Will Follow Lead of Other Makers and Lessen Number of Models

SPRINGFIELD, MASS., Jan. 27—Last Monday an involuntary petition in bankruptcy was filed against the Knox Automobile Company by three creditors which comprised the Samuel Eastman Company, Concord, N. H., $38; the Hartford Automobile Parts Company, Hartford, Conn., $757, and the Platinide Company, Providence, R. I., $2. This led to the appointment of receivers for the company, comprising E. O. Sutton, H. G. Fisk and C. C. Lewis, who have been carrying on the plant since Mr. Mayo's death. They each gave bonds in $15,000. The real estate of the company was given as valued at $250,000 and the value of the motor cars now finished or in process of being completed as $750,000. Since these proceedings the three receivers have appeared before Judge Morton, in the United States District Court, at Boston, and after explaining the situation relative to the company the judge approved an order allowing them to issue certificates to the value of $25,000 in order that the business might not be interrupted just at this time. This will act as a temporary financing of the company and allow the completing of cars and trucks for spring delivery and also give the company a chance to continue on the show circuit as it planned until the other resources are secured. When the money it is expected to raise from some capitalists is received the name of the company will be changed in the reorganization to the Knox Motor Car Company.

Under its new policy the Knox company will follow the lead of other makers and lessen the number of models. This will give the company an opportunity to utilize its plant to greater advantage. The truck section of the company has been growing rapidly in recent years and much attention will be given to this part of the production. With the aid of new capital to turn over the product now in course of construction and to increase production later the outlook for the company is much brighter than it was last year.

Yearly Dividend Reports

The Willys-Overland Company will pay an initial dividend of 1.5 per cent. on its newly issued common stock, on February 1. The Lee Tire & Rubber Company, Conshohocken, Pa., is declaring a half-yearly dividend of 3.5 per cent. on its preferred stock. The Buick Motor Company gave out its report on the year of 1912, during which the liabilities and assets, being equal to each other, were $12,271,200. The surplus of assets over liabilities for 1912 was $6,594,318, or $90,628 more than the surplus in 1911, which was $6,503,690.

Kelsey Sues Lycoming Foundry

HARTFORD, CONN., Jan. 25—Receivers of the Kelsey Motorette Company, Hartford, Conn., have brought suit against the Lycoming Foundry & Machine Company, of Williamsport, Pa., alleging breach of contract. The action is returnable in Pennsylvania.

Franklin Officers Are Elected

SYRACUSE, N. Y., Jan. 25—The H. H. Franklin Manufacturing Company and the Franklin Automobile Company, its selling organization, held their annual meetings Wednesday. John Wilkinson was elected vice-president of the H. H. Franklin Manufacturing Company, to succeed Giles H. Stilwell, and Mr. Stilwell was chosen vice-president of the Franklin Automobile Company in place of Mr. Wilkinson, the exchange occurring because since the preceding elections Mr. Wilkinson has become general manager of the manufacturing company, which owns the automobile company, the selling agency for Franklin cars. The manufacturing company's stockholders re-elected the following directors: H. H. Franklin, Mr. Wilkinson, Frank A. Barton, Mr. Stilwell, Edward H. Dann, Alexander T. Brown and Willard C. Lipe. The directors in turn elected Mr. Franklin president, Mr. Wilkinson vice-president and Mr. Barton secretary and treasurer. No change was made in the automobile company's officers, who are the same as for the other corporation, except the vice-presidency, and the fact that Messrs. Brown and Lipe are not members of the board.

Cox Not Infringing on Rose

Judge Hazel, in the United States District Court, Southern District of New York, rendered a decision in the case of the Rose Manufacturing Company, Philadelphia, Pa., vs. the Cox Brass Manufacturing Company, Albany, N. Y. The decision brought out the weakness of the patents owned by the Rose company, in a similar manner to the decision of Judge Cross rendered about a week ago. The lamp bracket made by the Cox company being the subject of the Rose complaint, Judge Hazel ruled that that bracket was quite different from the product of the complainant.

Big Attendance for Road Convention

From present reports the indications are that each of the forty-nine states will be represented, when the second Federal Aid

Automobile Securities Quotations

The developments of this week consisted principally in a falling off of the prices of tire stocks which had risen during the past few months. Among the stocks subject to this effect were: Ajax-Grieb common which fell 20 points and Miller, 10 points. International Motor preferred fell likewise, 15 points. On the other hand, Firestone common soared 23 points and Chalmers rose 5. The tone of trading was firm.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	160	185
Ajax-Grieb Rubber Co., pfd	..	..	95	100
Aluminum Castings Co., pfd	..	..	99	101
American Locomotive Co., com	34	35	39	40
American Locomotive Co., pfd	103	103½	104	106
Chalmers Motor Company	..	..	135	143
Consolidated Rubber Tire Co., com	5	10	19½	21½
Consolidated Rubber Tire Co., pfd	10	25	70	80
Firestone Tire & Rubber Co., com	..	..	357	365
Firestone Tire & Rubber Co., pfd	..	..	105	107
Garford Company, preferred	..	..	100	102
General Motors Company, com	34½	35½	33	34½
General Motors Company, pfd	77½	78½	76	78
B. F. Goodrich Company, com	..	..	63	63¾
B. F. Goodrich Company, pfd	..	..	104	105
Goodyear Tire & Rubber Co., com	250	260	445	452
Goodyear Tire & Rubber Co., pfd	104	106½	104	105
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	5	15
International Motor Co., pfd	..	..	25	50
Lozier Motor Company	..	..	..	32
Miller Rubber Company	..	..	160	170
Packard Motor Company, pfd	104	107	103	105
Peerless Motor Company	..	..	120	125
Pope Manufacturing Co., com	40	44	32	34
Pope Manufacturing Co., pfd	67	70	76½	78
Reo Motor Truck Company	8	10	11½	12
Reo Motor Car Company	23	25	20½	21¼
Studebaker Company, common	..	..	34	35½
Studebaker Company, pfd	..	..	92	94
Swinehart Tire Company	..	..	110	112
Rubber Goods Mfg. Company, pfd	100	100	104	108
U. S. Motor Company, com	..	..	..	..
U. S. Motor Company, pfd	..	..	..	..
U. S. Rubber Co., com	..	..	65½	66
U. S. Rubber Co., pfd	..	..	107	107¼
White Company preferred	..	..	105	108
Willys-Overland Company, com	..	..	70½	71½
Willys-Overland Company, pfd	..	..	98	99

Good Roads Convention, called by the A. A. A., takes place in Washington, D. C., on March 6 and 7. So far more delegates have announced their intention of attending the convention than the total attendance of last year. This is accounted for to some extent by the fact that the inauguration will be held on March 4. But the good roads movement itself has become so widespread, that a successful and enthusiastic convention is assured.

Twenty-nine governors have already appointed delegates to represent their respective states at the convention and the boards of trade of the larger and more prosperous towns throughout the country have also appointed delegates. Groups of delegates from chambers of commerce and State trade organizations help to swell the numbers, and these taken in connection with the large groups of delegates from good roads organizations, the forty-five State organizations and more than 500 local clubs which are constituent bodies of the A. A. A. will make a record-breaking and enthusiastic crowd. In fact, indications point to a successful session.

Columbus Buggy Aifairs Straightening

Columbus, O., Jan. 27—Steps have been taken by the preferred stockholders of the Columbus Buggy Company, of Columbus, O., which was thrown in the hands of Daniel McLaren as receiver recently, to protect their interests and a meeting will be held January 30 for the purpose of organizing. In all there is $132,800 preferred stock issued and $700,000 common stock.

A committee consisting of John G. Deshler, a banker of Columbus, W. D. Brickell, a capitalist, and H. B. Peters, of Lancaster, O., will take up the question of looking after the interests of the preferred stockholders. It is believed that after paying all claims the preferred holders will be protected. Assurances are given that the plant will continue in the field of automobile manufacturing.

Market Changes for the Week

Tin proved to be the most important change in the markets of last week, starting at $50.50 on Wednesday, a gradual decline in price resulted ending on Tuesday at $49.90 per hundred pounds, due to a light demand. The prices were irregular for electrolytic copper in the domestic market, closing at a loss of $.008 1-8 for the week. Lead remained quiet but steady, closing at $43.30 per hundred pounds. Antimony was weaker, due to poor trade, and closing at $.08 1-4 per pound. The situation in the local market for scrap market underwent no change last week. Domestic rubber is still moving into consuming channels in a moderate volume, and there has been no increase in supplies. Cottonseed oil was steady, due to a short covering in January.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, per lb...	.08¾	.08¾	.08¾	.08½	.08¼	.08¼	—.00½
Beams and Channels, 100 lbs..........	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	28.50	28.50	28.50	28.50	28.50	28.50	....
Copper, Elec., lb..	.16¼	.16⅛	.16⅛	.16⅛	.16¼	.16⅛	—.00⅛
Copper, Lake, lb..	.16⅜	.16½	.16⅜	.16⅜	.16⅜	.16⅜	....
Cottonseed Oil, October, bbl....	6.31	6.30	6.30	6.29	6.27	6.24	—.07
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil (Menhaden)	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 gals. @.....	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime....	.90	.90	.90	.90	.90	.90	....
Lead, 100 lbs......	4.30	4.30	4.30	4.30	4.30	4.30	....
Linseed Oil........	.47	.47	.49	.49	.49	.49	—.02
Open-Hearth Steel, ton.......	29.00	29.00	29.00	29.00	29.00	29.00	....
Petroleum, bbl., Kansas	.83	.83	.83	.83	.83	.86	+.03
Petroleum, bbl., Pa., crude......	2.05	2.05	2.05	2.10	2.19	2.19	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	....
Silk, raw Ital......	....	4.35	....	....	....	4.35	....
Silk, raw Japan....	....	3.72½	....	....	....	3.70	—.02½
Sulphuric Acid, 60 Beaumé......	.99	.99	.99	.99	.99	.99	....
Tin, 100 lbs......	50.50	50.00	49.98	49.95	49.90	49.90	—.60
Tire Scraps.......	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	....

Fisk Company Expands

Recent $400,000 Addition to Company's Plant To Be Supplemented by Further Increase of Manufacturing Facilities

Personal of the Organization Will Remain Unchanged and Present Business Policy Will Be Continued

Owing to the rapid increase of business, the Fisk Rubber Company, Chicopee Falls, Mass., is arranging for a considerable increase of capital with the purpose of expanding its manufacturing facilities. The $400,000 addition to the company's plant which is now nearing completion will be supplemented by further improvements. Sidney S. Meyers, counsel for the company, states that the increase of capital is to be made solely on account of the enlarged facilities necessitated by the company's growth. The personnel of the organization will remain unchanged, H. T. Dunn retaining the presidency and H. G. Fisk the treasurership. The business policy of the company will be continued unaltered. A more detailed announcement of the company's plans will be made in the near future.

Maxwell Reorganization Progressing

The process of reorganizing the former United States Motor Company into the Maxwell Motor Company, Inc., is progressing rapidly and Sidney S. Meyers, counsel for the company, states that the securities and cash to be taken by the various classes of creditors, according to the agreement made at the time of reorganization, will probably be forthcoming by February 15. The company has moved its executive force to the United States Tire building.

Rubber Again Weakens

The principal topic in the rubber trade was the outcome of the auction of plantation rubber which was held in London. The sale went off at lower prices. There was a good demand, according to cables recently received, but the offerings were large.

Colt Defends Rubber Stock

The following statement was given out Jan. 27 by Samuel P. Colt, president of the United States Rubber Company:

"Judging from newspaper articles to which my attention has been called, several matters in the recent application of the United States Rubber Company to list additional common and first preferred stock were misunderstood. As stated in the application, which has been duly granted by the authorities of the Stock Exchange, $6,000,000 additional common stock is to be given in exchange for the entire common stock of the Rubber Regeneratnig Company.

"It is only fair that our stockholders should know at this early date that the entire earnings of the United States Rubber Company for this fiscal year promise to be largely in excess of dividend requirements. The earnings of the Rubber Generating Company are now double the dividends on the amount of the United States Rubber Company common stock issued in exchange for the corresponding issue of that company. Furthermore, the United Statea Rubber Company will undoubtedly, aside from earnings, be indirectly benefited to a large extent by the acquisition of the Rubber Regenerating Company.

"There seems to have been some misapprehension as to the amount of surplus shown in the statement of the United States Rubber Company to the Stock Exchange for the six months ended September 30, in comparison with the surplus shown as of March 31 last, in the annual report. Apparently it has been overlooked that in the meantime the company has declared and paid a stock dividend of $5,000,000 to its common shareholders. Obviously the surplua was reduced by that amount.

"To my mind the important point in this whole matter is that which I have already referred to, namely, that the earnings of the United States Rubber Company promise to be largely in excess of all dividend requirements"

Coleman Not to Resign

Contrary to the rumor which has been circulated recently throughout the trade, C. T. Coleman, president of the International Motor Company, New York City, has no intention of resigning from that office. Mr. Coleman and the other officers of the company denied this report emphatically.

Albany Active on Motor Legislation

Shows Throughout the National Circuit Report Good Progress—Many Exhibits Are Promised

Pelletier to Handle Accounts of Maxwell and Also Those of Splitdorf Starter and Other Accessories

FOLLOWING is an amendment to the highway law introduced by Mr. Wilson in the Senate of the State of New York, read twice and ordered printed, and when printed to be committed to the Committee on Internal Affairs:

§ 329-a. *Lights on vehicles. Every vehicle on wheels whether stationary or in motion, while upon a public highway or bridge shall have attached thereto a light or lights, to be so displayed as to be visible from the front as a white light and from the rear as a red light from one hour after sunset to one hour before sunrise; provided, however, that this section shall not apply to a vehicle designed to be propelled by hand or to any vehicle while the same is upon any lighted street or highway if the street lights are maintained at a distance of not more than five hundred feet apart, or to a vehicle designed principally for the transportation of hay or straw while loaded with such commodities. Upon the written application and presentation of reasons therefore by the owner of the vehicle, the state commission of highways may in writing, and subject to such requirements as it may elect to impose, but without expense to the applicant, except said vehicle from the provisions of this section for such period of time as the commission may determine. Nothing in this section shall be construed to affect the provisions of any existing statute, rule or regulation requiring lights on motor vehicles or affecting the obligations of operators or occupants thereof. A person violating the provisions of this section shall thereby incur a penalty of five dollars for each violation, to be recovered by the said town or village in which the violation occurs.*

Pelletier Takes Several Accounts

LeRoy Pelletier, who recently severed his connection with the Flanders Motor Company, Detroit, has been engaged by the new Maxwell Motor Company, Inc., the successor to the United States Motor Company, to write and handle the organization's advertising, according to a statement made by Walter E. Flanders, the new president of the Maxwell company. Mr. Pelletier is not to be known as advertising manager, but rather as advertising counselor. He will have his own headquarters separate from the Maxwell plant.

Mr. Pelletier has also been engaged by John Splitdorf to handle the advertising of a new concern which is to market an electric cranking apparatus to be brought out soon. He will also act for a tire company, the name of which has not been announced.

Safety Museum Publishes Booklet

The American Museum of Safety has brought out another small pamphlet devoted to the danger to children playing in the street. The attention of the little ones is called, in this publication, to the risk they run in playing tag, blindfold or never-touched-me, in a street where automobiles abound. Simply, but effectively, the pamphlet brings out the fact that the pleasure of playing a dangerous game is by far over-balanced through the chance of being killed or maimed by a vehicle. THE AUTOMOBILE co-operated with the Museum in producing the booklet.

Detroit Show Is in Full Swing

DETROIT, Jan. 28—With more floor space, more cars of every variety, more complete decorations and a larger accessory section than last year, the twelfth annual show of the Detroit Automobile Dealers' Association was opened to the general public in the Wayne pavilion and annex Monday night. The annex, which probably will remain as one of Detroit's show buildings, is 173 x 124 feet across Front street from the main pavilion, and gives the exhibit more than 10,000 more feet of space for exhibits than in 1912.

At the Detroit show 42 makes of gasoline pleasure cars are exhibited, each manufacturer showing several models, thus making the number of models on display something like 300.

The show marks the entry of Detroit into the National circuit, which now, besides Detroit, comprises eleven large cities of the country. For this reason many of the exhibits were brought direct from the New York show.

8,000 Attended Buffalo Opening

BUFFALO, N. Y., Jan. 28—Buffalo's eleventh annual motor show was auspiciously opened last evening at 8 o'clock when President George Ostendorf of the Buffalo Automobile Dealers' Association, under whose auspices the annual exhibition is being given, escorted Acting Mayor Burley.

The show is being held in the Broadway Auditorium, and is the result of weeks of effort and preparation. Seventy-five exhibitors are showing cars at the hall, and the approximate value of the cars on exhibition is said to total $2,500,000. About 8,000 were in attendance on the opening night.

Over 200 Cars at Newark Show

NEWARK, N. J., Jan. 25—With a record-breaking entry of more than 200 cars, of both the pleasure and commercial types, comprising no less than fifty-three separate and distinct makes, the drawings for space at the Newark Automobile Show were held Friday. In addition to those entries already in hand, there are several others still to be heard from, which will bring the list up to an even greater figure. The space in the huge First Regiment Armory, where the show is to be held during the week of February 15-22, was more than over-subscribed, but by the curtailment of the number of spaces that would be allotted to any one firm, the space committee arranged for several more exhibits.

Take Nothing from Maxwell Plant

INDIANAPOLIS, IND., Jan. 27—Judge Albert B. Anderson of the United States District Court for the district of Indiana has issued an order restraining the receiver, agents or employees of the Maxwell-Briscoe Motor Company from removing any of the property of the company at Newcastle from the jurisdiction of the court or from the place where it is now situated.

The restraining order was issued at the request of a number of Indiana creditors who recently brought action to have the company adjudged bankrupt. The restraining order, however, does not interfere with the transfer or sale of the property as recently ordered by the United States District Court for the southern district of New York.

Older Chauffeurs May Be Required

An act has been introduced in the Senate of the State of New York to amend the highway law to read that "no person shall operate or drive a motor vehicle who is under twenty-one years of age, unless such person is accompanied by a duly licensed chauffeur or the owner of the motor vehicle being operated."

Jerseyites Against Fee Increase

The members of the North Jersey Automobile Club passed a resolution on January 20, to protest against the increase in license fees proposed by Commissioner Lippincott. The reason of the protest is that the fees were raised 50 per cent. last year, besides a personal tax to the full value of their cars.

Organize To Fight High Gasoline Prices

New York Garage Association Sets Movement on Foot To Combine Efforts For Concerted Action

Purposes of Nineteen Thirteen Club Explained to Garage Association as a Ways and Means Committee

WHAT may be the beginning of a country-wide movement has been launched by the New York Garage Association. The fuel situation has aroused the indignation of a number of scattered organizations and it is the purpose of the garage men to combine these efforts into a concerted movement which will be productive at least of a thorough understanding of the subject.

At the annual dinner of the association held Tuesday night 200 garage owners were in attendance. Captain Louis J. Joscelyn presided. The enthusiasm of this body of men and their determination to make use of every means at their disposal to force the fuel situation to an issue was evidenced by the speakers, who insisted that a combined effort is necessary. Alfred E. Ommen, formerly City Magistrate, was the first speaker. He dwelt at length on the grip that the Standard Oil Company has on the industry in this country and how futile the efforts of one or two hundred garage men are against the mighty influence exerted by this immense institution whose profits are such that its stock sells for over $600 a share.

William R. Gulik, a chemist of Princeton University, was the next speaker. He said that the question is entirely one of supply and demand and that the price is bound to soar. He ventured the prophecy that there never would be cheaper gasoline and that the solution lay in a new fuel. Mr. Gulik has invented a fuel which he states will supplant gasoline.

Edward W. Mitchel, of the Hydrocarbon Products Company, announced that his concern has perfected a new process of refining which reduces the cost of production to an enormous extent. He stated that if he were assured of the patronage of the garage dealers of New York City, who represent the sale of 10,000,000 gallons of gasoline annually, his firm could put up a refinery which would produce gasoline to be sold at a price much lower than that now charged the consumer. Congressman Baker also spoke on the Turner process used by the Hydrocarbon company and stated that many oil fields at present unavailable on account of the large percentage of asphaltum could be made of use. Even Bermuda oil, which contains between 50 and 60 per cent. asphaltum, has been refined by the process, according to Congressman Baker.

Purpose of the Organization

T. H. Cochran, a political economist, said a few words in regard to the Nineteen Thirteen Club and its purpose, which is outlined in the following bulletin:

The First Nineteen Thirteen Club.

No Officers. No Dues. No Fees

Simply a *"Ways and Means Committee"* which will attend monthly meeting for the purpose of discussing a fully developed and specifically defined plan or other plans that may be suggested for the solution of many serious business problems now confronting the nation.

There is every indication that the year 1913 will be an eventful and prosperous one for the American people, provided every legislative representative without regard to political faith will heed the voice of the businsss men of the country for the general welfare.

The various questions affecting the economic progress of the country, business men as well as theorists differ, and as these questions to be correctly settled must be settled by business men, we hereby agree to join the above named club for the discussion of economic problems, to the end that our views may be of weight in the working out of practical business reforms through Congressional and executive action.

This organization, which is now registered with the county clerk of New York, will shortly incorporate under the laws of the District of Columbia, and then will charter state and sub-organizations. The attention of the organization is concentrated on the petroleum problem at the present time but will later spread to all industries, according to the plan of organization.

A meeting has been called for next Tuesday evening when the co-operation of the garage organization with the Ninteen Thirteen Club will be discussed along with the best means of getting an organized body into action.

Among the other guests and speakers at the banquet were the Hon. Earle Moore, of the Municipal Explosives Commission, who dwelt on the desire of the commission to meet the question of the installations of garage separators in a fair manner; Charles R. Zacharius, Theo. K. McCarthy, counsel for the organization; William Burrows, Wm. R. Haradon and Arthur M. Giegerich.

Aluminum Company's Wages $101,375

MANITOWOC, WIS.—The Aluminum Goods Manufacturing Company, Manitowoc, Wis., in making its annual accounting to the Citizens' Association of Manitowoc, which assisted in financing the enterprise, showed that there was an increase of more than 105 per cent. in wages paid during 1912 and of 60 per cent. in the number of employees during the first year. The requirement of the association in lending its aid was that the company guarantee to expend $350,000 in wages in the first 6 years of operation. During the first year, 1912, there was expended in wages $101,375. The payroll numbers 300 men.

Massachusetts Accidents in 1912

BOSTON, MASS., Jan. 25.—Police Commissioner Stephen O'Meara of the Boston Police Department has just compiled his annual report and a part of it is devoted to the traffic regulations and the use of motor cars in the city. The commissioner goes back into history and recites that the first instance of a prosecution of a motorist occurred 11 years ago when a man was convicted for driving without a permit in a public park. Since that time the prosecutions have increased to such an extent that the total for 1912 was 2170, showing an increase of 271 over 1911. Commenting upon accidents, the first report of which was made in 1900, the commissioner says:

"After long and careful personal observation, the daily study of complete official reports of accidents and prosecutions, and an extensive experience with complaints by and against owners and drivers of automobiles, I have formed opinions which I express as follows:

"The leap in four years, from six killed and 127 injured in Boston in 1908 to 22 killed and 483 injured in 1912 cannot nearly be accounted for by the increased use of motor vehicles, large though that increase has been.

"I believe that the principal cause of the growth of the list of killed and injured is the increase in the average speed of motor vehicles. To the same cause may be charged an enormous amount of anxiety, inconvenience and delay suffered by the walking public.

"In the past five years the police of Boston have made more than 10,000 prosecutions under the automobile laws. No one can say that they have been without effect. Doubtless they have placed some restraint not only upon the persons prosecuted, but upon many owners and drivers of automobiles who have never been before the courts. But to say that they have secured a general obedience to the law, or even obedience in a reasonable degree, would be to say what everyhody knows to be not true.

"The small fines imposed by the lower courts are paid, or the cases on appeal disappear in the mass of business with which the Superior Court is required to deal."

The American Motors Company, Indianapolis, Ind., has formally entered two American cars in the Indiana Automobile Manufacturers' Association tour from Indianapolis to San Francisco.

Two new entries have been received for the Speedway race at Indianapolis on Memorial Day—a Nyberg and a Keeton. The Nyberg will have 389 cubic inches piston displacement and will be driven by Harry Endicott. The Keeton car will be driven by Bob Buman, who is going to reduce the weight of the chassis to 1,600 pounds for the contest.

One of the principal items in the coroner's report for 1912 showed that during this year in the horougbs of Manhattan and the Bronx, New York City, there were a total of 2,712 deaths hy violence. Out of this number 146 were killed by automobiles. The coroner's office has represented strongly to the legislative authorities the necessity for stricter automobile laws, in the belief that a large percentage of the deaths were preventable. Fifty-one people, a woman among them, were arraigned for deaths by automobiles. Of these, four were held for tbe grand jury.

Col. E. F. Glenn, of Twenty-third Infantry, stationed at Fort Benjamin Harrison, has completed his plans for transporting that regiment from its station to the Pacific coast and back again, using motor trucks in the transportation. Each truck could carry eighteen men with their baggage and equipment. Additional trucks would be used for transporting oil, gasoline, extra tires, parts, etc.

Guatemala Has 200 Cars

All Are Owned in Guatemala City as Roads Throughout the Country Are Exceedingly Poor

None Were in the Country 4 Years Ago—Streets and Roads of Capital Are Good

GUATEMALA City, capital of the Republic of Guatemala, has 200 automobiles, but aside from those owned in the capital there are not five in the whole country. The reason is that the only roads serviceable for automobile use are those in and radiating from the city.

There are two taxicab systems in operation, using about ninety cars, and the remainder are privately owned. Taxicab rates are $50 an hour, which is quite reasonable when the rate of exchange, eighteen to one, is considered. There are two public garages where a majority of the cars are stored although several private owners have garages of their own.

German, French and a few American automobiles constitute the motor equipment of the city. The roads are very good, where they are good at all, and the use of the automobile is growing steadily. In fact there were no automobiles in Guatemala 4 years ago, and the present number really represents the growth of but 3 years.

Price of Gasoline Is Very High

The customs duties on cars and parts are 20 cents per kilogram (2 1-5 pounds). This tax is divided half and half between gold and Guatemalan currency, which makes the duty about 10.5 cents per kilogram. Thus on an automobile weighing 4,000 pounds, the duty would be about $190. But gasoline is very high, not only on account of the long transportation required, but because of the heavy duty imposed. The Guatemalan government exacts a tax of 5 cents per kilogram, half in gold, which amounts to about 5.8 cents per gallon, a trifle more in fact. This makes the wholesale price of gasoline about 32 cents, gold.

Treibel & Company, founded by an Americanized German, was the pioneer in the field and today represents five or six American factories and a foreign car or two. This house is in general merchandising.

La Perla, said to be the largest jewelry house south of the United States handles a number of foreign makes.

So far, the business in Guatemala City is too small to warrant exclusive automobile agencies. The city has a population of 110,000 and the people generally are prosperous and able to afford cars.

William C. Smith, Guatemala City, in speaking of the present disadvantages of American business men in trading with Guatemala and other Latin-American countries as compared with the favor of Germany, France and England, said:

"Careless packing, curtness in business communications and an all around disregard for the wishes and customs of Latin-America, are the chief elements that stand against the growth of American business in Guatemala and elsewhere in Central and South America.

"In the matter of packing, there is excellent reason why the Guatemalans want it done in a certain way. Take for instance, a shipment of general supplies for a plantation located in the foothills away from the railroad which spans the continent between Porto Barrios and San Jose. We will assume that the shipment weighs 10,000 pounds. If it has to be transported by mule back, it is necessary to have the parcels limited to 200 pounds each. Just before I left down there, such a shipment was received by a planter. He had ordered it from the United States and had specifically instructed the shippers to divide the parcels so that they could be handled by mules. Instead, the whole consignment arrived in bulk.

"Now the result was that the consignee was obliged to ship the goods by rail to Guatemala City, repack them according to his ideas and trans-ship them to the railroad point from which the mule train made its start. As it affects the United States, I can say with certainty that never again will this particular good buyer purchase goods in this country.

"Not only were his specific instructions disregarded, but when he inquired why such action was taken, he was curtly informed by letter that the company making the shipment could not be bothered with such unusual procedure.

"I recall another case where a mirror for the chief hotel was ordered from San Francisco. Of course, it was insured in shipment, but on three occasions mirrors to fill that order were broken on account of the lack of care taken in packing. The customer finally became wearied and ordered his mirror from Germany, receiving it in perfect condition at the first trial.

"I have seen bolts of cloth into which nails were driven in packing, ruining 10 yards or more.

"The results of all these things, carried on over a period of years have led to German commercial supremacy. This is a bad thing from the viewpoint of the United States and also Guatemala, because the great coffee plantations which are the backbone of international commerce are owned by non-resident Germans in large proportion who simply maintain working forces on the plantations, doing all business at Hamburg. The coffee is grown and shipped down to the coast and supplies are shipped back. The pay-roll is prepared in Hamburg. Aside from the comparatively small return for labor, not a cent of the coffee money reaches Guatemala. Recently the government added 1 cent a pound to the export tax in an effort to get back a share of the profits.

"The climate of Guatemala is different from other low-lying tropical countries. Geographically the republic is divided by the main continental mountain range. On either coast there is a low belt of land which from Colombia to Corpus Cristi has been noted for its unhealthfulness.

"Yellow fever has been a periodic scourge for many years, until about 7 years ago when the last visitation occurred. After that time President Manuel Estrada Cabrera has succeeded in stamping it out. The United Fruit Company which controls millions of acres of agricultural land along the coasts followed the suggestions of the United States officers who had studied the question of febrile hygiene and concluding that the mosquito was at the bottom of the epidemic, screened the open water within its jurisdiction and took other means to suppress the growth of the mosquito and the result is to be seen in the fact that for 7 years there has been no yellow fever in Guatemala. In the capital the climate precludes the possibility of fever on account of the altitude and it has never been considered a danger, but on the coast there has been a very different story to tell.

"Through President Cabrera the whole situation has been changed and in my opinion the chances of any epidemic of yellow fever in the future are practically nothing."

Speaking of automobile possibilities, Mr. Smith said that the average citizen of Guatemala City is in better position to own an automobile than the citizen of New York, from the financial viewpoint.

Tomlinson Takes Over Invader Oil

The manufacture of Invader lubricants for automobiles, including cylinder oils, greases, etc., which has been in the hands of Charles F. Kellom & Company, Philadelphia, Pa., is now being taken over by the Invader Oil Company, 80 Broad street, New York. The company is incorporated with a capital of $250,000 under the laws of the state of New Jersey and its officers are as follows: Charles F. Kellom, president; T. E. Tomlinson, vice-president and general manager; H. Dunthorn, secretary and treasurer. Other men affiliated with the new company are: D. A. Scheu, A. A. Francesconi, Howard Plowman, Harvey Wilkins, E. Kalkhof, A. Rafelson and F. Menke.

T. E. Tomlinson, who is known as the original promoter and manufacturer of Havoline and Wolverine brands, and owns a controlling interest in the Invader concern, when interviewed by a represetative of THE AUTOMOBILE, stated that in addition to the Philadelphia factory, which will be continued, a new factory for the manufacture of automobile lubricants will be opened in New York City next week. The address of this factory will be 92 Pearl street, right in the heart of the oil trade district. The Invader company will manufacture products obtained from 100 per cent. Pennsylvania oil bases and nothing else.

Mr. Tomlinson was emphatic in stating that his interests in the Invader Oil Company are his only connections with this industry.

Electric Cranking and Lighting

Part III

Continuing the Electric Systems Now Used by Makers of Prominent Cars—The Widely Differing Practices of These Makers Should Be Noted—Methods of Regulation Important

Subject Digest

¶ What system best meets the requirements of electric cranking and lighting? A study of those adopted by different car manufacturers reveals a widely varying difference of opinion. The use of the electric cranking motor is in its infancy, so experience in this field is limited.

¶ The watt consumption per revolution should be a decided factor in the situation where a purchaser starts often and does not run at a high enough speed to recharge the battery.

¶ The means of regulation of the current vary among the makers. There are so many of these means each claiming a small group of supporters that no definite trend towards a given method can be noted.

¶ Devices for protecting the cranking motor after the engine starts are of interest. The use of the overrunning clutch is very prominent for this.

¶ Where a motor generator is used many of the makers drive the generator at one speed and have an entirely different reduction betwen the engine and the generator when the latter starts to operate. The means for this change of gearing also vary widely, planetary gearing, eccentric gearing, etc., are used for this.

FOR the past two weeks THE AUTOMOBILE has published a review of the electric problem as it is presented to the automobile manufacturer and buyer. In the following pages the review of the principle systems which have been adopted by various makers and which have actually been installed on their cars, is continued. It has been pointed out in these reviews that electric systems may be made in three separate and distinct systems. The three-unit, the two-unit and the single-unit. The three-unit system is that in which the cranking motor, the electric generator and the ignition current generator or magneto are in separate units. The two-unit system is that in which any two of these devices are combined into a single unit. The single-unit system is that in which all three of the units are combined into one. When an electric motor and generator are combined into one, the resulting instrument is a motor-generator.

It is of interest to note in what manner the systems vary. The voltages range between the limits of 6 and 30. The one, two and three unit systems are all in favor and are used by several of the makers. Many prefer flywheel installations where the motor-generator becomes the flywheel, the rotating members performing the functions of a balance wheel. The different methods of mounting are of interest because they vary widely.

There is a spirit of unrest among the makers and they have not accepted as standard the starting and lighting system as it now stands. It is to be predicted that the next 6 months will see a wide change in the mounting of the electric starter and also a gradual adoption of one voltage. The use of 6-volt lamps and ignition seems to favor this voltage, but there are others who believe that the requirements of the electric motor act against a voltage as low as this.

Rushmore—Uses Three Units

The Rushmore is a three-unit system. To the lighting equipment which has been on the market for some time, a cranking motor has been added. The entire system operates at 6 volts. In the Rushmore system the amount of current supplied to the lamps and storage battery is kept constant by the utilization of a peculiar property of iron wire, when included in an electrical circuit, of greatly increasing its resistance when heated. This is clearly shown in Fig. 6, in which the upper curve represents the performance of an iron wire resistance and the lower that of German silver or other material whose resistance does not vary with temperature. It will be seen that in the former the resistance is practically constant up to a certain point, allowing the current in amperes to be proportional to the pressure or voltage applied. At this critical point, however, which corresponds to a dull red heat in the wire, the resistance suddenly increases enormously as shown by the sharp upward trend of the curve. A very largely increased voltage is then required to force a single additional ampere through the wire. This form of resistance thus provides a simple means of maintaining a constant current so long as the voltage is not below that required to heat the wire to the "critical" point.

The Rushmore generator is of the ironclad bi-pole type, as shown in Fig. 3. The field ring is a plain cylindrical tube of electrically welded steel, inside which are bolted the two steel pole pieces. These pole pieces are simply sections cut from a steel bar cold drawn to exact shape and require no finishing. The field coils are of flat copper wire, wound in formers and afterwards bent so as to fit snugly the interior of the field ring. Each coil consists of two windings, the first being the field coil proper and the second, consisting of a number of turns wound on top of the first, forming an auxiliary coil, which operates in opposition to the main field coil. The armature is of the ordinary slotted type running on ball bearings fitted in the brass end castings, one of which also carries the two carbon brushes. Two lugs are provided when it is desired to bolt the machine to a flat surface, but these are removable so that a strap fastening may be employed such as is used in magneto fixture. This latter method

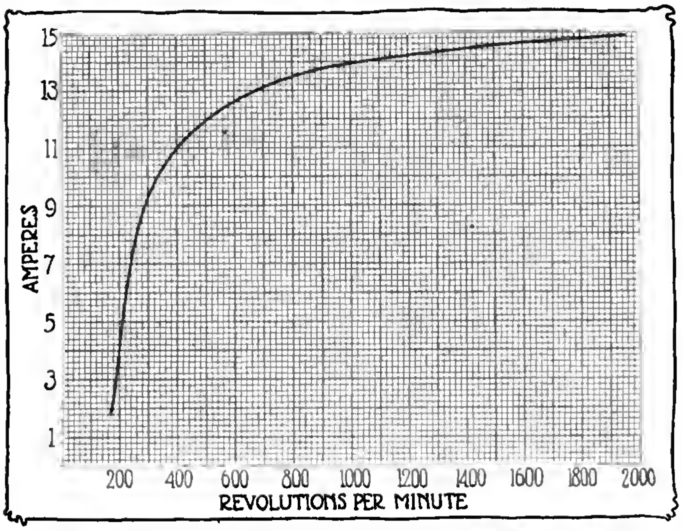


Fig. 1—Curve of output of Rushmore dynamo at various armature speeds

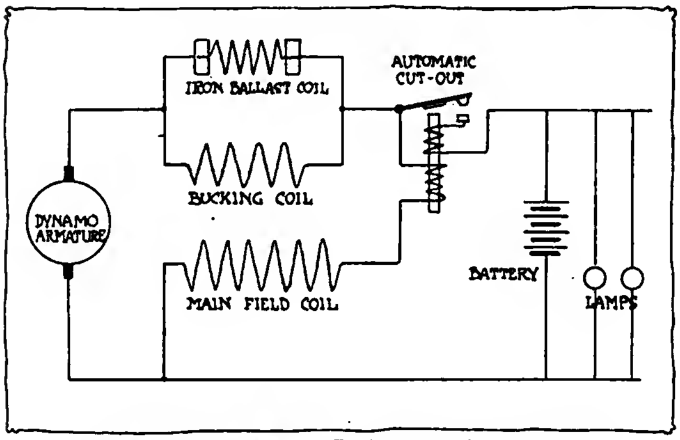


Fig. 2—Wiring diagram Rushmore lighting system

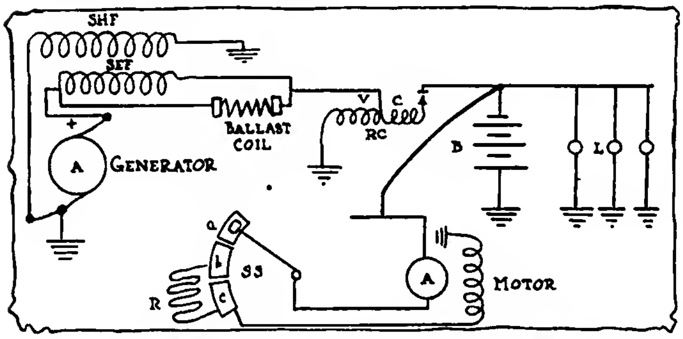


Fig. 3—Wiring diagram of Rushmore system with electric motor

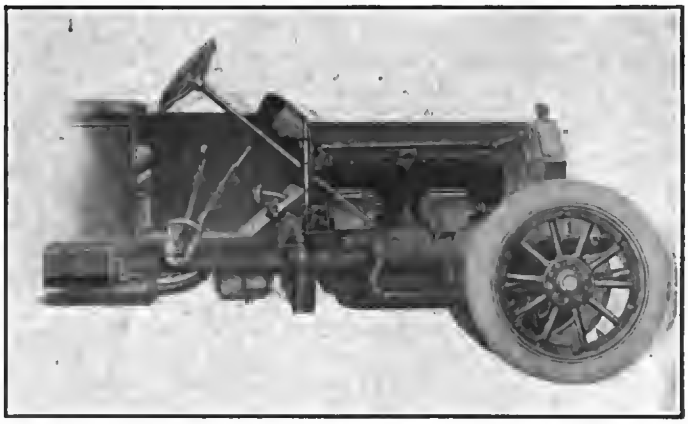


Fig. 4—Example of a Disco starting and lighting installation

requires a cradle type of bracket to fit the curvature of the magnet casing.

A small rectangular box fixed to the top of the casing contains an automatic cut-out, the purpose of which is to connect the generator to the battery when proper speed is reached, and disconnect it when the generator voltage falls below that of the battery. It consists of a double wound coil surrounding a short iron core, above which is pivoted a small iron armature. When this latter is attracted against the action of a spring, by means of current flowing in the coil, two switch contacts of silver are brought together completing the circuit from the generator to the battery. This cut-out, together with the iron resistance, mentioned above are the only regulating devices used. The latter is mounted on a small switchboard located on the dash and containing also the lighting switch and a fuse for the field coils. Owing to the heat generated in the iron wire and the necessity of allowing it to dissipate readily the wire is wound on a star-shaped insulator of a special asbestos compound, and surrounded by a ventilated cover permitting free circulation of air about the wire.

The technical term applied to this resistance is that of a "ballast coil." Its function may be seen by reference to the diagram of wiring Fig. 2. The ballast coil is shunted across the differentially wound coils on the field magnets. In other words, any current passing from the upper dynamo brush has two paths open, one through the ballast coil and the other through the secondary field winding. This latter is called a "bucking" coil. When the generator is running slowly the current flowing from the brushes is not sufficient to heat the ballast coil, which therefore provides an easy path, practically short-circuiting the bucking coils, and allowing the main field winding to fully magnetize the field magnets. The dynamo is now running as a simple shunt machine and its output increases with the speed, until sufficient current is generated to energize the fine winding of the automatic cut-out. This device is set to operate at a dynamo speed of 300 to 400 revolutions per minute, when the dynamo is furnishing current at about 7 1-2 volts. The current is now flowing through the series winding of the cut-out and thence to the battery and lights, furnishing the current necessary to light the lamps and also keep the battery fully charged. If the motor is raced the high voltage of the current generated raises the temperature of the iron ballast wire and so forces a quantity of current around the bucking coil, thereby reducing the magnetizing power of the main field, with a lowered output as a result. This output is practically constant. Its exact nature can be seen in the curve of Fig. 1, which has been taken from the Rushmore No. 2 generator.

When the car stops or is slowed down so that the generator is not supplying a sufficiently high voltage to overcome that of the charged battery the current from the latter passes in a reverse direction through the series coil of the automatic cut-out, releasing its armature and so disconnecting the generator from the main line. The lamps are then supplied from the battery alone.

The switchlock, intended for location on the dash, contains, besides the main switch, the iron resistance unit, a small fuse for protection of the field coils, and all the terminals necessary for wiring up to the lamps.

An incidental but important feature of this generator is its complete freedom from sparking at the brushes. This is of great practical importance, since a dynamo otherwise satisfactory, if it sparks, must have frequent attention to clean and occasionally sandpaper or true up the commutator, a job for which the average owner has neither the skill nor inclination. The exact reason for this absence of sparking is a little obscure, though the fact has been fully demonstrated. It appears to be connected with the location of the bucking coils which evidently have the effect of neutralizing the slight excitation which would otherwise arise in the coils short-circuited by the brushes.

Rushmore generators are supplied in two sizes, the smaller, No. 1, being 5.5 inches diameter by 8 inches long and weighing 23 pounds. Its capacity is 12 to 16 amperes at 6.5 volts. No. 2

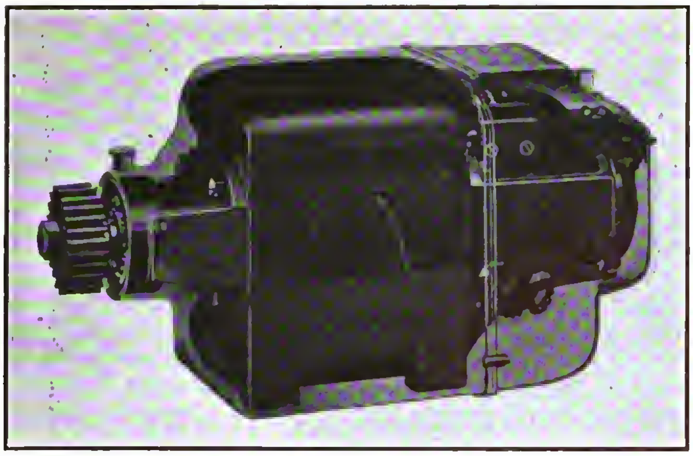


Fig. 5—View of Disco generator, showing armature and commutator

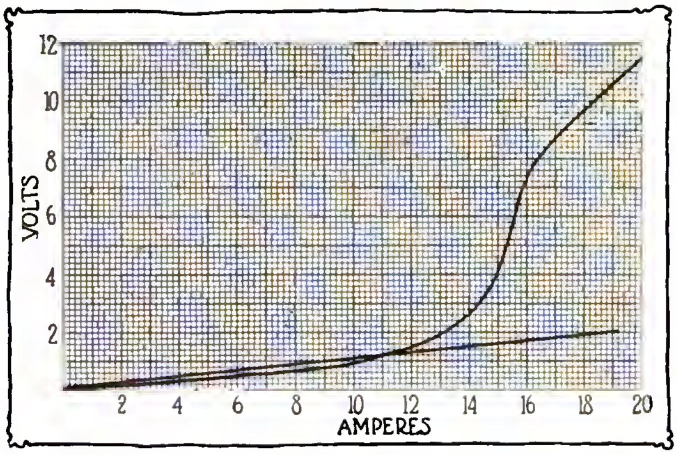


Fig. 6—Showing sharp rise of resistance of iron wire as compared to German silver

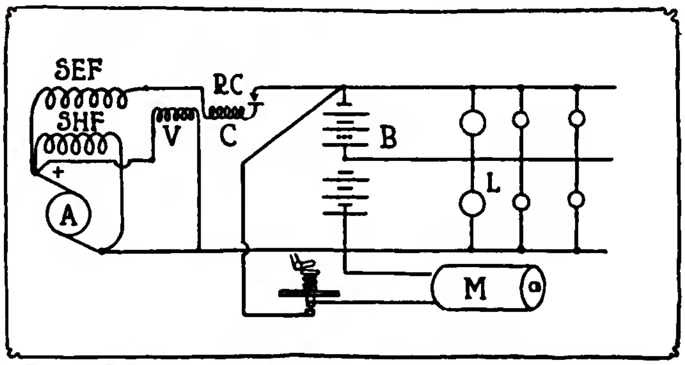


Fig. 7—Disco wiring diagram, showing series and shunt fields

dynamo measures 6 inches diameter by 10 inches long and supplies 15 to 18 amperes at the same voltage.

The cranking motor operates directly on the flywheel without intermediate gears. A pinion keyed rigidly to the end of the armature shaft meshes with a gear on the rim of the flywheel. The pinion is normally out of engagement. The pinion is engaged when it is desired to crank the engine and becomes automatically disengaged when the engine picks up and runs under its own power. There is no mechanism in the cranking part of the system outside the simple series motor and the starting switch. The armature is held normally out of line with the pole pieces by a coil spring acting against the armature shaft. The second point on the starting switch causes the fields to become energized sufficiently to draw the armature into line against the pressure of the spring. The next point on the switch the motor starts to rotate slowly, making it mesh firmly with the flywheel. The fourth point on the switch allows the motor to rotate at full speed.

When the engine starts the counter electromotive force or the electric flow in the opposite direction to that passing through the motor, neutralizes the fields and the result is that the coil spring forces the pinion out of engagement with the gear on the flywheel and the cranking motor comes to rest.

To further describe the motor it may be stated that it is of the iron clad type with a steel shell 7 inches in diameter, and four drawn steel poles on which the field coils are slipped after being wound on forms. Several hundred meters will be drawn on the jump in this system, owing to the small voltage used. Large cables and absolutely tight connections are necessary in order to reduce voltage drop through these connections.

Disco—Three Separate Units

The Disco electric lighting, electric cranking and ignition system is in three units. It consists of separate electric generator, separate motor and an optional make of ignition, the mounting of which units in connection with an engine may be made to conform with the dictates of the engineers on whose design they are placed.

The Disco electric generator and cranking motor work at 12 volts and are the same size, the aluminum cases being interchangeable for either unit. The windings are, of course, different, the motor being series and the generator compound wound. These instruments are made in two sizes, known as models 3-E and 5-E, the latter being the smaller for smaller engines. The total weight of the generator and motor of model 3-E is 70 pounds, while 5-E weighs 50 pounds.

The system may be used in connection with any storage battery equipment desired, provided it is of sufficient capacity to do the work.

The electric generator begins to generate energy which it sends to the storage battery when the speed of the engine has reached a speed corresponding to about 7 miles an hour of the car when running on direct. Below this speed of the engine the automatic cut-out switch does not operate to make connection between storage battery and generator, thus preventing the storage battery from discharging back through the generator when the engine is running idle or at very low speed. At car speeds above 25 miles an hour the generator is again automatically cut out, the charging curve being therefore between the limits of 7 and 25 miles. It reaches its highest point at about 15 miles an hour. This charging range may be varied, however. Below 7 miles an hour, and when engine is not running, lighting current comes from the storage battery.

The electric motor may be so placed as to drive through the flywheel by means of teeth cut in the periphery of the latter with which the teeth of a pinion mounted on the motor armature shaft mesh. Or the motor may be so mounted to drive through the timing gears or special gears at the front end of the engine. The preferred mounting, however, is the placing of the electric motor and generator on opposite sides of the engine and at the forward end so that they are driven, or drive, as the case may be, through some sort of connection with the front gears.

When mounted in connection with the timing gears, the Disco electric motor drives through a roller clutch which cuts out as soon as the engine starts. When the driver makes electrical connection between the electric motor and the storage battery through a switch it causes the cranking motor to operate, revolving the crankshaft until the engine takes up its own cycle. As soon as this happens a roller clutch automatically breaks the driving connection between the electrical unit and the engine, and providing the operator has released the switch, the electric cranking apparatus comes to rest.

The amperage required for starting depends upon the installation, upon the stiffness of the engine and upon the compression pressure. It is therefore difficult to give any definite figure for this. It has been found, however, that 60 amperes are required to turn over a Haynes 4 1-2 by 5 1-2-inch engine at 120 revolutions per minute. Another engine of larger dimensions—4 7-8 by 6 inches—drew 90 amperes for starting. These pressures are

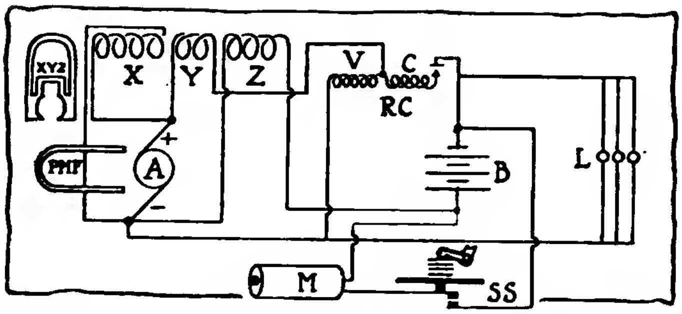


Fig. 8—Wiring diagram of the Esterline cranking and lighting system

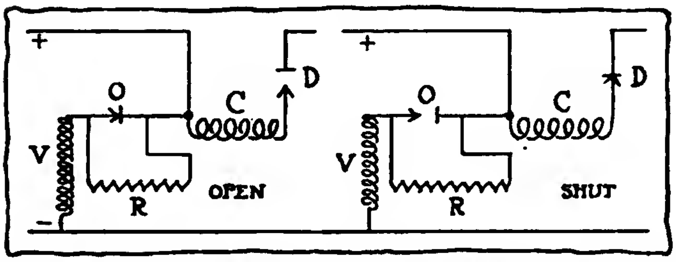


Fig. 9—Esterline reverse current cutout diagram, showing how the current is automatically interrupted when flowing in a reverse direction

only momentary, however, lowering immediately the moving parts of the engine are got under way. No compression release is used in connection with the cranking apparatus, it being so designed for each installation that it will work against full compression. The lamps are wired on the three-wire system and operate at 6 volts.

The reduction ratio between electric motor and engine depends upon the installation, but in the average case about twenty to one would be used. With this gearing an average four-cylinder motor should be cranked at about 150 revolutions per minute, while in the most extreme case the electric motor would turn the crankshaft at about 114 revolutions per minute.

If specially desired, the Disco system may be made to combine ignition along with its other electrical functions. In this case the electric ignition current comes direct from the storage battery. A coil is used, it being a low-tension arrangement. The ignition part, it will be seen, has only the storage battery in common with the rest of the apparatus.

Esterline—Made in Three Sizes

The Esterline is a three-unit system, having the generator, electric motor and magneto as entirely separate units. The electric motor is geared to the flywheel in the typical layout by means of a pinion on a roller clutch. When the speed of the gasoline engine equals or exceeds 100 revolutions per minute the roller clutch comes into action and the electric motor is disconnected from the engine. The generator is preferably driven by gearing or silent chains and is made in three sizes, differing only in the speed in which they operate. The largest machine operates at 1.5 crankshaft speed, the next size at double the crankshaft speed and the next size at 2.5 crankshaft speed. The entire system operates at 6 volts using a three-cell storage battery.

A simple series-wound motor is used. With this type of winding the turning moment, or torque, of the electric motor increases with the load, this being a condition which is rendered necessary by the function of cranking the engine.

The generators made by the Esterline company are built under the Berdon patents. The electro-magnetic field, which is combined with the permanent magnet field, has a shunt and differential windings, X, Y, Z.

The amount of current drawn by the starting motor in turning over an engine will depend altogether upon the size of that engine, the amount of compression, the temperature of the atmosphere and the rate at which it is revolved. Taking a four-cylinder motor of average dimensions the ammeter will register 160 initial starting current with a running current of 115 amperes. On a six-cylinder engine having a bore of 4.5 inches and a stroke of 7 inches the initial starting current was about 250 amperes and the running current 140. A compression release is not necessary with any starter. Two gear ratios between the motor and the engine flywheel can be furnished. One is sixteen to one and the other thirty-two to one, both being with herring-bone gears for silence.

The storage battery usually furnished by the Esterline system has a capacity of 120 ampere-hours at a discharge rate of 10 amperes. The length of time a motor may be spun by this battery depends, of course, on the power required to revolve the engine and the temperature conditions. On a medium-sized four-cylinder motor at about 65 degrees Fahrenheit the gasoline engine can be spun 45 minutes to an hour and a half. On the large six-cylinder motors the time is reduced to 30 or 45 minutes. The operation of the starter consists of pressing a foot button on the dash, which shifts the starting gears and closes the starting switch. The switch is of the laminated copper type, having a large conducting area.

Remy—Makes Any Type Desired

Remy makes any desired type. In the main the line consists of three interchangeable systems, a three-unit, two-unit and single-unit being produced. All these systems work at 6 volts and are interchangeable in that respect. The method used in mounting the various units in the Remy system is left to a large extent to the automobile manufacturer, and a special installation is used to suit each particular case. The generator is shunt wound and has the third brush regulation, which is common in lighting work. The generator is made in two styles, one including the combination timer and distributer for ignition purposes; the other without. Where magneto ignition is not desired the first type can be used, while with the magneto the ignition attachment will not be necessary. The generator starts to charge the battery at an armature speed of 200 revolutions per minute. Between 200 and 1,100 revolutions per minute where a maximum amperage is attained the charging rate is almost constant. Above this point the charging rate drops off. With the third brush regulation, in which advantage is taken of the distortion of the magnetic field at high speeds, the voltage is kept practically constant throughout the operating range. A reverse current cut-out prevents the battery from discharging through the generator when the car is at rest.

The cranking motor is simple series wound, whether it is single unit or incorporated in the two armature motor-generator. The installation of the cranking motor depends entirely on the engine to which it is supposed to be attached, but as a rule the motion is transmitted through reduction gearing in connection with a roller clutch. The cranking motor is meshed with the gearing when the starting switch is first thrown in, and then, upon the full application of the switch, cranks the motor. Battery used with this system is optional with the manufacturer, who may go as far as he likes in the matter of weight. One feature of protection which is unique on this system is the fuse, which takes care of the generator. Should the wires from the battery be severed the excess voltage would not burn out any part of the circuit except the fuse.

Auto-Lite—A 6-Volt System

The Auto-Lite is a three-unit system, the cranking motor, generator and magneto each being a separate and distinct unit. The system works at 6 volts, the motor, generator and magneto each operating at a current of this potential.

In the average installation the generator is driven from the crankshaft by a silent chain; the gear reduction between the generator and the crankshaft of the engine is two and one-half to one. The principal dimensions of the generator are as follows:

Generator base height	2.125	inches
Generator width	4.5	inches
Generator length	10.5	inches

The output is regulated by means of a slipping clutch and centrifugal governor. In this clutch the operation is entirely automatic. The weights fly apart and in doing so decrease the pressure between the frictional surfaces and allow one to slip over the other, thus decreasing the speed of the drive. This arrangement prevents the output of the generator from rising to a point where it would harm the storage battery.

In order that the battery cannot discharge back through the generator when the car is standing idle, a reverse current cut-out is used. This is of the magnetic type and is controlled by a voltage coil only. When the voltage of the generator falls below that of the storage battery the circuit is automatically broken by a spring which pulls the relay armature away from the magnet as the current becomes weaker, thus breaking the line between battery and generator. The operation of this type of reverse current output was explained in last week's issue and in this connection the hydraulic parallel drawn between the entire system and the lighting and starting system should be studied. The reverse current cut-out was compared to a ball check. In the Auto-Lite system it is housed between the magnets of the generator.

The cranking motor weighs 33 pounds. It is series wound and runs at from twenty-five to thirty-five times the crankshaft speed. The reduction gearing may be by spur gears, silent chain or worm or a combination of two or more. A roller clutch is used to disconnect the starter and its train of gears when it is not in use. After the engine has been cranked the control switch is thrown off and allows the electric cranking motor to come to rest until again needed.

Generally a 6-volt, 120-ampere-hour storage battery is used with this system. On two installations, an Abbott and a Jackson, where the motors were 5.5 and 5.25 inches respectively in stroke and 4.5 inches bore each, the starting motor turned the Abbott at a rate of 80 revolutions per minute and the Jackson at 88 revolutions per minute at gear reductions of thirty-five to one and thirty-three to one respectively.

Entz—Employs Motor-Generator

The Entz cranking and lighting system employs a motor-generator and is hence in the two-unit class. The motor-generator is mounted on the side of the gasoline motor and in one of the most prominent installations of this system is connected directly to the crankshaft of the motor by a silent-chain drive. The motor-generator is constantly rotating. The winding on the armature is such that at car speeds below 10 miles per hour on high gear it acts as a motor and is helping to propel the vehicle. Above this speed it acts as a generator and charges the storage battery, which is so designed that it cannot be injured by an overcharge, the decomposition of the electrolyte being the only result of a long-continued overcharge. The system operates at 18 volts and takes care of the lights as well as the starting apparatus in the customary way. The reduction between the electric starting motor and the gasoline engine is, in the customary installations, 3 to 1 on a 4 by 4-inch six-cylinder motor, and 2.6 to 1 on smaller motors. No compression release is used on this starter. In the early day of the electric starter this was more or less of a necessity with many of the systems, but it may be stated that through the gamut of starters now on the market which rely on electricity for their motive power there are none which require a compression release. To operate the starter a knife switch with a large handle located on the dash is pushed down. This connects the battery to the motor-generator which at this time acts in the capacity of an electric motor and turns over the gasoline engine at a speed of about 80 revolutions per minute. This is sufficient speed to allow the motor to be started on the magneto. The switch is then left down. When the speed of the gasoline motor becomes higher than necessary to drive the car at the rate of 10 miles an hour on high speed the motor-generator begins to fill the office of a generator and supplies current to restore that drawn from the storage battery for the purpose of starting the gasoline motor or for restoring the current used by the lights when the car is standing idle or when running slowly. In mid-position the generator is disconnected.

Deaco—Adds Motor to Lighting System

The three-unit system which has been added to the Deaco line of automobile electrical apparatus is incorporated with the lighting system in so far as the storage battery, which is charged by a lighting generator, furnishes current to an electric motor when the latter is used for cranking the automobile engine. The combination system of starting and car lighting consists essentially of a motor, a generator, an automatic cut-out switch, a control switch, storage battery and lamps. The starting system proper takes in the storage battery, control switch and electric motor.

The electric motor is connected to the engine in one of two ways, one being through silent-chain connection with the crankshaft at the front of the motor and the other through gearing meshing with teeth cut in the flywheel face. In the first case the chain sprocket mounted on the crankshaft contains a floating clutch which automatically releases the driving connection between the electric motor and the crankshaft when the engine begins to run under its own power, allowing the starting apparatus to come to rest.

To operate the cranking system, the driver simply makes the electrical connection between the storage battery and the electric motor by closing the control switch. This sets the motor in operation, turning the crankshaft through the silent-chain connection. The floating clutch takes care of the apparatus once the engine starts. Then the control switch is thrown off, allowing the starting motor to come to rest.

In the application of the starting motor to the flywheel, a roller clutch is used, the gear of which engages with the flywheel teeth on the pressure of a pedal on the floor board of the car. After connecting the gearing, the electrical connection is made the same as in the other method of mounting, the working of the device being the same.

The motor is geared 18 to 1 to the engine in the silent-chain

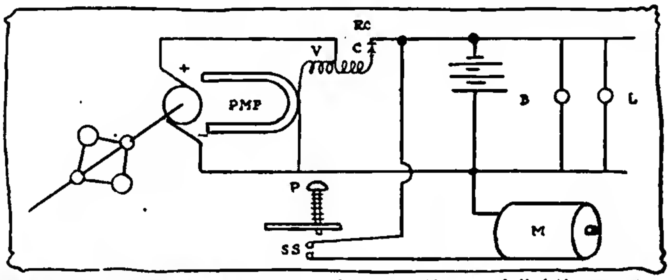


Fig. 10—Wiring diagram of Auto-Lite starting and lighting system

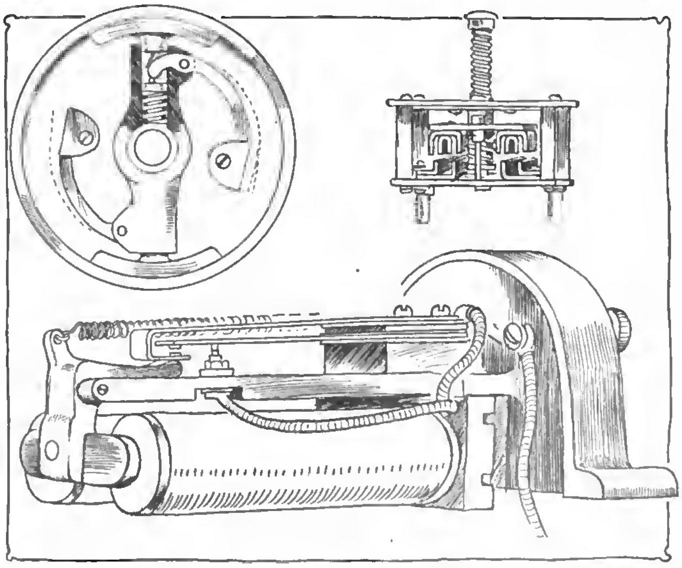


Fig. 11—The Auto-Lite control mechanism for regulating generator output

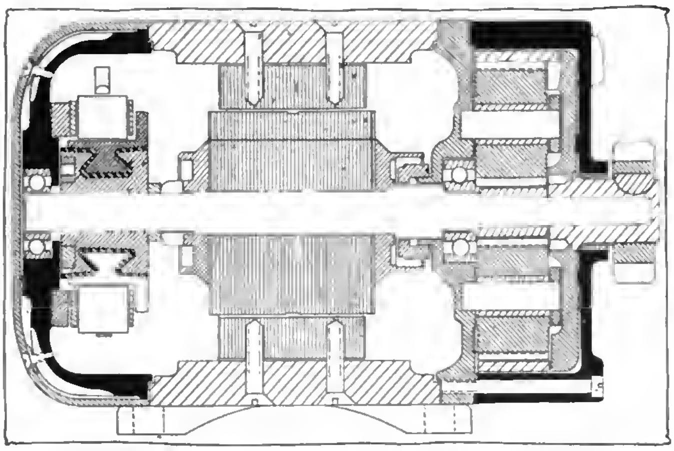


Fig 12—Section through the Deaco electric generator

arrangement, and will usually crank the engine when running at 1,500 revolutions per minute, which means an engine speed of about 85 revolutions per minute. The electric motor measures 10 inches in length by 6.75 inches in diameter.

The weight of the starting apparatus exclusive of battery is 60 pounds. The battery used is a Willard 6-volt and 120 ampere-hour type. It weighs about 69 pounds.

The starting motor draws from 150 to 200 amperes at 6 volts in starting an engine. This amperage is only momentary, for when the engine begins to get under way the high initial torque required to start the moving parts, due to their inertia, is overcome, and only 100 amperes are drawn to revolve the crankshaft until the engine picks up its own operation.

No compression release is necessary with the system. The motor and generator being mounted on opposite sides of the engine, they balance. A section through the center of the Deaco generator is given in Fig. 12. Note armature shaft mounting.

The automatic cut-out is installed in the circuit between the generator and the battery. It acts as a circuit-breaker to prevent the current which has been stored in the battery from discharging back through the generator when the engine is standing still. When the latter is started and the generator voltage is slightly greater than that of the battery, the cut-out established connection, allowing current to flow from the generator to the battery. But when the generator slows down so that its voltage drops below that of the battery, the circuit is automatically broken.

When the motor is not running so as to cause the generator to furnish current for the lights, the energy comes from the storage battery. But at high speeds the generator supplies the lights direct. At intermediate speeds when the current generated is not alone sufficient for the lights, the generator is assisted by the battery. This is all automatically regulated by the cut-out switch.

Adlake—A Three-Unit Type

The Adlake electric cranking and lighting system is made by the Adams & Westlake Company. It may be classed as one of the three-unit type as it consists of a generator and an independent motor. The ignition system is optional with the user.

The system is designed to operate at 6 volts both in starting and lighting. It has a new generator which is a simple, shunt-wound machine of large capacity with a two-pole laminated iron field. The older machine did not possess a laminated field. The latest machine carries its load at a slightly lower speed and yet weighs only 38 pounds instead of 48, as formerly. The generator is driven at engine speed and has capacity sufficient to carry the lighting load at about 325 revolutions per minute.

The system consists of a 6-volt generator, a three-cell, 6-volt storage battery, a field regulator and a series motor. The field regulator, the circuit breaker and the action of the headlight switch are the features of the system.

Regulation is obtained by varying the amount of resistance in the shunt-field circuit. As the current output increases resistance is added in the field circuit thereby cutting down the current therein and reducing the output of the machine. This is effected by the controller, Fig. 14. This consists of a wheel over which passes a flexible cable. To one end of the cable is attached a weight W to the other end a soft-iron cylinder S. To the wheel is fixed an arm with a brush V moving over the resistance contacts. When V is moved in a clockwise direction it adds resistance, thus cutting down the output of the generator. It is caused to move in this direction by the action of the electric current passing through the two coils a and b, which pull the soft-iron cylinder S downward. As the coils a and b are in series with the line they exert a pull which is always proportional to the output of the generator.

It will be noted that there are two coils. When the headlights are not burning both coils pull on the regulator and hold the output to 6 amperes, for example. When the headlights are turned on one of the coils is cut out. As the coils are the same size, this cutting out of one coil reduces the pulling power to one-half and as a result the generator practically delivers twice as many amperes as before or 12 as compared with that above.

What this variation in output means may be summed up as follows:

Output, Amperes	Lights	Charging rate, Amperes	
6	All out	6	Day running condition
6	Side and tail	1½	City running at night
12	All lamps	1½	Country running
12	Side and tail	7½	Winter work

The object as outlined in the first three conditions is to maintain a fairly low rate of charge when no lights are burning, as during the day. The second object is to maintain the same charging rate when the headlights are burning as when the side lights are lit. The last condition is that of driving in winter when the user of the car does little touring. He will therefore scarcely balance the demand for electricity caused by the longer hours of darkness which comes with the long winter evenings.

The circuit breaker in this system takes the place of the reverse current cut-out. It consists of two pairs of coils, one pair, the voltage coils, being permanently fixed, while the current coils are mounted upon an armature which closes the current switch. Their action is identical with that of any reverse current cut-out. The voltage coil first causes the closing of the relay. As soon as the current starts to flow through this relay from the generator to the battery the series coils of the relay are excited and help to keep the relay closed. On the other hand, as soon as the battery current starts to flow back through the relay to the generator, which happens when the motor is stopped. the series and voltage coils are repelled, thus opening the circuit and preventing the battery from discharging through the generator.

The Adlake starter consists of a cranking motor and suitable gearing to connect it with the flywheel. The reduction from motor to crankshaft is twenty to one. The starting motor weighs about 40 pounds and may be located wherever the automobile manufacturer desires to put it. It takes about 80 to 120 amperes when cranking a motor. this rate depending on the size of the motor to be cranked. Its application to some standard motors will be shown in a subsequent issue.

Elyria-Dean—Slow-Speed Generator

The Elyria-Dean system is of the three-unit type. The motor is arranged to be geared to the flywheel or some other suitable part of the gasoline engine, while the dynamo is operated at magneto speed and can be mounted in such a way that the magneto driving shaft can actuate it. The dynamo may. if desired, be made to take the place of the magneto by mounting a combination timer distributer on the end of the armature shaft. thus giving a two-unit system. The motor is only in operation when used for starting a gasoline engine. No gears or other portions of the starting equipment are in motion normally. The act of throwing the gears into mesh closes the battery switch so that the electric motor cranks the engine and as soon as the latter takes up its regular functions an overrunning clutch within the gearing disconnects the two elements. The releasing of the starting lever allows the gears and switch to return to normal. The dynamo is arranged to charge the storage battery at an armature speed of between 190 and 250 revolutions per minute, depending on whether a starter is applied or not. The system works at 6 volts, using a standard three-cell, 6-volt starting battery. Both the dynamo and the motor are wound for this voltage. The electric motor winding is of the simple-series type, while the dynamo has a differential compound winding. A differential coil regulates the charging rate at high speed.

The amount of current drawn for starting will depend entirely on the nature of the gasoline engine and the effort necessary to turn it over due to surrounding conditions. Under average conditions, however, with a motor of about 30 horsepower, the running amperage will be in the neighborhood of 80 when turning the motor over at 80 revolutions per minute. A compression release is not necessary for this type of starter. A battery of 120 ampere-hours capacity, figured on a discharge rate of 10 amperes, is recommended for the Elyria-Dean system. The gear ratio between the Elyria-Dean cranking motor and the gasoline motor is arranged to suit the power plant and varies between twenty to one and forty to one. On an average it may be stated that effective cranking speed can be maintained for over 20 minutes.

Characteristic Generator Curves

In general there are four types of generator characteristic curves. examples of which are shown here, Figs. 15 to 18. The first, that of the Ward Leonard generator; second, one which might be obtained either from the Westinghouse or the Esterline apparatus; third, that obtained from the Gray & Davis dynamo, and last, that which is produced by the Adlake system.

The first one has a very flat maximum out-put line due to the external regulation which prevents the amperes developed by the machine from exceeding this value. On the Ward Leonard machine this is accomplished by a relay outside of the generator which cuts resistance in and out of the field circuit.

The second sample is characteristic of all machines that have inherent or electrical regulation. Such machines always have a curve which rounds up nicely and does not have a knee as in the first curve shown. Having two out-puts, one with and the other without the lamps, is due to the special method of connecting up the windings on both the Esterline and Westinghouse systems.

Gray & Davis is so connected in the shunt field circuit that whenever the lights are turned on the output of the generator increases in proportion. Notice how the supply of current increases as the lights are turned on.

The same characteristics are found on the Adlake machine, a curve of which is here shown. The regulation here is accomplished by changing the connections when turning on the head lights, not by electricity, as in the case of the Westinghouse, Esterline and Gray & Davis systems.

The four types of generators which are here characterized by their output curves represent the different methods of regulation, namely, electromagnetic, Ward Leonard machine; inherent on the Esterline and Westinghouse machines; a centrifugal governor on the Gray & Davis machine and variable resistance on the Adlake.

(To be continued)

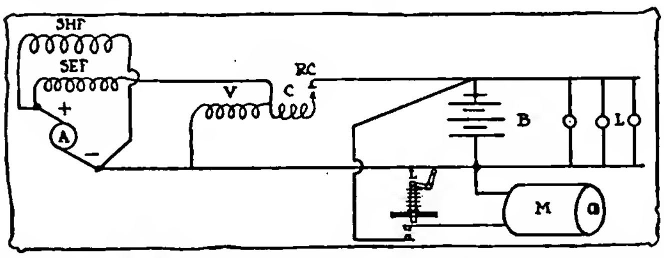


Fig. 13—Wiring diagram of Elyria-Dean starting and lighting system

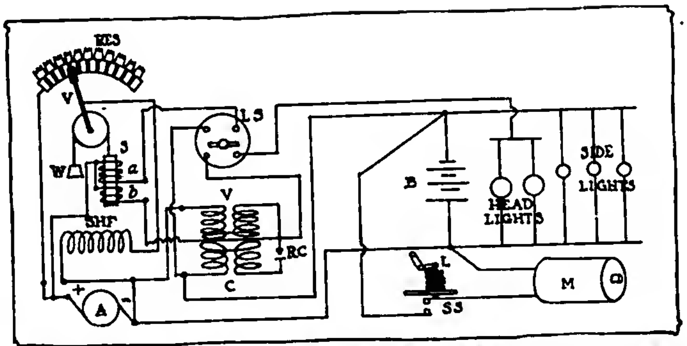


Fig. 14—Wiring diagram of Adlake starting and lighting system

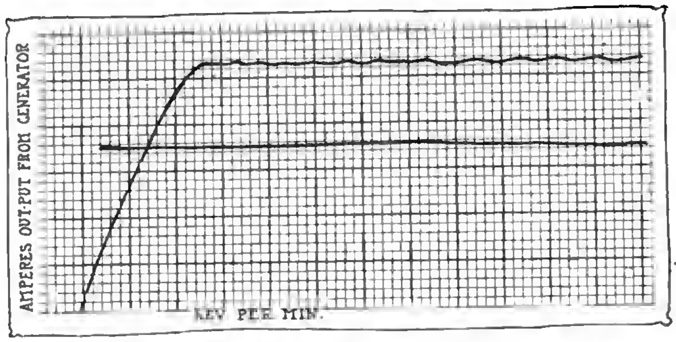


Fig. 15—Ward Leonard generator output curve. Note straight line maximum output characteristic

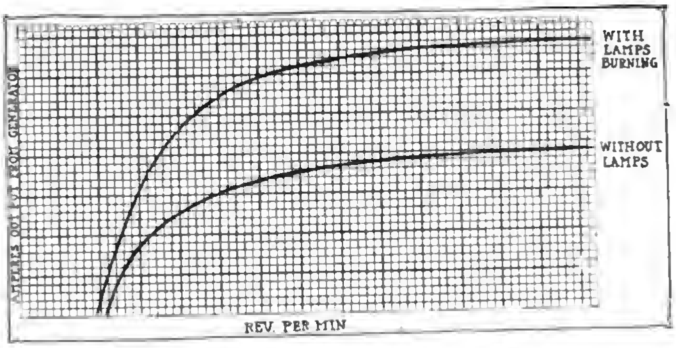


Fig. 16—Esterline output curves. Output increases in proportion to lamp load which is shown by the two curves

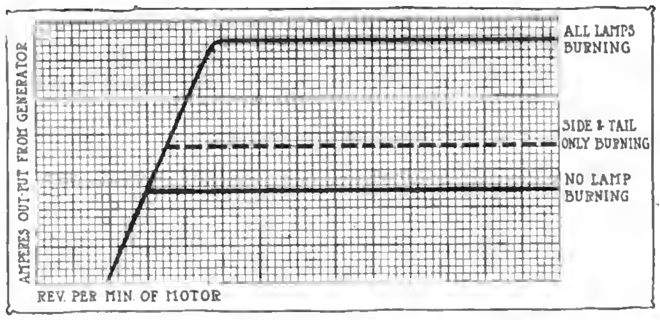


Fig. 17—Gray & Davis generator characteristic curve. Output depending on number of lamps burning

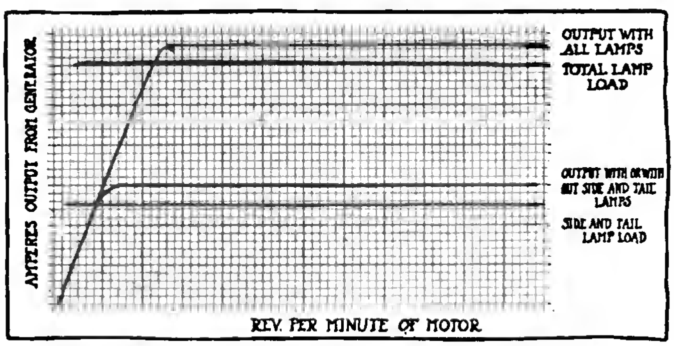


Fig. 18—Adlake output curves. Only when headlights are turned on output is increased

S. A. E. Papers Illustrate Progress

SIZING up the situation at the Winter Meeting of the Society of Automobile Engineers, the assembled members listened to the committee reports reproduced in last week's THE AUTOMOBILE, after which a number of special papers were submitted to them. During the commercial session of Thursday C. T. Myers, N. B. Pope, L. C. Freeman and B. B. Bachman read pertinent papers, followed by discussion, a gist of which appears below. Worm gears, truck motor starters and metal wheels were also discussed, although they were beyond the scope of the four papers. On Friday automobile motors and running gears were discussed after the reading of papers treating of various subjects. On Saturday the engineers heard papers on magneto couplings, the probable future of electric starting and lighting, the magneto and the six-cylinder motor.

ON Thursday, January 16, four articles dealing with freight automobiles, their design, equipment, handling and kindred phases of the subject were read. The first of these papers, dealing with truck performance, is reproduced below.

Comparative Data on Performance of Motor Trucks with Regard to Size of Motor and Gear Ratios

By Cornelius C. Myers

TWO years ago I was called upon to make a report of the gasoline motor trucks which were exhibited at the New York Show, for three concerns about to purchase nine trucks, varying in capacity from 2 to 5 tons. I was impressed by what I considered the large size of the motors installed to drive most of the trucks, and I tried to find out from several makers the points which governed their designers in the selection of the particular size and type of motor. I got almost no satisfaction, and was inclined to think that in some cases the size was an approximation somewhat on the order of the old rolling mill formula of "calculate it big enough and then multiply it by two."

Having done some little estimating myself on this point, I got together as much as I could of the data necessary for making a comparison of the rated motive power furnished with the various trucks, in relation to the duty to be performed. I compared these figures to see whether there was any uniformity, but found little to show that any particular rule had been followed. In scanning the details of the various trucks, however, I was not so surprised at this, for there was also evident in other features of design a considerable divergence from the ideal before the designer.

I think I can say without fear of contradiction **that all machine design is a compromise.** If you will admit this I think you will agree with me when I say that the design of our beloved motor truck is a compound of compromises. Large wheels mean easy riding, less power and more road clearance; but an increase in unsprung weight, higher body platforms and greater first cost. Large sprockets mean lighter, chain tension and less wear, but greater cost, less road clearance and in some cases lower efficiency. Inswept fronts of frames allow a shorter turning radius, but mean increased axle stresses and less room under the hood or floor-boards. Large motors afford power to overcome abnormally bad road conditions at high speed, but entail heavier construction and more dead weight, more expensive transmission systems, greater fuel consumption and tire expense, higher maintenance expense or depreciation charges, and greater manufacturing cost.

But in some cases it is hard to get absolute and authoritative data—and the motor truck design faces many such. In the absence of some of these facts we must proceed with caution toward a well-chosen ideal; certain standards must be assumed and experiments then carried on to check these standards and collect positive data.

Five Resistances to Overcome

I find but meager data on which to base the selection of motor sizes for trucks. This is the more regretable, in my opinion, because I believe that this point will have a very considerable bearing on the development and general expansion of the motor truck industry. At our meeting last summer Mr. Batzell presented a paper covering gasoline motor characteristics in a very thorough manner, and he advocated the adoption of motors much smaller than the average practice in motor trucks to-day. I will outline some of the conditions which must be considered in making the selection, and give the results of some work I have done along this line.

In order to operate a motor truck, its motor must be large enough to overcome a total resistance composed of five items.

(1) **The resistance due to the friction** in the component parts of the transmission system.

In chain-driven trucks this is generally based on an average efficiency of 70 per cent. This, I think, can be bettered now that the owners and drivers more fully appreciate the large returns to be netted by a little careful and regular attention to working parts; and now that designers understand the essential requirements of the transmission system in the way of proportion and suspension—the best compromise for those parts.

(2) **Wind resistance.** This is almost negligible except in the cases of high-speed delivery wagons and fire apparatus.

(3) **Acceleration.** This is generally covered if the motor can easily overcome the other items, and provided the gearbox is properly designed.

(4) **Grade resistance.** It goes almost without saying that the truck should be able to ascend light grades without shifting gears, unless the road resistance in Item five is unusually high. The truck, fully loaded, should be able to take grades up to 3 per cent. in high gear on good pavement.

Finding the Road Resistance

(5) **Road resistance.** This is the most important and complex item of the five. It will depend upon the total weight of the loaded machine, the character of the road surface, the diameter and width and compound of the tires, and the diameter and type of the wheel bearings.

In making comparisons with regard to motor size, I have used a formula which is a relative one, covering four-cylinder four-cycle motors, developing rated S. A. E. horsepower. This gives the tractive effort in ton of total weight on the tires for a transmission efficiency of 70 per cent.

$$E = \frac{23.52 \times d^2 \times s \times R}{D \times T}$$

E Tractive effort in lbs.	d Cylinder bore.
T Total weight in tons.	s Cylinder stroke.
D Diameter of driving tires.	R Gear reduction.

In the present state of the art of motor construction, I do not think it is unreasonable to expect a motor to develop 20 per cent. more torque at normal operating speeds than the equivalent of the S. A. E. rating. This may be questioned by some, but I know that better results are being obtained from several different makes of motors, and I see no reason why so important a machine as a motor truck should be burdened with an inefficient motor. On the contrary, I think it is very important that **only the most efficient and carefully designed motors should be considered fit for such service.** The constant in the formula then becomes 28.22, and if the result is divided by 2,000 we shall have the "tractive factor" of any particular truck and motor as a percentage of the total load on the tires. This "tractive factor" will denote the relative ability of a truck and its power plant to any other—provided, of course, that the motor is given an equal amount of power per cubic inch of cylinder displacement, and the transmission systems are equally efficient.

The following tractive factors are averages covering trucks of well-known manufacture as exhibited at the New York Show in 1911. They show what designers (or perhaps in some instances the sales department) considered good practice in 1910—the state of the art in that year:

1-ton	0.0864	3-ton	0.0700
2-ton	0.0730	5-ton	0.0616

Now let us figure, as well as we are able, the resistance to be overcome by a truck under average conditions. This resistance factor should be the measure of the power of the motor and equal to the tractive factor. In most of my calculations I have used the figures given by Mr. Churchward on page 9 of the S. A. E. Hand-book. Let us assume that with good tires the road resistance on hard, level asphalt is 20 tons, using this as a basis in the table that follows. If we divide this by 2,000 the resistance factor is .01 on this kind of road surface. Similarly, for the other six kinds of road surface there given we have:

Wood pavement	0.0115	Good dirt road	0.0110-0.0200
Level macadam	0.115 -0.0300	Ordinary country road (dirt)	0.0200
Plank road	0.009		
Cobble stones	0.0175	Sand	0.200

The French War Office has given much attention to the motor truck; in fact, the subsidies granted by the French Government through its War Office have had a very stimulating effect in increasing the average efficiency of the trucks made in that country and in promoting the sale of these trucks. Capitaine Renaud, the motor truck expert of the French War Office, gives the resistance factors as follows: City pavements—0.013-0.017, country roads—0.016-0.041. He uses a "tractive factor" = 0.041. Items (2), (4) and (5).

Grade resistance is readily reduced to an equivalent resistance factor by dividing the percentage by 100. Thus on a 3 per cent. grade it is 0.030.

I think the average resistance of a macadam road can be taken at 35 tons = a resistance factor of 0.0175, which, added to the grade, gives a total resistance factor of 0.0475. This is the measure of the power required of the motor when working under the conditions given above, and to which the "tractive factor" should be equal.

Referring now to the actual tractive factors of the 1911 show trucks. Under average level road conditions these motors would be operating at the following percentages of their S. A. E. load ratings: 21, 24, 24.8, 28.4. As against these figures the motor having a tractive factor of 0.0475 would be operating at 36.6 per cent. of full load; or, **the 1911 motors were respectively 75, 52, 48 and 28 per cent. larger than necessary.** If the greater part of the routes of a large majority of these trucks is over pavements having a lower resistance factor than 0.0175, the over-abundance of power is magnified, and by plotting these figures against the fuel consumption curve of the motor, the possible increase in gasoline mileage will be found to be very marked. Inasmuch as fuel now costs about 50 per cent. more than it did 2 years ago, and there are prospects of a further advance, this subject of fuel consumption must be seriously considered.

Motor Capacity Exceeds Load

Coming now to the trucks exhibited and offered for sale in 1912, the figures given below show some improvement, but it is not a very marked one.

Size	Percentage of aver. load on motor	Excess motor capacity	"Tractive factor"
1-ton •	22.1	66.0	0.0788
2-ton	26.3	39.0	0.0664
3-ton	28.8	27.0	0.0607
5-ton	28.9	26.5	0.0605

The averages were bettered to a large extent by the newcomers to the show; most of the manufacturers who exhibited the year before changed but little in their design in the respect we are considering.

While I do not claim that conditions in this country are the same as those in France, I think it will do no harm to set down here by way of comparison the "tractive factors" which French engineers have considered the best suited for economical truck operation. I give below comparative figures which to me are very interesting in the light of the results obtained in the matters of mileage per gallon of fuel and total tire mileage. These figures are averages of all but a few of the trucks which competed in the 1912 Trials conducted by the French War Office, and most of the trucks bear the names of firms celebrated throughout the world as masters in automobile construction:

Size	Percentage of aver. load on motor	Excess motor capacity	"Tractive factor"
2.5-ton	45.0	—19.0	0.390
3.5-ton	47.0	—22.0	0.0373
5.5-ton	48.0	—24.0	0.0356

These trucks will cover 11.7, 9.6 and 7.0 miles per gallon—performances certainly much better than those of our own trucks. It can hardly be claimed that these trucks lack power, either, for practically the same list of trucks entered the Russian War Office Trials, a short time after the French Trials, and all were accepted as eligible for army service in Russia, the Russian Government placing orders with every French firm which had a truck entered. From all reports, the trials were as gruelling as any which a motor truck ever entered.

As between the average "tractive factors" of the trucks in this country and those abroad, the figure I have given happens to stand about half way, although it was not arrived at by means of averages. Having assumed certain things as my standards, I made some experiments to check them, in accordance with the mode of procedure I mentioned early in this paper. These experiments confirmed, in a rather rough way, it is true, that my assumed tractive factor was on the safe side. The experiments were not confined to any one make of truck, or any one truck of a particular make. In some trucks substitutions of various parts were made for direct comparison. The trucks had all been in service from 1 to 4 years; all were of one type—double chains driven from a jackshaft—and in most cases they were handled by the owners' drivers. As examples I shall give the results of two tests.

Motors Too Large on Average

(1) A truck carrying 3,000 pounds, driven by a 3 by 4.5 four-cylinder motor, tractive factor 0.040. This truck repeatedly mounted a 2 3-4 per cent. grade over old, rough water-soaked, wood-block pavement, and mounted a 3 1-4 per cent. grade over a fair macadam pavement. The resistance factors overcome I estimated at not less than 0.0525 and 0.0300.

(2) A truck carrying 5.5 tons, driven by a 4.5 by 4.5 four-cylinder motor, tractive factor 0.0286. This truck mounted a 3 per cent. grade over a good brick pavement. Resistance factor estimated at 0.0400. With a greater gear reduction, gained by a change of jackshaft sprockets, so as to give a tractive factor of 0.0336, this truck mounted a 3.25 per cent. grade over a somewhat worn brick pavement. Resistance factor estimated at 0.0475.

Here are discrepancies due to the lack of positive data covering essential points in the problem. Either the efficiency of the transmission systems considerably exceeded 70 per cent. or the motors developed unusually heavy torques, or the road resistances were less than indicated. All my experiments, however, indicated that **motors of smaller average size than those now in use can be made to handle our trucks in a practical and economical manner, provided certain features are well carried** out in **design** and **construction.**

At our meeting last summer, Mr. David Fergusson, in discussing this subject, very rightly remarked in effect that the size of the motor must be chosen as the result of experience with a particular truck. Here, very likely, we may find the reason why some trucks have larger motors (in proportion) than others, and why a large majority of our trucks are burdened with so large a motor. Those particular trucks need the large motor, or their designers do not see how they can get along with a smaller one. The proper compromises have not been adopted or data is lacking to warrant them in risking the production of an underpowered car. That underpowered bogey of the pleasure car designer must be overpowered before it has a chance to give a most promising young industry a further setback. The surrounding conditions here are different and must be dealt with in the light of different ideals.

Calculating Resistance Factor

CORNELIUS T. MYERS, in summing up contents of his paper entitled "Comparative Data on Performance of Motor Trucks with Regard to Size of Motor and Gear Ratios" stated that the whole situation was in equating the resistance factor to the tractive factor at the point of ultimate attainment of the truck. The fact that his formula was made up of figures taken on the safer side is shown by the fact that where his tractive factor was calculated at .0286 with a motor measuring 4.5 inches mounting a .03 grade on a brick pavement with a resistance factor of .01 or a total resistance factor of .04.

He stated that his formula was assumed as to factors of tractive effort so as to reduce all motors on the same basis in the efficiency of transmission from motors to road wheels with double chain drive trucks, the only kind considered in the paper was 70 per cent., and added that at the same time he believed this assumed efficiency to be too low, but it was that generally taken in designing trucks of this type.

Foreign Tendency of Motor Truck Design

By Lowell C. Freeman

IT might as well be admitted in the beginning that the data presented in this paper do not justify the use of its comprehensive title, which was selected in sheer desperation after a futile search for one more expressive of the true character of the text. It is simply an attempt to set forth some of the details of design which are most interesting, together with some comments on their advantages and disadvantages, as they appeared to the writer in a recent trip abroad.

A composite picture of the predominant English motor trucks would show the motor under a hood in front of the seat as in conventional pleasure car practice; a cast-tank built-up radiator in front of the motor; right-hand drive; fixed spark magneto ignition; thermosyphon cooling; three-speed transmission; cast steel plain-bearing wheels; rear springs taking both drive and torque; both brakes on rear wheels, and worm, pinion or chain final drive. No one particular make embodies all these features, but they represent the writer's impression of the English truck, crystallized from information obtained and observations made.

Solderless Radiators Successful

There seems to have been a nearly universal and simultaneous adoption of the cast-tank built-up type of radiator. The top and bottom tanks are made for the most part of aluminum, the top tank being in some cases ribbed to secure increased radiating surface. The radiator seems to have the following points in its favor: It has very few soldered joints as compared with the "tin case" type, as the Englishmen call it, and the joints are stressed very little or not at all, as any forces acting on the radiator are transmitted through the side bars to the comparatively rigid tanks, and as long as there is no movement of the bolted joints or deflection of the tanks and side bars, the soldered joints cannot be stressed except by the action of inertia forces set up by the core itself. The filler and inlet and outlet connections may all be cast on the tanks if desired, while the side bars may be designed easily for practically any form of support. Hood ledges may be cast on, thus doing away with the trouble caused by relative movement of the hood and radiator cutting the sheet metal ledge. The core may be of any type whatsoever, either cellular or vertical tube; the latter either with or without fins as the individual designer may prefer.

It would seem that cast iron could be substituted successfully for aluminum if the percentage of efficiency per pound of weight were not considered important. The weight and cost of an aluminum-cast-tank radiator should not exceed greatly that of the usual type of the same capacity and efficiency. The greatest advantage, however, would be to the user. The cores can be made strictly interchangeable if master spacers are used in assembling, and as the cost of the core, which is the only part ordinarily liable to damage through accident, will be about 50 per cent. of the total cost of the radiator, the user's repair bills due to accidents to this part of his car will be cut exactly in half.

The fact that an ordinary wooden block seems to make a sufficiently flexible support is eloquent testimony of either the strength of the radiators or the excellence of the roads in England.

Brake hand-levers are big two-handed affairs that look as though they were really to be used for braking and not merely as locks to hold the car when standing still. There seems to be a marked tendency to place both service and emergency brakes on the rear wheel hubs, which I believe was originally a purely American construction. All brakes noted were practically without exception of the internal-expanding type with metal-to-metal and lined shoes apparently in about equal favor. The brakes were in most cases cam-expanded and usually equalized, some of the mechanisms to accomplish this being very ingenious.

Plain Floating Bushings Favored

Plain floating wheel bushings seem to be perfectly satisfactory, with low first cost, non-adjustability and cheapness of replacement as big points in their favor. Some have hardened sleeves in both the wheel hub and on the axle, while on others the bushing rotates on the soft axle. There are several different methods of lubricating, all of which seem to work very well and apparently considerable variation in design is allowable without materially affecting the service obtained.

While cast steel wheels seem to give very good results under certain conditions, they do not appear to be a universal panacea for all wheel troubles. One user who has operated a great many trucks of many different makes said that cast steel wheels were all right until the tires

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FOLLOWING the reading of L. C. Freeman's paper, Slade discussed the need of more power in America on trucks than would be required in Europe and stated that at least 50 per cent. greater power of motors was required to carry a given load here than abroad on account of the difference in road conditions. Perkins, in comparing the widely varying conditions to be met in America with the more or less uniform requirements in Europe, stated that a motor which was suitable for one part of the country would be entirely inadequate to meet the requirements of another section. He suggested that motors of different sizes and horsepower be made with standard attachments to the chassis in order that these two motors would be interchangeable. It was also brought out that the motor truck was essentially the vehicle of good roads, and that where road conditions were poor the motor truck could not be made to pay. Also that the present motor is too large, for we do not need bigger motors here than in Europe, and, differing from Mr. Slade in this respect, Perkins prophesied that in a few years the motors will be the same size here as in Europe, and stated that commercial vehicles are run faster here than in Europe and much too fast for economical operation.

R. L. Morgan announced that the practice abroad was to keep motors as small as possible, that the underpowered truck, like the underpowered touring car, cannot attain great speed, but will stand up. B. B. Bachman stated that it was necessary to allow for average conditions in a motor designed to accommodate the demands of the truck buyer. In that respect it was necessary to have a motor which would have more power than necessary on good level roads, or small hills, and which would be somewhat underpowered on steep hills and very rough country. The heavy motor worked against this in that it meant heavier parts and hence actually required a higher power to carry it along. Mr. Bachman stated that he was a thorough believer in a small motor for commercial service, that economy was one of the most vital items, nad that was in direct relation to the motor size, that the big motors were more expensive in the fuel used per ton mile. This precipitated a general discussion in which it was brought out that possibly the reason for the employment of small motors in Europe was the question of economy, particularly since the cost of fuel over there was considerably greater than it is in America. It was also stated that the sale of trucks was restricted to a definite locality and that trucks could be built to meet definite conditions and be of less power than could those built to overcome such widely varying conditions of loads and grades as are met with in the localities where American trucks are marketed. It was declared that the power of motors obtained from Myers' formula would work in all parts of the country. In reference to this Myers stated that the relation of motors to truck size all goes back to the question of weight, that the question was to obtain pounds of effort per pound of weight, that by his formula all the various resistances, such as load resistance and so on encountered in service, could be reduced to a total tractive resistance.

Discussing Low-Grade Fuel Paper

The discussion of N. B. Pope's paper taking up the question of fuel for commercial vehicles brought out the fact that there were motors running on low-grade fuel. One was mentioned which has operated ever since it was manufactured on nothing but the low-grade fuel. This was also used by two concerns on the Pacific Coast which had never used anything else but the lower-grade fuel. While discussion was in progress on this paper, R. L. Morgan stated that he had observed a casting in which an electric coil was placed in a passage below the venturi and which permitted a start, with the low-grade fuel, 20 seconds after this coil had been thrown in.

Cornelius T. Myers, the author of the previous paper, had reduced his resistance factor to the figures shown in the discussion of the comparative data on Performance. He naturally worked on the basis that the tractive effort must equal the resistance or the truck would not be able to navigate. The discussion on this paper reflected back on Mr. Myers' treatise and brought out the fact that very few of the truck manufacturers, if any, had gone into the matter with a formula. Another point which was brought out was that the fuel consumption was of such importance that it was extremely necessary to cut the motor size to the utmost limit. The author of the paper, in speaking of this phase of the situation after having read the paper, stated: "The weight of the motor increases proportionately with its power. Therefore we have not only added power, which is necessary, but also an added weight, which renders it still more necessary to carry excess power." Several of the members present commented on the stand taken by the French and English war offices in subsidizing motor trucks. The fact that the English war office has only subsidized the bevel drive while the French war office refuses to subsidize the bevel drive was especially noted.

Comparing Pneumatic and Solid Tires

The last paper to be presented at the session was a discussion of truck tires by B. B. Bachman. The paper was entitled "Comparative Results with Solid and Pneumatic Tires on Light Commercial Vehicles." Bachman stated that his paper was a summary of results on one make of truck, 3,000 pounds capacity. Bachman stated that the comparative cost per mile with solid tires against pneumatic tires was 3 cents a mile for the solid and 5 cents per mile for the pneumatic. When the car maintenance action was considered it was found it was nearly 50 per cent. greater for the solid tire as compared with the pneumatic and that it was a 30 per cent. saving of gasoline in favor of the pneumatic-tired trucks. In fact, in all respects except tire maintenance the figures were in favor of the pneumatic.

Bachman completed his remarks by stating that the pneumatic tire for truck service has been given a black eye by most users on account of the very general under-tiring of trucks and excessively high speeds at which they are operated. In the discussion of this paper Mr. Myers suggested that the proper tire equipment and particularly the trouble with the pneumatic to date was a question of two things. First, that the tire pressure advance employed is not sufficient, that greater tire pressure is needed for the same size of tire in commercial vehicle service than is used for pleasure cars, and second, cost.

Tests on factory trucks showed an increase of tire cost with pneumatic but a lower maintenance cost. It was generally brought out as far as engine cost was concerned that the balance was in favor of the pneumatic tire on smaller trucks which were run at fairly high speeds. The vibration of the motor truck was stated to be its one weak point and in the lighter vehicles where the cost of pneumatic tires would not be beyond reason, they were in the long run more economical.

Slade inquired as to whether there were any cushion tires which were interchangeable with the present solid tires for motor trucks. This was wore thin. In this statement I think there is food for a great deal of thought. A built-up wheel of structural steel was giving him excellent service and almost no trouble.

The usual mounting of the chassis is on four semi-elliptic springs, although some cases of three-quarter fronts and semi-elliptic rears were noted. French designers seem to favor wider springs, the average being 25 per cent. wider than on the English cars of the same capacity.

The most interesting point is, however, that both torque and drive are taken through the rear springs, with evident success. There is possibly a little more trouble with the springs, but none at all with radius and torque rods and their attendant fittings. It has evidently been found that the maintenance cost of a Hotchkiss-drive truck is less than of one with radius or torque rods or both; the first cost is certainly less. This is the true test of the worth of a design—does it make the total cost of operation minimum? In the case of one truck noted it was a question as to how the torque was taken, as the long reinforced-wood radius rod flexed so much under load that the springs must have taken some of it.

Starters Progress Little Abroad

An interesting commentary on the favorable conditions for motor truck operation abroad is that a pleasure car chassis with a van body seems to make a perfectly good truck with a capacity of about one ton for retail delivery.

The opinion was advanced in some quarters that the three-wheeler is the solution of the problem of satisfactorily and economically replacing one horse with a motor vehicle. It is a question, though, whether it could be operated at a lower cost than a certain-priced American car, when "operated" is taken to mean the entire cost of the service.

In London there does not seem to be much attention paid to motor starters, and less still in Paris. In both cities traffic is about as hadly congested as could be imagined, and it would seem that if motor starters were worth while at all, such a condition would hasten their adoption. The answer probably is that more is lost than gained by their installation.

In regard to the final drive, there seems to be more unanimity of opinion than there is in the United States.

In England the worm has a shade the better of the argument at present, but is not gaining ground very rapidly; while in France, judging from the exhibits at the Paris show, it is not considered seriously. One of the advantages of the worm drive is, of course, quietness, but the pinion-drive Schneider buses in Paris are certainly as quiet as could be asked. Any one of the four types of final drive which are at the present time considered as possibilities, undoubtedly has certain points of superiority over any or all of the others, but is also subject to troubles which are peculiar to it and not found in the others.

Opinions Are Divided on Driving

Let us sum up the situation. When all the good and bad points of each are balanced, it will be found, everything considered, that no one of them is from the user's point of view so very much superior to the others. This was borne out by the things the writer saw in the different repair depots and garages which he visited and by the statements of the men with whom he talked. Each, of course, had formed his own opinion from experience with the various types, but the opinions and experiences were by no means uniform. Thus, of four different men interviewed, each of whom had had about the same amount of experience with the different types but under different conditions, one pronounced the chain drive to be still the most satisfactory; another was very enthusiastic about the worm; the third was best satisfied with the results he had obtained from the pinion drive; while the fourth was very strongly impressed with the possibilities of double reduction. So, while beyond question fairly good and consistent results can be obtained with any of the types, it seems that no one has yet heen developed to the point where it is all roses and no thorns, and that considerations other than those of a strictly engineering or technical nature will in the immediate future largely influence the choice of the type of final drive in new designs. Ultimately, of course, the design which will give the greatest number of users the maximum of service for the minimum cost will be the one to survive in the long run of operations.

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followed by a statement that shortly one company was to put out cushion tires which could replace the solid, and this statement by expressions of widely varying opinions as to the relative efficiency and economy of the cushion and filler tires versus the solid tires.

The discussion was then turned to the subject of worm gears. Henry Souther, who had made a study of this subject while on a recent trip abroad with the American engineers, stated that while the manufacturers were in agreement as to the specific composition of the worm gear they did agree that the best results were obtained from hardened steel against bronze, the steel being of course the worm member. In some cases he went on to state where the bronze was not of the proper composition it has been known to flow under the pressure of the worm, and that the bronze should resist peening. He also added that the worm gearing as a whole required very careful machining and is known to obtain satisfactory results, and that the only disadvantage of the straight worm over the hourglass type is the resistance load clearance provided when the worm is under the axle.

Mr. Burgess stated that worm drive had proven successful in Europe and that it was being developed here, that the issue could not be pushed, but the adoption of worm was a question of time. 'It must be given a chance to grow. Mr. Burgess stated his belief that a worm gear, contrary to present practice, would be employed most extensively on trucks. He stated that simplicity was an issue, and that for success a device must have the minimum number of bearings, but that so far as worm gears were compared it was only a matter of cutting the worm teeth correctly, and that they required the development of special machinery. At present the engineers have not as yet had time to develop this phase properly. He stated that the Hindley shape of tooth will make a successful worm, that the nearer you get to the flat tooth the better efficiency, better lubrication, longer wearing qualities and less heat will be obtained.

C. T. Myers said that it must be remembered that the commercial vehicle industry is not the same as the pleasure car field, that designers must not go too fast but must work for a simple design of vehicle. He stated that the worm was less simple than the chain drive and had the further disadvantage of increasing the nonspring weight on the rear axle. He concluded by saying that the new ideas are good and that engineers should sit down and think about them but go slowly in their adoption.

Mr. Buckwalter then made the remark in referring to the several references to different formulæ throughout the discussions of the evening that it was his belief to accomplish anything practical by the mere use of a formula. Mr. Alden in replying to this stated that a formula was necessary in order to make a start and that it would be nearly blind work to attempt to proceed without them. The discussion on starters for motors was then opened.

Morgan Argues Against Truck Starter

Mr. Morgan stated, in discussing truck starters, that in his belief it was best to leave off the starter because if he hired men husky enough to handle freight and found that they were too lazy to turn over the motor he would get rid of the men. He also stated that on the truck simplicity was the biggest feature of design. Every part which could be left off without affecting the effort of the truck was so much gained. This was in his opinion the case where the larger trucks were concerned. There is not the need of economy of time. A motor starting on the smaller size that there is in the larger size of trucks because the non-production during the time the truck is idle is not so great in the smaller sizes. Mr. Cohan remarked that one reason that the electric truck is supreme in certain fields is that it is easily started, and said that when gasoline trucks become easy-starting it will improve on the field of the electric. He went on to say that huskies do not make the best drivers, and that the driver that is torn between duty in saving gasoline for his employer and letting the motor run to save his elbow is likely to take the former alternative unless the motor is equipped with a starter. Mr. C. T. Myers added that he had found starters not desirable and not in great demand for vehicles of over 1-ton capacity.

Bowers Declares Metal Wheel Useless

A general discussion then followed on the simplicity of motor trucks. It seemed to be the general opinion of the members who entered into the discussion that simplicity should be a cardinal factor. The discussion of the subject of metal wheels involved a wide variance of opinion among the truck makers and engineers present. Mr. Bowers, one of the wheel makers, stated that it was his belief that the metal wheel is utterly rigid, non-resilient and hence devoid of practicability.

It was stated that wood wheels used on trucks were found in many cases to be from .125 to .25 inch out of round, while the metal wheels would stay true. It was stated that the manufacturers of wood wheels have not developed with the truck industry and that the heavy weight causes many of the wheels to fail. Mr. Bowers responded to Mr. Morgan's criticisms by saying that wood wheels were now manufactured which remained perfectly true and which gave excellent service inasmuch as they possess resiliency, and thereby absorbed the road shocks and cut down to a remarkable degree the cost of upkeep on the entire car. The ensuing discussion brought out the fact that the members were in agreement in stating that excess weight must be guarded against. Some agreed that they had broken more axles with solid wheels than with the wood wheels while others claimed that, owing to bad wooden wheel construction, the life of the tire was shortened on the latter type. The difficulty of securing light castings was also mentioned. Mr. Haynes stated that it was his belief that the cast steel wheel would supersede the wood wheel in time, inasmuch as cast steel wheels can be made if the same material is employed as is used in making wheels for railroad cars.

A doubt was expressed as to the advisability of taking up the metal wheel inasmuch as the railroads were looking to the paper wheels. Mr. Bowers said that it seemed that engineers in the discussion have lost sight of the necessary balance of ear and parts in considering the metal wheeel.

Cornelius T. Myers, the author of a previous paper, had reduced his resistance factor to the figures shown in the discussion of the Comparative Data on Performance. He naturally worked on the basis that the tractive effort must equal the resistance or the truck would not be able to navigate. The discussion on this paper reflected back on Mr. Myers' treatise and brought out the fact that very few of the truck manufacurers, if any, had gone into the matter with a formula. Another point which was brought out was that the fuel consumption was of such importance that it was extremely necessary to cut the motor size to the utmost limit. The author of the paper in speaking of this phase of the situation after having read the paper, stated, "The weight of the motor increases proportionately with its power. We therefore not only have added power which is necessary but also an added weight which renders it still more necessary to carry excess power."

Points To Be Observed in Adopting Silent Chains for Camshaft and Magneto—Their Effect on Valve and Spark Timing—Graphic Method for Comparing Results Obtainable with Fire Engine Equipments Before Ordering Them

SILENT **Chains in Motor Construction.**—As silent chains of the Renold and similar types have been used only very sparingly in German automobile manufacture but are now under consideration by reason of the fashionable demand for noiseless operation, some observations with regard to their use in motors, mainly for driving the camshaft and the magneto, are offered the German public by Engineer L. Merz of Charlottenburg. Hans Renold Ltd., Coventry Chain Co., Westinghouse Railway Brake Co. (of Hannover, Germany), F. Stolzenberg & Co. and W. Wippermann, Jr., are mentioned as the sources of supply, and especial attention is called to the Westinghouse chain which is made under Morse patents and has fixed chainbolts, each made in two parts of which one rocks upon the other. The other models are considered as equivalent in design if not necessarily in quality.

The following summary of the information imparted in text and illustrations may be of general interest:

The silent chains used for motors have usually a one-half inch (12.7 mm.) pitch, but some as small as 8 mm. and also some larger ones are used here and there. The width, which is produced by the combination of a smaller or larger number of link plates of like thickness, varies, and it is to be noted that by some of the manufacturers the outer guide plates, which prevent lateral displacement of the chain upon the sprocket wheel, are not counted in the width, while by others they are counted. A single central guide plate in each link, riding in a groove in the sprocket wheel, is not considered as reassuring as the more customary design.

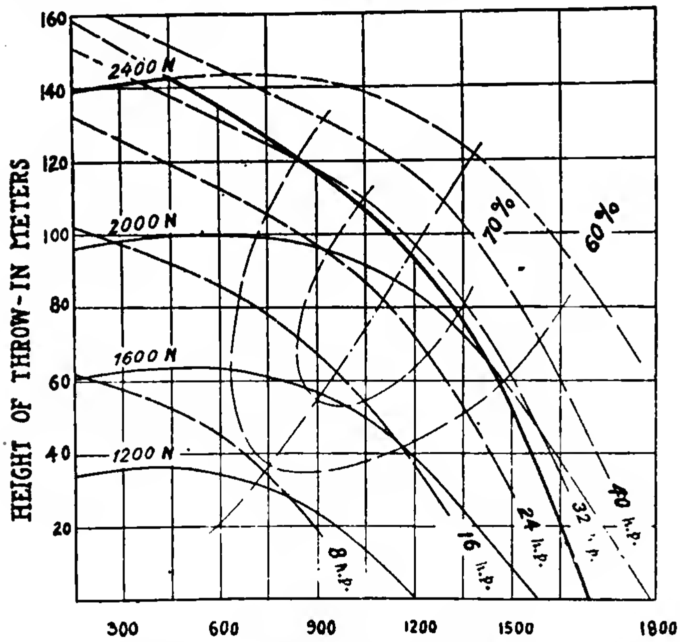


Fig. 1—Operating conditions and working range of fire engine driving centrifugal pump from automobile motor

The principal advantage over gear wheels is the silent running. Further, the time-consuming training of the gear wheels by running them in mesh on a test stand is obviated; the distance between shafts need not be so scrupulously accurate as with gears and the cost of assembling and testing are correspondingly reduced.

When only one camshaft is to be driven it should be located so that the chain runs more nearly horizontally than vertically. One shaft can never be vertically above the other as the slack must be on one side only and not at the teeth in engagement. The chain should be chosen so it can have an even number of links, because, with an odd number, the free ends cannot be joined without using one link with bent and divided plates, and a link of this kind is liable to stretch unduly. Manufacturers consider 15 to 17 the low limit for the number of teeth on the smallest sprocket wheel, and Renold goes further, recommending 21 and 42 as the most favorable numbers for camshaft driving. The Coventry company makes chains of special design for wheels with down to 12 teeth. The small wheel should always have an odd number of teeth (a "hunting tooth") so as to distribute wear on all links and teeth equally and independently of the inequalities of the work.

The distance between the shafts or the length of the chain is obtained from the formula:

$$L = 2A + \frac{Z_1 + Z_2}{2} + \frac{(Z_1 - Z_2)^2}{4\pi^2 A}$$

in which L is the number of chain links, A the distance between shafts in number of pitch unit lengths, Z_1 the number of teeth in the big wheel and Z_2 that of the small wheel.

Certain peculiarities of sprocket chains make it undesirable, it seems, to use them without a tension idler, especially for large motors. The chains, as they come from the factories, never correspond accurately to the length arrived at by multiplying the pitch by the number of links. According to Renold's own statements, the greatest care in manufacture still leaves an average difference of 0.025 mm. in the length of links, when the total lengths of two chains, which should be alike, are compared. It can therefore happen that new chains refuse to fit upon a construction laid out according to the above-mentioned formula. Hereto comes the fact that chains stretch. During the first 100 hours of use the stretch amounts to from 0.2 to 0.4 per cent. After this first "settling" of the chain, the stretch by wear sets in but amounts to only about a one-hundredth part of the figures mentioned, for the same amount of work. Some manufacturers therefore sell pre-stretched chains. Nevertheless, the conviction is growing that a tension idler is the best remedy for the troubles referred to.

An idler must always work on the slack side of the chain, and the adjustment-eccentric must be so used that the pull of the chain cannot draw the adjustment tighter but only looser. According to experience, the idler must work on the inside of the chain and must be shaped accordingly. It should engage at least three links of the chain. Adjustment by hand rather than by means of a spanner is of advantage to guard against too great tightness.

If not only one camshaft but perhaps two, and perhaps also the water pump and the magneto, are to be chain-driven, it is advisable to use more than one chain in order to avoid excessive lengths, by which the wear accumulates too fast. Usually a broad chain is used for the camshaft and a narrower one for the magneto. If a single tension idler is used for both these chains, it is to be foreseen that they may not stretch equally. The idler should therefore be so mounted that, when tightened, it will distribute the tightening effect automatically between the two chains. This may be done by means of a double eccentric, one concentric with the other, of which only the inner one is adjusted.

By reason of the chain stretch and the adjustments made to keep the tension right, the adjustment of the camshaft becomes gradually inaccurate, and it is therefore recommended to mount the camshaft sprocket wheel crown upon a flanged spider rather than direct upon the shaft, and to provide the sprocket wheel crown with oblique slits—say three of them—and the spider with similar slits running crosswise of those in the crown. By securing a bolt in each pair of slits, the crown and the spider are joined, and when the timing of the cams becomes inaccurate it can be corrected by loosening the bolts, turning the crown around the required small angle with relation to the spider and securing the bolts again at the new intersection of the slits.—From *Allgemeine Automobil-Zeitung*, January 3.

WORKING Range of Centrifugal and Pittler Fire Pumps.—Since it has become known through the developments in German fire-fighting practice that the greatest simplicity, economy and efficiency are obtained by coupling a rotary pump with the same internal-combustion motor which is used for propelling the fire engine vehicle, the data which should govern this combination of elements have been studied by all those members of the automobile industry who turn out commercial vehicles and who realize that the type of fire engine referred to is the only one which can be turned out in an automobile factory without interference with other routine production and that it, in fact, can be turned out there better than in any other industrial establishment. The desire to utilize old steam pumps, chemical engines and other material on hand for its allotted time and for keeping the equipment of each fire station uniform and unmixed, remains the only factor which can retard the new development, provided the working data of the simple new type of fire engine are made known and the most suitable construction is adopted by those who produce it.

Having in mind this situation, so interesting to the automobile industry as well as to insurance companies and the public, Engineer Hüpeden of Wiener Neustadt presents a comparison of the working results which may be obtained accordingly as the rotary pumps used are of the centrifugal and non-positive variety or of the design devised by the late v. Pittler, which may be designated as a rotary piston pump and is almost positive in action. These data gain further interest because the limitations of the Pittler pumps are found considerably aggravated in pumps with reciprocating piston action, if these are driven from an internal combustion motor, while their advantages are not similarly emphasized.

The accompanying diagrams, Figs. 1 to 5, summarize the findings and conclusions of Mr. Hüpeden which are reproduced in substance in the following:

The pumping work of motor fire engines is still too frequently estimated according to the height and reach of any stream thrown at a demonstration trial. While larger fire departments stipulate the amount of water which must be discharged at a given pressure and compliance with this condition may be readily tested out, it does not exhaust the requirements which must be made with regard to the adaptability of the pumping equipment to the widely varying conditions which may arise in fire-fighting work. The producers of motor pumps are often themselves not well informed with regard to this adaptability, as the pumps and the motors usually come from different factories between which the needed exchange of information is incomplete, while the time for searching trials of the completed apparatus is usually lacking. But a pre-determination of the working conditions is so important and decisive for the design that it seems very desirable to have made clear in words and drawings the mutual relations existing for the three elements: the pump, the motor and the work.

In order to represent actual conditions, the curves must show the work done not at only one but at a number of different pump speeds (N in the diagrams). So far as centrifugal pumps are concerned these data are now usually obtainable, and in addition there has recently appeared (in *Zeitschrift des Vereines Deutscher Ingenieure*, 1912, No. 47) an article by H. A. Janssen giving a new method by which all necessary details of the working results with rotary pumps may be deduced with sufficient accuracy from fragmentary data. The curves which may be drawn according to this method agree very well with the test results which have so far come to notice in practice and diagrams. The curves in Fig. 1, representing the work of a high-pressure centrifugal pump, have been drawn according to this method. They show directly the mutual relations between number of revolutions, capacity, throw and efficiency. [The word "throw," as used here and in the diagrams, inaccurately, does not refer to the stream thrown from the nozzle of the hose but to the height which the nozzle will deliver a stream.—Ed.] The power necessary throughout this range of conditions has been calculated in each case from the other data and entered upon the diagram. The pump chosen for illustration was a medium large one rated to give 1200 liters of water per minute at 8 atmospheric pressures. In practice the pump dimensions are properly so chosen that the demanded capacity falls within the limits of the maximum efficiency, corresponding to 70 per cent. in the diagram. When this is done, the required horsepower may then be read on Fig. 1 directly.

Fig. 2 shows the torque curve of a gasoline motor selected to suit this power requirement. It can be drawn with sufficient accuracy from a few data giving the power at different motor speeds. Usually the pump and the gasoline motor are designed for different speeds and a gear must be used to equalize them. There is then available for driving the pump only the motor power minus the friction loss in the gear. This loss, estimated at 10 per cent., is therefore entered upon Fig. 2. The gear ratio is in the present example taken to be 1 to 2.

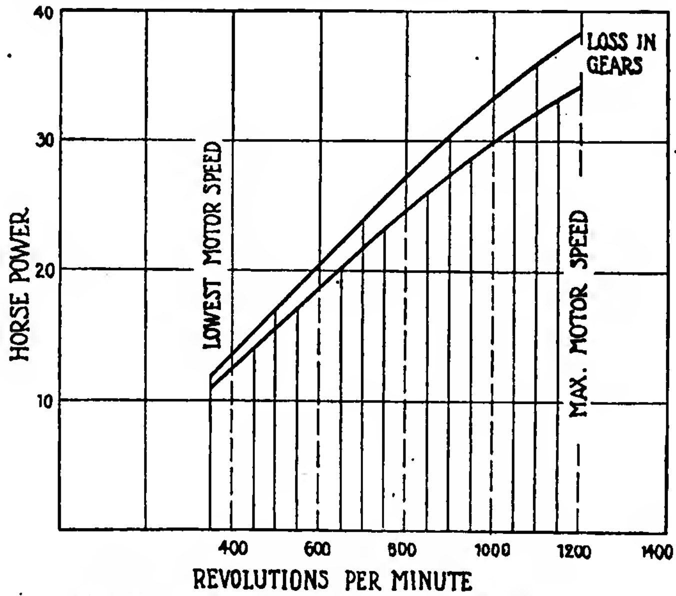


Fig. 2—Curves of motor power available for pump

When now the maximum torque of the motor at different speeds is carried into the diagram of the pump curves, Fig. 1—by connecting those intersections of revolution and capacity curves which according to Fig. 2 belong together, there is obtained the curve which is drawn thickest in Fig. 1 and represents the maximum obtainable performances of the whole motor pump for the complete series of working conditions.

All performances ranging below these maximum values can be obtained by simple throttling of the motor.

While in the case of stationary pumps the fuel efficiency of the motor is an important factor, it is of no consequence in fire engine service except in so far as it influences the range of performance. The latter, on the other hand, is a main issue, as the performances demanded vary very widely. An incipient fire in a dry-goods store, for example, should be extinguished with a discharge at the nozzle of, say, 200 liters per minute, in order to minimize the damage from water, while a fire in a warehouse should usually be fought with a maximum quantity of water. Similar differences apply to the pressure. While a cellar may be inundated with the smallest expenditure of motor power, churches and other tall buildings may demand a pressure of more than 100 meters. The adaptability of the pumping engine to these varying requirements is shown exhaustively by the curve of maximum performance in Fig. 1. It shows, for example, that the 200 liters per minute for the incipient store fire can be delivered at a pressure of 6 atmospheres (60 meters) with the motor throttled to 800 revolutions, giving 1600 revolutions for the pump; also that the cellar may be flooded with 1500 liters per minute at the same pressure and that, in the case of the church or high building, 300 liters can be delivered against 140 meters and about 800 liters against 120 meters pressure.

Other inferences from the performance curves are made clearer by a comparison with the results obtained with the rotary piston pump; a type designed by the late W. von Pittler and subsequently improved. As it gives results very similar to those obtained with the high-speed pumps with reciprocating pistons which have lately been employed in a few places, the remarks to be made with regard to it apply in the main to the latter as well. Fig. 3 shows the operating conditions of a Pittler pump. The curves showing performances at equal speeds deviate from the vertically running lines representing equal capacities only by reason of the volumetric losses sustained in the motor at the higher speeds, so that the capacity is almost proportionate to the number of revolutions. The efficiency increases with the pressure but drops with the number of revolutions. On this point no data from tests have been found obtainable because the motors used for factory tests were lacking in the required flexibility. But as the efficiency is of subordinate importance—within certain limits—the efficiency curves drawn into the diagrams, from such data as could be had, will be sufficiently accurate for the desired comparison.

By carrying the torque values from the motor diagram, Fig. 2, into the pump diagram Fig. 3, in the same manner as they were marked in Fig. 1, the complete working range for a fire engine with Pittler pump can now be shown, the pump dimensions being selected, for the purpose of a comparison on equal terms with the centrifugal pump, so that the normal performance is the same in both cases, this performance being taken as the delivery of 1200 liters per minute at a height of 80 meters, and the motor being the same.

The curves obtained in this manner, by combining the values of Fig. 2 and Fig. 3, and representing the working range of the Pittler pump is reproduced in Fig. 4 together with the corresponding curve for the centrifugal pump equipment from Fig. 1. The full-line represents the results of direct drive of the pump and the nearest broken line those obtained with a driving connection geared up in the ratio of 1 to 1.2. By the choice of gear ratio the working range of a Pittler pump may be materially changed, as further shown in Fig. 5 which is drawn on a basis of a 1 to 2 ratio of the gear. There is, however, a limit to this method for adapting the equipment to special requirements through the fact that the speed of a Pittler pump, in its present development, cannot very well exceed a certain maximum, which lies somewhere between 600 and 1000 revolutions per minute, by reason of the inertia of its unbalanced masses. If this maximum speed, which is taken as 1000 r.p.m. in the diagrams, is lower than that of the motor (here assumed to be 1200 r.p.m.) the highest power of the motor cannot be utilized by a direct-driven pump, but in practice the difference in best motor speed and best pump speed is often so small that, for simplicity's sake, the direct drive is preferred, even though a loss in working range and reach is involved.

With centrifugal pumps a best gear ratio cannot be in question. If the curves for any given equipment are plotted out as in Fig. 1, the gear of the drive can always be chosen from these curves, on the plan that the highest motor power should coincide approximately with the highest pressure requirement and with that capacity, in liters per minute, which is selected as minimum. Other gear proportions would only contract the working range without adding materially either to pressures in one direction or to capacity in the other.

The difference in the working ranges of centrifugal and of positive pumps operated under the same motor conditions is striking. The reason lies in this that the resistance-moment (which determines the efficiency) in the centrifugal pump drops by reduction of its delivery-rate even though the pressures are correspondingly increased, and thus the motor can reach higher speed and produce its highest power against the highest pressures. The resistance in the Pittler pump, and in ordinary piston pumps, on the other hand, increases with the pressure, so that the performance of the motor drops off when the water has to be

(*Continued on page* 357.)

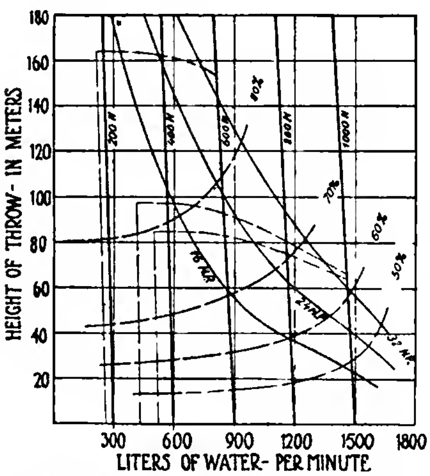


Fig. 3—Operating conditions of Pittler pump

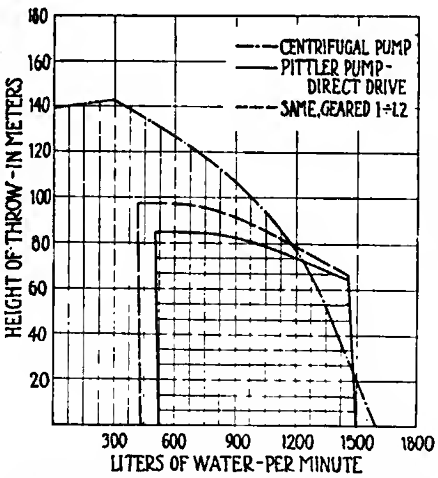


Fig. 4—Comparing working range of centrifugal and Pittler pumps

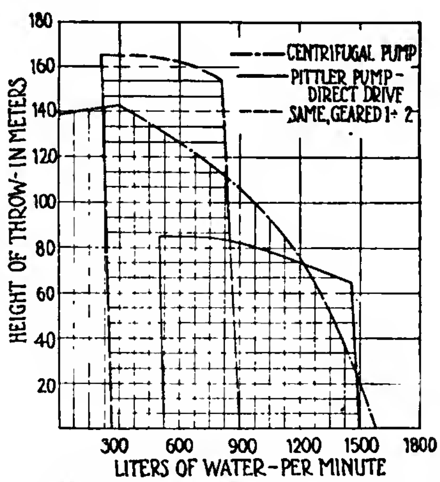


Fig. 5—Effect of gearing-up on positive pumps

The Engineers' Forum

Front Wheel Design

Bearings Must Carry Part of Car Weight and Withstand Centrifugal Force at Turns

TOLEDO, O.—Editor THE AUTOMOBILE:—It is customary in choosing bearings for the front road wheels to estimate the weight on each wheei and then select bearings of such a size as to safely carry their proportion of the load, this proportion being determined by their respective distances from the vertical center line of the point of contact of the wheel with the road. As the wheels are usually tilted this center line does not always coincide with the center line of the wheel. As this selection is usually modified by judgment and a large allowance made for safety the bearings chosen for this work are usually ample. This is attested by the fact that the bearings in the front wheels of the present day cars give very little trouble indeed.

I wish to show the action of the forces involved and the pressures they produce on the bearings.

The front wheel of a car is acted upon by two forces: First, the force due to the weight of the car, and second, that due to the inertia of the car when making a turn. By the graphical solution of forces we may compose these forces into a single resultant. This is shown Fig. 1. In this figure the force F is shown acting upward. This upward force will be equal and opposite to the downward force and is equal to the reaction of the road on the wheel.

Fig. 1 shows a wheel in which the thrust is taken on the inner bearing. In this case the hub will pivot about a point somewhere near the center of this bearing. This point will be the center of moments. The force F will produce a moment about this point which will be equal to the product of this force multiplied by the perpendicular distance from the line of action of the force to the center of the inner bearing. This distance is denoted by L, Fig. 1. This moment will be resisted by an equal and opposite moment which will be equal to the product of the pressure on the outer bearing, multiplied by the distance between the bearings. This distance is denoted by D, Fig. 1.

From this we get the following formula for the pressure on the outer bearing: $P = \frac{FL}{D}$

The inner bearing will be acted upon by two forces, one of which will be equal to the force F and acting in the same direction. The other is equal to the reaction of the pressure on the outer bearing and acting vertically. These two forces may be composed to form a single resultant by the graphical method. This is shown at R, Fig. 2. This resultant may be again resolved into two components, one vertical and the other horizontal, shown at C, Fig. 2.

By reference to this force diagram it will be noted that **the vertical pressure P is equal to the sum of the force P and the vertical component of the force F, which is the weight on the wheel.** Then for the pressure on the inner bearing we get the formula: $P_1 = W + P$.

The thrust will be equal to the centrifugal force CF.

The magnitude of the force F will depend upon the proportion of the weight of the car that rests on this wheel when the car is turning. This cannot be very closely estimated and is a point open for argument. The proportion of the weight that rests on the front wheels when the car is standing still or traveling straight ahead may be easily determined, but as soon as the car begins to turn a greater proportion of the weight is thrown upon the front wheels, due to the inertia of the car.

It is generally conceded that the maximum coefficient of

(*Continued on page* 357.)

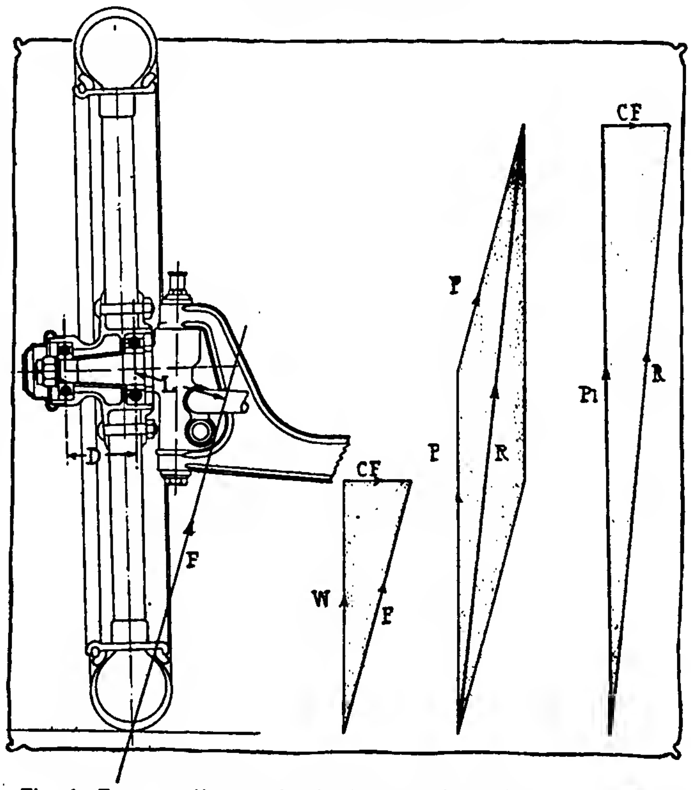


Fig. 1—Forces acting on front-wheel bearing. Fig. 2—Diagram of forces, showing components

Centrifugal Force of a 3,000 Pound Car on Turns of Different Radia at Various Speeds.

Speed in m.p.h.	Radius in feet 200	150	100
5	25.1	33.6	50.4
10	100	136	210
15	226	310	450
20	411	535	807
25	625	835	1250
30	895	1215	1820
35	1210	1641	
40	1670		
45			
50			
55			
60			

NOTE.—When the centrifugal force exceeds .6 of the weight of the car it is not given.

Explaining the Differential—Reader Offers Suggestion—Discussion on Duryea Rotary Valve Continued—Some Points on Multiple Series—How Horsepowers Are Rated—Use of Two Flywheels—Making Oil Tests

Differential Action Explained

EDITOR THE AUTOMOBILE:—Define the construction of a full-floating rear axle ball bearing?

2—In jacking up my car and inserting into lower gear and running motor, one wheel will run much faster than the other. Explain why this is so.

Shinnston, W. Va. BROOKS F. MARTIN.

—1—The floating rear axle is one in which the load is carried by the housing of the axle. The driving members do not aid in the support of the car. The ball bearings used in supporting the driving members of a floating rear axle are of the annular type. The balls revolve between two cylinders. The cylinders are known as the inner and outer races. The balls are held apart so they cannot run upon each other and they are also held so they cannot fall out. The part holding the balls in place is known as the retainer or cage. These bearings are known as the annular type. They are designed to take a load in the direction of the radius of the bearing. They are capable, as a general rule, of sustaining an endwise or axial load of 10 per cent. of the radial load.

2—The reason that one wheel turns more rapidly than the other is because the resistance to turning of one was greater than the other. This might be due to a dragging brake shoe. If the resistance to revolving were equal on both wheels they would both turn at the same rate. On the other hand, if you jacked up but one wheel and started the car, the wheel that was in the air would revolve while the car would remain stationary.

Offers Valuable Suggestion

Editor THE AUTOMOBILE:—I would like to offer a suggestion as a source of help to garages and repair shops and owners through your columns. I would suggest in each issue that you set aside one sheet dealing with and giving some information on different subjects. For instance, ignition systems, their wiring; suggestions for locating trouble on same and the correcting of same. After exhausting the electrical end resort to other parts such as transmission, giving the names of manufacturers of parts, showing a clear cut of construction, different views where necessary. This would be of great value to repair departments where various types of cars are handled. I should think it well to run back to the early days or start back about 6 years and work up on cars in general.

Little is necessary other than a clear cut showing internal constructions. It would be well to know that the most valuable information would be on such construction as was not adopted as standard, as a good mechanic at this stage is well acquainted with the present equipments though there is always something new to one that might be old to another. Such I am sure would meet with a success and be of help to many and could be extended from one thing to another until each shop would have a volume of information dealing on everything in general.

Philadelphia, Pa. J. M. WHITE.

Discusses Timing Further

Editor THE AUTOMOBILE:—Thanking you for your kindness in answering my questions upon motor design in your issue of December 19, 1912, I must still beg leave to differ with you upon some of your answers:

1—It was the rotary valve of 1907 of Mr. Duryea's to which I had illustration of his later designs.

2—I have never seen a crankshaft that did not have the central cranks upon the same side, and never seen an illustration of but one that did not have them that way, and that was used in one of the first models of the Peerless and was made with 1 and 3 up and 2 and 4 down. I do not know what the timing for that was, but it must have been 1, 2, 3, 4, or it might have been 1, 4, 2, 3. I had supposed that the 1, 2, 4, 3 timing had become settled practice until reading the article upon the new Hudson machine in a recent number of THE AUTOMOBILE. I learned it had been changed to 1, 3, 4, 2 timing, which could also be correctly stated as 2, 1, 3, 4 timing, and was curious to know why.

4—With the flywheel in front, the cranks would be working between the resistance due to the load upon the rear end and the inertia of the flywheel upon the other, since, even if the flywheel is running at speed, the cranks under the influence of the kick of the cylinders are moving or tending to move with a greater angular velocity than the flywheel and if you will hold a shaft fast at both ends and apply a twisting effort to the center it will require a much greater effort to attain a given twist than it will by holding fast one end of the same shaft and leaving the other free. The Daimler vibration damper is in effect a flywheel with a slipping rim; why it would be allowed to slip, I do not know, unless they figure on allowing the cranks to spring and for the slipping rim to catch it, when it is springing back. Several engines I know of with the flywheel in front construction, the Maxwell in particular is a very smooth-running engine, but that any of its smoothness was due to the flywheel in front construction, I don't know that they ever claimed.

6—A S. O. Company wagon driver once told me that they figured on losing 5 gallons of gasoline a day per wagon from evaporation. All gas tanks not under air pressure have a breathing hole, and it is quite probable that some big tanks upon roadsters lose 1 quart or more a day from evaporation, an appreciable amount enough in the life of the car to more than pay for the cost of covering it. This point seems to ge given more attention upon the other side judging from illustrations of the Olympia and Paris shows. The only exposed tanks shown there were at the rear of the chassis partly under the tonneau and under pressure.

7—Have you any tables showing the coefficient of friction for smooth iron driving wheels (for tractors) and the ground or road and that for cleated drivers, same weight?

Mentone, Cal. JOHN LEFLER.

—7—THE AUTOMOBILE has no comparative figures on smooth and cleated tractor driving wheels as far as coefficient of friction goes. Weight for weight it would hardly appear that the increased tractive effort would compensate for the greater effort consumed in the drive.

Points on Multiple Series

Editor THE AUTOMOBILE:—I note in the questions and answer department of THE AUTOMOBILE in the January 16 issue where you answer a subscriber's query about why dry cells are better (more mileage) connected in multiple series than being in a single series. You are correct so far as you go, but I believe there are other features to this question which are still unanswered.

There are several sides to this idea why there is greater mileage per cell when connected in multiple-series than where a single series is used. To illustrate, a single series of cells, we will say, will ignite a car for 500 miles connected as in Fig. 1A. Now if we make a multiple-series connection as at B, using twelve cells instead of six as at A, instead of getting the even 1,000 miles we will easily get 1,100 miles. Now if we further increase the series in this multiple connection, as at C, we can still further increase the mileage per cell, say, about 1,700 miles.

There are several reasons for this; the main one, however, is that you are able to drain out the battery more completely. Take, for instance, one of the cells at A; after it is exhausted for ignition purposes and measure the amperes and it will still give 2 or more amperes, which is insufficient to energize the coil, but if there are two series of cells, as in B, you double the cells on the coil and have, hence, double the amperage output. This keeps the car going quite a while longer. This same idea is still further carried out with connections, as at C.

Another idea which favors multiple connection, as at B and C, is that there is a much lower discharge rate. Take, for instance C, where the rate of discharge per cell is only one-third what it is for A. A dry battery is by nature an open circuit battery and has to have time to recuperate between periods of service; therefore, if the rate of discharge is lower, it has a proportionately better chance to recuperate. Therefore the total mileage or total output per cell is increased when multiple-series are used instead of single series.

Woodsfield, O. J. K. MERCER.

Horsepower Difference Explained

Editor THE AUTOMOBILE:—Will you kindly explain the rating of the different makes of cars in your New York show issue:

	Horsepower	Cylinders	Cubic Inches
Ford Model T, 4 cyl., rated at....	22.50	3.75 by 4.00	176.7
Hupmobile C, 4 cyl., rated at.....	16.90	3.25 by 3.38	112.0
Lambert Buckeye, 40-4, rated at..	16.90	3.25 by 5.25	174.2
Oakland 35, 4-cyl., rated at......	19.90	3.50 by 5.00	192.4

I do not understand how they can figure the horsepower in the case of the Ford with 176.7 piston displacement cubic inches 22.50 horsepower, and the Oakland with 192.4 piston displacement only 22.50 horsepower.

Is the Ford motor superior to other motors according to size? If so, why?

Cotesfield, Neb. H. BLANCHARD.

—These horsepowers are all figured out by the S. A. E. formula, $\frac{D^2N}{2.5}$. Where D is the bore, N the number of cylinders and 2.5 a constant adopted by the S. A. E. This method of rating is not accurate and does not show the true horsepower developed by any motor. It furnishes a basis of comparison, however, and is used for that reason. This does not show superiority in any motor. It is purely a mathematical formula. Recently there has been more or less agitation among manufacturers, engineers and designers regarding the value of the S. A. E. rating which promises some interesting discussions.

Depends Largely on Leakage

Editor THE AUTOMOBILE:—Please advise through your Letters Answered and Discussed what pressure can be obtained from a compressor with 3 inches bore and 3 inches stroke. Rings and cylinders are in fine condition and compressor space is practically nothing. Should it be driven at a speed over 200 revolutions per minute?

Prattsburgh, N. Y. H. C. MORGAN.

—With good fits at the rings you should be able to get a pressure of 120 pounds to the square inch easily. This is figuring that the machine was originally designed for a compressor and was not a motor. If the compressor is water-cooled, you should get from 15 to 20 per cent. more than this. It would not be wise to drive this over 200 revolutions per minute if it is air cooled.

Suggest Two Flywheels for Motor

Editor THE AUTOMOBILE:—Why would it not be a good idea to put two balance or flywheels (one on each end) on the shaft of a motor? Make each one-half as heavy as at present, but not reduce the diameter. Make them one-half as thick.

It always looked to me that a heavy wheel on the end of a shaft when the explosion takes place, exerts an awful tendency to twist or yank the shaft. With one on each end, would it not minimize that twist, and at the same time steady the motor by equalizing the weight and thereby reducing the vibration?

Providence, R. I. J. J. COOPER.

—This idea has been worked out successfully before now and is in actual use at the present time on the Daimler-Knight motor. The distortion of the shaft at the time of rapid acceleration is cut down considerably by this means as the twist is taken up through both halves of the shaft instead of through one end alone.

Testing Oil at Home

Editor THE AUTOMOBILE:—Please inform me if there is a way that lubricating oil may be tested at garages for specific gravity, viscosity, flash and fire test.

Greenwood, S. C. C. M. OUZTS.

—The various tests on oil may be made at home, although the same accuracy as would be secured with a complete laboratory cannot be expected. There are five tests which are generally made on lubricating oil and all of them except one can be made within very close limits at the garage. The five are the specific gravity, flash, fire, cold and viscosity. The last named, the viscosity test, is the only one that cannot be made to great satisfaction without any other tools but a bunsen burner and a porcelain dish along with a few other equally common utensils. Taking these tests in order, the first to be considered is the

1—Specific Gravity: Place the oil in a long cylindrical vessel and with a hydrometer read off the specific gravity of the oil. The hydrometer is an instrument which is weighted at one end so that it will float in an upright position. It is made of glass

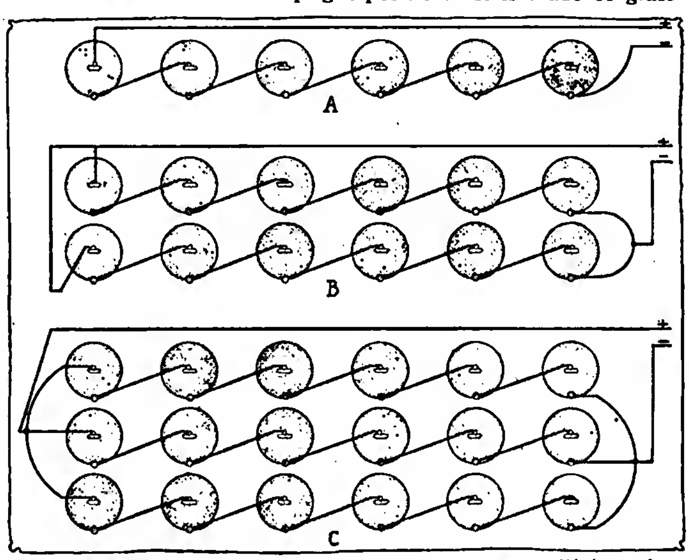


Fig. 1—A, Series; B, two multiple series; C, three multiple series

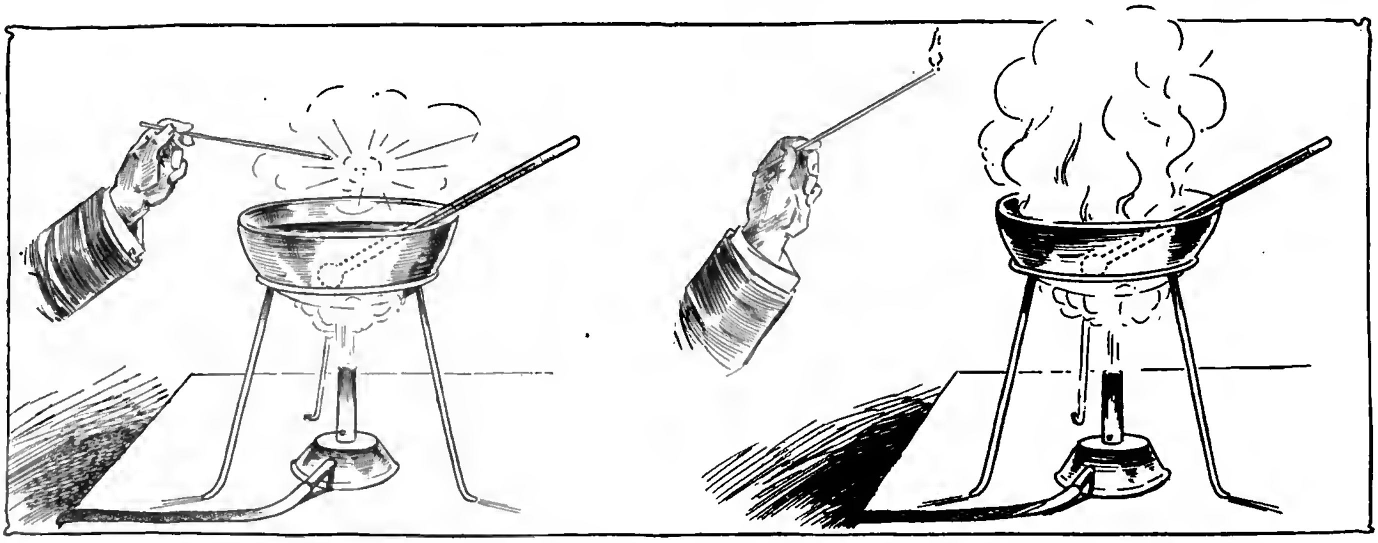


Fig. 2—Making flash tests and fire test on oil with porcelain dish, Bunsen burner and wax taper

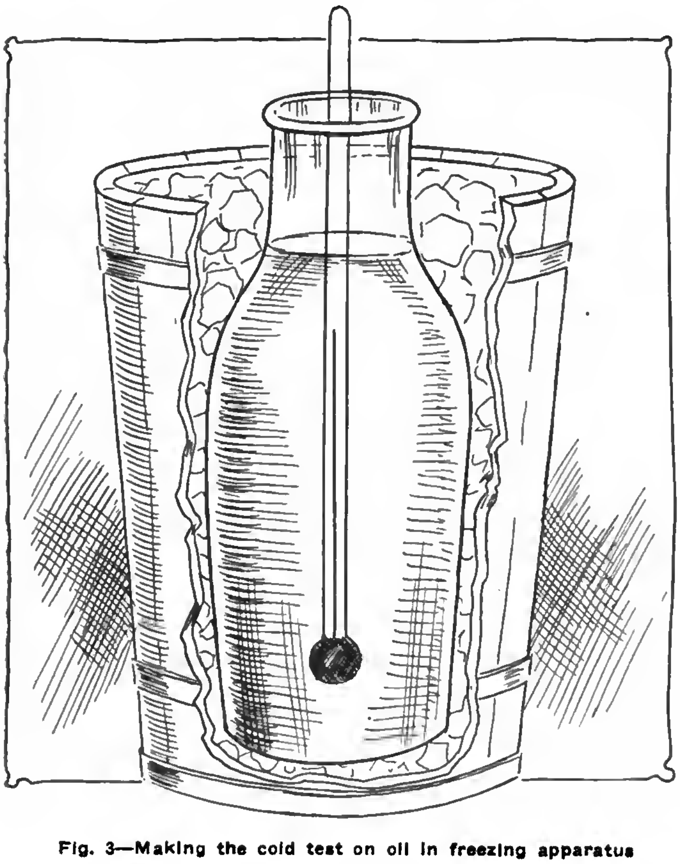


Fig. 3—Making the cold test on oil in freezing apparatus

and on it are imprinted the specific gravities. The level of the liquid furnishes the point at which the reading is taken. If it desired to convert this over to the Beaumé scale, a conversion table will be found in any mechanical or chemical handbook.

2—The flash point of an oil is that Fahrenheit temperature at which it will give off an inflammable vapor. This differs from the fire point in that the vapor need only flash and does not burn steadily. It may be found in the garage in the manner shown in Fig. 2. First secure a burner and a porcelain dish. Place a thermometer which registers between 300 and 475 degrees Fahrenheit in the porcelain dish and pour in a quantity of the oil to be tested. When the temperature of the oil has risen to 300, try the taper over the dish every 10 seconds, watching the thermometer carefully. At last there will be a point where the vapor above the oil will ignite with a flash. This is the flash point of the oil. Note the temperature at this point.

3—Fire Test: Continue the operation described under the flash test until the vapor above the oil ignites and burns steadily. The temperature reading at this point will give you the fire point. The fire point is always very close to 50 degrees above the flash point. With this knowledge it is easy to begin the tests at very close to the correct temperature.

4—Cold Test: This is sometimes called the cloud test. When the temperature of an oil drops to a certain temperature, the oil becomes cloudy and will not pour readily. The point at which the oil refuses to pour is the cold point. It can be secured by the method shown in Fig. 3. A bottle containing the oil is placed in a larger vessel packed in salt and ice in the same manner as in an ice cream freezer. A low-reading thermometer is placed in the bottle containing the oil and the temperature of clouding noted. At this point the oil will be found to have reached its cold point. The cold point may be expected somewhere in the neighborhood of 20 degrees above zero.

5—Viscosity: This is the rate of flow of the oil through an orifice. The actual viscosity must be taken through a Seybold or other viscosity meter. A comparative test may be made as shown in Fig. 4 by taking an oil of known viscosity and the oil of which the viscosity remains to be known. The funnel is closed in some manner so that a small opening is left. The opening in each should be the same. If necessary one oil can be run through and the drops timed with a stop watch and then the other run through the same opening. The temperature of both oils must necessarily be the same if the viscosity is to be tested anywhere nearly correctly.

Wants to Know Correct Tires

Editor THE AUTOMOBILE:—I have a Jackson car. Its weight is 3,100 pounds. I would like to know what size tires would be best. The ones I have on it are 34 by 4, and they blow out very often. If they are too small for the weight of the car, please tell me what size to use.

Luanna, Fla. HENDERSON BROS.

—The correct size tire to use with your car would be 35 by 4.5 inches. Any standard make of this size will go on your car and will fit the 34 by 4-inch rim.

Charging Magneto with Dry Cells

Editor THE AUTOMOBILE:—Can an ordinary low-tension, alternating-current magneto be charged with a set of dry cells, in the absence of a storage battery or direct current? If practical, how many dry cells of the ordinary ignition type would be necessary where the original magneto output is 5 amperes at 12 volts, normal speed.

Kindly give a diagram showing the correct way of connecting up for this purpose.

Maynard, Minn. O. HAWKINSON.

—This would be highly impractical and very costly. It would be a much cheaper plan to send the instrument to the manufacturer who would only charge about $2.50 to do the work. The only way it is possible to charge the magnet with a direct-current supply of any kind available would be to have a special winding made. The magnet must have a certain number of lines of force and the only way they can be properly secured without going to a considerable waste of time and money is by an electro-magnet.

Converting a Touring Body

Editor THE AUTOMOBILE:—I am driving a 1910 Cadillac touring car and wish to make a roadster out of it.

Can you tell me where I could find a firm making bodies that would be suitable?

Is there any in Indjana?

Salem, Ind. REED PHILLIPS.

—Either the La Porte Carriage Company, La Porte, Ind.; Robbins & Company, Eleventh and Canal streets, Indianapolis, Ind., or the Union City Body Company, Union City, Ind., should be able to handle the work for you.

Digest of Leading Foreign Journals

(*Continued from page 352.*)

raised to great heights. Another shortcoming of the positive pump is that it cannot handle small amounts of water. As the minimum speed of the motor is limited to about 300 revolutions and the capacity of the pump changes positively with the number of revolutions, there is always a minimum capacity below which the pump cannot work, and this minimum comes higher the larger the maximum performance is chosen. With the centrifugal pump the minimum falls below practical working requirements.

Fig. 5 shows the great change in working range of the positive pump which is secured when the gear ratio is made 1 to 2. The reach of the equipment is greatly increased and the minimum capacity is reduced—very desirably—from 525 liters to 260 liters per minute, but this is accomplished only by sacrificing the maximum capacity, reducing it from 1500 liters, on direct drive, to 900 liters. Only an optional gear ratio would give the adaptability to all working conditions, and the operation of a gear box in fire-fighting would represent a considerable complication.

The curves also permit an estimate of how the different equipments will behave in two frequently occurring instances. When the pressure channel is obstructed, as by the freezing or clogging of a hose or nozzle, the pump pressure rises while the capacity drops to zero. The centrifugal pump in this case partly unloads the motor but not sufficiently to make it run wild. If the motor was working under full fuel charges, the pump continues to work under maximum back-pressure, while the motor, according to Fig. 1, goes up to about 1300 r.p.m. Only the high pressure to which the hose is subjected consequently requires immediate attention. The positive pump under the same condition comes to a stop, since the minimum capacity is limited.

The other possibility referred to is that a hose may burst. The resistance in the centrifugal pump is then increased, since it depends upon capacity, and the pump drops automatically to a reduced speed; according to Fig. 1 to about 900 revolutions of the motor. The Pittler pump in this case takes most of the load off the motor, and the latter speeds up rapidly.

As may be seen from the foregoing a great need exists for diagrams from which it may be determined in advance what combination of motor and pump should be selected for a given set of local conditions in fire-fighting.—From *Zeitschrift des Mitteleuropäischen Motorwagen Vereins*, December 15.

Engineers' Forum—Front Wheel Design

(*Continued from page 353.*)

friction between rubber tires and the road surface does not exceed .6. In this case the lateral pressure on the wheel could not exceed .6 of the weight resting on that wheel. At this point the wheel would commence to slide sideways. I am confident that this pressure is never reached in the front wheel. I have carefully observed racing cars taking turns fast enough to slide sideways and have noticed that the rear wheels slide but the front ones do not. The reason for this is quite clear. **When the car begins to turn the greater proportion of the weight is thrown on the front wheels.** Thus the friction between the rear wheels and the road is decreased and they begin to slide.

The wheel, Fig. 1, is that put out by one of the prominent axle manufacturers. It is for cars weighing 3,000 pounds.

By reference to the accompanying table we find that a car of this weight making a turn of 100 feet radius at 20 miles per hour will have a centrifugal force of 807 pounds. If we assume that one-third of the entire weight of the car rests on the wheel, then the weight on the wheel will be 1,000 pounds, and the lateral pressure will be 269 pounds. By laying out these forces graphically as in A, Fig. 2, we find that F is equal to 1,035 pounds. The distance L in this case is 4.66 inches, and B is 3.5 inches. Substituting these values in the formula $\frac{1{,}035 \times 4.66}{3.5} = 1360$, or 1,360 pounds load on the outer bearing. The load on the inner bearing will be $1{,}360 + 1{,}000 = 2{,}360$ pounds radial load and 269 thrust.

The bearings in this wheel are numbers 306 and 308 ball bearings. One manufacturer gives a rating for these sizes of 1,320 pounds and 1,980 pounds respectively. Thus it would seem that the inner bearing was overloaded. This overload, however, would be easily taken care of by the overload capacity of the bearings.—F. C. SHEEHY.

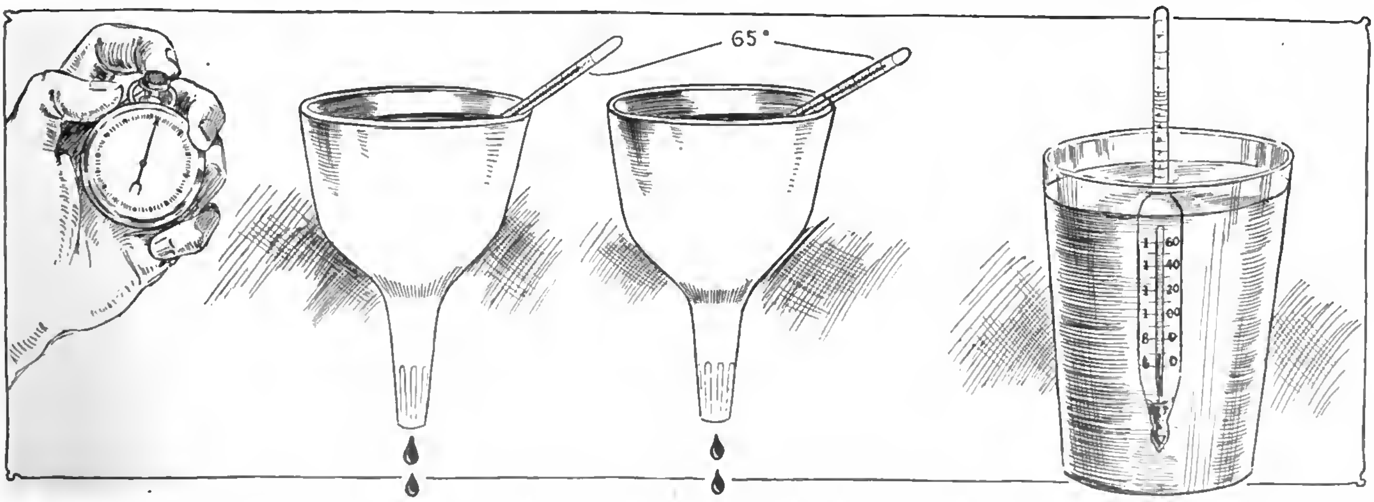


Fig. 4—Getting a comparative viscosity of an oil through a small orifice; testing specific gravity

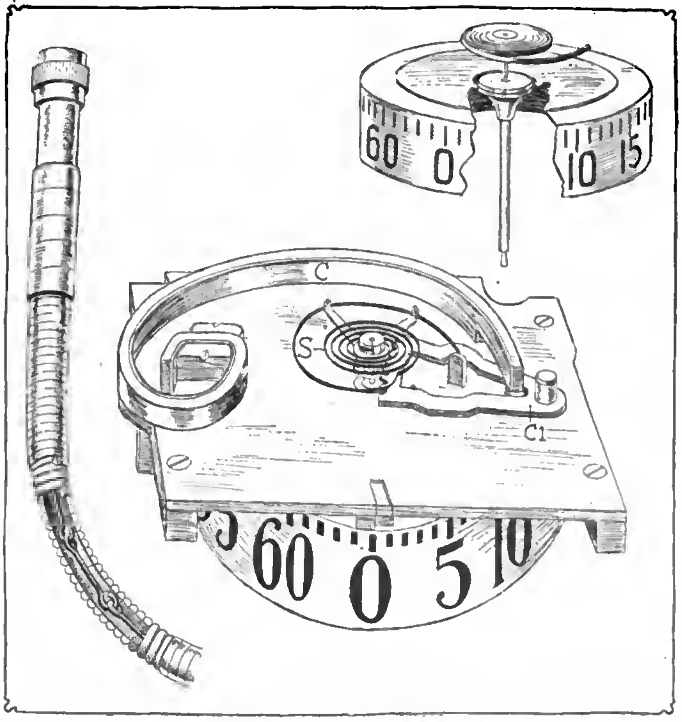


Fig. 1—Automatic temperature compensator and new shaft of Stewart speedometer

1913 Speedometers

Refinement of Details Makes For Exactness and Strength

IN the speedometer field practically no radical change has been made during 1912 and the 1913 exhibits resemble those of last year to a great extent. Most of the companies show the same models which they exhibited last year and the only differences in the constructions are of a nature of refinement and general strengthening of the mechanisms, making the latter more exact and more capable of withstanding shocks and vibration. In several cases improvements of a gratifying nature have been made in the swivel joints and in the flexible driving shafts. A new compensator which balances the expansion and contraction of the indicator control spring in the Stewart & Clark instrument deserves special mention as a simple and apparently efficient means for obtaining greater exactitude of the instrument under all conditions. Below short descriptions of the speedometers shown at the National Show are given, special attention being paid to the changes which have been made.

The maker of the Jones speedometer has made a new step in speedometer construction by introducing in one model a recorder mechanism which not only indicates the traveling speed of the car, but shows at what speed it moved every minute during half a day.

Stewart Has Automatic Compensator

Stewart speedometer, made by the Stewart-Warner Speedometer Corporation, Chicago, Ill., comprises two series of models, namely, magnetic and centrifugal. In the centrifugal type a governor by its deflection due to the rotation of the shaft carrying it moves an indicator hand which shows the speed of the car in miles per hour on a circular scale calibrated on the silver faced dial. In the magnetic type a vertical cylinder, which is dragged along by the attraction of the rotating magnet, indicates the speed. The disk or cylinder is not influenced by a change of temperature such as may be due to a warmer or colder climate, but the hair spring S which returns the disk to the zero position when the magnet-carrying shaft is at rest is subject to expansion and contraction in heat and cold respectively. To compensate for this change a compensator is usel consisting of a plate on which a laminated strip C of steel and brass is mounted. This combination of materials is very sensitive to a change of temperature and as it expands or contracts acts on a sector C1 and pinion lengthening the hair spring in warm weather or shortening it in cold, thereby counteracting for the expansion or contracting of the spring itself. The centrifugal types are likewise equipped with a compensator acting on the hair spring which returns the hand to zero when the shaft ceases rotating. The company makes 16 models for automobile speed indication, as follows: Models A, A2, A1 and A3 are known as Tachometers and are distinguished by the use of a hand operated compensator for increasing or decreasing the indication for given speed of the car. The latter two models are fitted with Seth-Thomas 8-day clocks. Models B, B2, B1, B3 and B4 are known as Speedometers and all of them excepting the first two are fitted with 8-day clocks; the entire series B is also equipped with a gradiator consisting of a cylindrical disk rotatable about a horizontal axis and operating on what the company calls a pendulum principle, that is the center of gravity lies at that point of the cylinder periphery which is 90 degrees below the point marked 0 degree. Models C, C2, C1, C3, E and 26 are lower priced products, the last named model being the only example of a centrifugal speedometer on this company's line. The principal improvements for this year are the above described automatic compensator and all steel flexible shaft; besides a steel dropped forged swivel joint is used. The corporation continues its Warner Auto-Meter without any change. This meter is of the magnetic type in which a magnet mounted on the rotating shaft which is driven by the flexible shaft, exerts a torque through magnetic attraction on a thin cylindrical metal disk surrounding it. A spring attached to this disk tends to hold it in the position when the zero mark is in alignment with the indicator point on the dial of the meter. As the magnet rotates it exerts a pull on this disk and tends to rotate it against the tension of the spring, the pull having a definite proportion to the speed of rotation of a magnet so that the torque may be used as a means for measuring this speed.

Jones Recording Speedometer New

Jones speedometers are continued from last year. No changes have been made in the models which are but carried over, but two new models are now being offered, the speedometer model 40 and the recording speedometer model 34/39. The latter combines all features of Jones speedometer with the construction of the recorder which was brought out by the Jones company a year ago and which records exactly the speed made by a car during the day and for how long each speed was kept up. The record is made on a wax-covered sheet by a metal point. The wax sheet turns once in 12 hours, being carried on a clock-driven pin, and the metal point which makes the record is moved up and down by a cam when the car moves. Consequently a zigzag line is produced, the pitch of which is an indication of the car speed, being determined by the travel of the pencil—which is proportional to that of the car—and the travel of the sheet proportional to the time during which the car moves. The sheet is concealed behind a glass plate held in a rim which locks on the body of the casing. The speedometer mechanism is of the centrifugal type and the dial is adapted to indicate speed up to 60 miles an hour; a 100,000-mile odometer and a 100-mile trip meter are also provided. The model 40 speedometer is built along the same lines as the other speedometer models, without the recorder mechanism, and is equipped with a 70-mile and hour dial and 100,000-mile and 100-mile odometer and tripmeter, respectively.

Six speedometer models are the 1913 product of the Hoffecker

Company, of Boston, Mass. Two of these models, K and L, include speedometer season meter and daily tripmeter only, while the remaining four are equipped with 8-day Waltham clocks. The operating principle of this speedometer is as follows: A three-disk governor rotates around the speedometer shaft, being held close to it by a spring which is wound around that shaft. When the shaft rotates the convex disks fly away from the axis of rotation and in doing so press upon a curved spring, one end of which is secured to the back of the indicator dial and the other end to a lever which transmits the deflection of the spring to the indicating needle on the face of the dial. Gears actuated by pinions on the governor shaft drive the odometer or season meter, which has a 10,000-mile capacity in the smaller types and a 100,000-mile capacity in the larger models. The daily tripmeter mechanism actuates a hand mounted on the central spindle, which also carries the speedometer hand. The changes in the 1913 models include the use of an adjustable shaft which permits setting the arm containing the swivel joint at any angle and therefore makes the mounting of the instrument easy on any car. The pleasure car meters of the model L type are fitted with a gradiator, so called, for indicating the incline of an upgrade over which the car travels; this gradiator is furnished at option, taking the place of the 100-mile daily indicator. In the truck meter the swivel joint has been done away with, having been supplanted by a single pair of pinions, one of which is mounted on the cross-shaft actuating the governor shaft and the other at the end of the driveshaft, to which the flexible shaft is attached. The latter is made of highly elastic steel, wound closely and giving a stronger and more elastic means for driving the meter than the ordinary shaft. At the same time vibration transmitted by the shaft is avoided at least to a considerable extent.

Dean Brings Out Centrifugal Type

A newcomer in the line of speedometer manufacturers, the Dean Electric Company, Elyria, O., maker of automobile horns, has exhibited its speedometers for the first time at the Garden and Palace. This instrument is of the centrifugal class, four steel balls being so connected to a spider that when the latter is rotated the balls are deflected from the axis and rotation and lift a cup which is directly connected to the hand on the dial. The flexible shaft enters a key in the spider shaft, so that no gears are required between them. The odometer and tripmeter mechanisms are driven by worm gears, and the latter meter may be reset to zero by means of a button in the side of the casing. The face of the meter is oxidized black with nickel or silver scales.

The Veeder Manufacturing Company, Hartford, Conn., has made practically no change in its product. The hubodometer mechanism is the same as last year, and the only difference is in the front cover which screws on the casing of the mechanism proper instead of being riveted to it as last year. After being thus attached the cover is pinned to the casing to prevent unscrewing of the former. The other instruments made by this company, including the odometer and tripmeter as well as the tachodometer, are continued without change.

The Standard Thermometer Company, Boston, Mass., continues its line of speedometers, which are of the centrifugal type. The changes which have been made since last year in these models are in the nature of refinement and increased strength of parts. By this practice the use of the meter is made practicable for commercial vehicles on which there is a great deal of vibrations and shocks that must not disturb the workings of the speed indicator. As the swivel joint is one of the placed subjected to most strains, the Standard company uses now gears which are made of nickel steel. Furthermore, to insure the good working of the device a practically unbreakable kind of flexible shaft is used for driving the meter. This casing is nickel-plated and looks as substantial as it is constructed.

The Corbin Screw Corporation, New Britain, Conn., which has taken over during 1912 the Brown speedometer, continues the latter without any changes. It will be remembered that this speedometer is of the centrifugal type and driven by a flexible shaft, the governor shaft carrying a gear which actuates the gear trains of the odometer and tripmeter mechanisms. The Corbin-Brown speedometer is made in two types, namely, as a simple speedometer and in combination with a clock.

Speedograph for Trucks Continued

One of the instruments in this class and which was shown at the Garden is the Speedograph made by the Recording Speedometer Company of Newark, N. J., which serves for recording the actual time during which an automobile moved during a day and the speed at which it moved. The instrument comprises an inclosed mechanism, the casing of which carries on its top cover the indicator mechanism. The latter consists of two spools, one of which is rotated by a clock incased in the housing and the other carries a paper tape which is wound up from it to the spool driven by the clock. A vertical shaft fixed to the top of the casing carries a pencil contacting with the paper, leaving the spool from which it travels to the other; the pencil is held against the paper by a spring. A flexible drive entering at the bottom of the casing actuates a vertical worm shaft meshing at its top with a worm gear turning about a horizontal axis and carrying a heart-shaped cam which alternately lifts and drops a follower, the latter carrying in turn the above mentioned pencil. The worm mechanism being actuated when the car moves causes the pencil to be reciprocated vertically through the height of one inch at a speed proportional to the traveling speed of the car. At the same time the clockwork draws the paper tape from one spool to the other at a uniform rate of speed during the day so that as the pencil reciprocates relatively fast a series of steep lines is made by it, while a lower travel of the car is indicated by a lesser incline of the line made by the pencil. When the car is at rest the pencil is stationary and describes the horizontal line on the tape. Excepting a slightly heavier construction this device has not been changed since last year.

The American Taximeter Company exhibited Jones and Popp taximeters in which a few changes have been made since last year. A star-driven collar is used instead of the gear drive of last year, and it is claimed that this construction makes the whole mechanism stronger than before. A foolproof casing is provided by the use of an overlapping front cover between which and the casing strips of metal are inserted to prevent tampering with the indicating mechanism.

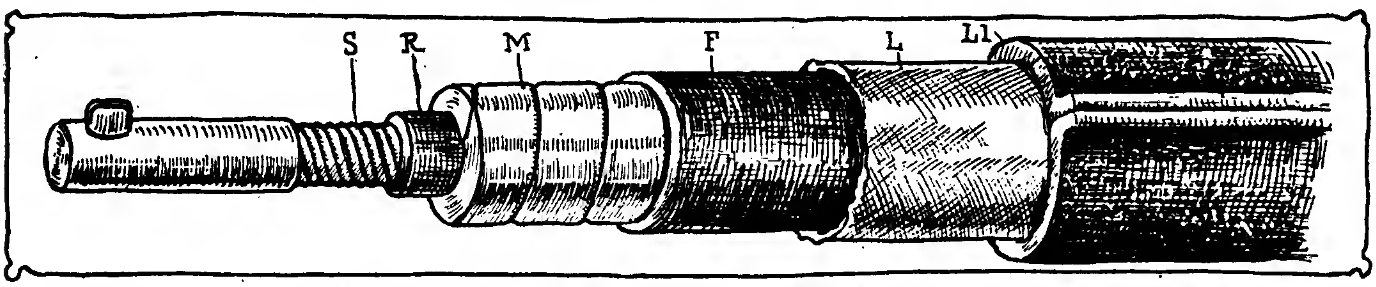


Fig. 2—New driving shaft of Hoffecker speedometer and flexible casing

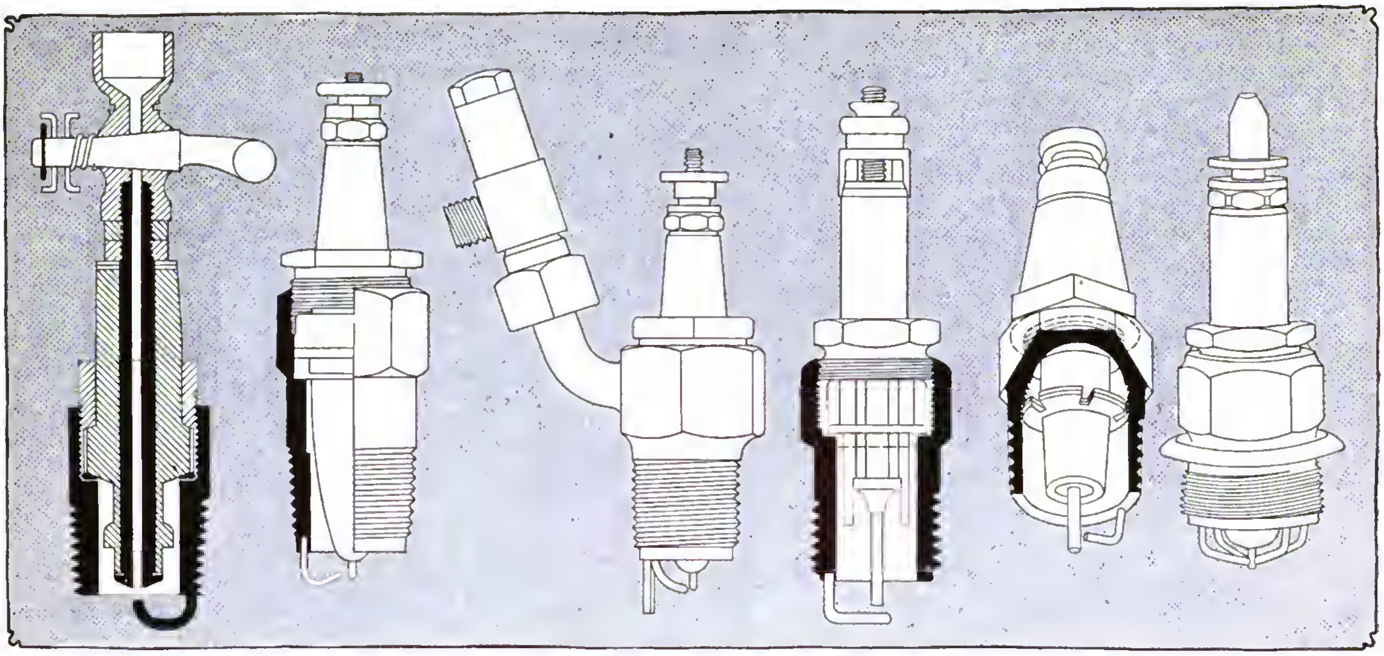


Fig. 1—Heco priming. Fig. 2—AC Ford plug. Fig. 3—AC priming type. Fig. 4—MacKee Blitz plug. Fig. 5—Wright. Fig. 6—V-Ray

Many New Spark Plugs This Year

Priming Plugs and Mica-Porcelain Designs Galore

FOR 1913 the American automobilist and automobile manufacturer are being offered a selection of spark-plugs greater in number and variety than ever before. As for the first, the plugs here described include hardly any except what was seen at the New York shows, whereas the variety is furnished by the use of all types, designs and materials. There are long and short, thin and stout plugs; plugs with steel and brass bushings, mica or porcelain insulation, or both; copper, asbestos or combination copper-asbestos packings; ordinary plugs, heavy-duty types, priming plugs and visible spark designs.

Several noticeable tendencies which are illustrated by the following review of the situation are: The trend toward a mechanically strong, if not unbreakable plug; the use of an absolutely insulating covering for the electrode, such as the combination of porcelain and mica offers; features permitting of quick inspection and removal of the plug, and, finally, priming plugs which combine the work of spark-plugs with that of cups for squirting gasoline or air into the cylinders.

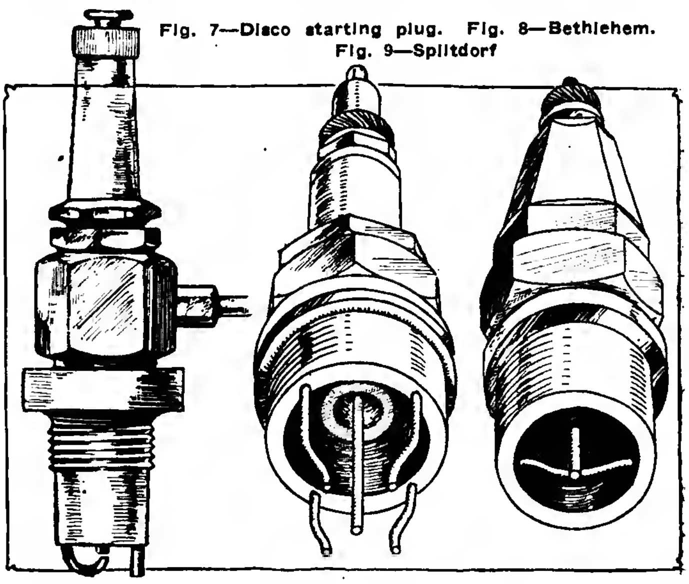
Red Head Priming and Combination

The Emil Grossman Company, New York City, has added three types of plug to its line of regular Red Head designs during the past year. These types are the Platinum Point, the Combination, Fig. 11, and the Priming plugs, the latter being shown in Fig. 12. The first is the highest priced plug of the line and while its shell and insulation are designed much the same as the regular plug, it differs from the latter in the shape and nature of the electrodes. The positive one is plated, from the point to .03 inch above it, with a layer of platinum .03 inch thick; the negative one is bent horizontally from the shell toward the center, making the entire plug more compact. The combination plug uses both mica and porcelain for protecting the positive electrode. A mica cover is wrapped around the metal and, in addition to this, the section of the electrode which is inside the shell is covered with porcelain, thereby making use of both the great heat-resistance of the latter and of the electrical strength of mica. A slight contraction of the shell above the point supplies a priming combustion chamber. The priming plug is different from all these types, due to the use of a brass priming cock and the adaptation of the porcelain to make the use of the cock efficient. The latter is so designed that the fuel squirted into it flows upon the porcelain insulation to the plug point where it is vaporized or at any rate is in readiness for combustion. The insulation used in this plug is of uniform porcelain.

Bosch Changes Electrode Shape

The spark plugs of the Bosch Magneto Company, New York City, are continued without essential changes, the only development being the new form of negative electrodes. The latter are three in number for every plug and are bent inward from the shell periphery, being shaped of heavy wire and with flattened ends; this gives a wide sector-shaped

Fig. 7—Disco starting plug. Fig. 8—Bethlehem. Fig. 9—Splitdorf



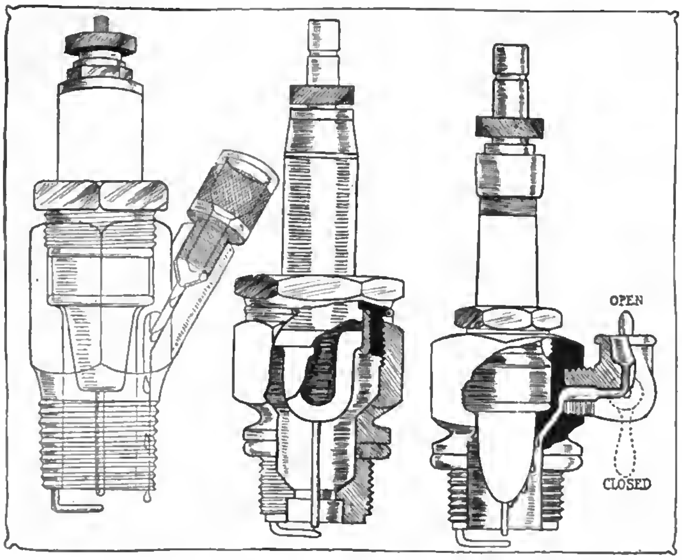


Fig. 10—Champion priming. Fig. 11—Red Head combination. Fig. 12—Red Head priming

sparking line, with all points equidistant from the central electrode. The negative electrodes are built somewhat heavier than last year. As for the positive electrode, this is a stout nickel rod welded into the steel terminal to give effective transfer of the heat from the former to the latter. The insulation is of steatite, a material adopted by the company as specially suited for its needs. The insulation is packed at its upper shoulder against the bushing by a washer of soft metal, which is compressed between steatite and metal; the lower shoulder is packed by a copper-asbestos ring.

Blake Plug's Many New Features

A spark-plug not exhibited in New York before the recent show which is suitable for use as a priming cup, without containing a cock used in other plugs for this purpose, is made by the Blake Spark-Plug Company, Boston, Mass. On this plug, the lower edge of the shell, Fig. 13, is formed with two diametrically opposed taper surfaces sloping in the same direction as the thread of the plug. These surfaces afford a tight engagement with projections formed on the bushing which holds the nut containing the porcelain. The bushing itself, Fig. 14, is ground to a taper fit against the inner face of the shell and is formed with a .06-inch shoulder at its upper end to insure gas-tightness. Attached to this shoulder is a wooden handle which permits of turning the bushing so as to engage or disengage the tapered projection at its bottom portion with the surfaces on the shell. If the turning of the handle is continued after the faces are disengaged, the plug shell is unscrewed from the cylinder. The electrode design is also original. The positive electrode extends but .04 inch below the lower edge of the bushing and the negative electrode is formed by a flat arch connecting the opposite points of the brass bushing and affording a wavering spark. The insulation is of porcelain down as far as .5 inch above the lower edge of the bushing.

Herz Plug Continued Unchanged

Herz & Company, New York City, are continuing their line of spark-plugs without any alteration whatsoever. This plug is distinguished by a funnel-shaped, positive electrode, from which four projections extend toward the surrounding shell, giving four sparks every time the secondary circuit is passed through the plug.

Mosler Junior Plug an Addition

A. R. Mosler & Company, New York City, continue their former spark-plug types and besides having developed, during 1912, a number of types specially adapted for certain makes of car, they have brought out the Junior plug in which the asbestos packing and wicking has been done away with, being supplanted by copper packing. Furthermore, a steel bushing is used instead of the brass part which constituted part of the former standard designs. The special plugs made by the Mosler company are designed for the following motors: Ford, Overland, R. C. H., Alco, Chalmers, Fiat, Hudson, Locomobile, White and Knight.

Bethlehem Five-Point Plug

A spark-plug having one positive and four negative electrodes is made under the name Bethlehem by the Silvex Company, New York City. On this plug, Fig. 8, the central electrode projects .5 inch below the edge of the shell, being surrounded by four negative points which are secured to the shell and are bent inward, offering four spark-gaps, so that there is always a possibility for firing the mixture even if one or two gaps are useless, due to deposits; the latter are burned in time by the explosions started from the other points. The Bethlehem plug is forged from cold-drawn Bethlehem steel and the porcelain is of German material which does not crack in any heat produced by a motor.

Heinze Priming Plugs

Another company making priming plugs is the Heinze Electric Company, Lowell, Mass., manufacturer of the Heco plug, Fig. 17. The ordinary type of plug made by this company contains either mica or porcelain as insulating material. The appearance of the plug is distinctive by reason of the peculiarly formed electrodes. The positive one is a straight point as in other plugs, while the negative electrode is formed by a straight, horizontal, diametrical bridge, the spark jumping downward through a gap of .03 inch. The priming plug known as Heco is shown in Fig. 1 and is of the mica-insulation type. The

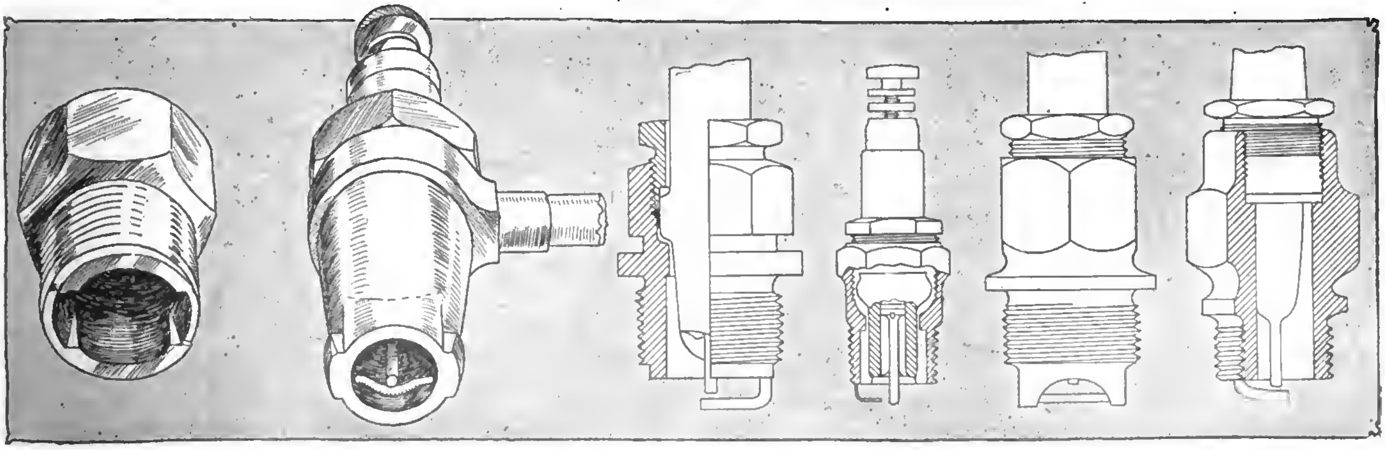


Fig. 13—Blake plug shell. Fig. 14—Blake body. Fig. 15—H. M. S. Fig. 16—Mezger Soot-Proof. Fig. 17—Heinze. Fig. 18—Bull's Eye

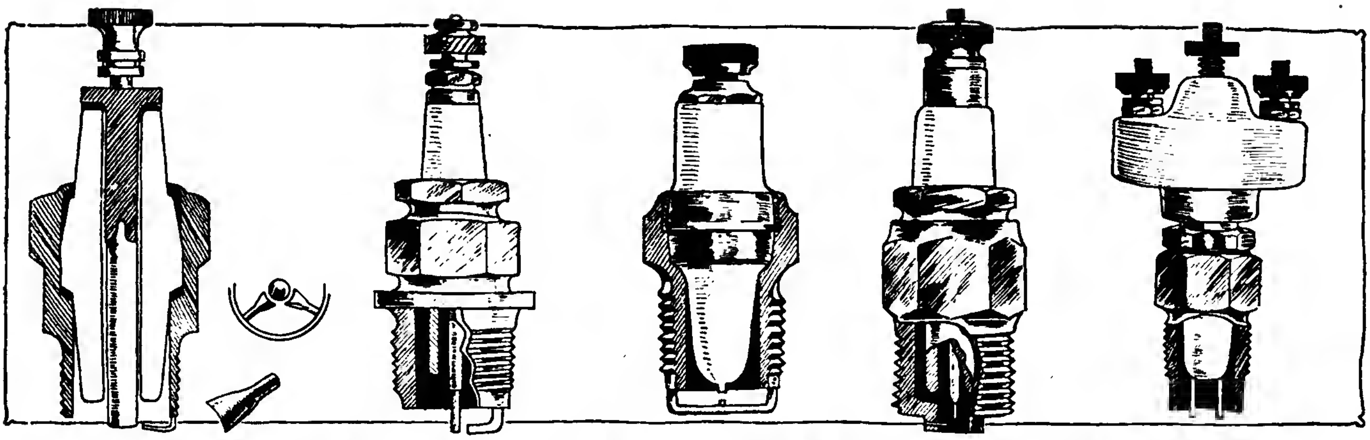


Fig. 19—Bosch. Fig. 20—Miller plug. Fig. 21—J-D heavy duty. Fig. 22—Janney-Steinmetz plug. Fig. 23—J-D two-point plug

positive electrode extends right through the plug as far up as the cock which when turned up forms a priming channel permitting of squirting fuel into the cylinder. A brass nut and washer between insulation and cock form the part to which the wire led from the magneto is attached. The shell carries a wire curved into a semi-circle and forming the negative electrode. A copper washer is fitted to the bottom of the priming channel which at the same time forms the positive electrode. Special priming plugs for Model T Ford motors are being made by this company.

V-Ray Plug Has Some Improvements

The V-Ray spark-plug, Fig. 6, made by the V-Ray Company, Marshalltown, Ia., differs from other plugs principally by the formation of the insulation. The latter issues from the shell into the cylinder without any clearance in which deposits of carbon and oil may form; the insulation is formed of lava for the lower part and mica for the top. The electrodes are of Bokers Meteor wire and four negative electrodes are arranged around a positive one. The plug has a wide shoulder, calling for the use of a packing to insure perfect tightness.

Kingston Plugs Unchanged

The Kokomo Electric Company, Kokomo, Ind., continues its line of Kingston spark-plugs without a change. These plugs are made in three sizes and are formed with stout mica insulations and shells and electrodes of conventional design.

Monarch Plugs of Two Types

Two principles of design are used in the plugs shown by the Benford Manufacturing Company, Mount Vernon, N. Y. The porcelain types are made with insulations fashioned much like those used in the majority of plugs and the electrode design is also the common sort, consisting of a single point extending from the shell to the central electrode. The magneto plug, so called, uses mica for the insulation and the positive electrode is formed as a star giving eight sparking points.

Pittsfield Insulation of Porcelain

The Western Electric Company continues its spark-plugs with few changes. All plugs may now be obtained with porcelain insulation instead of mica, which was the universal equipment before. Furthermore, single or multiple sparking points may be obtained with any type of plug. There is also a combination plug, combining the use of porcelain and mica for the covering of positive electrode.

Splitdorf—New Form of Electrode

Two minor changes have been introduced by the Splitdorf Electrical Company, Newark, N. J., in its spark-plug line. The principal one is the new form of electrode used on the standard plug. This was formed last year as a point projecting horizontally from the shell toward the positive electrode, while now it is shaped as a bridge extending from two diametrically opposite points of the shell periphery toward the positive sparking point, being arched around it, so that more sparking positions become available. This results in a series of sparks reciprocating from one side to the other, a desirable practice according to many experts. Another refinement of the standard plug is the use of a combination terminal screw, Fig. 9, which permits the use of a Rajah, Hedstrom, wire or punched sheet metal terminal. Otherwise the line of plugs, which includes the Standard, Metric and Common Sense designs, has not been changed.

Mac-Kae Blitz Spark-Plug

The Randall-Faichney Company, Boston, Mass., maker of the Jericho horn, handles the Mac-Kae Blitz spark-plug which is made with a combination insulation, an inner coat of mica and an outer one of porcelain protecting the positive electrode. The mica is designed primarily for the purpose of electrical insulation, while the porcelain protects it against moisture and oil. Tightness between the shoulder of the porcelain and the shell and bushing is insured by a copper gasket. The electrodes are designed as seen in Fig. 4 and are platinum-iridium plated.

Two H M S Types of Plugs

The H M S plug, Fig. 15, of the Hartford Machine Screw Company, Hartford, Conn., is being made in two types this year, the former type having been continued with the only change being the use of a steel bushing instead of the brass bushing of 1912. The new model, like the old one, is a porcelain-insulated type, the porcelain being conical in shape, while in the old type it is formed in such a way as to justify the name of the plug, namely, petticoat type. The electrodes are conventional in form.

Best Plug Has Button Electrode

The Best Ignition Equipment Company, New York City, makes the same type of plug which it has manufactured during 1912. In this plug the end of the positive electrode is formed as a button which acts also as a condenser and from which the spark jumps to a ring-shaped attachment of the shell, which serves as negative electrode. A detail of the construction worthy of mention is a helical spring which presses a nut washer against a lock nut on the end of the positive terminal, whereby the wire from the magneto is held tightly in place.

Jeffery-Dewitt's Novelties

Among the three spark plugs made by the Jeffery-Dewitt Company, Detroit, Mich., are three new types of plug—the visible-spark, heavy-duty and two-point plugs. The first type, not shown here, has a small, glass-incased gap interposed in the circuit, between the terminal nut and the sparking end of the positive electrode, which shows a spark whenever the circuit is closed. When a plug misses the gap shows no spark, thereby indicating the plug being foul. The heavy-duty plug is distinguished by the stout porcelain insulation making the plug, which otherwise is built along standard Jeffery-Dewitt lines, specially suitable for truck work. Finally, the two-point plug is adaptable for dual or double ignition, containing two positive electrodes which are connected to battery and magneto respectively. Depending on the system, either point may be used if dual ignition is the equipment, while with double ignition both electrodes operate, giving two sparks for every cylinder with but one set of plugs; the latter are made in standard threads and interchangeable with other spark plugs.

Bull's Eye Plugs Continued.

A visible spark feature plug is manufactured by the G. C. Blickensderfer Manufacturing Company, Stamford, Conn., under the name of Bull's-Eye. This plug is distinguished by the specially shaped shell, and has two glass windows at two opposite points of the shell, behind which visible gaps are in place. By means of this construction a blue light is radiated from the plug whenever it is firing, while, if it is foul, the windows are dark, indicating which plug is missing.

AC Plugs Make Up Wide Line

The Champion Ignition Company, Flint, Mich., offers a variety of spark plugs for 1913, consisting of the former models and several new types. The special Ford plug, Fig. 2, consists of a conical porcelain insulation, a brass bushing and steel shell specially threaded to fit into a Ford Model T cylinder. The electrodes are of wire, the positive being straight and fitted into the insulation in a conventional manner, while the negative is bent as in Fig. 2. The priming plug has its shoulder formed with a priming attachment, bored with a fuel passage which connects with a vertical bore through the shell, ending in the vertical tube arranged close to the negative electrode. All A C plugs are insulated with porcelain.

Champion Priming Spark-Plug

A priming plug constitutes also the leader of the line of the Champion Spark Plug Company, Toledo, O., being shown in Fig. 10. This porcelain insulated plug is formed with an inclined lateral shoulder bored and threaded internally so as to permit of inserting in it the priming cup, the end of which is formed as a needle. When the cup is screwed tight in the seat the needle closes the passage for the fuel which otherwise drips down as shown. The porcelain is so formed as to provide a primary combustion chamber around it, which makes the ignition of the priming fuel easy.

Wright Plug Continues Unchanged

Stevens & Company continue the Wright spark-plug without any change. The plug, Fig. 5, includes a conventional electrode design and a copper packing ring between the shell and the bushing. The insulation is of mica, East Indian material being used for the lower and South Dakota mica for the upper portion of the insulation.

Janney Steinmetz Flash Light

Janney, Steinmetz & Company, Philadelphia, Pa., make the Flash Light plug, Fig. 22. This plug is of the porcelain insulation type, this part being wrought heavily and with ample clearance between electrode and insulating material. The electrodes, both positive and negative, are made of platinum-covered steel wire and all parts of the spark plug are designed on such a scale as to produce a heavy-duty product capable of withstanding severe strains.

Mezger Soot-proof Spark-Plug

Under the name of the Soot-Proof spark plug the C. A. Mezger Company, Inc., New York City, manufactures a product distinguished from all other plugs by the form of the porcelain insulation. The latter is formed with a shoulder and a wide flare extending back into it at the lower side, so that there remains a considerable distance between positive electrode and porcelain. By this expedient sooting of the plug is averted, as a carbon deposit between electrode and porcelain would offer more resistance to the current than the air gap between the point and the negative electrode. The joints are kept tight by means of copper gaskets.

Disco Acetylene Starter Plug

The Ignition Starter Company, Detroit, Mich., brought out an acetylene starter plug during 1912. This plug, Fig. 7, is formed with a specially shaped shell. The latter has a vertical bore opening adjacent the spark gap and communicating with a laterally extending tube in the upper part of the shell which may be connected to the distributer valve of an acetylene starter. The insulation is porcelain.

Charles E. Miller Special Plug

Charles E. Miller, New York City, is having manufactured a special spark plug for his business. This plug is designed along conventional lines, consisting of a steel shell and bushing, a porcelain insulation, alloy steel wire electrodes and a terminal screw shaped in Fig. 20. The plug is said to be manufactured in large quantities and will be ready shortly.

Wasting Current in Garages

Among the principal items of garage overhead expense is the light bill. Anything that serves to reduce this expense must prove a great help to the garage operator, whose profits are, at any rate, limited. As in the garage and repair shops incandescent lamps installed as drop lights are used mostly, a great waste in their application is encountered. The fact is that it is very comfortable to light a drop light, as well as to pull the chain in order to turn it out; but few people think of the second act of the play and the lamp consumes electricity long after he who turned it on has ceased requiring it. Sometimes lights are burning for hours without any purpose and unnoticed by any one. It would pay for the garage owner to employ a boy for the express purpose of looking after the lights and see that tools after use are returned to their proper places. Furthermore, such a boy could give the men a hand, at least to the extent of procuring the tools, etc., which they require during their work, and the saving of the skilled men's time would almost pay for all of the boy's work. The owner of any fairly large garage who takes the trouble to inspect his establishment regularly with a view of verifying the above statement on the waste-light question will find that in many cases the saving of unnecessarily used current would more than pay for a boy's wages. Almost the same may be said for the lost motion incurred by men working around the garage and on cars, who often leave their work for 10 or more minutes to do some small job which might as well be done by a boy of 13 or 15 years. It is obvious that such a waste of labor is among the most serious influences which make for inefficient and uneconomic garage management.

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The present practice for compression pressure in the modern touring car averages about 65 pounds to the square inch, cold. There are some cars, however, which run as high as 85 and 90, although it is very undesirable to go quite as high as the latter figure in a small or medium-powered car used for touring purposes. If your compression is above 85 pounds it would be well to reduce it. Take your compression, however, by gauge, which could be inserted in the spark-plug aperture, rather by attempting to determine it by volumetric computation.

Running with a rich mixture is a prolific cause of carbon trouble. Try cutting down the gasoline a little on your carbureter.

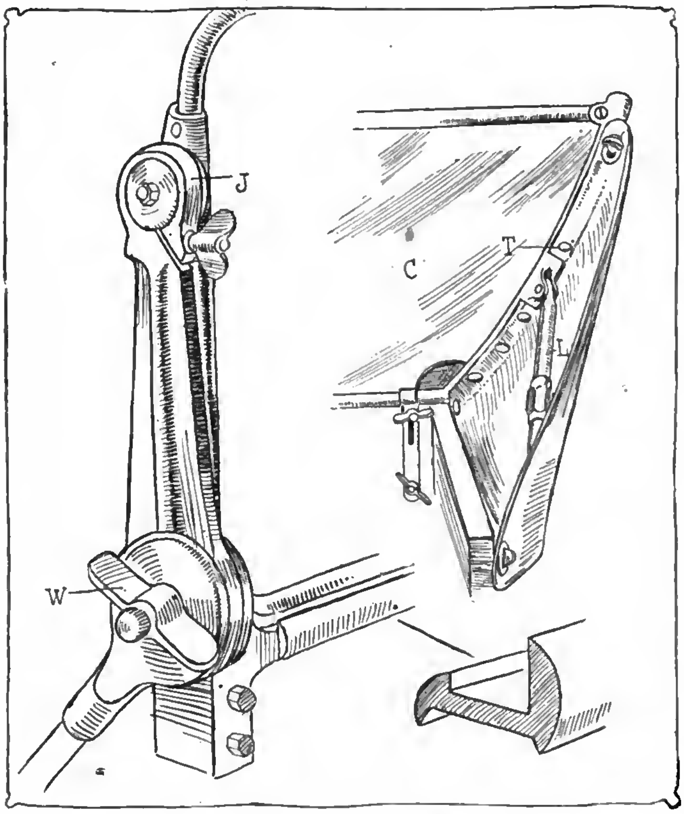


Fig. 1—Cox shield. Fig. 2—Perfecto deflector

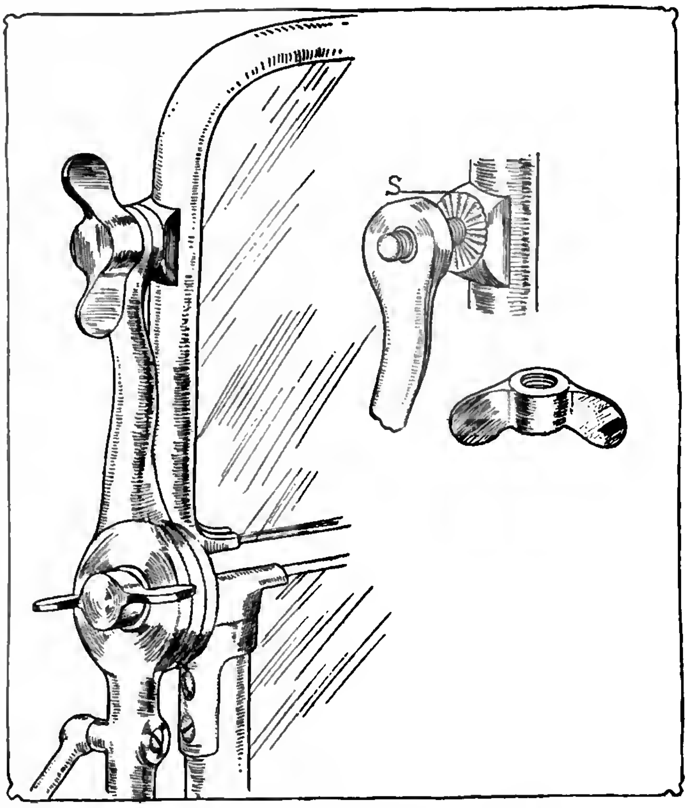


Fig. 3—Cox two-pane shield and joint design

Windshields at Show

Devices seen at the Garden and Palace show many new features which make for ease of operation and effective protection of the driver against air currents rushing against the traveling car. Heavy glass panes held in metal frames capable of varied adjustment constitute the majority of types, although flexible or elastic designs are also in evidence. Improvements tend to make the shields useful under any conditions, especially in inclement weather.

WINDSHIELDS seen at the Palace and Garden shows constituted by no means a complete exhibit of the products manufactured in this branch of the accessory industry. As a matter of fact the number of windshields exhibitors was small and the goods shown, therefore, far too sporadic to be truly representative of practice. This becomes very clear when one considers that fully four score manufacturers make windshields of some design or other, while less than half a dozen of these makers were represented at the show.

The exhibits formed, nevertheless, what might be termed an illustration of the manufacturing trend in windshields. They showed that in designing these accessories the producers always carry in mind certain ideas which tend to make the working of the shield easier and the shields themselves more effective than before. As several of the shields shown are designs which have continued without changes for 2 or 3 years a comparison of these products with the latest designs afford an excellent opportunity of studying just what changes windshield designs are undergoing and what specific ideas the makers endeavor to incorporate in their wares.

The advantages which are being striven toward seem to be great flexibility, more secure attachment, ample protection in combination with the directing of a slow air current toward the driver, perfect transparency of the shield at all times and strength of all parts to reduce the probability of breakage.

Taking up in turn these requirements it is interesting to note how they are being met at present by various designers of windshields.

1. **Flexibility**—While a year ago there seemed to be a decided trend toward the elastic shield made of celluloid or a similar material, glass seems now to have regained its former reigning position. Instead of making the transparent material flexible the makers seem to prefer, in most cases, the use of a number of rigid plates held in individual frame sections, which are individually movable and make possible the use of a variety of positions of the shield. Two and three-pane shields are appearing, in which the individual plates and their frames are connected by specially constructed joints, the latter being so designed as to permit the holding of a pane in four, eight or more positions. The joints themselves are supported on vertical and inclined rods, through which the whole shield or part of it may be shifted forward or backward, giving the possibility of a rain-vision arrangement of the plates.

2. **Secure Attachment**—This condition is fulfilled by the aforementioned vertical and inclined rods or struts. Each of the latter, namely, the inclined, is attached at one end to a shield side support and at the other to the floorboard of the car in such a way that the length of strut between the floor and the vertical side member may be lengthened or shortened to give the above referred to flexibility. Tight adjustment is obtained by various simple mechanical devices.

3. **Protection**—While the protection given by the elastic, curved windshield lies in the deflecting of the air currents above the head of the driver the glass shield achieves this end in a different manner. With multiple pane shields the upper pane is either vertical or slightly inclined so that practically all the air met is caught on its surface, striking the latter under an almost right angle and exerting a considerable pressure on the entire glass surface. The latter must therefore be substantially mounted, more so than the elastic shield, and this is done by the metal rods mentioned under 2. To obtain some ventilation for the passengers of the front seats the upper, and, in some cases, also the lower panes are movable and a little air is permitted to enter between both panes, and this

air being distributed all through the front compartment of the tonneau gives ample and pleasant ventilation.

4. **Transparency**—It stands to reason that the protection given by the shield must not be balanced by the evil effects of an impaired vision on the part of the driver. Especially in rainy weather it is a problem to keep the shield clear in front of the driver, and special windshield cleansers have been designed by various companies to remove moisture from the surface with one movement of the hand.

5. **Strength of Parts**—Multi-pane windshields are made of brass or steel rods and heavy plate glass. The latter feature is necessitated by the fact that every windshield is now and then struck with hard or soft objects and must be strong enough to withstand a moderate blow. Of course, plain glass cannot stand a collision with a metal or stone object at high speed, and though laboratory experiments have demonstrated wire-reinforced glass to be much better adapted for windshield requirements than plain glass not a single shield seen at the exhibition showed the adaptation of this knowledge. With flexible or elastic designs strength is not half so great a problem as in the case of glass models. Leather and metal strips afford the necessary rigidity and no more.

Individual Shield Makers

Coming to the specific exhibits the Cox Brass Manufacturing Company, Albany, N. Y., has seven different shields. All of these are of the metal-glass class, and two original designs are shown in Figs. 1 and 3. The first is a one-pane model which attaches to the dash and is adapted to swing forward with its lower edge, opposite movement being prevented by the upward projection of the base beam shown in cross section. The frame of the pane is of round section and is held in place by two grip members each attached to a joint J. The latter is a friction joint, the internal member of which may be turned after loosening the wing nut which holds the surrounding annular shoe tight upon it. The wing nut W holds the upright side arm in positive relation to the inclined strut and the horizontal base member of the shield, the arm ending in a flat ring, both sides of which are fashioned with ratchet faces and engage similarly shaped faces on the ring attachments of strut and base. The model, Fig. 3, has two panes, the lower of which remains stationary with a given length of the strut; the upper pane may be swung forward or backward by suitable adjustment of the vertical side arms, all joints being of the serrated or ratchet face type illustrated at S.

The Garage Equipment Manufacturing Company, Milwaukee, Wis., showed the shield, Fig. 4. The lower pane is held under an incline by the vertical strut, to the end of which a friction joint is fixed; a friction-material ring between two metal rings, which are attached to the upper and lower panes respectively, constituting a friction joint. The knurled nut holds the metal and material rings in engagement.

Fig. 6 shows the Polson windshield, made by the Polson Manufacturing Company, Buffalo, N. Y., which is constructed in a manner entirely different from the foregoing designs. The frame of the shield consists of two upward side members which have right angles at their lower ends, through which they are attached by screws to the dashboard. Both the upper and lower panes are independently movable, through a full circular arc, around their pivot joints. The latter consist of friction plates, as illustrated in the case of the shield, Fig. 4. Each pane is held in round-section frame arms, surrounding it on three sides, and the upper edge of the lower pane, as well as the lower edge of the upper, are free from metal, making a clear contact when both panes are vertical.

The only elastic shield seen at the show was the Perfecto, made by the Perfecto Wind Deflector Company, Boston, Mass. This shield consists of celluloid C slightly concave when seen from the front and reinforced at the edges by metal rods. The side edges are attached to leather strips by wing nuts T, Fig. 2, passing through eyes in the leather; the leather is part of the side element—there being two in every shield—and being secured to the car body by wing nuts as shown. A link L acts as a strut and holds the flexible side material tight and the celluloid shield in an approximately constant position.

Windshield cleaners for rainy weather were shown by the Emil Grossman Company, New York City, and the Gabriel Horn Manufacturing Company, Cleveland, O. The first device consists of a strip of so-called squeegee rubber clamped to a brass rod; the rod is movable along the shield by means of a split ring to which it is attached and which slides on the upper horizontal frame member. The Gabriel cleaner consists also of a rubber strip held in a longitudinal metal clamp and in contact with the glass pane. The upper end of the clamp is hinged to a split ring slidable on the top frame member; it may be turned around the hinge and moved over the glass surface by pulling a cable or cord suitably connected to the steering wheel or any other position desired.

Another novelty is the Tobey glare remover, Fig. 5, which is designed to protect the driver against the headlight glare of automobiles met on country roads. This device is a circular dark yellow glass plate attached to a rod and by the latter to a rubber-faced clamp which may be slipped over either a glass or metal edge. The device is so installed that when a car with glaring headlights is met with the driver bends his head slightly to the side and looks through the yellow glass.

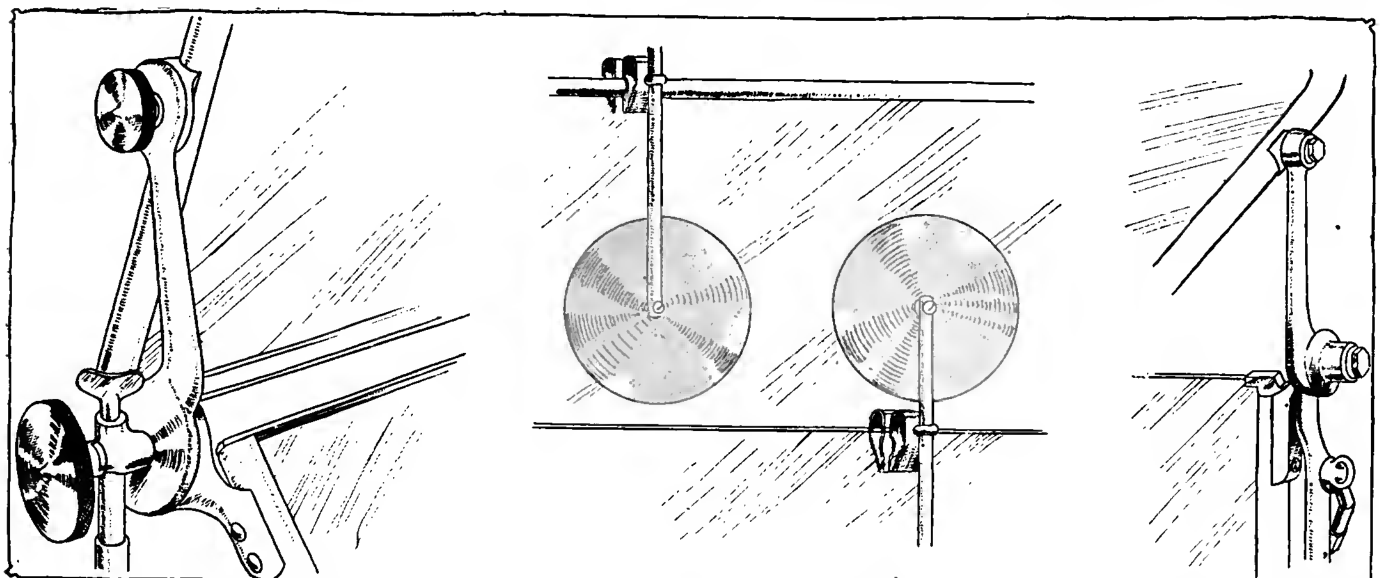
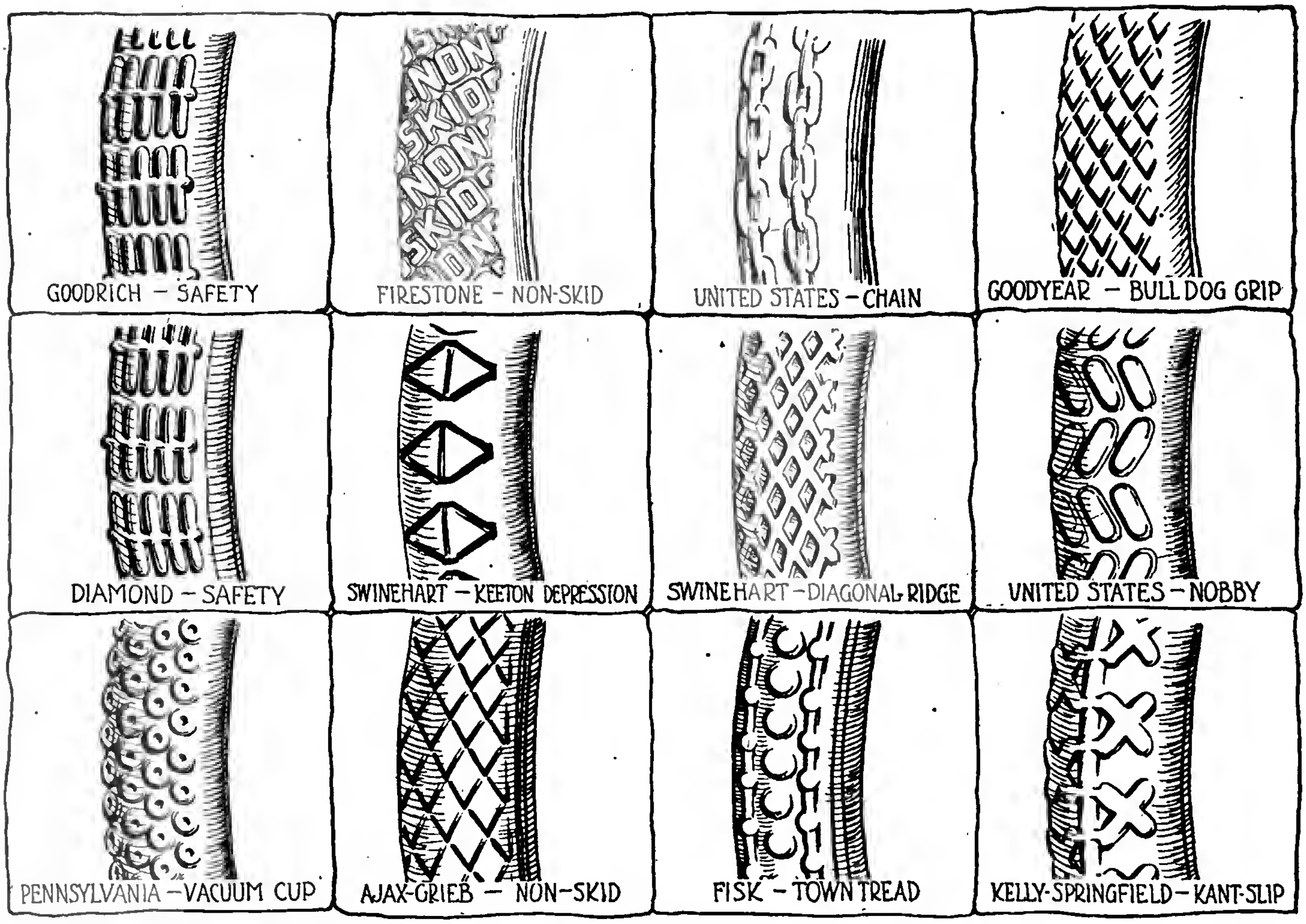


Fig. 4—Garage Equipment Manufacturing Company's shield. Fig. 5—Tobey headlight glare remover. Fig. 6—Polson two-pane windshield



A dozen leading types of anti-skid tires for the present motoring season

Tire Progress Shown by Anti-Skid Treads

The progress of pneumatic tires during the year consists largely in the production of anti-skid tread types and in the manufacture of special pneumatics for electric passenger vehicles. There are over a score of different types of anti-skid treads now on the market by important tire builders and nearly as many more by tire makers of local territories.

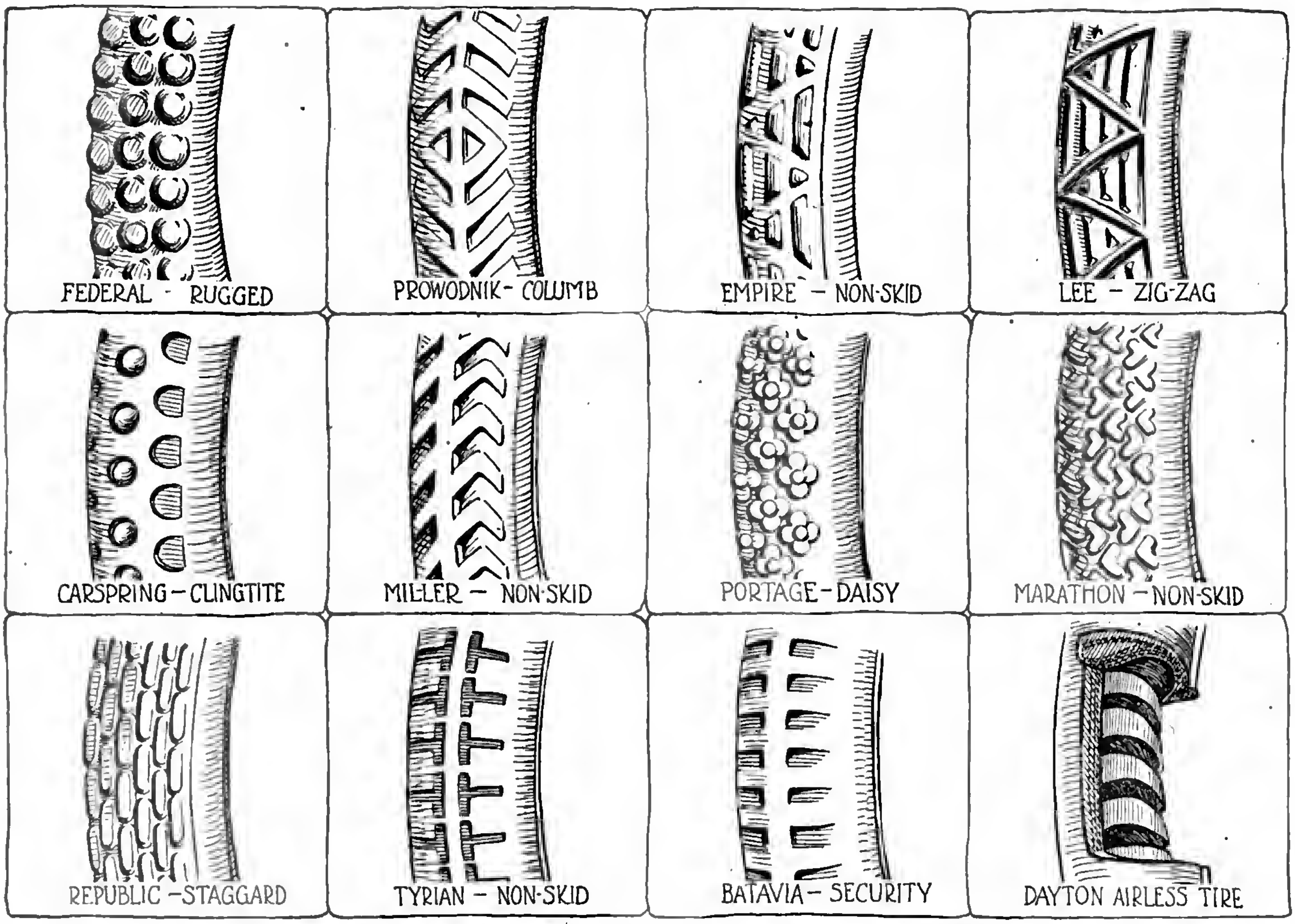
HOW many motorists keep a tire mileage book? Unfortunately, very few. The book must be kept by the chauffeur, or rather should be, and where there is one driver who will take the trouble to keep tab on tire expense, there are 99 who will not take the trouble. The tire mileage book will tell its tale, and if one takes the trouble to turn back the pages several years and compare the average mileage then with that obtained at the present day it will be immediately apparent that tires have very much improved.

From a superficial inspection of the pneumatic tires themselves very little would be learned. Process of manufacture and experience in choosing the right materials are the keynotes of the success.

The tread of the tire has received more attention than any other part during the last year, and in a few words this situation resolves itself into one of types of treads. Treads may be subdivided into two classes: first, where the design is, so speak, superimposed upon the main tread and, secondly, where the tread is indented so that a vacuum is created between the road bed and the tire and as soon as the tire starts to roll or skid, the sharp edges of the incisions reduce slipping to a minimum. In both cases there is an additional thickness in the tread than in the case of the plain round-tread tire, affording greater wearing surface and consequently increased tire life.

There is a growing tendency among the majority of owners to take advantage of the oversize standard tires that are manufactured by nearly every maker of repute. When the car is delivered by the makers, it is usually fitted with one of the standard size rims and tires of a corresponding size, but after the first set of tires have worn out, replacements are generally made by substituting for the worn tires others of oversize dimensions. Many people puzzle their brains to remember what the oversize standard is for some particular make. There is a simple rule which is not hard to remember, namely, by adding 1 inch to the diameter and .5-inch to the width of any standard size tire, one obtains the size of the oversize tire that will fit the standard rim.

The question of loss of power or absorption of energy in tires of different makes has stimulated makers to study the tire question from a different angle. The electric vehicle has been in a measure responsible for this and there are quite a number of makers of regular pneumatic tires who have turned their attention in this direction. The speed of the electric is nothing like that of the gasoline vehicle under normal conditions, and consequently the tires for the former type do not have to be so robust. Resiliency is the word that is usually employed to



Another dozen types of anti-skid tires for the present motoring season

describe a tire that is capable of absorbing part of the road shocks instead of imparting them through the mechanism of the vehicle. By making tires more resilient it is claimed that the current consumption of an electric car can be reduced by 25 per cent. If this is true, and official tests prove that it is, there is no reason why the power of a gasoline vehicle cannot be increased at the road surface or the same power that is now expended can be obtained with a reduction in the gasoline consumption. From the foregoing remarks it would appear that there is still scope for tire makers to increase the resiliency of their tires without reducing the wearing qualities. Of course, if the resiliency were left as it is and the lasting qualities increased the same results would be accomplished as by the other means.

Many of the tire companies which have had a type of non-skidding tread in the past and which have been satisfied with the results have continued the manufacture without any modifications. Among these may be mentioned the United States Nobby tread, the Firestone with the embossed lettering. Goodyear and Ajax with rectangular corrugations and the Republic Staggard tread. The fore-runner of the different treads to be found at present was undoubtedly the Bailey, and this type is still listed by many makers.

Many new designs of tread surfaces have been evolved during the last year or so. It would be impossible to enumerate all of these, but among them are the Vacuum cup, Safety and Chain types.

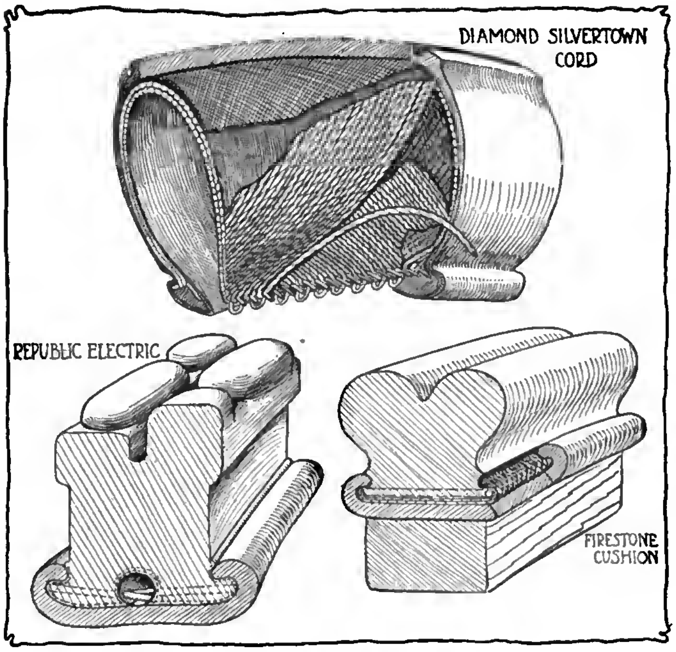
A type of tire that has earned a good reputation, owing to its freedom from rim cuts, namely, the straight sided tire, is being listed for the first time by several makers. Another type of tire that is not new, but which is receiving more prominence this year, may be cited as practically the only thing new in pneumatic tires. This is the cord tire. It consists of a series of cross strands of rubberized cord used where the conventional layers of duck or, as it is more often termed, fabric, are usually employed.

Goodrich—New Safety Tread

In addition to the regular line of plain tread, Bailey tread and metal studded non-skid tires the B. F. Goodrich Company, Akron, O., has placed a new type of tire on the market in the form of the Safety tread tire. A view of this tread is shown in Fig. 1. It consists of a series of five bars of rubber running parallel with the circumference of the tire, each series of bars being intersected in the middle by a single bar placed at right angles to the others. A suction effect is produced as the tire passes over wet ground and the numerous projections grip the roadbed, thereby preventing undue slipping. Another new tire made by this company is the Goodrich cord for electrics. Most types of tires may be had this year with a straight-sided bead.

Diamond—New Squeegee

A tire with a new tread was brought out by the Diamond Rubber Company, Akron, O., during the latter part of last year and forms one of the features of this year's line. The tread is known as the Diamond Safety Tread or Squeegee and is similar to that described above made by the Goodrich Company. The tire was first brought out by the Diamond Company. The tire is convex, and provided the correct pressure is maintained only three of the bars contact with the ground under normal running conditions until such time as the tread has worn down sufficiently to allow the two outside to come into contact. In going round a corner the tire is usually caused to bulge in the opposite direction to which the turn is being made, and this action *per se* brings the outside



Three 1913 tire types

bar into contact with the road surface and arrests skidding action. The Diamond Silvertown Cord tire is built up of a series of cord strands instead of fabric. Each strand of cord is composed of many finer units or strands thoroughly impregnated with rubber solution. The bead has a series of wire hooks and with the aid of special machines the cord is passed over a layer of coated fabric at an angle of 45 degrees to a cross-section of the tire. The machine regulates the tension of the cord rendering it uniform throughout. After the first layer of cord has been applied a layer of rubber is placed over it to separate the first layer from the second. This latter is applied in a similar manner to the first, only in the opposite direction. For example, if the first layer is applied from right to left the second layer runs from left to right crossing the first at right angles. The second layer of cord is covered with a sheet of pure rubber, which in turn is encircled with a layer of fabric acting as a breaker strip. The tread is then applied, after which the bead is put on.

A new composition known as Vitalized Rubber is being employed by the Diamond company this year and is being used in the treads of tires of this make.

Pennsylvania—Vacuum Cup Tread

The distinctive feature of these tires made by the Pennsylvania Rubber Company, Jeanette, Pa., is the form of tread employed known as the Vacuum Cup tread, Fig. 1. The entire tread is encircled with four rows of circulars protrusions with hollow hemispherical cores. As these pass over the road surface while the car is in motion each cup forms a suction grip. The suction action has no retarding effect, as the edge of each cup is automatically raised edgewise and its hold released by the rolling of the wheel.

A new departure in tire making was recently introduced by this concern by oil-proofing the treads of these tires. It is claimed that by a special compound a tread has been developed that is oil-proof.

Firestone—Adds Electric Tire

There is nothing new in the way of gasoline pneumatic tires being offered by the Firestone Tire & Rubber Company for the coming season. The non-skid tread with the words Non-Skid embossed forms a series of angular projections, increasing traction and preventing skidding.

A new Firestone clincher cushion tire for electrics is the latest addition to this product. A feature of this tire apart from any other is that it can be fitted to any ordinary standard clincher rim without alteration. The tire has somewhat the appearance of a dual tire with a single base, Fig. 3. The outer portion of the tire is built with an overhang and the base is of the same resilient compound as the tread. The dual tread, by means of the cut-in center, allows the rubber that is displaced when passing over obstructions free expansion. It is claimed that when the tire moves sideways in beginning a side skid the outer of the two treads rubs the moisture from the road surface, permitting the second tread to obtain a grip upon a dry place and thus prevent the skid. Further, the curved-in section creates a suction upon the roadbed.

Goodyear—Continues Bulldog Grip

The Goodyear Tire & Rubber Company is continuing the type of tread known as the Bulldog grip, which was placed on the market in 1911. It consists of a series of deep cuts in the tread forming a large number of diamond shaped blocks—Fig. 1. These present to the road surface countless edges and angles, facing in every direction. Each of the blocks widens out at the base, thus preventing any possibility of tearing loose.

The effect of widening the base is to evenly distribute the load over the entire width of the tread that contacts with the road. The non-skid tread is separate from the regular tread and is vulcanized over the latter. It is claimed that the passage of air through the corrugations of the tread assist in keeping the tire cool. A feature of Goodyear tires is the straight-sided bead which prevents rim cuts, at the same time affording increased air capacity. Goodyear tires are 10 per cent. oversize and a double cure process is employed in their manufacture.

Republic—Adds Staggard Electric Tire

These tires have undergone no material change during the last year and are manufactured either in plain tread or with a non-skid tread. A new electric tire has been added to the line known as the Republic solid staggard electric tire. Fig. 3. The studs on the tread are so arranged that the intervals between the studs in one row come exactly opposite the studs of the adjoining row. There is a deep depression or groove between the two lines of studs increasing the elasticity of the tire. This type of tire will fit any clincher or quick-detachable rim. Cross wires are inserted in the base, to prevent the tire from creeping or pulling off. They are made in four sizes.

United States—Three Types of Tread

United States tires for gasoline cars are manufactured with three types of treads; namely, plain, Nobby and Chain. The Nobby tread is too well known to need much explanation. It consists of a series of protrusions on the tread, three in a row, and placed alternately at opposing angles; that is to say, the knobs in one row run from left to right and the next row face in the opposite direction, Fig. 1. The effectiveness of the all-rubber non-skid tires is proportionate to the life of the raised sections and if these are high enough to offer broken contact to the road surface after several thousand miles running there is no reason why the effectiveness of the non-skidding properties should not remain.

A new tread in the form of a double chain encircling the tread was placed on the market last year. As the name Chain tread implies the new idea is an adaptation of the chain to pneumatic tire construction, Fig. 1. Additional traction is obtained and the links create suction upon wet surfaces, minimizing skidding. The protrusions of rubber which form the chains also offer lateral resistance besides affording additional wearing surface to the tire.

A special electric tire has recently been placed upon the market known as the United States special electric tire, for which greater resiliency is claimed. The fabric or inner framework, instead of heing made from square closely woven fabric, consists of plies of parallel cords entirely separated from one another by cushion rubber so arranged that each assumes its due proportion of the strain when the tire is in service. This in a measure allows the tire to absorb the obstructions of the road instead of repelling them and causing the wheel to be lifted. These tires are being made in a number of sizes and with plain round, Nobby and Chain treads.

Swinehart—Keeton Depression Added

The latest addition to the Swinehart line of pneumatic tires is the Swinehart non-skid tread, Keeton Depression type, Fig. 1. The tread is composed of a series of rectangular indentions in the tire with the corners squared and cut in half by a further indention. Triangular shaped blocks are thus formed with their apex toward the outside of the tread. No matter in whichever direction the tire is moving there are always a considerable number of sharp edges to prevent any slippage. The diagonal ridge type of tread is also manufactured. All Swinehart tires are wrapped tread and of two cure construction.

Fisk—Adds Town Tread

The latest addition to the Fisk line of tires is the Town Tread type. The other types have been continued, including the bolted-on type. The new Town Tread consists of a plain tread with rows of circular protrusions. In the center of the tread the disks are large and are not connected in any way. On either side there are rows of smaller disks, succeeding disks being connected with a rubber bridge, Fig. 1. The outer rows of disks are smaller than the center row. There are two ridges running circumferentially around the tire outside the smaller rows of disks. These ridges do not normally form part of the tread except when rounding a corner or when through a tendency to slip the tire is bulged sidewise.

Ajax—Rectangular Corrugations

The tread of the Ajax non-skid manufactured by the Ajax-Grieb Rubber Company, Trenton, N. J., consists of raised, beveled rectangular corrugations. Besides aiding traction on any road surface the numerous points of contact are of material aid in pulling a car out of bad places. The corrugations and their inter-spaces create a suction upon the road surface, while the tire is moving, thereby minimizing the possibility of slipping on wet roads. Straight-sided tires are beng manufactured for the first time this year. Another feature of these tires is that they are guaranteed for 5000 miles.

Kelly-Springfield—Kant-Slip Tread

The name given to the non-skid tread tire made by the Kelly-Springfield Tire Company, Akron, O., is Kant-Slip, Fig. 1. There is a central ridge running circumferentially around the tire and at either side there are rows of crosses, the sides of which contact with the center ridge, thus forming triangular depressions. These exercise suction upon the road surface, besides offering a large number of sharp protrusions in the event of any tendency to skid.

Michelin—Continues Semelle

The Michelin Tire Company, Milltown, N. J., continues the Semelle anti-skidding tread in which the prevention of side-skid is obtained by the use of flat-headed steel rivets. The tire consists of an ordinary pneumatic casing, identical with the plain Michelin fabric and rubber design, but differing from it by the tread. The latter is of leather, through which a large number of flat-headed rivets pass, the legs of which are bifurcated and bent open on the other side of the leather. These rivets pass through several layers of leather and are held from coming loose by a rubber layer vulcanized to the leather over the bent ends of the rivets. Due to the large number of the small rivets—there are 460 in a 36 by 40-inch tire—the anti-skidding effect produced by them resembles that of a chain; with the difference, however, that the metal objects, which hold on to the ground, are in an infinitely more intimate contact with the tire proper than a chain may be. The work of the rivet-studded tire remains the same for practically all speeds.

Portage—Daisy Non-Skid

The Portage Rubber Company, Akron, O., besides making regular round-tread tires has placed on the market a non-skid type known as the Daisy Non-Skid Tread, Fig. 2. The name is indicative of the form of the tread. There are three rows of rubber protrusions in the form of daisies offering countless edges and angles to the road surface. The daisies are added as an extra tread to the regular smooth casing. Portage tubes are also manufactured and delivered in sealed boxes.

Tyrian—Hold-Tite Tread

These tires are manufactured by the Tyer Rubber Company, Andover, Mass. They are distinguished by a white rubber tread. A non-skid type, known as the Hold-Tite, Fig. 2, is made, the tread of which consists of two rows of capital T's running around the entire circumference of the tire. This forms a tread with a plain center, two rows of intersected indentions parallel to the tire and a series of cross indentions formed by the base of the letter T.

Federal—Four Tire Types

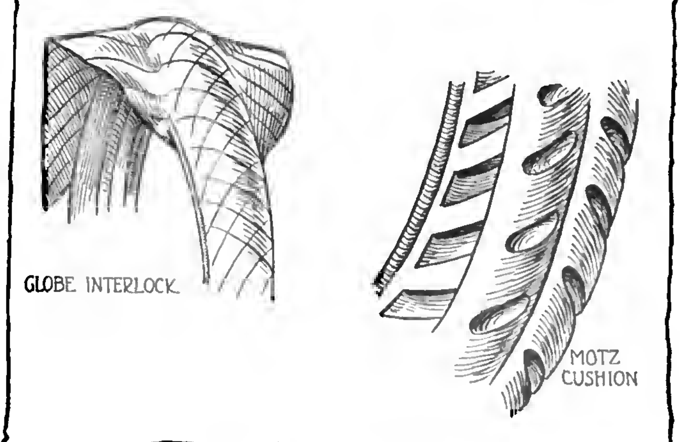
These tires are made in four types, by the Federal Rubber Manufacturing Company, Milwaukee, Wis. These are: The regular clincher round tread, quick-detachable round tread, straight sided detachable round tread and the Rugged non-skid tread. This latter, Fig. 2, consists of a series of large studs arranged parallel, three in a row, forming an integral part of the tread. These studs expand outwardly at the base, preventing them from tearing off under severe strains.

Globe Interlock

These tires are manufactured by the United & Globe Rubber Manufacturing Company, Trenton, N. J., and the principal point of difference between these rubber tires lies in the method of forming the carcass. Instead of wrapping the fabric circumferentially around the tire, strips of fabric are cut on the bias and laid diagonally across the body of the tire. Two layers of rubber-coated fabric are placed one upon the other, Fig. 4, thus forming intersecting strata, one ply running one way and the second in the opposite direction. The tire is made with either a plain or non-skid tread.

Dayton—Airless Tire

These tires are primarily intended to take the place of a pneumatic and perform in the same manner as a pneumatic only without the inconveniences of air. Externally the tire presents the appearance of an ordinary pneumatic, but instead of a tube the inside of the tire is built up of numerous sections



Two tire types for the present season

of rubber and straight cut fabric in the form of arch supports. These supports are spaced apart, so that when the tire passes over an obstruction, the rubber can be momentarily displaced and after passing the stone or rut resume its normal shape, the piers of rubber vulcanized to the casing becoming part and parcel of it, as can be seen in the illustration of a section in Fig. 2. These tires are manufactured by the Dayton Rubber Manufacturing Company, Dayton, O., with either plain or non-skid treads.

Empire—Uses Red Rubber

These tires are manufactured by the Empire Tire Company, Trenton, N. J., and are distinctive in appearance, being made from red rubber. The non-skid tread consists of four ribs, Fig. 2, running circumferentially around the tread of the tire and intersected at intervals by diagonal grooves. The grooves are zig-zagged so that the protrusions form a shape of a series of pyramids whose apexes alternate from one side to another. This concern also manufactures Peerless red tubes.

Motz—Electric Cushion Tire

The Motz Tire Rubber Company, Akron, O., manufactures a cushion tire especially adaptable to electrics. It is virtually a solid tire offering a dual profile to the road surface. In order to create a cushioning effect when going over road obstacles the sides of the tire are undercut slantwise, and the tread is of the tire is undercut at intervals to afford good traction and to prevent skidding. Increased surface contact is claimed for this tire.

Racine—New Trusty Tread

A new type of tread known as the Trusty has been placed upon the market by the Racine Rubber Company, Racine, Wis. It consists of three rows of elongated rubber studs, the center row being aligned with the circumference of the tire and the two outer rows being set irregularly so that the brakes between studs in the inner and outer rows do not come opposite each other.

Carspring—Introduces Clingtite

These tires are manufactured by the New Jersey Car Spring & Rubber Company, Jersey City, N. J., and are made in plain and anti-skid tread types. The Carspring anti-skid tread, known as the Clingtite tread, differs in many respects from others at present on the market. The tread is to all sense and purposes smooth with a series of holes indented at intervals, Fig. 2. The holes look as if a rubber ball were beneath them; that is to say the rubber comes to an apex in the center of the hole, tapering off to the sides. On either side of the row of holes there are a series of arches cut into the tread decreasing in depth from the point nearest the center of the tire. The center holes form a suction on the road and increase traction and the side slots or arches offer sharp edges to the road in the event of a slip. This concern also makes red inner tubes.

Miller—One-Cure Type

Miller tires are manufactured by the Miller Rubber Company, Akron, O., and the method employed is what is known as the one-cure, wrapped tread type. The wrapping of the fabric is effected by means of specially designed machinery and the final vulcanizing is carried on in live steam instead of molds. Besides the usual line of plain tread tires this concern makes the Miller non-skid, Fig. 2. The tread of the non-skid tire presents the appearance of two series of V's placed one over the other on either side of a center line. The apex of the V's on one side points in the direction in which the car is traveling, while those on the other side point in the opposite direction.

Batavia—Security Tread Continued

These tires are manufactured by the Batavia Rubber Company, Batavia, N. Y., in a variety of treads and beads. Among these may be mentioned the Security tread, Fig. 2. This consists of a series of corrugations or notches equidistantly spaced apart from a rib running circumferentially around the tire.

Favary—Mechanical Tire

This tire is made up of a series of rubber-coated bands of fabric spaced apart by small supports, the tread consisting of solid rubber. When an obstruction is encountered the supports beneath the layers of fabric move in such a manner as to allow the fabric to flex and thereby absorb the obstruction and giving the tire a degree of resiliency.

Brown Scientific Tubes—Extra-Thick

These tubes are manufactured by the Voorhees Rubber Manufacturing Company, Jersey City, N. J., and consist of a red rubber tube which has a layer of fabric running through the rubber at the point equivalent to the tread of the tire. This section of the tube is materially thickened. The fabric is non-elastic.

Interlock—Inner Tires

These inner tires consist of a series of layers of fabric vulcanized together, and placed inside of an ordinary outer casing between it and the inner tube. In order to prevent the inner tube from being pinched, the lining is made wider than the tire and the two edges lap one over the other. These have been improved and are now rubber coated externally.

Reason—Non-Blow-Out Inner Casing

This device consists of an interliner between the outer casing and the inner tube. As it takes up a certain amount of space inside the tire, a smaller inner tube than usual is used with it. In order to give the additional thickness a degree of elasticity, air pockets are introduced, forming cushions, the liner consists of two rows of rubber-coated fabric and one breaker strip a layer of white rubber in which there are a number of air cells. Between this layer of rubber and the inner tube there are two more layers of rubber-coated fabric.

Prowodnik—Non-Skid Columb

These tires are manufactured in Russia and handled in this country by the Russia Tire Sales Company, of New York City. A non-skid type known as the Columb, Fig. 2, consisting of a wide rubber ridge running around the center of the tread. This rim is supported by a number of ribs in the form of a herringbone. In order to insure equal traction and non-slipping properties the angles of the ribs alternate, that is to say several of the ribs face one direction followed by a series facing in the opposite direction.

Marathon—Angle Tread

Marathon tires are manufactured in round tread as well as angle non-skid treads by the Marathon Tire & Rubber Company, Cuyahoga Falls, O. The term Angle tread describes the type of tread employed. There are five rows of right angles, in the form of protrusions, above the surface of the tread as shown in Fig. 2, each successive row having the angle facing in the opposite direction.

Lee—Adds Lee Zig-Zag

In addition to the regular plain tread puncture-proof tire manufactured by the Lee Tire & Rubber Company, of Conshohocken, Pa., a non-skid tire has been added known as the Lee Zig-Zag. The puncture-proof device consists of three layers of circular disks, each layer overlapping the other and separated by a cushion of rubber. The new non-skid tread, as the name denotes, consists of protrusions passing diagonally around the tire from one side to the other, the spaces between the diagonal lines being partially filled with small projections increasing in size from the apex outwards, Fig. 2.

Shock Absorbers Show Improved Details

Friction, Spring and Dashpot Devices Mostly Unchanged and Number of New Apparatus Is Small

As in previous years, the large majority of shock absorbers produced operate on the friction principle, spring being used more frequently to act supplementary to the ordinary suspension, while dashpot designs are limited to expensive cars.

FEW new types of shock absorbers have appeared this year, although there have been several changes in existing types in order to make them more effective. The ideal absorber of road jars must dampen the great spring vibrations, but it must not perform this function at the expense of the resiliency of the springs. This difficulty has been experienced with earlier types, which, while they prevented big road inequalities from reaching the occupants of the car, had stiffened the spring action, taking from the suspension its smoothness and defeating the purpose for which it is intended.

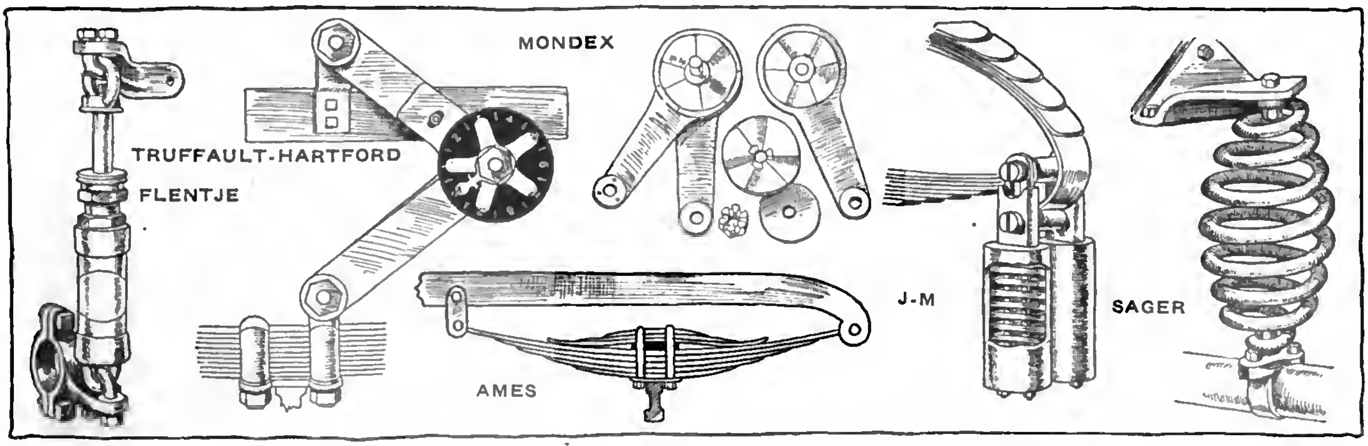
Shock absorbers generally operate on one of three principles, viz., friction, fluid resistance (dashpot action) or equalizer spring action. There are combinations of these various methods of operation. For instance, in one type both friction and spring action are utilized. Absorber makers have in the main designed their devices for application to all makes of cars, and have developed special brackets or other necessary attachment features to meet any conditions.

In lengthening the life of the automobile as well as in adding comfort for the passengers, some form of road equalizing arrangement is of great value. Many car manufacturers realize the part which shock absorbers play in the reduction of depreciation, and there is an increasing number of them who are fitting their cars with some form or other as standard equipment.

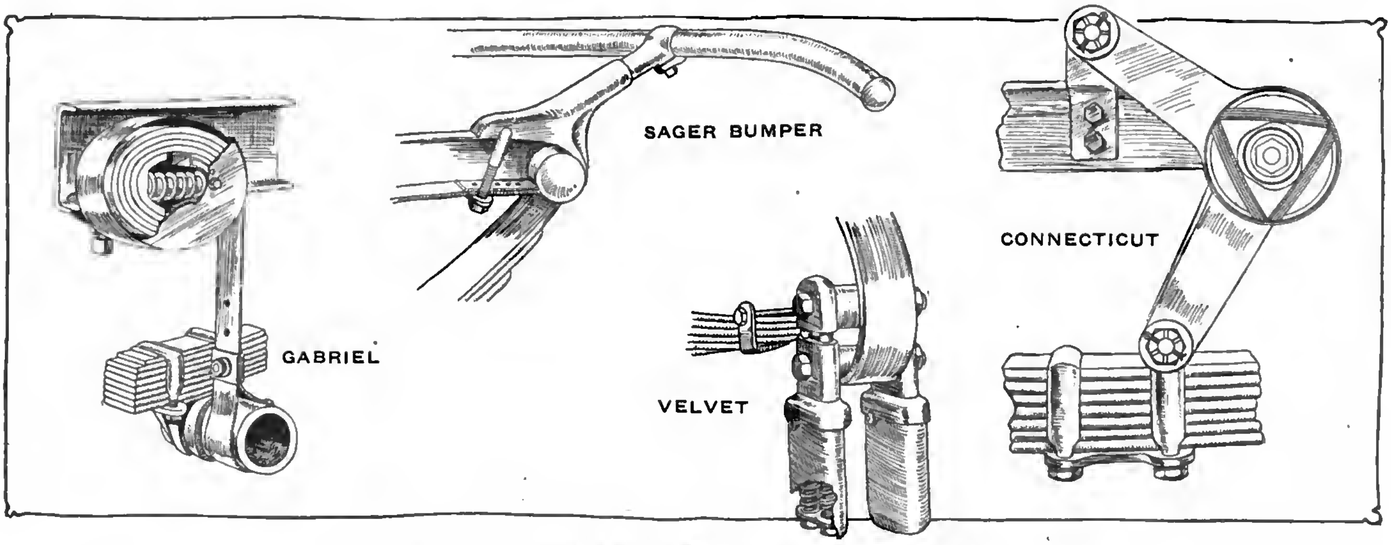
Truffault-Hartford—This shock absorber is of the scissors type, and consists of a single arm attached to the frame of the car and a double arm, frictionally jointed by a bolt and adjusting nut, as shown in the illustration. The upper arm works between the two parts of the lower, giving a straight up and down movement. The upper arm is made of spring steel and therefore allows for any side sway. This arm carries a flanged cover, forming a cup-like space on either side, in which spaces the friction plates are placed. Each of the friction plates is covered by a flanged steel disk which fits to the flanged cover and prevents dust and water from reaching the friction disks. A bolt carrying the friction adjusting nut holds the parts together. By tightening up on the nut any degree of friction is obtained, and the action of the shock absorber modified to produce soft or stiff suspension, in accordance with the wish of the car passengers or the driver.

The sketch shows the new Truffault-Hartford type, which is a refinement of the standard model. An auxiliary short arm has been inserted which follows the direction of the upper arm. It is placed between this upper arm and one of the friction disks. In its upper end, this short arm has a slot cut about 1 inch in length. A knob or projection from the upper main arm fits in this slot as shown. The idea of the new feature is to absorb small vibrations without in the least interfering with the resiliency of the springs. When the springs sink a small amount, the long arm descends a like amount and the metal projection slides down in the short arm slot. Since there is no friction between this short arm and the upper arm, they slide over each other and only one friction disk is brought into play, thus making for slight frictional resistance. But when the vibration is large, the upper arm is depressed a greater amount and its metal button finally reaches the end of the slot, when it moves the small arm also. This brings the outer disk which is in contact with the other side of the small arm into play, doubling the friction acting against the shock. Thus the frictional tension varies in proportion to the shock. In addition to the automatic model, there are four other sizes for different sizes of motor cars.

Mondex—This absorber is one of the scissors design. It is placed between the frame and the axle at the side, controlling the spring movement up and down. There is a single arm attaching to the frame, while a double arm is fixed to the axle. The lower arms are jointed one on either side of the upper arm. In the makeup of the joint of the two sets of arms, there is a series of inclined planes of high-carbon steel working against smooth brass. These ride upon one another on the wedge principle, thus expanding and contracting disks of firm resilient rubber. This rubber cushioning rapidly increases in resistance the further it is compressed, so that the magnitude of the shock is met by a corresponding resistance, it is claimed. The difference between the downward motion and the upward recoil of the spring is met by having a greater amount of rubber compression on the upward movement than on the downward. The illustration



Five types of shock absorbers designed to produce easy riding in 1913 cars



Four other shock absorber designs which have met with the public favor

shows the wedge disks and other parts which go into the makeup of the device.

Connecticut—The Connecticut is similar in outward appearance to the scissors types already mentioned, and it fastens to the car in much the same way. There is a single upper arm attached to the frame, while the lower part is in two sections. Referring to the sketch, it is seen that the working elements consist of a three-face cam working between three sets of flat springs of suitable tension to give the necessary resistance for different weights of cars. These springs are three to a set and placed in a triangle within the retaining shell or cup with an anti-friction material inserted between each cam face and its springs so as to minimize wear. The shell is packed with grease, which keeps the parts well lubricated. The case is made grease tight. When the arms are caused to close up in proportion to the road inequality, the cam is turned and presses put on the springs which resist an amount dependent upon the degree to which the axle is raised.

Gabriel Rebound Snubber—This shock absorbing device, which remains practically unchanged for this year, utilizes the friction principle. It does not work on the downward movement of the springs, but acts upon the rebound. The application of the device to the car and the internal construction are shown in the illustration. The snubber consists of a circular base split into two semi-circular parts around which a strap of fabric belting is wound four times. One of the halves of the base is stationary and is integral with the clamp which fastens the device to the car frame by means of two set screws. The other half of the base is free to move and is pushed outward by a coiled spring. This outward motion is opposed by the windings of belting. When the frame and axle come closer together than normally, the strap slackens and the spring expands to take up this slack. The coils must slip over one another to do this. But on the rebound when there is a tendency for axle and frame to get farther apart the belt is pulled and the coils tighten, increasing the friction between them in proportion to the pull. Thus the resistance to rebound is in relation to the severity of the shock. The device comes in models for all sizes of pleasure cars and trucks.

Sager—The Sager company offers a specially designed type of equalizing springs which dampen the excessive vibration of the main springs, and it is claimed for them that they do not destroy the resiliency of these main springs in any way. They are wound with the largest coil in the center and taper to the ends. The spring and its attachment to the frame and the axle is shown in the cut. In addition to these auxiliary springs, the concern makes all styles of bumpers for attachment to the front springs. One of these models is seen in the illustration. It is made of steel tubing and is adjustable for width. Concealed springs within the brackets take any shock to which the front cross tube is subjected.

J-M—Replacing the spring shackles at the rear of the car, the J-M shock absorber, which takes its name from the initials of Jacquet Maurel, a French mechanical engineer, consists essentially of a helical spring within a cylinder, which spring is compressed according to the amount of shock. The illustration shows the construction and mounting at the end of a three-quarter elliptic spring. The lower flat laminated spring end carries the cylindrical guide for the helical spring by means of the U-bolt passing to the bottom of the cylinder. This cylinder bottom also forms the seat of the helical spring. The end of the upper flat spring fastens to the head or piston, which rests on the coiled spring. The action of the device is self-evident, and in addition to absorbing shock it acts as a shackle to take care of the elongation of the laminated springs. The device is made with two coiled springs, as shown, or with a single coil for small cars. The latest type to be brought out is the model which is designed for the peculiar rear springs of the Ford car. This is a single coil type and is mounted upside down as compared to its usual application.

Velvet—The Velvet shock absorbing springs also take the place of the rigid steel shackles of the rear ends of the flat springs. They are simply resilient shackles. The construction is seen in the sketch as well as the attachment to the main springs. Each set consists of two pairs of helical springs on which the car weight rests. These are housed within the rectangular metal cases shown. Steel studs around which the helical springs are placed fasten to the lower part of the laminated spring. These studs carry plates held in place by nuts on which plates the coiled springs rest. The sliding sleeves to which the end of the upper part of the flat spring is bolted rest on the coiled springs. Compression of the main springs acts to compress these auxiliaries also, causing them to act as absorbers. The velvet springs are made in five sizes for various weights of cars.

Flentje—The Flentje is a cylinder and piston type of shock preventing apparatus, and is made for attachment to the axle at one end and the car frame at the other. The sketch herewith gives the outward appearance of the device, which is on the dashpot principle, similar to that used in connection with the valve operation of the Corliss type of engine. The Flentje consists essentially of a piston working within a cylinder, the former being attached to the frame and the latter to the axle. The piston is drilled with several holes or valves through which the mica and oil mixture, which fills the cylinder, may escape from above or below the piston depending on whether the piston is forced down or up. When a shock forces the piston down, it acts upon the liquid, which must escape through the piston holes, the resistance to flow increasing with the pressure exerted. When the spring recoil tends to draw the piston out of the cylinder the liquid is then above it and must be forced through the valves into the lower portion of the cylinder, the same fluid friction again acting as a compensating force against the recoil action. This is the principle of the device, although the details of the valves, etc., are somewhat complicated. The car weight is at all times suspended on the liquid cushion.

Westinghouse—The Westinghouse air spring, so called, is a device which is designed to be placed between the spring shackle and the frame. It consists essentially of two cylinders, one of which telescopes within the other. One of these is attached to the frame and the other to the spring shackle. Within the cylinders there is contained a volume of air normally at atmospheric pressure, and below this a certain quantity of oil. The lower cylinder is really a modification of the usual piston rod, and it carries a piston. The action of the device is similar to that of the dashpot. The car weight rests upon a fluid cushion, which consists of a quantity of air below which is the oil. Suitable valves are interposed which regulate the flow from the upper to the lower chamber or vice versa. After the air has been compressed a certain amount, the valves open and allow the oil to escape into the other chamber. Thus, when, due to the road inequalities, the axle is forced up nearer to the frame than normally, the tendency is to force the cylinders together. This serves to compress the air in to the top of the upper cylinder, the force being transmitted through the oil. When the air has been compressed somewhat, a valve opens, allowing it to escape into the lower chamber and permitting the oil to flow through the valves, the resistance to flow increasing with the pressure.

Ames—A new auxiliary spring shock absorbing device has appeared this year in the Ames, sketch of which is given. This spring is mounted directly on top of the lower main spring, and while it has no effect upon the resiliency of the main spring, it serves to smother the recoil vibrations. This device is a three-leaf affair, which bolts under the spring bolts, a metal block being interposed between the main spring and the oppositely-acting auxiliary leaves. When the main spring is normal, the ends of the longer leaf of the Ames spring are in contact with the upper leaf of the former. These leaves are not in engagement when the main spring is compressed, due to the use of the distance block. Thus the main spring vibrations are not imparted to the Ames device, which therefore tends to smother them when contact is again made on the recoil. The device is noteworthy for its simplicity.

Harking Back a Decade

FROM THE AUTOMOBILE for January 31, 1903:

So rapid is the progress of automobilism that principles which are laid down one day as established factors very soon become obsolete and have to be replaced by something more suitable to new and constantly changing requirements. Despite the wonderful development of the industry, it is far from having settled down on definite lines, and in striving at perfection manufacturers find themselves continually confronting new problems which lead them to unexpected issues.

In Pittsburgh there are 530 automobiles in use, of which 56 per cent, are used exclusively for pleasure parties, 40 per cent. for business and pleasure combined and 4 per cent. for commercial usage.

In 1759 Dr. Robinson, then a Glasgow student, talked about a wagon driven by steam and in 1772 Oliver Evans, of Philadelphia, actually did drive a wagon by steam, though the wagon was made for a boat, on the road, and in 1786 Evans tried to have the Pennsylvania Legislature give him a patent on steam wagons and did obtain a patent in that state on steam-driven flour mills and in 1787 the State of Maryland granted Evans an exclusive right to build steam wagons. Evans said then that he fully believed steam wagons to travel 15 miles an hour, or 300 miles in a day, and could carry passengers as well as goods; Most people thought Evans was crazy, of course.—Retrospect of the Steam Vehicle.

A novelty in after-dinner entertainments was sprung on the members of the Automobile Club of America and their guests on the occasion of the fourth annual dinner held at the Waldorf-Astoria recently. Between speeches a smart electric runabout came into the great banquet hall at a rate of speed that would have given a country constable palpitation of the heart.

"I don't claim that every man who runs an auto is a jackass, but I do claim that every jackass runs an auto. I run one myself."—Simeon Ford.

As a matter of fact, it is notorious that the drivers of horses are far more apt to be frightened than their beasts, and that when the horse takes fright it is commonly because he is notified by his sort of telepathy through the reins that the approaching object is to be feared. The driving public is in much more need of an education in this respect than the noble animal.—Editorial.

The feature of the annual report of the Secretary of Agriculture of Pennsylvania, John Hamilton, was the recommendation that $1,000,000 be appropriated for the construction and maintenance of concrete roads.

Express trains can dash across a public grade at the rate of 70 miles an hour and trolley cars can run at the rate of 30 miles an hour on a public highway for private gain, but an automobile, according to the government's idea, should not exceed 15 miles an hour.—New Jersey Drastic Law.

French visitors, of whom there were many, including well-known names among European manufacturers of cars and carriage bodies, must have been astonished at the vigorous prosecution of automobile designs not at all contenanced in their country.

Before the ladylike electric carriages of the various makes fair woman stepped with critical surveys of styles and upholstery, and the great improvement in design—mostly due to underslung batteries—probably did not escape them.

Descending to the level of male creatures, there is no more difficulty in picking out the centers of interest. They are grouped according to technical conviction, or perhaps more according to road experience, on the principle that he who paid full price for a spavined horse is likely to look out sharply for spavin, but, on the other hand, may be tripped again by weak kidneys or "thumps."

No doubt a large number of show visitors felt perfectly justified in declaring the cars here referred to the most interesting and promising in the whole display, especially as the Franklin and the Backus vehicles include a number of other highly original features, well worth studying. In the Backus car, for example, the ignition and the throttle are tied together for convenience in operation, but a special movement is introduced for increasing the dimensions of the valve parts, an accelerator, in other words—when full charges are required.

Magneto Field Well Stocked

Development Has Sought to Eliminate Vulnerable Points—Automatic and Fixed Control Gaining

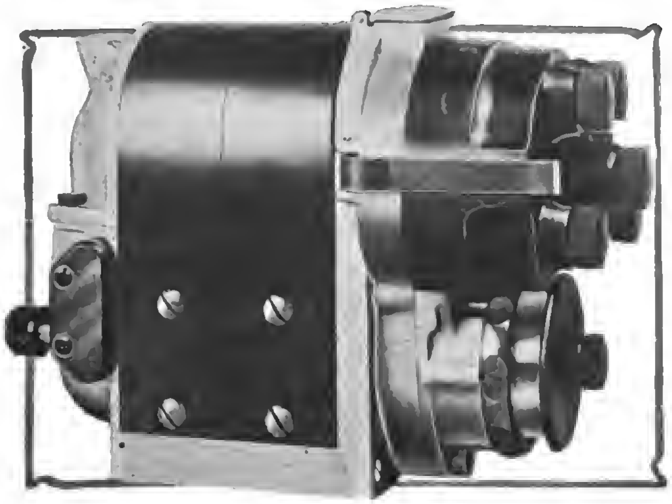


Fig. 1—The Bosch ZR 4 two-spark magneto which has a double distributer disk. The disk is held in position by two flat springs which have snap-on connection. The breaker-box cover has a bayonet lock catch, so that both of these parts are easily removable

SURVEYING the ignition field, development in general has sought to eliminate the vulnerable points, with the result that new types now appearing are a step further toward perfection. Radical changes are absent, but the big makers have tried to determine just where their instruments are weak, the principal aim being to eliminate the personal equation so far as possible in their manipulation.

Spark control has received considerable attention and in addition to the variable control, we now have fixed, automatic and governed methods of arriving at the proper time for exploding the several charges. The fixed-spark method has appeared on a number of cars, but its use is specially favored for trucks. For small motors this fixed ignition is well enough but it is doubtful if it is advantageous for large engines.

Automatic spark control is a system by which the spark is mechanically advanced or retarded, as the motor speed increases or decreases; while governed control is essentially the same as automatic up to a certain predetermined speed, above which the spark is not advanced further. This maximum point depends upon the motor in question.

Simplification of breaker box mechanisms by reducing the number of parts to the minimum is striven for with the result that the new instruments are much less liable to get out of order. Makers are also tending toward standardization of the parts which enter into the make-up of these breaker mechanisms, so that, where possible, the parts of all boxes are interchangeable.

The sturdier, lighter, more effective, more easily demountable and more readily attachable instrument of 1913 is in many cases also made water, dust and oilproof by the fitting of a protecting hood. This waterproofing is usually carried to the distributer connections as well. There is a general smoothing out of the devices, not only electrically, but also mechanically.

A few of the latest magnetos are provided with means for timing or setting without the removal of any of the parts. This is a specially desirable feature from the standpoint of repair, since it involves the time-saving element.

Several new schemes for intensifying the spark at low engine speeds, for use in starting have been produced to assist the cranking devices which are now in such profusion. A number of makers have also combined ignition with lighting in single units. To the ordinary lighting generator they have added a distributer and timer which take care of the ignition. The machine must then be driven in fixed relation to the speed of the engine, of course.

Bosch ZR Features Line

The Bosch standard types of magnetos are offered for 1913. The ZR series, which features the line and which was introduced 1 year ago, is being employed in those cars which heretofore used the D and DR types. The DU series retains its popularity, due to its special adaptability to engines of medium power. This type is supplied in either independent, dual, two independent or duplex systems.

The ZR magnetos—either as independent or two-spark ignition or in conjunction with battery systems, such as dual and two independent arrangements—are entirely inclosed, special packing being inserted between the magnets themselves and also between them and the end plates. By special arrangements, the cable connections are also made waterproof. The magneto being thus inclosed, any gear noise or that emanating from any other source is eliminated. The lubricant ducts are very accessible and are protected by suitable covers preventing the entrance of water and dust.

Fig. 1 shows the Bosch ZR4 two-spark type with double distributer disk. For ordinary purposes it is not necessary to remove the plug cables from the distributer, inasmuch as the disk can be easily detached for inspection of the rotating carbon or for cleaning of the segments. The disk is held in position by two strong, flat springs which have a snap-on connection, as shown. The timing-lever casing which carries the interrupter segments is fastened by a bayonet catch, a quarter turn of this casing allowing it to be removed without the use of tools so that the interrupter can be examined. The timing-control arm is no longer a part of the breaker-box casing, but is a separate piece in itself. A lug on its inner circumference is made to fit into any one of a number of evenly-spaced slots around the periphery of the breaker-box housing. The arm can therefore be fixed in any position about the interrupter casing, thereby greatly facilitating the connecting of the advance and retard mechanism of the car. Fig. 4 shows the interrupter mechanism of the ZR4 dual instrument. The interrupter lever is shown at B and the platinum contact points at C.

In the ZR types, the special toothed pole pieces, Fig. 14, are used, making it possible to produce a spark at low speeds or at any position of the advance lever. For the timing of these magnetos in relation to the motor, a method has been devised which makes it unnecessary to remove any of the parts. To set the older types, the distributer disk and dust cover of the interrupter housing must be removed. This new feature is shown in Fig. 3. Above the distributer gear there is a window through which the gear teeth may be seen. One of these teeth is marked while the edges of the window are also marked for reference. There is a second window in the face of the distributer plate through which the numeral 1 appears when the armature is revolved. In setting the magneto, the crankshaft is first turned until piston No. 1 is in full advance firing position, after which the magneto armature is revolved until figure 1 appears in the distributer window. The marked tooth will then be close to the upper window marks and should be turned until there is exact register between them. Distributer terminal 1 is then connected to cylinder No. 1 and the other wires connected in accordance with the firing order. The gear is then fastened in position and is now timed for full advance position.

The Bosch ZR types correspond in their principal dimensions with the DR models, so that one magneto may be substituted for the other in the same space. The ZR is made for both four and six-cylinder installations.

Eisemann Has New Low-Tension

In the list of Eisemann products for 1913 appears a new model low-tension magneto, type EB. With this instrument a separate coil is used to transform the current to high tension. All the special Eisemann features are incorporated in the new machine. The contact breaker and its cover and the front view of this type are seen in Fig. 2. The breaker mechanism is extremely simple, consisting of the ordinary platinum points held in contact by a flat spring. The points are pulled apart to break the circuit by a cam mounted on the magneto shaft, which cam bears on a follower connected to the flat spring.

The EM type magnetos for one, two, three, four and six cylinders are continued without change for both dual and single ignition of the direct high-tension variety. Models EA, EU and ED, in both manual and automatic spark control, are the products of the Stuttgart, Germany, factory of the Eisemann company. The principal importations of these models are of the automatic control design. This control is of the centrifugal-governor type and makes use of a cage which is rigidly mounted on an extension of the armature shaft. Within this cage there is a rectangular sliding block which is drilled and threaded to pass over the helically-cut driving shaft of the magneto. Governor balls are attached to the block through linkage, which fly out an amount proportional to the shaft speed. This causes the block to travel along the shaft, and to so move, the block must then rotate slightly, carrying with it the cage and thus advancing the armature with reference to the pole pieces. The opposite operation takes place when the speed falls off and the governor balls fall inward. To apply the automatic control to any motor the double shaft thread is made in varying pitches so as to give varying degrees of advance. By using a spring of varying tensions and lengths for acting against the centrifugal motion of the governor balls, any desired advance curve is possible.

In connection with these automatic spark control magnetos is the provision for setting the armature in relation to the crankshaft. The governor casing is slotted for the reception of a key which will fit into place only when the armature is in such a position that the breaker points are just about to part. The insertion of this key holds the cage stationary while the setting is made.

Numbered among the Eisemann products are also the low and high-tension types for slow-running stationary engines and the like. All Eisemann magnetos are constructed with the specially designed pole shoes which are pointed at the center of their length and so shaped that the extended portion is approximately in the plane of the theoretical axis of the armature core. The magnetic lines of force are thus concentrated, increasing the volume and intensity of the spark at the break.

Splitdorf Four New Magnetos

A new series of four magnetos has been brought out by Splitdorf. These are models W, X, Y, Z, all of which are of the low-tension type, which method of ignition has characterized the Splitdorf products for some time. The newcomers bear some of the familiar earmarks of Splitdorfs of the past, but they are refined in details to meet the growing demand for sturdy, light and effective mechanisms. The newcomers are compact and smooth in appearance and have vertical distributer blocks.

Model X is designed for use on all of the standard four-

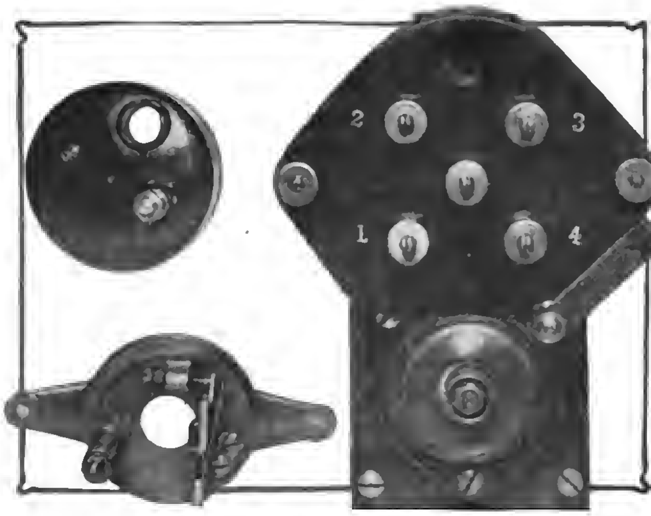


Fig. 2—The Eisemann type EB low-tension magneto arranged for four cylinders. The contact breaker and its cover are shown removed. The breaker mechanism is very simple

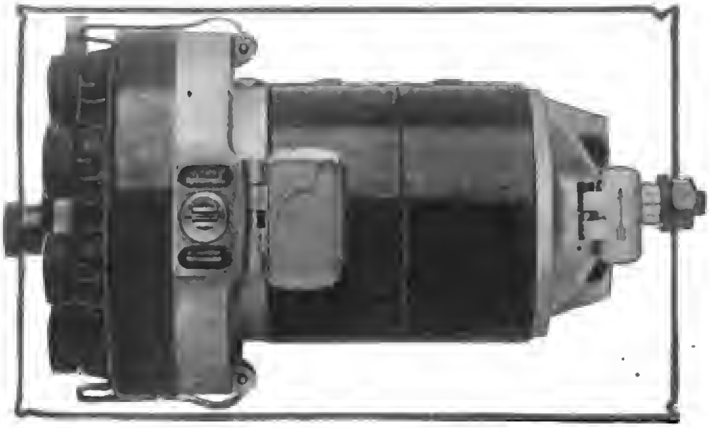


Fig. 3—Top view of the Bosch ZR6 magneto, showing the window through which the marked distributer tooth appears and the registering marks on the edges of the opening. At either side of the window is an oil hole. All three openings are covered

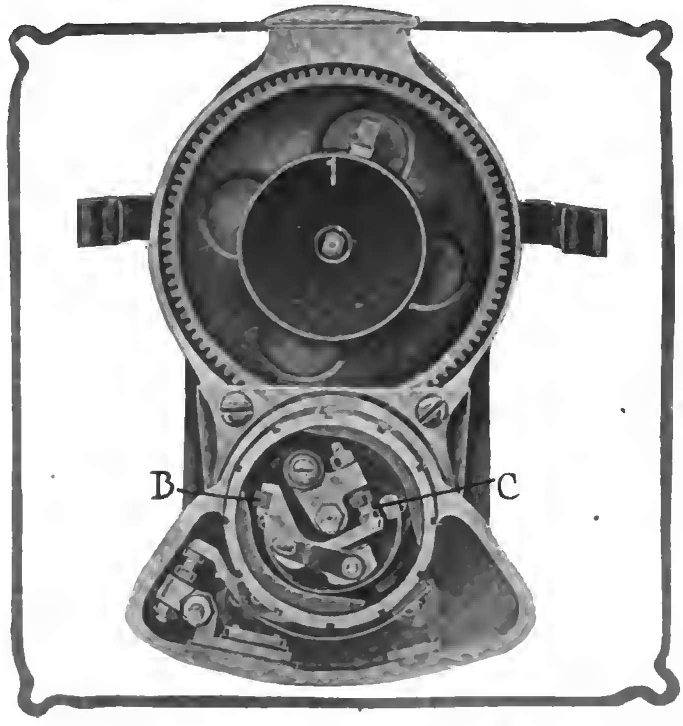


Fig. 4—Front view of the Bosch ZR4 dual magneto. The distributer and breaker housings have been removed. The interrupter lever is at B, while the platinum contact points are at C

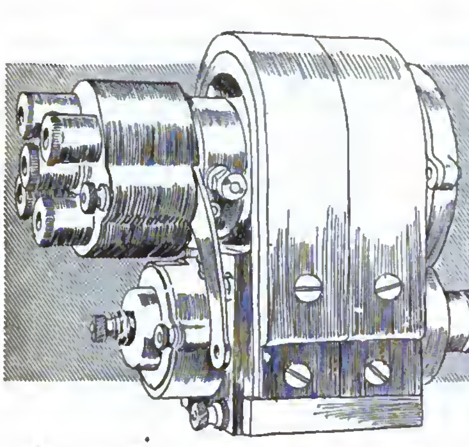


Fig. 5—The National type C4 which is used in connection with a double system and a transformer coil. A condenser is incorporated in the magneto

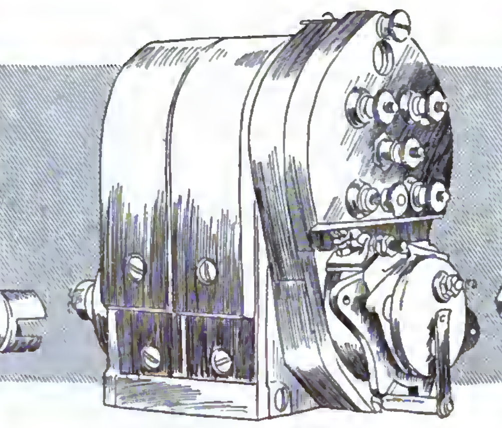


Fig. 6—Eisemann type EM four-cylinder magneto which is a dual direct high tension type. It uses the Eisemann center-pointed pole pieces

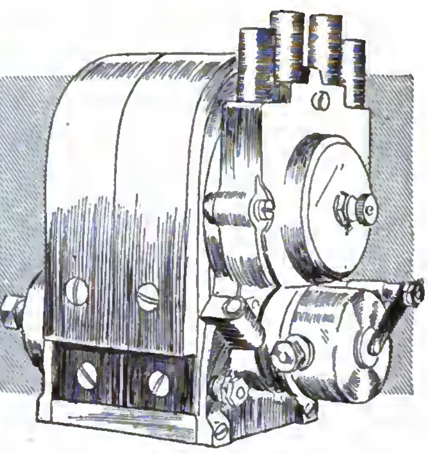


Fig. 7—The Splitdorf model X, which is designed for use on any of the standard four-cylinder motors. This is one of the four new low-tension Splitdorfs

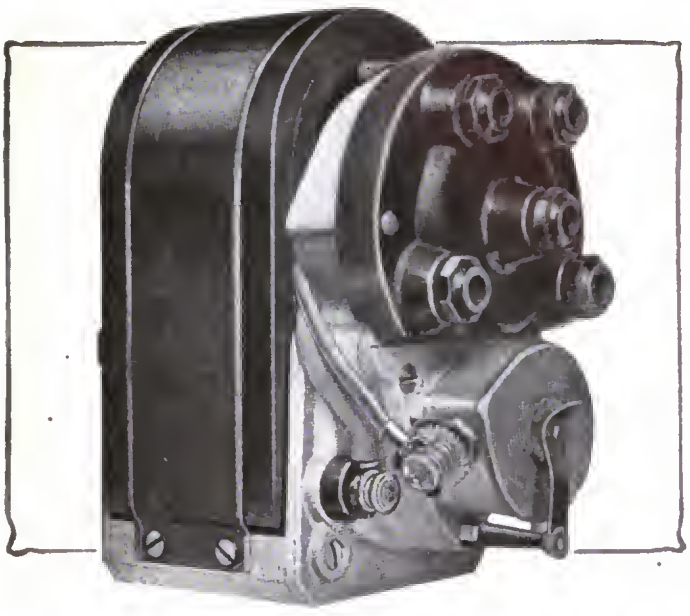


Fig. 8—The latest Remy type, model RL, which is a two double magnet machine operating on the inductor principle common to all Remys. This machine supersedes all types of this make. There are no moving contacts or windings in the inductor construction, the current being set up in stationary cells placed in the magnetic field

cylinder motors, while model Y, which is of the same general dimensions as the former, is made for the operation of any of the six-cylinder engines on the market. Both of these types are of the two-pair magnet design. Models W and Z are of the three-pair magnet variety and are constructed for use with heavy, slow-speed motors of four and six cylinders respectively.

The armature connection on each of these new models has been placed in the back plate of the instrument instead of being located at the front of the breaker box as formerly. The details of the breaker-box mechanism have been altered somewhat with the view of bringing about a greater degree of efficiency. One large contact brush replaces the two formerly used, thus insuring a better wiping contact with the armature. The breaker-box spring pillar has been lifted from the line of the base to a point above the breaker box. All breaker box parts in this series have been made interchangeable throughout and all have taper shafts of the same taper. The S. A. E. standard magneto dimensions have been adhered to in the design of these new instruments.

Along with its new magnetos Splitdorf has brought out a new vibrating coil known as model TS, which presents a durable and compact appearance. It is designed to extend through the dash and is inclosed in a water tight case effectively protecting the wire terminals. These are numbered for easy wiring reference. The coil proper is mounted on the base of the switch, which is provided with an ignition button for use in starting the car on battery. A lock is incorporated to prevent any of the switch operations.

Remy RL Retains Inductor Design

Remy has a new model, known as RL, which is provided with a waterproof distributer. It is a two-double magnet machine. Like former instruments of this make, it has a stationary winding, being of the inductor type. The only moving parts are the inductor shaft and inductors, between which the winding is placed. This winding is of coarse wire in which the current is set up and thence passed to the terminals. Besides being between the two inductor segments, the winding is housed on the sides by the pole pieces. Thus when the parts are all assembled it is completely protected. The principal advantage claimed for this inductor arrangement is the absence of moving wires and contacts.

The inductor segments are balanced for best efficiency mechanically, this balancing relieving undue strains on the shaft and bearings. The new RL models also have a timing push button for simplicity in installation. This button is located at the top of the distributer and connects with a small plunger. There is a small recess in the distributer gear which, when in register with the push-button plunger, locates a segment opposite a marked terminal on the distributer cover. The magneto is also so inclosed as to be waterproof. This new RL type is shown in Fig. 8.

New Mea Armature is Rocked

Mea has introduced a model which differs radically from standard construction of its make in that it does not involve the feature of rocking horizontal field magnets. This new model is waterproof, which result is accomplished by entirely covering the whole upper part of the instrument in a metal housing. The connections are so fitted that there is no possibility of water entering the housing to do damage to the armature or the contact features. The only portions protruding from the case are the driving gear, the terminals and the arm by which the spark is advanced or retarded by revolving the armature within the fields. By insulating the terminal plate in which the holes for the leads to the spark-plugs are drilled at an angle, protection is afforded for the high-tension terminals. Vertical holes in the top of the terminal plate take the connecting studs, the heads of which are beveled to close the holes. Instead of rocking the field magnets as in other types of Mea devices, this newer design accomplishes the same result by reversing the operation, keeping the field stationary and rocking the armature on its shaft. This permits of the housed character of the instrument.

In the ordinary Mea construction which has held exclusively up to this year, the instrument makes use of a bell-shaped magnet mounted horizontally on an axis so that it can be revolved through a certain angle around the armature. See Fig. 9. This magnet is so suspended as to be balanced in any position so as to be readily adjustable for any timing position. The idea of the peculiar bell-shaped magnets is that the armature receives full benefit of the magnetic field, being located so as to be in the path of the greatest number of lines of force. This makes for intensity of spark and permits of the production of an igniting spark when the motor is turned over slowly.

Simms Offers Two Models

The American Simms magnetos for this year are styled SU types, and are furnished in two models—independent and dual—for both four and six-cylinder motors. They are all of the high-tension, two-magnet design, in which the high-tension current is generated in the double winding on the armature. The independent magneto, with which no batteries are used, is intended for motors up to 5 inches bore, while the dual type provides a battery system of ignition in connection with the magneto ignition. The SU independent magneto for four-cylinders may be had with fixed spark if desired. In this case it is fitted with a stationary cam ring. But unless otherwise specified, this magneto comes with a timing lever permitting a timing range of 30 degrees. The dual system is so arranged as to give a vibrating battery spark for starting. It is said that this vibrating spark will fire a cold mixture.

When fitting these magnetos to the engine, the timing and setting is facilitated by a window in the distributer board in which the figure 1, which is marked on the distributer gear, appears when the distributer arm is making contact with the segment corresponding to cylinder No. 1. The distributer is water and dustproof. The distinctive Simms pole shoes are among the principal features of this design. They are notched on diagonally oposite ends, as shown in Fig. 13. This notching serves to concentrate the lines of force at the edges of the notches, making for a hot spark at the break. This spark is equally as intense in any position of advance or retard. These special pole shoes are fitted to both duals and independents, although the fixed-spark machines employ the ordinary straight form of shoes instead.

Both independents and duals are of the same general construction, the only difference being the addition of the commutator on the dual and the substitution on it, also of the dual contact breaker for the independent breaker. This commutator or battery timer on the dual is a new design and consists of a shell of condensite into which are moulded four bronze segments, Fig. 10. Two of these are connected to the commutator terminals, while the other two simply serve as a path for the contact breaker brushes and assure even wear of the commutator, which is fitted to the timing lever in place of the dust cover of the independent type, and held in position by a flat spring.

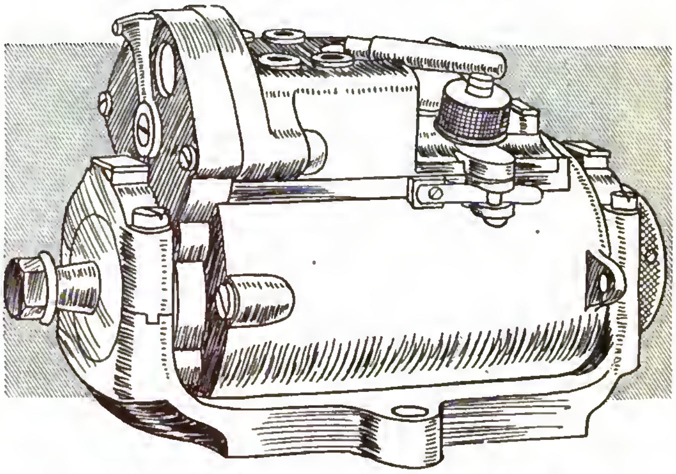


Fig. 9—One of the Mea rocking, bell-shaped magnet types. The field magnet is mounted horizontally on the same axis with the armature, causing it to get full benefit of the lines of force

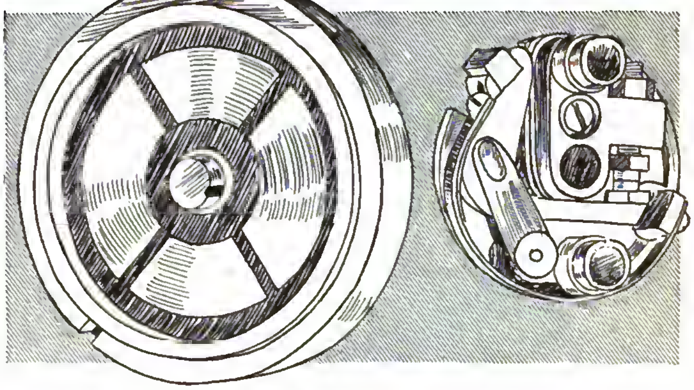


Fig. 10—The new Simms dual battery commutator which consists of a condensite shell into which are molded four bronze segments

Fig. 11—Simms dual contact breaker, showing the substantial contact arm and platinum points of ample size

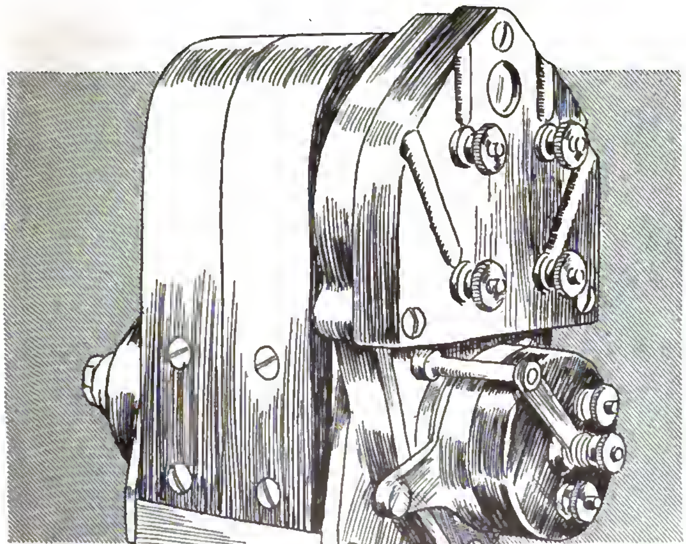
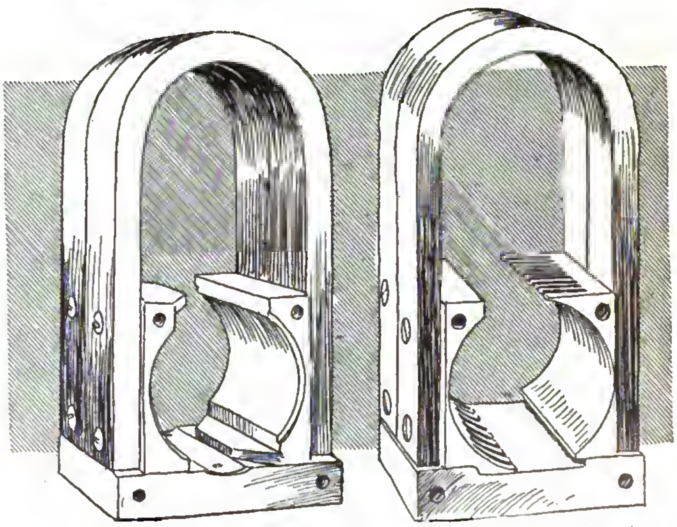


Fig. 12—The Simms SU4S dual magneto of the high-tension type. The window in the top of the distributer board to facilitate timing is shown. When the figure 1 appears it indicates that the distributer arm is making contact with segment number 1



Two pole piece constructions designed to intensify the spark

Fig. 13—The Simms type. Diagonally opposite pole shoes are notched back from the ends, concentrating the lines of force at the extreme pole ends and producing an intensified spark

Fig. 14—The Bosch toothed pole pieces which serve to concentrate the magnetic lines at the ends of the teeth

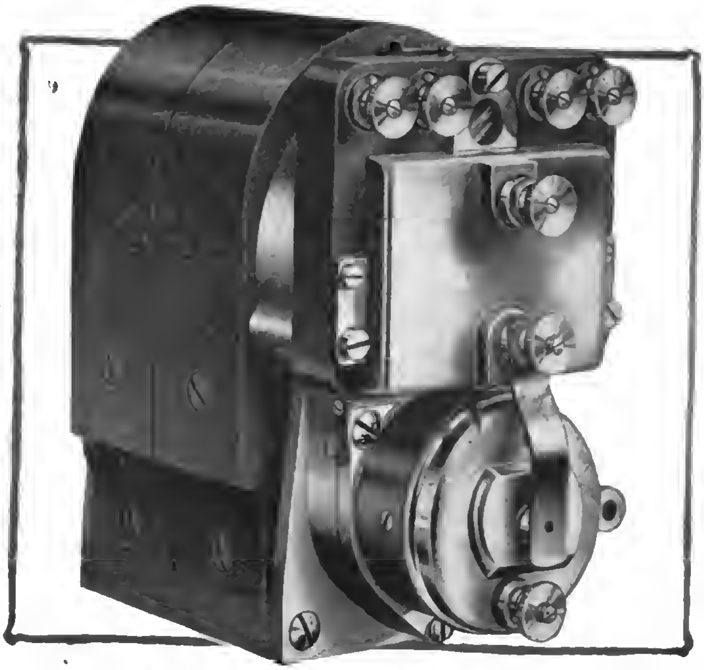


Fig. 15—The new magneto used in connection with the Hi-Fre-Co ignition system brought out by the Dean Electric Company. This instrument is a dual type and has the condenser mounted on the front of the distributer. The instrument is a low-tension device, the voltage being stepped up at the plugs

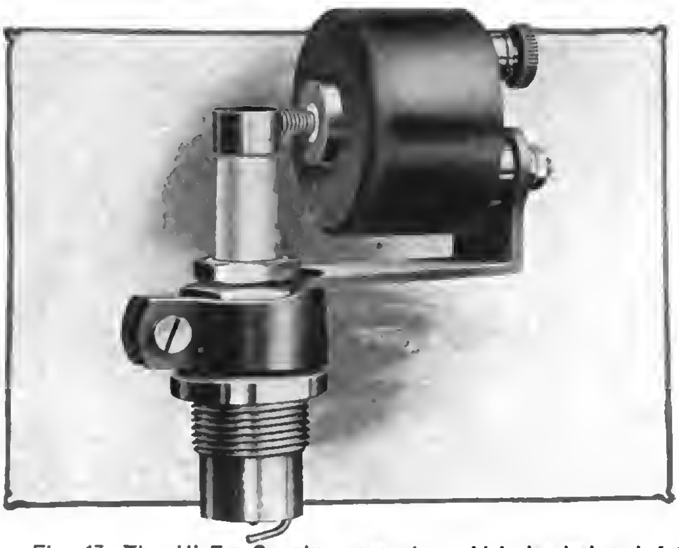


Fig. 17—The Hi-Fre-Co plug resonator which is designed for application to any standard spark plug. These plug transformers are used to step-up the voltage directly at the point of use so that there is no high tension wiring leading to the plugs

Westinghouse Regenerative System

After several years of experimentation the Westinghouse concern has finally placed upon the market a combination lighting and ignition system, the single generating unit, Fig. 21, forming the basis of the arrangement. This system is regenerative, that is, when the engine is not operating or when it is running at very low speed, power for ignition and lights is furnished by the battery and returned to it when the car is running at all usual speeds and at high speeds. The features of this system which apply to car lighting will be covered in connection with an article on electric light systems.

The ignition features consist principally of a dual system and automatic spark advance. Fig. 18 shows the interrupter and automatic advance mechanism. This interrupter or breaker has two series contacts, seen at the lower center. The sketch shows the position of the interlocking spark advance mechanism at high speed. The two metal segments or cams, which operate the breaker mechanism, fly out from their normal position an amount proportional to the speed. Thus they advance the time

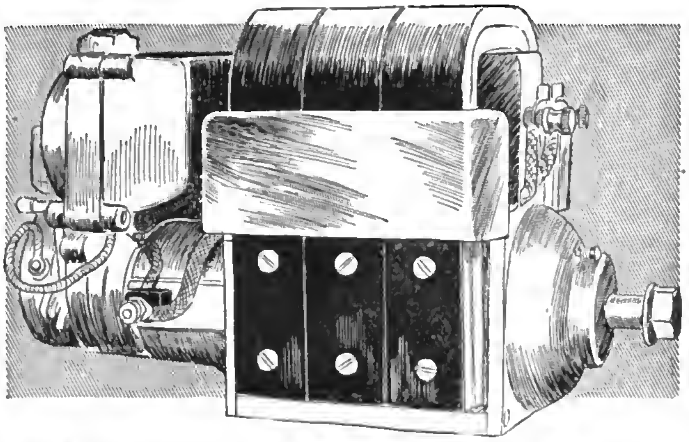


Fig. 16—The Deaco combination ignition and lighting generator, showing the mounting of the distributer and circuit breaker at the front end. Though combined in one unit, a special grounding feature entirely separates the ignition and the lighting circuits

of break in proportion to their position. This automatic centrifugal device adjusts the spark advance to all speeds, keeps the period of contact nearly constant at all speeds and prevents by its design any inequality between the two interruptions that occur in succession during each revolution. The distributer is of the ordinary magneto type and is detachable without interfering with the contact brush. Provision is made with this system for the manual operation of the spark if desired in addition to the automatic control. In this case the spark lever need only be used for the original adjustment and may then be locked in position. Running variations in spark are taken care of by the control. Since this instrument is primarily a generator, it may be had without the ignition parts and coil if desired.

Two Western Electric-Pittsfields

The Western Electric Company, which recently took over the Pittsfield Spark Coil Company, offers two types of magnetos for this year. These are type F, which is a fixed spark instrument, and type N, which is provided with variable spark. The magnetos themselves remain practically as they were, but a new dual system uses in addition to the magneto removable unit spark coils for the battery side. For starting purposes this dual system is supplied with a push-button switch, which throws two sets of dry cells in series, doubling the primary voltage. At the same time the current is automatically sent through a vibrating coil, making the starting spark of high intensity and long duration.

The Western Electric-Pittsfields are of the high-tension induction type. That is, the current is generated in a stationary winding within the field of the magneto. There are no moving contacts or windings. The armature which carries two iron segments but no winding is the only revolving part. Instead of placing the stationary winding between the rotor segments as in several other inductor types, the Pittsfield practice is to place it at the rear of the instrument, Fig. 20. This illustration depicts the variable spark model N. In outward appearance and general construction the two types are the same, differing only in internal construction. There are four poles in the magnetic field, two of which are the poles of the permanent magnets, while the other two with the iron core compose the field.

Deaco Has Combined System

The Detroit Electric Appliance Company makes a combination ignition and lighting system which remains practically the same as last year. While primarily a generator, the electrical unit is adaptable to the addition of distributer and circuit breaker so as to take care of ignition as well. The Deaco generator is treated in this week's installment of an article on starters running serially in The Automobile. Though combined in the one unit, the ignition and lighting systems are entirely separate and operate independently of one another. The distributer gear is carried at the rear and meshes with the armature gear. These are housed by the rear end plate. The distributer is fastened to the gear and carries the carbon brushes which distribute the high-tension current and make contact to the coil, which together with the condenser is fastened in a housing against the distributer block. The interrupter is fastened to the rear end plate by a retaining spring. No pole of the generator, battery or interrupter is directly grounded, a grounding scheme being used which causes both ignition and lighting systems to perform their functions independently of each other.

Briggs High-Tension Unchanged

Briggs model C magnetos are continued practically as heretofore, although slight changes in the finish are to be noted. This magneto is designed for dual ignition for four and six-cylinder motors. It is a high-tension type and provided with two magnets. The breaker-box mechanism and the distributer parts are inclosed within a cover plate which is easily removable for inspection. In this magneto an oil tank is placed in the arch of the magnets, which has a capacity of 6 ounces of lubricant. The oil feeds automatically to the bearings from this small tank. The circuit-breaker mechanism is of simple form and has the usual platinum contact points. The distributer is constructed of hard rubber. For automatic spark control a centrifugal governor is provided. The breaker for this mechanism is fixed in relation to the armature at the point of best efficiency. The governor acts to advance the spark according as the motor speed increases, and vice versa. In addition to magnetos, the Briggs products include a combination lighting and ignition outfit and a lighting and starting system.

Atwater-Kent K Unisparker New

In addition to its standard type F Unisparker system of ignition the Atwater Kent concern is now furnishing a new model, known as type K, which has automatic spark advance and an insulated primary circuit, designed especially for use in connection with lighting and starting equipment. The automatic spark governor is of the centrifugal type, the amount of advance depending on the deflection from their normal position of the metal segments which take the place of balls. The outward motion of the segments is opposed by springs. The principle of the sparker is the transforming of the low voltage sent to the sparker from the battery into high-voltage electrical energy, which is then distributed to the spark-plugs in the usual way. Fig. 19 shows the type F Unisparker, which is furnished for any number of cylinders up to six. The type K system is made for two, three, four and six cylinders.

Hi-Fre-Co Uses Step-Up Plugs

The Dean Electric Company has developed a system which gets its name from the high-frequency oscillatory discharge at the spark points. The magneto used is of the conventional type, Fig. 15, while there is a separate resonator coil mounted on each spark-plug, as shown in Fig. 17. These plugs may be of any standard type. The resonators are used to step up the voltage of the high-frequency current directly at the plugs so that all of the wiring to the resonators can be of low voltage. The coil winding is imbedded in a special insulating material which will withstand heat, oil and water and which is durable. The system combines a dual arrangement by means of which a combined dash coil and switch is employed utilizing battery current instead of magneto. In connection with each of the spark coils there is a small condenser for intensifying the oscillatory discharge. The frequency of this is given at from 500,000 to 1,000,000 oscillations per second. The magneto is a two-pair type having distributer and breaker box at the forward end. The magneto differs slightly from other conventional types in that the armature has one winding of comparatively coarse wire. The condenser is mounted on the front of the distributer. This distributer and all electrical circuit portions of the instrument carry low voltages.

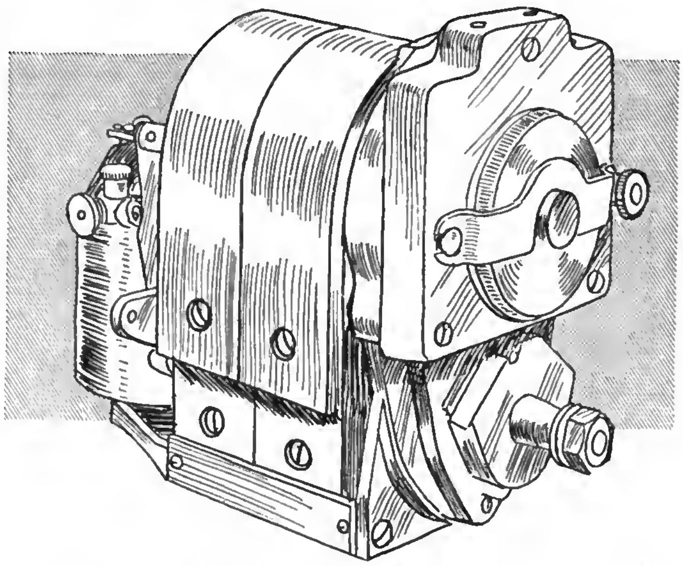
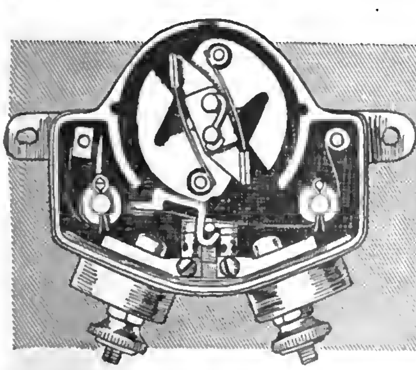


Fig. 20—The Western Electric-Pittsfield type N variable spark instrument. It is a high-tension inductor type, the winding in which the current is set up being stationary and placed at the rear of the machine as shown. Type F which has fixed spark is similar to this in outward appearance



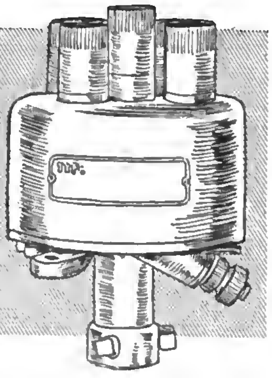


Fig. 18—Sketch showing the position of the Westinghouse centrifugal automatic interlocking spark advance mechanism at high speed

Fig. 19—The type F Atwater-Kent Unisparker, a combined transformer and distributer which steps-up the low battery voltage before sending the current to the plugs

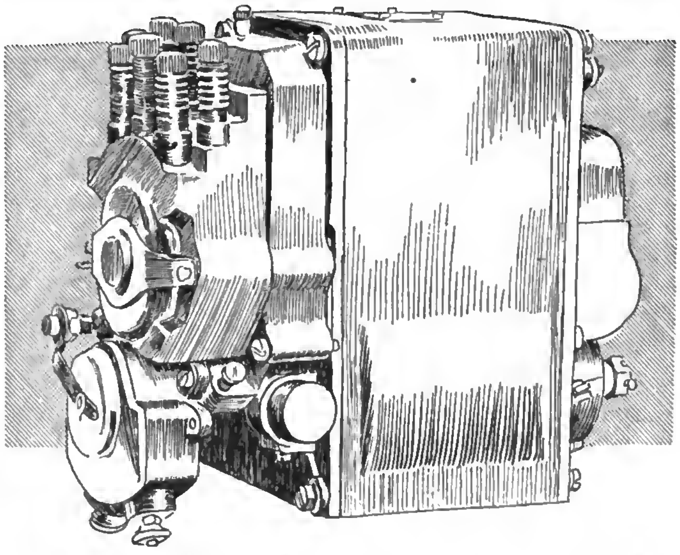


Fig. 21—The Westinghouse combined generator and magneto which is used in connection with a regenerative system. The magneto portion of the apparatus has automatic spark advance and it is of dual type. The generator has an electro-magnetic and not a permanent magnetic field. The entire front plate carrying breaker and distributer is removable

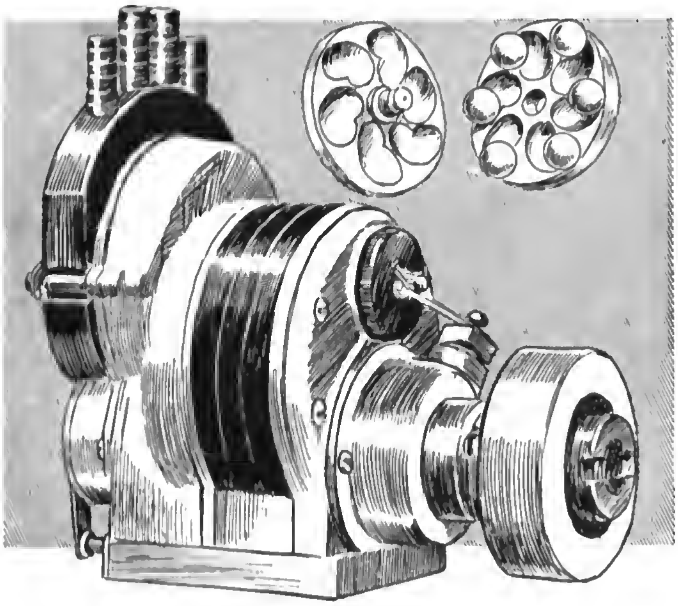


Fig. 22—A Herz magneto equipped with the Herz centrifugal automatic timing adjustment. In the upper corner are shown the two disks in which are cut six grooves for the insertion of balls, which act as governor weights and twist the armature in proportion to the speed

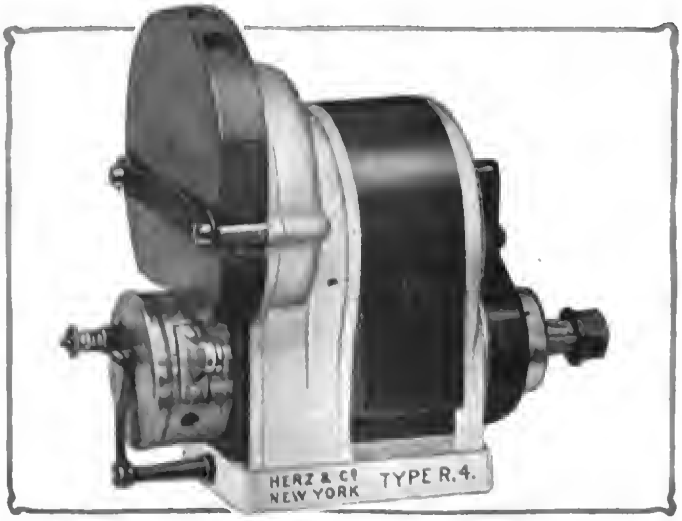


Fig. 23—The latest Herz model type R4 which is a fully inclosed high-tension type. The magneto makes use of double U-shaped magnets in place of the round flat variety

Connecticut Magnetos Not Changed

Connecticut magnetos remain practically as heretofore, although an igniter has been added to the line. This is really a transformer coil which steps up the battery voltage sent to the ignition point. The Connecticut magneto is completely housed and is made for either independent or dual ignition. To facilitate timing, an indicating arrow is placed on the rear of the housing, together with proper reference marks on the armature shaft. The distributer and breaker box are carried at the front end.

K-W Has New Low-Tension

K-W magnetos are of the inductor type, having no moving windings. The rotor or armature carries two segments which are mounted with their axes at right angles. The windings are fixed between these rotors in the center of the magnetic field and the cutting of the lines of force passing between the magnetic poles induces a current in the windings which current passes to the terminals at the front of the instrument. The K-W types are made with three, four and five magnets in both high and low-tension models. The largest high-tension type of this make is shown in Fig. 26. This is model HT, which is designed for the largest engines without the use of starting batteries. The complete line includes, in addition to this model, the model J, a three-magnet instrument for medium-size motors, and model H four-magnet type, for large engines. These are all high-tension types. In the low-tension class are models A, E, M, D and U, which are all of the four-magnet design and differ in the method of mounting and drive. The latest of these low-tension designs to be brought out is the three-magnet machine, model LS. All these low-tension instruments may be used for lighting purposes.

National Uses Double System

The National Coil Company is producing a double ignition system, which makes use of the National type C-4 magneto and on the battery side operates with either five dry cells or a 6-volt storage battery. Fig. 5 shows the C-4 instrument, which is a two-pair magnet machine, and which carries distributer and breaker-box mechanism at its front end. This double system uses a transformer coil which is designed to be mounted near the magneto to avoid long runs of cable. The magneto carries the condenser and it is also provided with a self-oiling system with a reservoir holding .25 ounce of lubricant. At the drive end there is a timing dial for facilitating magneto setting.

Briggs and Stratton Is Complete

The Briggs & Stratton igniter is the combination of a spark coil, distributer and contact maker within a single unit. The system works with either a 6-volt storage battery or six dry cells, and operates to transform the low voltage from this electric source into high-tension current, which is then sent to the cylinder in which the charge is ready for firing.

Rhoades Improved in Details

The Rhoades ignition system has been refined and a type has been brought out for use on cars which have lighting and starting systems of the electric design. This new igniter is entirely insulated from the ground by making the shaft in two sections insulated from each other by a fiber bushing. Other changes have been in the utilization of a round coil and the addition of a small condenser which eliminates sparking at the breaker points. Another improvement is in the use of weatherproof terminals which are so constructed as to permit of the attachment of the wires without solder or tools. The general appearance of the instrument remains the same.

Herz New R4 Has U Magnets

The latest Herz model is known as type R4, which is a fully inclosed high-tension device. It has double U-shaped magnets which are exactly ground to fit together within an aluminum housing. The instrument is waterproof, distributer and breaker mechanisms being completely inclosed. The secondary connections are all well insulated and also protected against dust and water. The apparatus is small and light in weight.

The Herz centrifugal automatic timing adjustment is continued in an improved form. It consists essentially of two mating disks, Fig. 22, which are placed between the magneto shaft and the main magneto driveshaft. Each of these disks has cut in it six curved grooves which when mated form chambers in which are placed balls, one to a pair of grooves. These balls being free to run in these combined grooves act the same as governor weights and fly out from their innermost positions an amount proportional to the speed, imparting a twist to the armature and thus advancing the ignition a corresponding amount of its total range of 40 degrees.

Kingston Condenser in Magneto

For automobile ignition, the model B Kingston is the principal type made by the Kokomo Electric Company. This magneto is a two-pair, high-tension type, in which the principal change for the year is the incorporation of the condenser within the magneto, whereas it was formerly located with the spark coil. This change is made necessary due to the replacing of the box type of coil by a tubular design which is placed back of the dash, the switch plate to which it is attached being flush with the dash. However, the ordinary box coil carrying the condenser and the magneto without condenser may be had if desired. The magneto is inclosed so as to be impervious to water, oil and dust.

Another Kingston instrument is the model D, which is the same in construction as model B except that it has three pairs of magnets and is generally used on heavy, slow-running engines. Single-cylinder magnetos and make-and-break types are also made. The combining of condenser with magneto is also optional in the case of model D.

Heinz Has Circular Magnets

The Heinz magneto is of the compound-armature type, so that no outside coil is needed. The magnets are of the circular type which is a characteristic feature of the instrument. This year both of the primary winding ends are grounded, whereas formerly only one of them was so connected. The instrument is made for use with either four or six-cylinder engines.

Motsinger Is Driven by Friction

The Motsinger direct-current magneto is really a small electric generator designed for use without batteries. It is made to operate with any make-and-break coil and is intended to be driven by friction connection with the flywheel face. A sketch of the instrument is given in Fig. 24. The poles are made up of fourteen laminations, which are bolted together. To keep the speed and output of the instrument constant, it is equipped with a centrifugal governor which varies the engagement of the frictlon wheel with the flywheel according to the motor speed.

Holtzer-Cabot Friction Types

The Holtzer-Cabot Electric Company makes several types of low-tension magnetos to be driven through friction pulleys with flywheel face engagement. These are usually fitted with centrifugal governors for keeping the driving speed constant. The magnets used with these instruments are thinner than the conventional type, while the armatures are laminated.

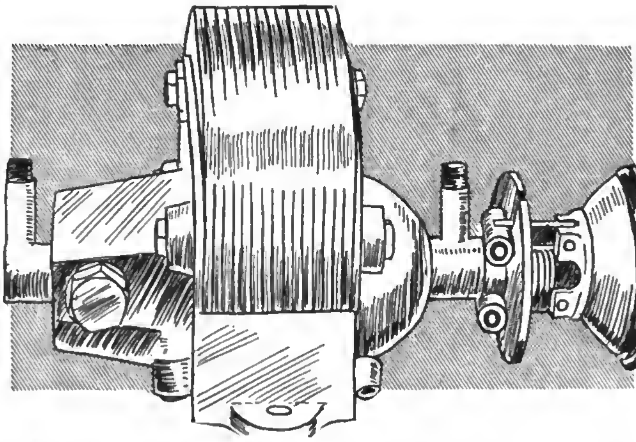
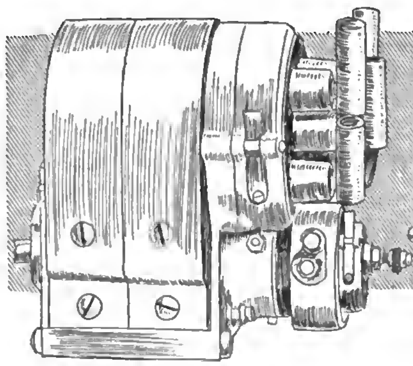


Fig. 24—The Motsinger direct current magneto which is of the low-tension type designed to be driven by friction pulley from the flywheel face. The poles consist of fourteen laminations bolted together as shown. It is fitted with a centrifugal governor to keep the speed and output constant



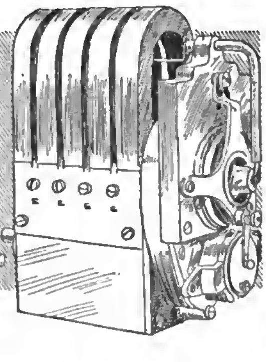


Fig. 25—The two-pair Kingston model B magneto, which is of the dual type. The condenser is incorporated within the machine in its latest refinement

Fig. 26—The K-W five-magnet machine, HT, for large engines. This make of magneto is of the inductor type, there being no moving contacts or windings

Year's Progress in Vulcanizers

Among the new vulcanizers on the market is the Shaler Vulkit. It consists of a cylindrical metal pot with a flat bottom inside of which there is a smaller cylinder, with a pointer in the center. The inner cylinder is covered with a removable lid around which is wound an asbestos fabric. Gasoline is poured into the inner receptacle and on to the asbestos fabric and the whole body clamped into position over the inner tube to be vulcanized. A suitable clamp is supplied by the tool. The gasoline being lighted sufficient heat is generated to vulcanize the tube, which is prepared beforehand in the usual manner for such work. The outfit is manufactured by C. A. Shaler, Waupun, Wis. In addition to the Vulkit, the company continues its regular line of electric and steam-heated vulcanizers for use by motorists and garages in mending tubes and casings.

For those who have electric light in their houses and garages the Gibney Eleck-Trick vulcanizer is a useful repair outfit. It is constructed of nickel-plated cast-steel body with a heat-resisting handle. A concealed coil is arranged inside the instrument to give the necessary heat, the temperature being automatically maintained at the proper degree for vulcanizing by means of a thermostat which forms part of the instrument. With it tubes and casings can be repaired. The outfit consists of the vulcanizer with 10 feet of cord, with plug for lamp socket, asbestos pad, clamp and the necessary tools and repair materials. In addition to the Eleck-Trick, James L. Gibney Rubber Company, of Philadelphia, also makes the Gibney rheostat and Gibney steam vulcanizer. These instruments resemble that of the Eleck-Trick, but in the case of the rheostat the temperature can be controlled to the required degree by means of a rheostat and in the case of the steam vulcanizer the heat is furnished by an alcohol fire pot and controled by an adjustable ventilator.

The B'Co. gasoline vulcanizer, manufactured by the Brown Company of Syracuse, N. Y., consists of a small oblong metal receptacle with a concave base and provided with a chain for use with outer casings to hold the vulcanizer in position and a flat base for inner tubes, slightly convex on one side to follow the contour of the base. The inside of the main body of the vulcanizer is hollow and has several small verticals cast integral, the heads of which are slightly larger than the main body. A measuring cup is supplied to determine the correct amount of gasoline to use.

The National vulcanizer manufactured by the National Motor Supply Company, Cleveland, O., is an instrument upon which the side of the tread of an outer casing can be repaired, or three inner tubes can be repaired at the same time. The main body of the machine forms a water chest below which there is a gas heater. A steam gauge denotes the amount of pressure which can be regulated by a safety valve. When it is desired to use gasoline for heating purposes a special heater and tank are provided for a small extra charge. However, the gas equipment will meet all requirements.

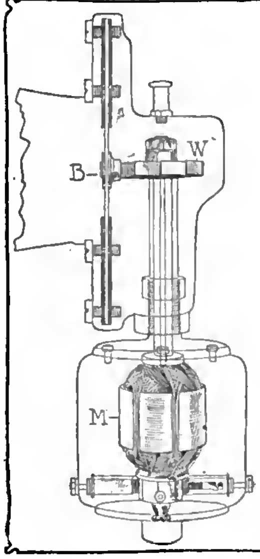


Fig. 1—Klaxon electrical signal

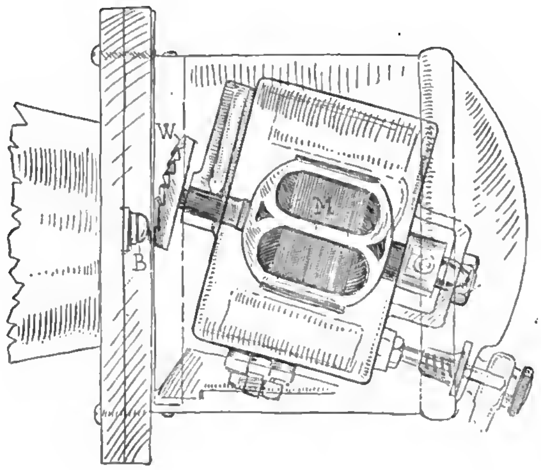


Fig. 2—Klaxonet medium-sized signal

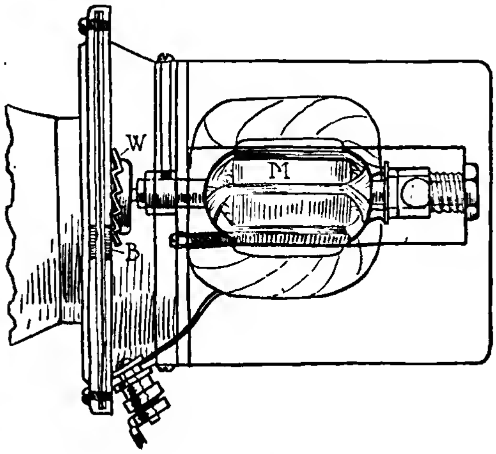


Fig. 3—Klaxet small horn

Automobile Signals

¶ In tha following review of 1913 warning signals for motor cars, THE AUTOMOBILE gives a statement of the situation by illustrating the new types of horns which this year's market affords, as well as the improvement made in the devices continued from 1912. Tha trend pointed out by thasa examples is toward small, electric signals of effective sound and comfortable operation of the horn from the steering wheel.

THE past year has been a period of fruitful activity so far as the manufacture of sound signal for automobiles is concerned. Besides most of the manufacturers who were in the field a year ago, a number of firms which have not made horns heretofore have exhibited this line of products at the national shows. Outside of these makers, however, there are a great number who did not show their goods at all either at the Garden or the Palace.

The trend in the horn line is toward the electric signal. As a proof of this statement it is only necessary to compare the number of electric horns now on the market as compared with what it was 2 years ago. To be sure, the exhaust horn is holding its own, but as manufacturers drop the making of bulb horns, the majority turns to the manufacture of electric signals rather than to the exhaust type. The explanation is probably that the installation and care of an electric horn is certainly as simple as that of the exhaust signal and the operation is easier. There can hardly be any argument as to the great ease with which an electric horn is operated by pressing a button on the steering wheel; it may be just as little work to press a pedal operating an exhaust horn, but it seems that automobilists feel that their feet are already attending to enough pedals.

That manufacturers of exhaust horns recognize the truth of this situation, is shown by the example of one which now brings out a push-button operated exhaust horn, while another company has practically dropped the manufacture of the pedal-operated horn, and now uses a bulb on the steering wheel, to which position it has been brought through the favor of the public toward the latter *modus operandi*. The electric horns themselves have gained in number so far as both the motor and the vibrator types are concerned. A noticeable tendency exists toward the small type of electric horn. The makers of the Klaxon began this movement by the announcement of the Klaxet and since then several well-known makers of vibrator and motor horns have brought out so-called junior types which are specially fitted for the needs of the small car. These horns consume a little less current then the other types and the noise they produce is generally not as strong as that made by the larger types and therefore better adapted for small cars.

The new horns seen at the show are the double-diaphragm Jaco, the Tuto-Ette, the Sparton motor horn, the Newtone Superior and Fire-Alarm types, the Electra, which is made by the same company as the Newtone; the Klaxet, the models JS, JM and D, Long Horn, the electrically operated Jericho, the Jericho Ford Special, the Nonpareil hand-operated ratchet horn, the Cubit vibrator horn type and the Riley-Klotz nòvelties.

Klaxon, Klaxonet, Klaxet—The line of signals made by the Lovell-McConnell Manufacturing Company, Newark, N. J., is being continued practically the same as what it was in the middle of last year. The Klaxon, Fig. 1, Klaxonet, Fig. 2, and Klaxet, Fig. 3, as well as the Combination Klaxon, have not been altered. The fact that the Klaxet is a new

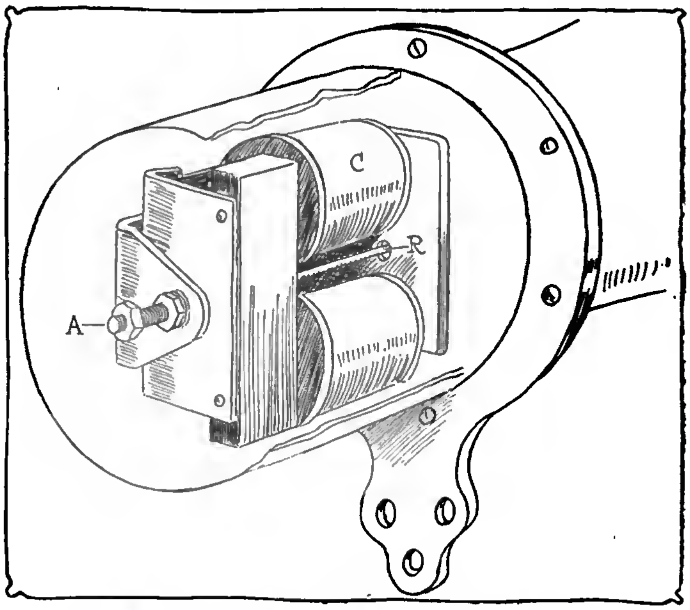


Fig. 4—Electra vibrator made by Newtona company

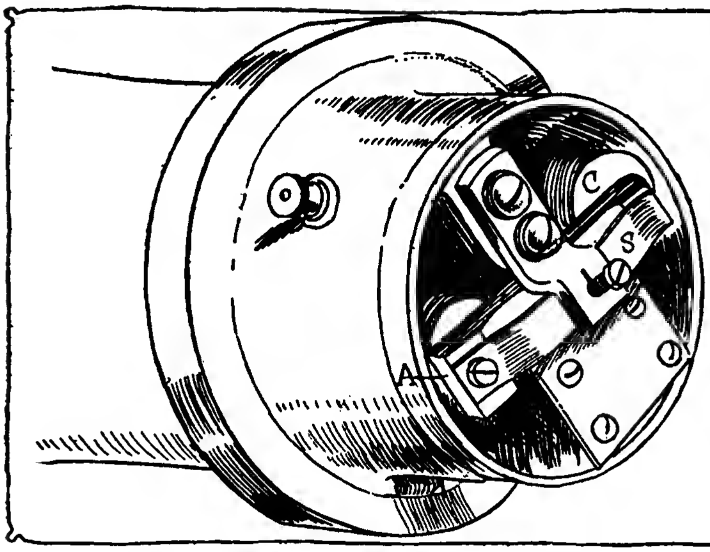


Fig. 5—Vibrator mechanism of Monoplex

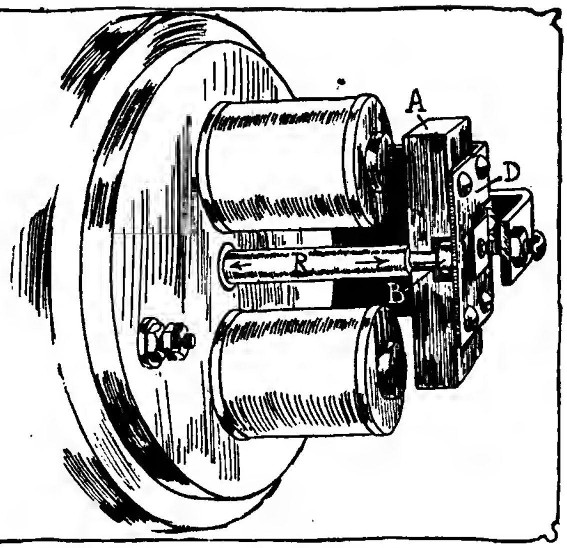


Fig. 6—Jaco double-diaphragm horn

device and one of the first attempts to produce a low-priced and high-class electric signal makes it advisable to give a short description of it here. It resembles in all essential features the larger horns made by the company, and differs from them principally by its lesser size and the arrangement of the motor M which is located horizontally in the casing, while in the Klaxon it is in a vertical position and in the Klaxonet inclined under approximately 40 degrees. A few details of constructions which are included in the larger type have been obviated in the case of the Klaxet, but the points of adjustment and lubricating details have been transferred to it from the larger designs. The current consumption is, of course, less than that of either of the large types. The sound is produced by the wheel W striking the button B on the diaphragm.

Newtone—Continuing its line of horns and adding to it three new devices, the Automobile Supply Manufacturing Company, Brooklyn, N. Y., is represented by five models. Models M, N and Torpedo are all dash designs and are continued practically without a change. The Newtone Superior is a novel product, built along similar lines to the larger models, but somewhat smaller than they. Finally, there is the Newtone Factory Fire Alarm type which is also well adapted for use on small cars. This type differs radically from all others in appearance, being equipped with a short and strongly flaring reflector and a casing finished in brilliant vermilion. The sound produced by the Superior and the Fire Alarm types—which latter, by the way, owes its name to the fact that the Fire Department of Jersey City has recommended it for installation in factories—is of the same pitch as that of the other types, but the Superior is distinguished by the large and the Alarm type by the smaller volume of the sound. One feature of the entire Newtone line for 1913 is the use of laminated armatures, which last year were used only on the Torpedo and M models. The field is likewise of laminated construction, being built up of seventy-five thin steel disks; and this new feature has made it possible to operate the same sizes of horn motors with much less current than before. An average consumption of 2.5 amperes is claimed.

Electra—The maker of the Newtone line of horns has added to this a new type of signal, named the Electra, Fig. 4, which is of the vibrator type. The construction is not radical in any way and simply embodies the principle of the buzzer which is also used in many other signals. The horn is about 3 inches in diameter, with a projector 6 inches in length and 4.5 inches wide. The finish is either brass or black and all horns are adapted for mounting on the dash. A core C moves the armature, adjustable at A, which has a rod R striking the diaphragm.

Jaco—The J. Alexander Manufacturing Company, New York City, continues the Jaco electric horn. Last year this signal employed a single diaphragm which was vibrated by the enlarged end of a rod attached to the armature of the

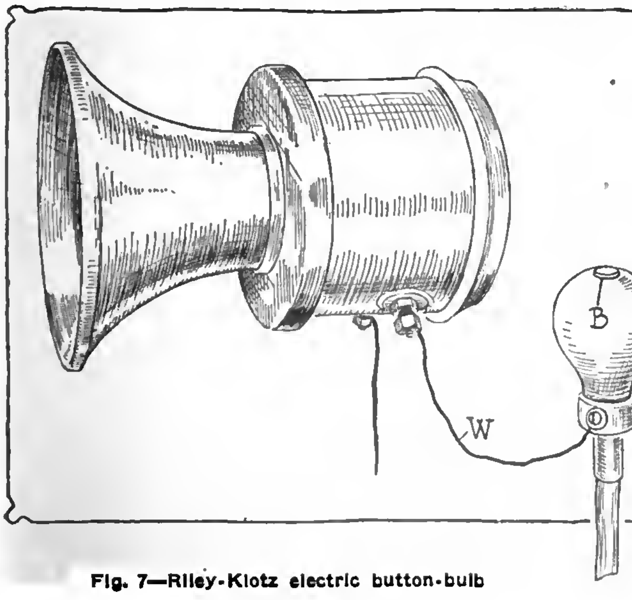


Fig. 7—Riley-Klotz electric button-bulb

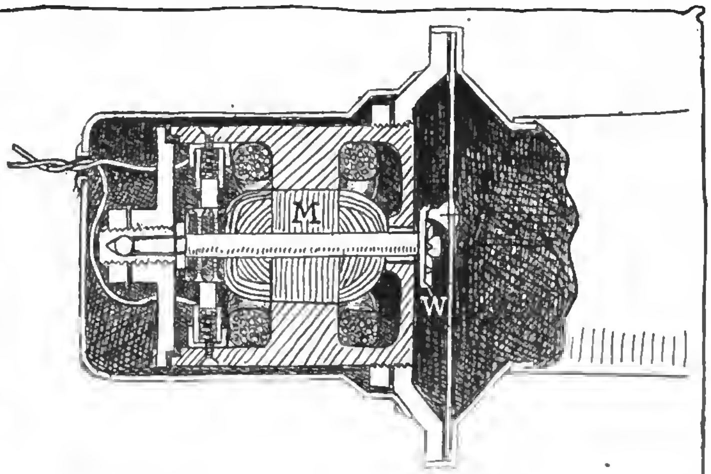


Fig. 8—Sparton electric motor horn

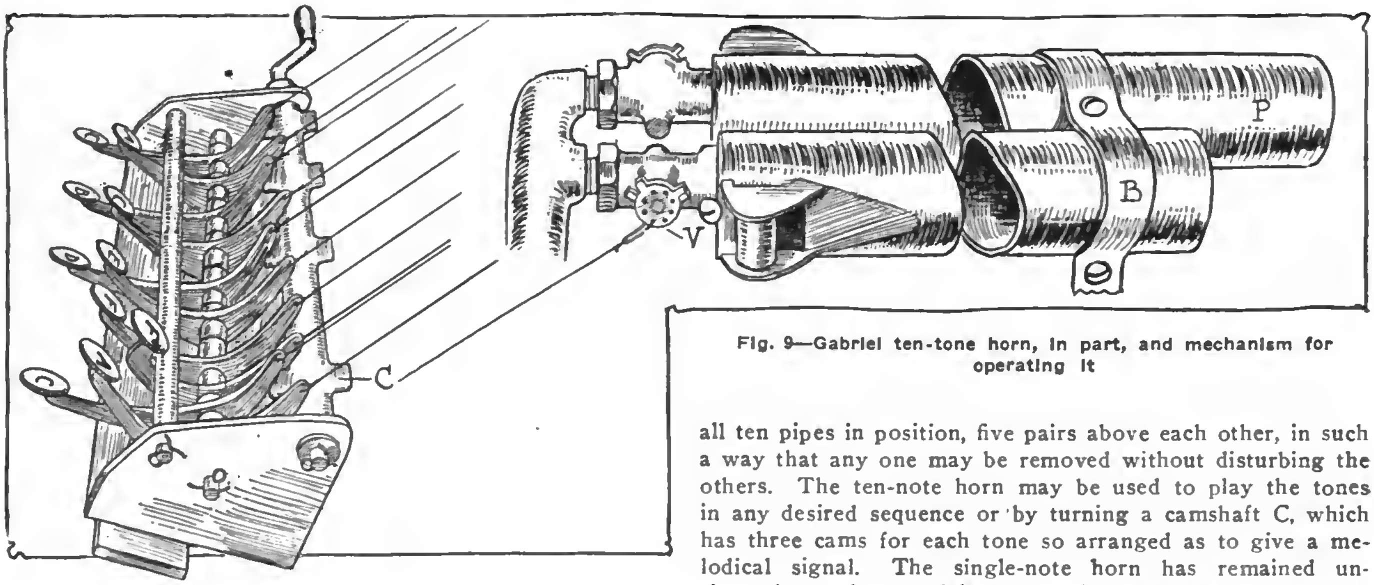


Fig. 9—Gabriel ten-tone horn, in part, and mechanism for operating it

magnetic coil, but for 1913 a small diaphragm D, Fig. 6, which is fastened to the side of the coil opposite to that attracting the armature A, has been added. A button B on the armature rod R strikes this small diaphragm when being attracted and the large one when being repulsed, so that a double series of sounds is produced, both of which follow each other alternately and rapidly, melting into a practically continuous tone. This is the only new development. The horn may be obtained in any of the finishes used nowadays for automobile signals.

Sparton—The Sparks-Withington Company, Jackson, Mich., known as a manufacturer of fans, has brought out a motor-driven horn, Fig. 8, coming in two types, the dash type and that going under the hood. The former is 12 inches long and has a resonator of the parabolically divergent type, while the latter has a shorter and narrower resonator. The construction differs in no essential from conventional practice. The armature shaft of the motor M carries a ratchet wheel W which, when the armature is rotated, strikes a button mounted eccentrically on the diaphragm, which is thereby caused to vibrate. The armature and field are laminated. This horn is finished in brass.

Monoplex—The Atwater Kent Manufacturing Works, Philadelphia, Pa., makes its Monoplex vibrator horn, Fig. 5, in two sizes which have not been changed since last year, except that the little type has a somewhat smaller diaphragm than before. Both types may be obtained in either nickel and black or brass and black finish. The average amperage necessary for working the horns is 2.5 amperes. The Atwater Kent company, due to increased manufacturing facilities has found it possible to reduce the price on this line of product.

Gabriel—The Gabriel Horn Manufacturing Company, Cleveland, O., continues its three types of musical horn, one of which has one note, the other four notes and the third ten, both in two sizes. The principle of this horn and the characteristic and pleasing signal it produces are well known; the horn is of the muffler-operated class and consists of as many pipes as it can produce tones. A manifold which is secured to the muffler outlet divided the exhaust into a number of leads, each conducting gas opposite the mouth of a pipe, where it streams freely into the air. If a valve V controlling this passage is closed, the exhaust is forced through a reed into the pipe P, producing a sound. The 1913 type of Gabriel horn includes several improvements. All the valves on the ten-tone horn, Fig. 9, which are of the perforated, rotary disk order, operate now in the same direction, while formerly some were operated clockwise, and others vice versa. A combination bracket B holds all ten pipes in position, five pairs above each other, in such a way that any one may be removed without disturbing the others. The ten-note horn may be used to play the tones in any desired sequence or by turning a camshaft C, which has three cams for each tone so arranged as to give a melodical signal. The single-note horn has remained unchanged, and the materials used in all the horns are the same as before. There is also a four-tone horn with all pipes in one.

Sireno—An electric horn operating on the siren principle and which has not been changed since last year is the Sireno, made by the Sireno Company, New York. This device consists of an incased motor, the shaft of which carries an impeller fan. When the latter is rotated as the motor turns it forces a current of air forward, after having drawn it in through an opening in the rear wall of the casing. The air current is passed through a siren device which interrupts it and produces undulations of the air, resulting in sound. This interrupting device consists of a drum, the two plain surfaces of which have perforations in alignment with one another, and which contains a rotating wheel which is also perforated. The wheel which is turned by the air current interrupts the latter and is thus the generator of sound. A projector serves to intensify the sound. This type of signal is made in three sizes: Sireno, consumption 6.5 amperes; Junior, consumption 5 amperes; Midget, consumption 4 amperes.

Tuto—The line of vibrator horns made by the Dean Electric Company, Elyria, O., continues from last year with none but minor improvements. It will be remembered that the principle of this horn is along vibrator-signal lines, the circuit of the sound-producing current being made and broken, by the armature of the magnetic coil in the horn. It is stated by the makers that this year's Tuto produces a much louder signal than the previous model and the sound carries about one-third farther than before. The smaller types of this horn, known as Rexo and Tuto-Ette, respectively, are built on similar lines as the larger model. Instead of producing either of two sounds—such as may be obtained from the Tuto by pressing a button to one of two stops whereby various resistances are inserted in the circuit—the Rexo is capable of goving only one sound, but the Tuto-Ette is fitted with a two-tone button. The vibrator principle is the same as in the Tuto. Adjustment of the sound is by a screw which varies the limit of movement of the armature spring returning the armature to its original position, when the current is interrupted. Both types of horn are furnished with either a long or a short projector and in any desired finish, the standard being brass and any other finish being furnished on a very small additional price.

Jericho—The Randall-Faichney Company, Boston, Mass., continues the former types of Jericho and Jubilee horns which operate on the exhaust of the motor if the latter is forced through the reed of the horn by closing a by-pass valve. The Jericho horn may this year be obtained with an electric-operating mechanism, consisting of an incased solenoid coil S, operated by a push button B and on a dry battery, which pulls the cable controlling the by-pass mentioned above, thereby causing the exhaust to pass through the horn. Another addition to the Jericho line is a miniature model specially designed for Ford cars which may be slipped over the exhaust pipe of the Ford muffler without the use of a coupling. This Ford horn is 8 inches long, finished in aluminum, and is guaranteed for the life of the car.

Aermore—The Aermore Manufacturing Company, Chicago, Ill., continues its exhaust horn without a change. This horn, designed to give a strong but pleasing signal, consists of a manifold pipe which is attached to the end of the exhaust pipe or to a side pipe entering the exhaust pipe; from this manifold, four small outlet pipes lead to the signal pipes, four of which signal pipes are provided, all being different in length. If the signal is operated a valve directs the exhaust into the manifold and thence through the signal pipes, producing a four-tone accord.

Cubit—A new electrical horn, operating on the vibrator principle, was shown by the Kosmak Electrical Company, Jersey City, N. J. This horn has the vibrating armature attached by a single screw to the center of the diaphragm which is held in place along its periphery, being fastened to the casing by means of screws. A make-and-break current vibrates the armature and with it the center of the diaphragm, creating a series of undulations resulting in sound. The horn requires for its operation from 1.5 to 2.5 amperes of a 6-volt current.

Waymaker—The Lee Tire & Rubber Company, Conshohocken, Pa., continues its Waymaker horn, Fig. 11, without any radical changes but simplified in one or two minor respect. The bulb control of the horn, with the bulb secured to the steering wheel, is now practically standard and it is hardly probable that the company will once more replace this convenient method of operating the horn by the pedal formerly used.

Nightingale—The Riley-Klotz Manufacturing Company, Newark, N. J., shows a full line of bulb horns in many styles as well as its Nightingale whistle which is being continued from last year. The new features of this company's line are: A chime horn, 15 inches in length and operated by a bulb, which may be attached to the steering wheel of the car and the Alpha whistle which is exhaust-operated and fitted to the exhaust pipe. It consists of a resonator drum into which exhaust gas enters through a reed passage, if its free exit from the muffler into the atmosphere is prevented by the closing of a valve. The latter is operated by a chain from the dash, which chain may be connected to either a pedal or a hand lever. Another novelty is the button-bulb which serves for operating both a bulb and an electric horn. This bulb is fitted over the end of the flexible casing through which the air is forced into the horn, and in its apex contains a button B controlling a contact; the latter closes an electric circuit when the horn is pressed as shown in Fig. 7, while the ordinary operation of the bulb produces a sound in the bulb horn.

Long Horn—One of the cleverest productions of the horn field during the year 1912 was the Long Horn, made by the G. Piel Company, Long Island City, N. Y. This horn creates the signalling sound much in the same way as motor-driven horns, namely, by the striking of a ratchet wheel on the steel button mounted on an acoustic diaphragm. The wheel is actuated by a rack when the handle of the horn is pushed down; the handle being returned to its original position by the pressure of a spring. Model S which was brought out last year is being continued, and models JS, JM and D have been constructed during the latter months of 1912. Model JS is a smaller reproduction of model S, and JM differs from JS by the shorter type of resonator. In model D the handle which operates the ratchet and diaphragm has been supplanted by a Bowden wire which slides in a flexible casing and pulls down the rack instead of pushing it down as the handle does. The way of operating it is by means of a cam, to which the Bowden wire is fixed, which is depressed and pulls the wire from under the rack, whereby the pinion is operated.

Nonpareil—The Nonpareil Horn Manufacturing Company of New York City, besides its usual line of bulb horns is now bringing out a hand-operated ratchet and diaphragm signal in which the ratchet is connected to a handle fitted diametrically across the back cover of the horn; the turning of this handle operates the ratchet, and the pitch of the teeth engaging the button on the diaphragm is such that a piercing signal is thereby produced.

Non-Skid Devices

Weed Tire Chain

The Weed tire chain made by the Weed Tire Chain Grip Company, New York City, is the most widely used accessory to be found in this country. The principle is simple, consisting of a series of cross chains lying on the surface of the tire attached to two circumferential side chains. There have been no material changes in the construction during the past year. In order to maintain uniform tension of the chains over the tread of the tire chains adjusters are used. These consist of several springs connected with lengths of chain, the ends of the latter being fitted with hooks to fasten on the outside body of the chain proper which prevents skidding.

Woodworth Tire Grips and Treads

The Woodworth tread manufactured by the Leather Tire Goods Company, Niagara Falls, N. Y., consists of a leather covering for the tire in which a number of metal rivets are imbedded. A new type has been added called the double grip, in which the studs previously employed have been supplemented by more studs standing higher than the major portion. The tread is applied over the outer casing and held in position by a series of hooks.

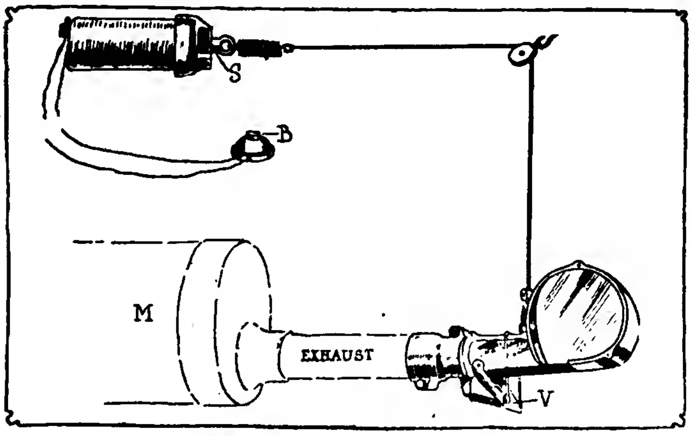


Fig 10.—Jericho electrically-worked exhaust horn

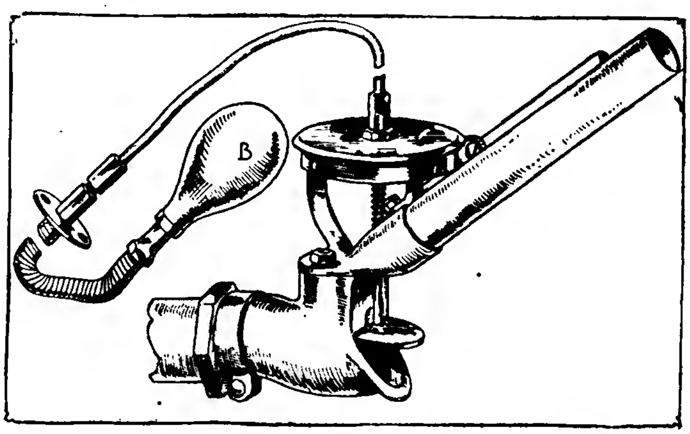


Fig 11—Waymaker exhaust signal operated from steering wheel

THE AUTOMOBILE

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Truck Maker's Burden

READ the letter on the opposite page from the Commissioner of Docks in New York City before reading this editorial.

This letter should be read and re-read by every manufacturer of motor trucks and delivery wagons, if he markets them in New York City or in any of the other big cities of America.

It should be read and meditated upon by every builder of motor commercial vehicles in the country, whether building fire-department machines or tractors for agricultural uses. There is a note of common interest in it to all.

This letter tells the reason why so many industrial houses in New York City and in other cities hold back from buying motor vehicles to replace their present horse-drawn equipment.

This letter suggests to the manufacturers of motor freight vehicles the necessity for co-operating with municipal authorities, and insisting on modernizing steamboat and railroad terminals not only in New York City but also in Chicago and a score of other cities, where the present antiquated means of handling freight are inflicting an enormously heavy toll on the introduction of the motor truck.

When the Commissioner of Docks in New York City reports as follows, then it is high time that manufacturers of trucks and our national automobile organizations get together with dock and terminal commissioners and give them all information on what physical requirements the modern motor truck calls for at these terminals.

First—Great cities of modern times are made possible only by improved transportation methods which permit raw materials, food and fuel to be regularly supplied to concentrated masses of population.

Second—Improved transit methods and cold storage have revolutionized city living conditions and if railroad and steamship terminals shall be properly co-ordinated so that unnecessary handling, storage and truckage shall be avoided city living conditions will be materially benefited.

Third—The administration of the Port of New York is a great national responsibility rather than a local city affair.

Fourth—New York in recent years has grown at the rate of over 4 per cent. per annum, yet during the past three years virtually nothing has been done to provide for the growing demands of commerce.

Fifth—New York's orderly development is hampered by lack of modern terminals and connections between them more than by anything else.

Sixth—All of the railroad and steamboat terminals of the port should be ultimately converted into public terminals publicly controlled.

Seventh—Local retail markets, like local postoffices, distributed about the city at convenient points, may later on be found necessary as adjuncts to wholesale terminal markets.

Eighth—Wherever it is practicable for suburban farmers to bring their produce by drays into the city, street markets should be provided for their convenience.

Ninth—The Dock Department of New York City is planning for the construction of public terminal markets near the water front in Manhattan, the Bronx, at Staten Island and at South Brooklyn.

Tenth—The railroad and steamship companies, being common carriers, have no interest in the commodities handled except to deliver safely the goods at the station called for by the bill of lading.

It would be wrong to expect that architects laying out plans for modern terminals and devising modern means for handling freight can design what is best for motor truck efficiency if the truck-making organizations fail to place before them the requirements. It is useless to wait until plans for these new terminals are completed and building commenced only to find entirely inadequate facilities provided. The situation calls for immediate united action on the part of the truck industry.

The motor truck is annually playing a greater part in city transportation and social conditons will demand that it play a still greater part. Hence the necessity of well-organized, rational, concerted action at the present time.

The tenth excerpt from the Commissioner's report shows that little may be looked for from the railroads excepting insofar as it concerns them and that their concern ends with delivery of freight at the terminal, the point at which the concern of the truck maker begins, hence if he looks to the railroad to protect his interests in this new terminal plan he will meet with disappointment.

The third excerpt, namely, that the administration of the Port of New York is a national rather than a local responsibility, points to the great influence that proper New York terminals will have on all of the other cities of the country; and if every facility to lay out these terminals to save loss of motor truck time in

The Motor Truck Maker's Burden

EDITOR THE AUTOMOBILE: *I understand economy of motor trucks is most noticeable on long hauls. I presume it would be equally true to state that short hauls would be more remunerative, providing the delays incident to loading and unloading could be materially cut down. With celerity of despatch at both ends, a series of short hauls under such conditions might approximate in economy the long haul where loading and unloading took more time.* The terminal delays at the railroad and steamship piers on the west side of Manhattan are the heaviest charge to which the commerce of the Port of New York is subjected. *These delays are serious enough in connection with the old-fashioned inexpensive horse dray, but in my judgment* they will materially diminish the opportunities for using motor trucks in city deliveries, unless remedied. *Frequently the horse trucks make only one trip a day to the west side steamship and railroad terminals.*

Modernization of these terminals I believe to be necessary if there is to be a general use of motor trucks in Manhattan. *In this connection I commend to your consideration the plans of the Dock Department for modernizing the terminals. The marginal railway, over which traffic should be as public and unobstructed as is the water in front of the docks, I believe to be a controlling factor.*—CALVIN TOMKINS, *Commissioner of Docks, New York City.*

loading and unloading is accomplished, these means will be widely imitated throughout the entire country. It is an opportunity not to be overlooked, and offers an economical solution so far as motor truck interests are concerned.

Excerpt eight points to the erection of local retail markets throughout the city for suburban farmers, or truck gardeners. These terminals must be adapted to motor truck needs, because within 5 years this work will practically all be done by motors. The track makers should lay before the necessary parties what they consider rational arrangements in such markets.

That motor trucks are losing much time in loading and unloading at the New York freight terminals was proven in a paper read before the National Association of Automobile Manufacturers at its Detroit Convention last November on this subject. Observations made at the terminals of the west side of Manhattan showed that on one day the delays of trucks and horse vehicles averaged 11 minutes per vehicle and on the following day 15.5 minutes per vehicle. Some individual cases showed delays of over 2 hours waiting to load or unload. These facts are corroborated by Commissioner Tomkins' letter, namely, "frequently horse trucks make only one trip a day to the west side steamship and railroad terminals."

These terminal delays are due to a variety of causes, some because of the drivers, some because of the clerical forces within the terminals, some because of the physical arrangements of the terminals, and others because of the inadequate space and objectionable loading and unloading methods used. No matter what the cause of the delay, the net result operates against the motor truck maker. He bears the burden. If only one trip per day can be made to some of these terminals by horse vehicles what hope is there to sell motor trucks to such owners of horse vehicles?

Truck makers must unite; they must put their shoulders to the wheel; they must get out of the narrow sphere of manufacturing and testing; they have to go out into the field of operation and insist that antiquated horse-pace environments be eliminated and modern facilities installed. When dock commissioners realize the forlorn situation, no better opportunity could possibly present itself. Immediate action is needed.

Business at the Truck Show

WHILE there were some who were dissatisfied on the whole, the New York truck show which closed Saturday night was conceded by the manufacturers who exhibited, to be a great success. It must be remembered that people who walk into a showroom and buy a truck without any previous arrangements are very scarce indeed, yet there were many instances where that very thing occurred both at the Palace and at the Garden. Some of the exhibitors sold as many as six trucks at retail to purchasers who had not been prospects before the show opened.

One of the most promising features of the show was the large number of new agencies secured. Many of the exhibitors who did not sell a single truck during the entire show week more than made up for this lack of retail business by the agencies closed in large centers. From all reports it is evident that many of the up-state people were in town to look the trucks over and to select that which they would like to represent in their town.

The number of foreign agencies closed this year was remarkable. An example of this Lippard-Stewart, which, according to sales manager W. F. Reynolds, appointed as a direct result of the show, agents in Australia; Cape Town, South Africa; Venezuela; Philippine Islands; Buenos Ayres and Montevideo. This concern made ten actual retail closures at the show nearly all of which, however, were prospective buyers before the opening day. The Service Motor Car Company also closed a number of foreign agents according to Jean Marks. Those who signed up represented Colon, Australia and New Zealand.

In most cases it was difficult indeed for a sales manager to tell what the net result of the show would be. The number of prospectives secured was in some instances high while the actual sales were few.

Big contracts secured during the show week were not scarce and although these cannot be published owing to the fact that details are still pending it can be stated that the General Vehicle Company, according to F. N. Carle, closed a sale of twenty-five 5-ton electric trucks with Jacob Ruppert, and twenty 5-ton trucks with George Ehret. The Atterbury company closed an order for six trucks with the La France Auto Garage Company of Elmira, N. Y. Two of these were 2-ton trucks, the other four consisting of a 5-ton, 3-ton, 1-ton and a 1,500-pound wagon. This concern sold, according to F. Lindoerfer, sales manager, twenty-seven commercial vehicles as a result of last year's show.

The attendance at the Garden show was good, that at the Palace not so good. In fact the exhibitors of accessories during the truck week, closed up their stands and left before the show was over. They were located on the upper floors and nobody got up their except a few stragglers. During the pleasure car week conditions were different, all the exhibitors being kept constantly busy.

General interior of Belgium's combined automobile and aviation show

European Exhibition Circuit Is Closed

Belgium's National Show a Representative One—Few New Makes Shown

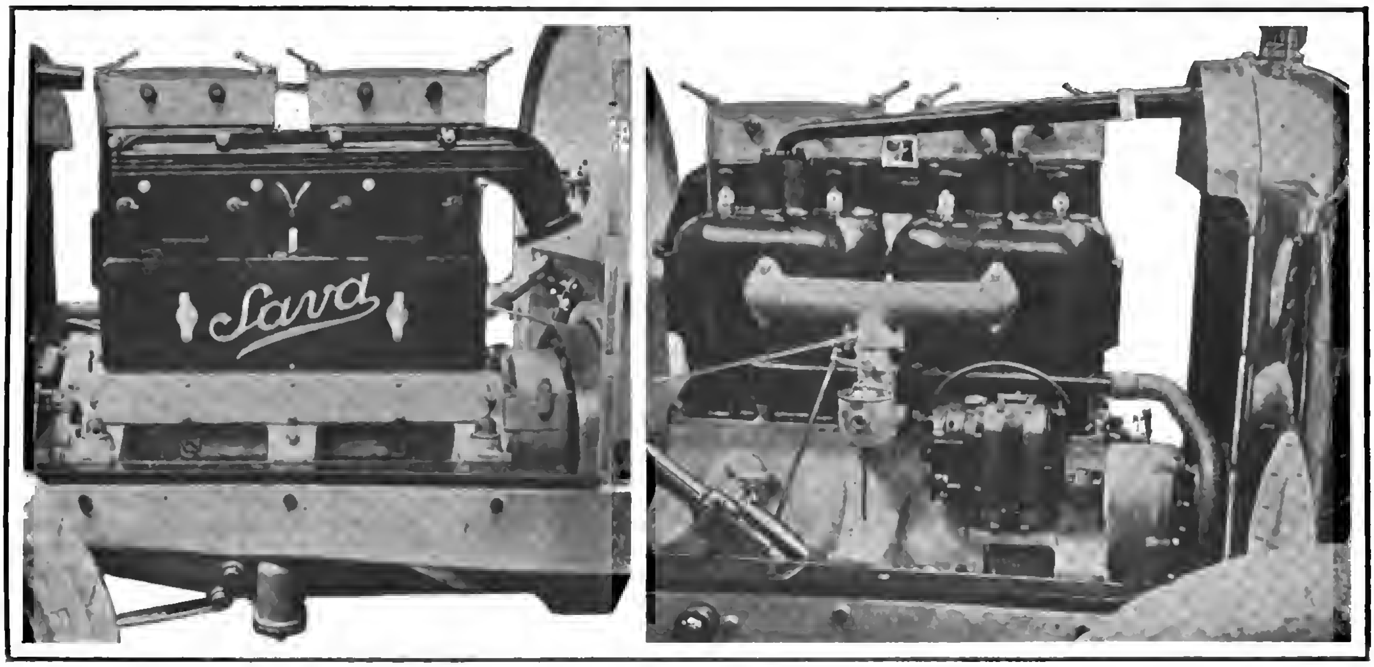
BRUSSELS, Jan. 13.—With the Brussels show the series of important European motor exhibitions comes to a close, for although there are a few more shows they are all of a provincial nature and will not reveal anything not previously seen at London, Paris, or in the Belgian capital. The present show, the twelfth of a series, is being held in the Palais du Cinquantenaire, and unites 196 exhibitors, compared with 175 last year and eighty-two in 1911.

Although Belgium is an automobile manufacturing country of considerable importance, the native manufacturers are outnumbered by the French, the number of French car makers having stands in the hall being twenty-one; Belgians, sixteen; German, seven; English, three; Spanish, one, and America has as its representatives Ford, Hupmobile, Overland and Flanders. The total value of the exhibits is estimated at $750,000, of which aeroplanes are responsible for $180,000.

Among the few entirely new models is a four-cylinder Sava car with its 4.3 by 6.2-inch cylinders in pairs. The valve disposition is of the superimposed type, commonly applied to all Sava cars, the intakes being operated by overhead rocker arms contained within an aluminum housing and working in oil. The pushrods being within the cylinder casting and the valve stems being inclosed, there are no visible moving parts. The gas passages are cast with the cylinders, but the exhaust manifold is bolted on, this being the disposition adopted on the large majority of Belgian cars, and indeed on most European cars. The integrally cast water-cooled exhaust manifold is less commonly employed on account of its tendency to overheat the cooling water if special provision is not made. This new Sava chassis has timing gears at both front and rear. At the rear the camshaft is driven by silent chain, the top of the housing being detachable in order to give admission to the chain and the camshaft pinion. The chain drive for the magneto and water pump is at the front. There is a detachable cover over the camshaft housing and a compression release on the camshaft for ease in starting up. Ribs are cast on the base chamber for cooling.

The shaft between the cone clutch and the four-speed gearbox is incased by an extension of the gearbox in a manner adopted this year for the first time by Renault. A feature of the gearbox is the method of forced-feed lubrication instead of by grease churned up by the gears. In the base of the gearbox is an oil reservoir from which a pump draws lubricant and directs it onto the face of the teeth in contact. The gearwheels do not dip in the oil. There is an aluminum housing round the transverse gearshifter rod, this housing also combining the sector, and being entirely independent of the frame member. The housing being merely bolted onto the gearbox, is made in various lengths to suit individual requirements, thus making it possible to bring the sector directly over the frame member or within it, as desired. Overhead worm drive is employed, the Sava company appearing to be the only one in Belgium preferring this to bevel gearing. The worm is carried in a concentric sleeve and can be adjusted externally with the greatest ease. The driving effort is taken through the springs, and the torque provided for by a tubular housing with forked arms, around the propeller shaft. Greasers are also provided for the trunnion mounting of the radiator. The rear brake mechanism is rather an interesting feature. On the forward end of the torque tube is a transverse bar carrying a grooved pulley mounted on a vertical axis. One end of the bar is pivoted, and the other end is connected by a ball-and-socket joint to the connecting rod going to the brake pedal. A cable passes round the pulley, one end being attached to each of the rear brake levers. The arrangement is neat and simple and gives a perfect equalizing effort.

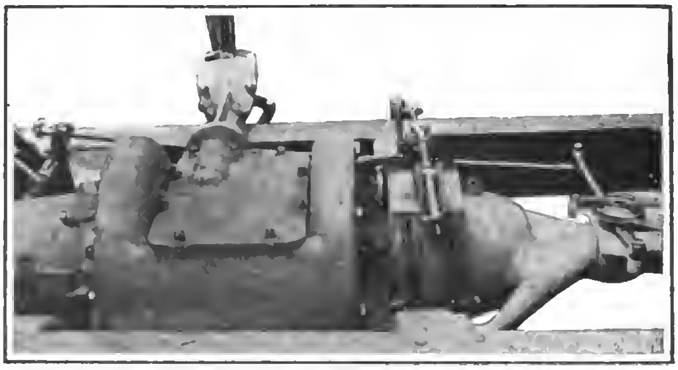
Non-poppet valve types of motors are not a strong feature in Belgium. The Minerva company is building the Knight exclusively, and Germain has one model with the Knight motor. There appear to be no other non-poppet valve motors built in Belgium. Germain has produced a new model for the coming



The Sava motor was one of the new features at Brussel's show

season, but it is of the poppet valve type, its dimensions being 3.1 by 5.5 inches bore and stroke, with the four cylinders cast in one block and offset in relation to the crankshaft. Two independent chains are used for driving the magneto and water pump and the crankshaft, and are placed at the flywheel end. Lubrication of the motor is under a pressure of 40 pounds to the square inch, the pump being driven off the camshaft and the oil leads to the three main bearings being external.

Among the outstanding features of the Belgian construction are three and five-bearing crankshafts for four-cylinder motors, forced-feed lubrication to either all or to the main bearings, with constant-level troughs for the connecting rod ends; a tendency to put the chain or timing gears at the rear of the motor; high-tension ignition with either variable or automatic advance; metal clutches more frequently than cone type; four-speed gearboxes, and shaft drive with a torque tube surrounding the propeller shaft. A considerable effort has been made to reduce the unsprung weight of the rear axle by the use of higher-grade material. Wire or detachable steel wheels are very commonly employed. Cranking motors are altogether unknown, but electric lighting dynamos are either fitted or provision is made for fitting them on the majority of chassis.



Unique Gearbox design on Sava chassis

Number Cylinders	BORE AND STROKE Millimetres	Inches	Cylinders	Cylinder Type	Camshaft Drive	Speeds
Metallurgique						
4	75x 96	2.95x3.78	Block	L	Chain	4
4	80x130	3.15x5.12	Block	L	Chain	4
4	90x140	3.54x5.51	Block	L	Chain	4
4	101x150	3.98x5.91	Pairs	L	Chain	4
4	125x150	4.96x5.91	Pairs	L	Chain	4
Excelsior						
4	85x130	3.35x5.12	Block	L	Chain	3
6	85x130	3.35x5.12	Block	L	Chain	3
6	90x140	3.54x5.51	Threes	L	Chain	3
F. A. B.						
4	75x120	2.95x4.72	Block	L	Gears	4
4	90x140	3.54x5.51	Block	L	Gears	4
F. N.						
4	69x130	2.72x5.12	Block	T	Gears	4
4	85x120	3.35x4.72	Block	T	Gears	4
4	125x140	4.92x5.51	Pairs	T	Gears	4
F. I. F.						
4	75x120	2.95x4.72	Block	L	Chain	4
4	75x130	2.95x5.12	Block	L	Chain	4
4	75x130	2.95x5.91	Block	L	Chain	4
4	65x110	2.56x4.33	Block	L	Chain	4
Germain						
4	80x140	3.15x5.51	Block	L	Chain	4
4	90x130	3.54x5.12	Pairs	K	Chain	4
4	92x150	3.62x5.91	Separate	L	Chain	4
4	102x140	4.02x5.51	Pairs	K	Chain	4
4	86x110	3.39x4.33	Separate	L	Chain	4
Linon						
4	75x120	2.95x4.72	Block	L	Chain	4
4	80x140	3.15x5.51	Block	L	Chain	4
4	90x150	3.54x5.91	Block	L	Chain	4
Miesse						
4	80x110	3.15x4.33	Block	L	Gears	3
4	90x140	3.54x5.51	Block	L	Gears	4
4	80x140	3.15x5.51	Block	L	Gears	4
4	100x140	3.94x5.51	Block	L	Gears	4
Minerva						
*4	75x120	2.95x4.72	Block	K	Chain	4
4	90x130	3.54x5.12	Pairs	K	Chain	4
4	100x140	3.94x5.51	Pairs	K	Chain	4
4	124x150	4.88x5.91	Pairs	K	Chain	4
Nagant						
4	70x118	2.76x4.65	Pairs	L	Chain	4
4	90x120	3.54x4.72	Pairs	L	Chain	4
4	90x130	3.54x5.12	Pairs	L	Chain	4
4	90x150	3.54x5.91	Pairs	L	Chain	4
4	106x130	4.17x5.12	Pairs	L	Chain	4
4	106x150	4.17x5.91	Pairs	L	Chain	4
Pipe						
4	75x110	2.95x4.33	Block	I	Chain	4
4	75x120	2.95x4.72	Block	L	Chain	4
4	80x150	3.15x5.91	Block	L	Chain	4
4	100x180	3.94x7.09	Pairs	L	Chain	4
4	140x180	5.51x7.09	Pairs	I	Chain	4
Sava* S						
4	75x140	2.95x5.51	Block	S	Chains	4
4	82x140	3.23x5.51	Block	S	Chains	4
4	110x160	4.33x6.30	Pairs	S	Chains	4
Springuel						
4	75x100	2.95x3.94	Block	L	Gears	4
4	70x120	2.76x4.72	Block	L	Gears	4
4	80x130	3.15x5.12	Block	L	Gears	4
4	90x140	3.54x5.51	Pairs	L	Gears	4
4	100x160	3.94x6.30	Pairs	L	Gears	4

L—L-head. K—Knight. I—Overhead. S—Superimposed. *Worm-driven models.

Quakers' Show A Success

Week's Attendance 35,000—New Business Done 50 Per Cent. in Excess of That Done Last Year

Sixty-nine Makes of Cars on View and Score of Accessory Displays

PHILADELPHIA, PA., Jan. 25—Neither in point of attendance nor in the amount of business transacted has any former automobile show approached the record established by the twelfth annual motor car exhibition held in the mammoth new garage of the Automobile Club of Philadelphia, under the auspices of the local Automobile Trade Association, Part I of which closed tonight.

While no accurate figures upon which to base a comparison are available, the week's attendance has been conservatively estimated to have been 35,000, a daily average of 5,000, while as a business proposition the amount of new business actually consummated will show an average increase of 50 per cent. over last year, with an exceptionally strong list of prospects. For the most part the visitors at this year's show were a discriminating lot, and the expectations engendered by last Saturday night's record-breaking opening that this would be the most successful automobile show ever held in Philadelphia were fully realized. Individual exhibitors to a man are enthusiastic over the results attained.

Sixty-nine Makes of Cars Shown

Sixty-nine different makes of cars were represented on the three floors of the Automobile Club's building, occupying approximately 90,000 square feet of space. In addition there were over a score of accessories dealers. Probably 90 per cent. of all the displays had been installed when the show opened on Saturday night, but an almost entirely changed view presented itself on Monday, the transformation having been accomplished over Sunday, when many of the exhibits temporarily placed for opening night gave way to others brought over from New York upon completion of the pleasure car exhibit there. Many minor changes looking toward the relief of congestion similar to that which characterized Saturday night had also been made by the management. The service of the two 20-foot elevators used to haul passengers was rearranged, one being confined to carrying visitors up and the other down only. A hand rail dividing the wide stairway had also been built.

Wednesday evening was observed as Club Night, the 1,600 members of the Automobile Club of Philadelphia having been specially invited to attend the show as guests of the Philadelphia Automobile Trade Association. Representatives of the Rambler car from eastern Pennsylvania and New Jersey also attended the show on Wednesday, piloted around by F. E. Devlin, local manager of the Rambler agency.

Thursday was set aside as Society Day, when the price of admission was doubled, and although it rained most of the day and night a good attendance was noted, the automobile owner and prospective owner predominating. This was the day the electric came into its own. the fair sex lingering around the booths where the electrics were being demonstrated eagerly absorbing information.

Following a close second to the pleasure car exhibit both in the variety of displays and in general interest, Part II of the show will open on Monday morning with the most comprehensive collection of motor trucks ever assembled in this city. Thirty-one different makes will be shown, ranging from 500 pounds capacity to 10 tons. This less handsome but more utilitarian exhibition will comprise commercial vehicles adapted to every purpose of every business in which the transportation problem figures. Demonstrating the maximum of efficiency with the minimum of expense appeals to the business man, consequently the coming week's show will be a strictly business proposition, so a decided falling off in attendance is anticipated. No change in the interior decorative scheme will be made for the coming week's show and the nightly musical concerts will continue.

Notwithstanding the immense exhibition conducted in the Automobile Club of Philadelphia building, Twenty-third and Market streets, the first annual domestic and importers' exhibition conducted under the auspices of the Philadelphia Board of Trade, Ltd., in the First Regiment Armory, Broad and Callowhill streets, closed a successful week tonight. Indeed, so successful was this initial effort at a combination show that a permanent organization has been effected, with the object in view of making the Importers' Salon an annual fixture.

Costly and luxurious foreign models ranging in price from $8,000 to $18,000, none of which had ever before been exhibited in Philadelphia, were the magnet that attracted motor car enthusiasts. Side by side was shown a representative collection of American cars.

Tire Makers Adopt Standard Guarantee

At a meeting of the Motor and Accessory Manufacturers' Association held during the show period in New York City a standard form of tire guarantee has been adopted. Some false reports have been circulated that this will mean the forced abandonment of all mileage guarantees. This is not true, although it is likely that the ultimate result will be that several concerns now guaranteeing a definite mileage will abandon this policy. This is a matter, however, which is up to the individual manufacturer. The wording of the new guarantee is as follows:

We guarantee all Pneumatic Automobile Tires, bearing our name and serial number, to be free from imperfections in material and workmanship. Tires returned for consideration under this guarantee will be accepted only when all transportation charges are prepaid. If, upon examination, it is our judgment that tires are defective, they will be repaired or replaced at our option.

When tires are replaced by us, charges will be made to owners at the time new tires are delivered, for such amounts as in our judgment will compensate for the service rendered by such replaced tires.

Tires worn out in usual or unusual service, abused knowingly or unknowingly, misused, used on rims not bearing these stamps, injured through accident or design, are not covered by this guarantee.

(Manufacturer's name) Pneumatic Automobile Tires are not guaranteed to give any definite miles of service and any and all guarantees are expressly waived by any purchaser of these tires who uses therein any substitute for air; or who uses them under weights or in excess of those for which the various tires are recommended, or who does not keep tire inflated to the pressure recommended by us.

Two Interesting Opinions Rendered

ST. PAUL, MINN., Jan. 27—Two opinions affecting automobile companies have been handed down by the Supreme Court. In the first, that of the Travelers' Casualty Company against the Fawkes Automobile Company, the court held that in the case it devolved on the defendant to show he exercised ordinary care in keeping the property which he admitted inability to return to meet a *prima facie* breach of contract. "Where the proprietor of an automobile repair shop had notice that his foreman had proclivities rendering it likely that he would injure cars left at the shop for repairs, by taking them out at improper times and make unauthorized use of them, it was such proprietor's duty to exercise ordinary care to protect such cars from the danger of injury to which they were thus subjected. The action of the court, in an action for injury to an automobile in a collision which occurred while the foreman of the defendant's repair shop was using it for his own private purposes, in submitting to the jury the question whether the defendant was guilty of negligence in retaining such foreman in his employ is sustained. The contention that the complainant failed to state a cause of action held in any event too late when made for the first time on appeal. Where the facts litigated were known to the defendant, a variance, if any, between the complainants and his proofs is held harmless. Where the defendant in an action for injury to an automobile had acted virtually as appraiser between the plaintiff, an insurance company and the owner of the machine, and the plaintiff had paid the owner the amount of the loss fixed by such appraisement, the defendant was estopped to introduce evidence as to the value of the machine. Other claims were held to be without merit."

In the second case, F. W. Geiss against the Twin City Taxicab Company, appellant, the court's opinion read: "First, where a servant, without authority from the master, permits a stranger to assist him in his work for the master, and such stranger, in the presence of the servant and with his consent, negligently does such work, the master is liable for such negligence."

Briscoe Heads French Company

PARIS, Jan. 18—On the latest list of French joint stock companies appears the announcement "Briscoe Freres, a company for experimental and research work in automobile construction, with headquarters at Billancourt, Seine." Inquiries revealed the fact that the new French company has Benjamin Briscoe at its head and that work is actively progressing on a car for the American market. Interviewed by THE AUTOMOBILE representative, Mr. Briscoe admitted that he was laying plans for a big business campaign. His intention in coming to France was not primarily to enter the European market, but to get on the American market on a larger scale and on a more solid foundation than ever before.

The car would be sold in America fully equipped for less than $1,000. It was learned that the preliminary work is well advanced and that the first models will be entirely completed and tested out in France. When all the preliminary work has been completed, its construction in large quantities is to be commenced in America. It is stated that the car will be ready in ample time for the 1914's season's trade.

Stephenson vs. Case Suit in Court

MILWAUKEE, WIS. Jan. 25.—Arguments are now being heard in the circuit court of Milwaukee county, Branch IV, in the case of the Stephenson Motor Truck Company against the J. I. Case Threshing Machine Company and Pierce Motor Company of Racine, Wis., since merged under one name. The Stephenson company sues for $100,000 for breach of contract, claiming that the Case concern contracted to purchase its entire output and later the entire plant and real estate. The trial of the case lasted nearly a month, and the volume of testimony on which arguments are now being made cover more than 5,000 typewritten pages. A decision is expected early in February.

Hughes and Mercer Company Sued

MILWAUKEE, WIS., Jan. 27.—Hughey Hughes and the Mercer Automobile Company of Trenton, N. J., have been made defendants in a suit for $10,000 damages for personal injuries by Charles Hoch, a farmer residing near the Wauwatosa course, on which the last Vanderbilt cup and grand prix races were held. Hoch alleges that Hughes struck his wagon, throwing him out and injuring him, probably permanently. He asks $10,000.

Indiana Branch of S. A. E. to Meet

INDIANAPOLIS, IND., Jan. 27—The Indiana branch of the Society of Automobile Engineers will discuss motor fuel at the monthly meeting of the branch to be held February 18. John A. Secor is to be one of the principal speakers.

INDIANAPOLIS, IND., Jan. 27—The Empire Automobile Company announces that owing to the fact that it was unable to secure adequate space at the National Automobile Show at Chicago, it will have a special exhibit at the salesroom of the Ralph Temple Automobile Company. The concern manufactures a five-passenger touring car.

Chicago Ready for Show

Exhibition to Open on Schedule Time—There Will Be 600 Exhibitors—Many Accessories To Show

Pleasure Car Exhibits Will Number 100 and Those of Commercial Vehicles Seventy-eight

CHICAGO, ILL., Jan. 27—As usual, Samuel A. Miles, general manager of the National Association of Automobile Manufacturers, will have his show ready on time. Since the middle of last week his decorators have been busy in the three buildings which comprise the show unit this year, and by next Thursday afternoon it will be possible for those exhibitors, who so desire, to install their cars or sundries, and the show will open on schedule time at 1 o'clock next Saturday afternoon. Through the securing of the Wilson building, which is to the immediate south of the Coliseum annex, Miles has secured a little more room than he ever had before. For the first time in the history of the Chicago show there will be no foreign cars displayed. The Fiat is in, but it is now so thoroughly Americanized it is not now regarded as of foreign extraction.

In all there will be in the neighborhood of 600 exhibitors at the show, with 100 of these exhibiting pleasure cars and seventy-eight motor trucks. This is a slight increase over last year, when there were ninety-six pleasure car makes and sixty-five trucks. In the accessory line there are from thirty to thirty-five more exhibitors than last year, the majority of whom are going to exhibit both weeks of the show.

40,000 Attendance at Toledo Show

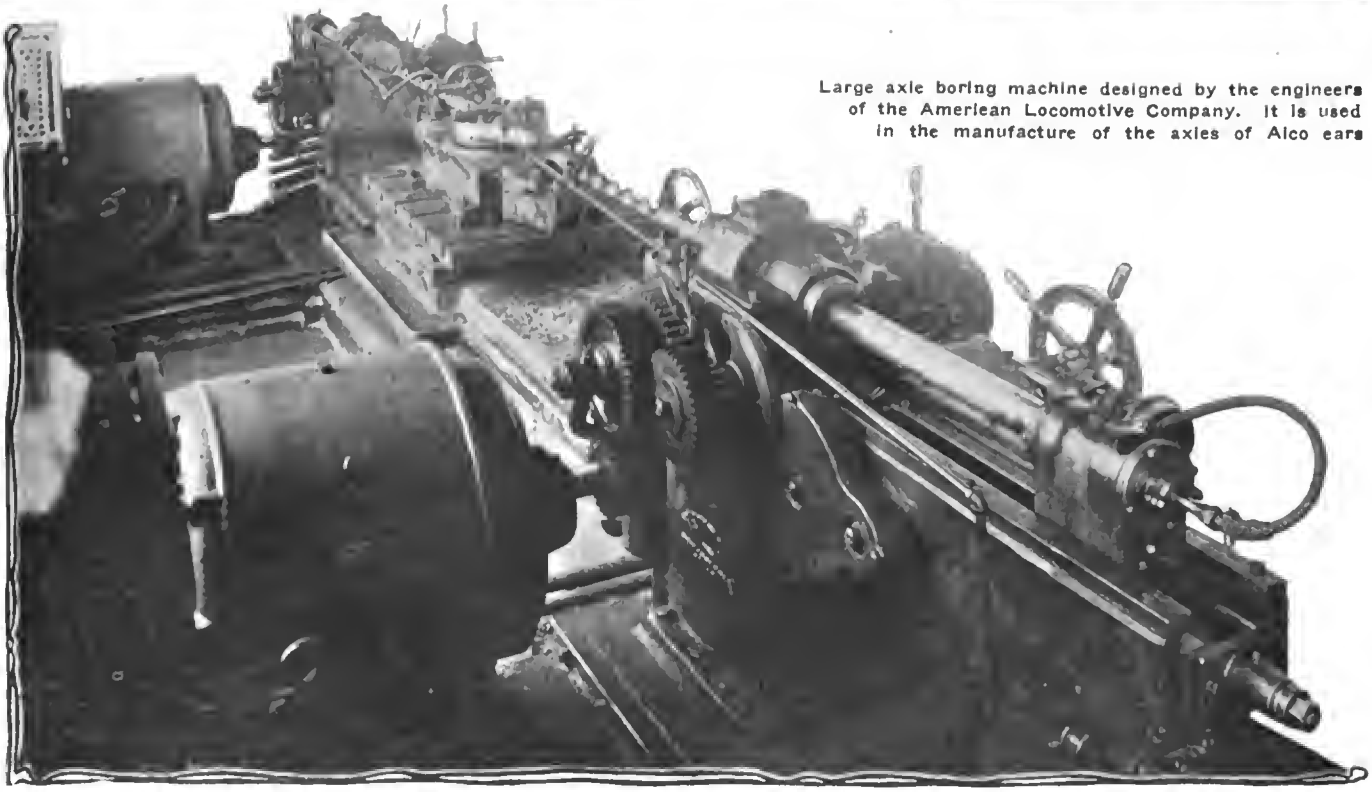
TOLEDO, O., Jan. 25—There were more than 40,000 persons in attendance at the Automobile Show given in the Terminal building on Cherry street by the Toledo Auto Shows Company, a large percentage of whom were farmers and persons living in small cities within a radius of 50 miles of Toledo. There were more than fifty exhibitors, and about 250 cars, of all classes, on the floor. Toledo manufacturers were well represented, especially in electric cars and trucks. The buying is being done by the farmers, this year, and they are buying $1,200 and $1,500 cars for the most part.

HARTFORD, CONN., Jan. 28—(*Special Telegram*)—Twelve makes of gasoline pleasure cars, one electric and two makes of gasoline commercial cars, were displayed at the second annual automobile show which opened Monday evening for the week at Waterbury, Conn. The attendance was fairly good and all indications point to a successful exhibition. The affair is being conducted shown by Hartford dealers. The decorations were effective.

PROVIDENCE, R. I., Jan. 25—Two motor car shows opened here this evening, one under the auspices of the Rhode Island Automobile Dealers' Association in the Armory and the other at the Narragansett Hotel held by some of the dealers who were unable to get space at the big show. The two shows will run for a week.

MILWAUKEE, WIS., Jan. 24.—A team match trophy tour between the Milwaukee Automobile Club and the Milwaukee Athletic Club and a match run with the Chicago Automobile Club are being figured out as the principal touring events of the Milwaukee motoring organization, which this year for the first time intends to engage in competitive touring.

Factory Miscellany



Large axle boring machine designed by the engineers of the American Locomotive Company. It is used in the manufacture of the axles of Alco cars

THE above illustration shows an extraordinarily large axle boring machine. Although built by a prominent manufacturer of machine tools this machine was designed in the factory of the American Locomotive Company, Providence, R. I., for use in the manufacture of the Alco pleasure axles. As may be noted the machine is driven by an electric motor which actuates the boring shaft through a train of gears. There are in reality two machines mounted in opposed fashion, the two cutting tools working toward each other. The illustration shows an axle in place, it having both its ends bored at the same time. Since the boring shafts are accurately aligned the axle is sure to be bored true by this machine. Although automatic in its action the rate of feed of the drill is under instantaneous control of the man in charge of the machine.

KEETON'S Big Factory—The Keeton Motor Company, Detroit, Mich., recently purchased the immense automobile plant formerly occupied by the Oliver Motor Car Company, paying $50,000. The property consists of three buildings of modern factory construction 220 feet by 80 feet each, and one building 140 feet by 40 feet. With other smaller buildings, the factory will comprise 50,000 square feet. Building No. 1 will be given over to the chassis assembling, and building No. 2, which is 110 feet by 80 feet, will be the rough test department. In building No. 3, which is of equal size to building No. 1, will be the rough and finished stock, receiving and shipping. The fourth building will be the machinery room, 140 feet by 80 feet, and the fifth building will be the painting and trimming room, same being 220 feet by 80 feet in size. The offices are contained in a projecting wing at the corner of the factory group.

Goodwin Car Company Building—The Goodwin Car Company, Chicago, Ill., is erecting a one-story factory, 60 feet by 200 feet, costing $20,000.

Mohawk Using Stein Plant—The Mohawk Rubber Company, Akron, O., has taken over the plant of the Stein Double Cushion Tire & Rubber Company.

Morrow's Plant—The Morrow Manufacturing Company, Elmira, N. Y., has adopted plans for a new addition, 700 feet by 100 feet, to its present automobile plant.

Falls Tire Increases Capacity—After March 1 the Falls Tire & Rubber Company, Cuyahoga Falls, O., will increase its tire capacity by installing new machinery.

Pennsylvania Rubber's Addition—The Pennsylvania Rubber Company, Jeannette, Pa., have plans in progress for a three-story factory addition, costing $100,000.

National to Build—The National Motor Vehicle Company, Indianapolis, Ind., is planning to build a three-story building, 83 feet by 97 feet brick addition to its factory.

Hanna Equipping Plant—The Hanna Motor Manufacturing Company, Kansas City, Mo., recently incorporated with a capital of $60,000, will equip a plant for the manufacture of motors.

Drop Forge Company's Addition—The Park Drop Forge Company, Cleveland, O., manufacturer of automobile forgings, has awarded contracts for the erection of an addition, to cost $9,000.

Speedway Recently Organized Builds—The Speedway Tire Company, recently organized in Louisville, Ky., with a capital of $250,000, will erect a large plant for the manufacture of automobile tires.

Amplex Builds Assembling Room—The Amplex Motor Car Company, Mishawaka, Ind., will erect an addition to be used as an assembling room. It will be one story high and 120 feet by 255 feet.

General Vehicle's Planning—The General Vehicle Company, New York City, has plans for a large factory which will be erected in the automobile manufacturing district of Long Island City, N. Y.

Michelin Adding—The Michelin Tire Company, Milltown, N. J., is adding a large wing to building No. 14. It will be one story high, with a second story over one portion of it. It will be constructed of reinforced concrete, with roof of saw-tooth design.

Automobile Foundry Destroyed—An explosion in the brass and aluminum foundry of the Buick Motor Car Company's plant at Flint, Mich., recently, destroyed that building and the machinery it contained. The total loss was estimated at $40,000. No one was seriously hurt.

Shows, Conventions, Etc.

Jan. 25-Feb. 1.....Montreal, Que., Montreal Automobile and Truck Show, R. M. Jaffray, Manager.
Jan. 25-Feb. 1.....Providence, R. I., Annual Show, State Armory, Rhode Island Automobile Dealers' Association, Inc.
Jan. 27-Feb. 1.....Philadelphia, Pa., Truck Show.
Jan. 27-Feb. 1.....Buffalo, N. Y., Annual Automobile Show.
Jan. 27-Feb. 1.....Detroit, Mich., Annual Automobile Show.
Jan. 27-Feb. 1.....Rochester, N. Y. Annual Show, Exposition Park, Dealers' Association.
Jan. 27-Feb. 1.....Scranton, Pa., Annual Automobile Show, Hugh B. Andrews.
Jan. 27-Feb. 13....Troy, N. Y., Annual Show, State Armory, Troy Automobile Club.
Jan. 27-Feb. 1......Waterbury, Conn., Annual Show.
Feb. 1-8...........Chicago, Ill., Annual Automobile Show, Coliseum and 7th Regiment Armory.
Feb. 3-8...........Washington, D. C., Annual Show.
Feb. 8-15..........Hartford, Conn., Annual Show, State Armory, Hartford Automobile Dealers' Association.
Feb. 8-15..........Minneapolis, Minn., Annual Automobile Show.
Feb. 10-15.........Chicago, Ill., Truck Show.
Feb. 10-15.........Winnipeg, Man., Show, A. C. Emmett.
Feb. 10-15.........Ottawa, Ont., Ottawa Motor Show, Howick Hall, Louis Blumenstein.
Feb. 11-15.........Binghamton, N. Y., Annual Show, State Armory. Dealers' Association, R. W. Whipple.
Feb. 15-22.........Albany, N. Y., Annual Show, State Armory, Dealers' Association.
Feb. 15-22.........Newark, N. J., Annual Automobile Show, First Regiment Armory, New Jersey Automobile Exhibition Company.
Feb. 16-23.........Richmond, Va., Annual Show.
Feb. 17-22.........Kansas City, Kan., Annual Automobile Show.
Feb. 18-19.........Madison, Wis., Annual Show, City Market Building, Dealers' Association.
Feb. 18-21.........Grand Forks, N. D., Annual Show, Auditorium, Dealers' Association.
Feb. 18-22.........Baltimore, Md., Annual Show, B. A. D. A.
Feb. 19-22.........Bloomington, Ill., Annual Show, Coliseum, McLean County Automobile Club.
Feb. 19-22.........Geneva, N. Y., Automobile Show, Armory, Louis Blumenstein.
Feb. 19-23.........New Orleans, La., Annual Show.
Feb. 19-27.........Topeka, Kan., Annual Show.
Feb. 20-22.........Canandaigua, N. Y.. Automobile Show, Louis Blumenstein.
Feb. 22-Mar. 1....Brooklyn, N. Y., Annual Show, 23rd Regiment Armory.
Feb. 24-27.........Kansas City, Mo., Truck Show.
Feb. 24-Mar. 1....St. Louis, Mo., Annual Show.
Feb. 24-Mar. 1....Memphis, Tenn., Annual Show.
Feb. 24-Mar. 1....Omaha, Neb., Annual Automobile Show.
Feb. 24-Mar. 1....Paterson, N. J., Annual Show, Paterson Automobile Trade Association.
Feb. 24-Mar. 5....Cincinnati, O., Annual Show, Music Hall, Cincinnati Automobile Dealers' Association.
Feb. 25-28.........Eau Claire, Wis., Annual Show, Armory, Dealers' Association.
Feb. 25-Mar. 1....Syracuse, N. Y., Annual Show, Syracuse A. D. A.
Feb. 26-Mar. 1....Fort Dodge, Ia., Annual Show.
Feb. 26-Mar. 1....Glens Falls, N. Y., Automobile Show, Louis Blumenstein, Manager.
Feb. 27-Mar. 1....Toronto, Ont., Annual Show, Toronto Automobile Trade Association.
March 3-8.........Bridgeport, Conn., Show, Park City Rink, B. B. Steiber.
March 3-8.........Pittsburgh, Pa., Annual Automobile Show.
March 3-8.........Springfield, Mass., Automobile Show, New Auditorium Building, United Amusement Company.
March 3-18........Des Moines, Ia., Annual Show, Pleasure Car Section, Coliseum, Dealers' Association.
March 5-8.........Tiffin, O., Annual Show, Tiffin *Daily Advertiser*.
March 5-8.........Louisville, Ky., Annual Show, Dealers' Association.
Mar. 5-8...........London, Ont., Annual Show, Drill Hall, Louis Blumenstein.
March 8-15........Boston, Mass., Annual Automobile Show.
Mar. 8-15..........Columbus, O., Annual Show, Billy Sunday Tabernacle, Automobile Club and Trades' Association.
March 12-15.......Ogdensburg, N. Y., Automobile Show, Louis Blumenstein, Manager.
March 19-26.......Boston, Mass., Annual Truck Show.
March 20-24.......New Orleans, La., Annual Show, N. O. A. D. A.
March 24-29.......Indianapolis, Ind., Annual Automobile Show.

Race Meets, Runs, Hill Climbs, Etc.

May 30............Indianapolis, Ind., 500-Mile Race, Speedway.

Foreign

March ....France, Sealed Bonnet 3000-Mile Run.
March 31..........Montevideo, Uruguay, International Competition of Agricultural Motor Vehicles.
April..............Barcelona, Spain, International Exhibition.
May............... St. Petersburg, Russia, International Automobile Exposition, building of Michael Maneze, Imperial Automobile Club of Russia.

Dayton's Branch Factory—It is stated that the Dayton Motor Truck Company, Dayton, O., will establish a branch factory at Chattanooga, Tenn.

Fire at Studebaker Factory—Fire broke out in the basement of the plant of the Studebaker Corporation, South Bend, Ind., but no damage was done.

Ravenna Erecting Plant—The Ravenna Auto Truck Company, Ravenna, O., is erecting a plant 50 feet by 150 feet for the manufacture of the Ravenna automobile truck.

Beaver's Vancouver Plant—The Beaver Automobile Company, Portland, Ore., recently incorporated with a capital of $150,000, will erect a plant at Vancouver, Wash., for the manufacture of automobiles.

Morgan & Wright Adds—The Morgan & Wright Company, Detroit, Mich., tire manufacturer, is beginning work on a five-story addition to its plant, 94 feet by 250 feet, to cost about $100,000.

Automobile Works Sold—The Findlay Motor Works, Findlay, O., have been sold to J. G. Cleary, of Milwaukee, Wis., who will dismantle the plant and remove the machinery to that city. The price paid was $50,000.

Garage Equipment's Building—The Garage Equipment Manufacturing Company, Milwaukee, Wis., is receiving bids for rebuilding its factory recently destroyed by fire. The building will be one-story high and 100 feet by 93 feet.

Abolishes Factory Manager Office—The management of the Abbott Motor Company, Detroit, Mich., has abolished the office of factory manager, the duties formerly attached to this position being divided between the general manager and the factory superintendent.

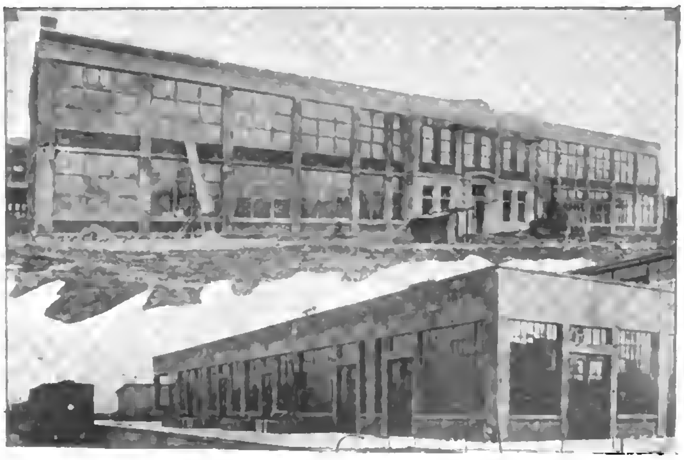
Factory Additions at Passaic—The Manhattan Rubber Manufacturing Company, Passaic, N. J., is contemplating large additions to its factory. There is at present being completed the erection of a hose department building, as well as a box factory and machine shop.

Nova Scotia's Plant Completed—The main building of the Nova Scotia Carriage & Motor Car Company, Amherst, N. S., and the power house and dry kilns have been completed. It is 60 feet by 340 feet and four stories high. The automobile department is being transferred from Kentville, N. S.

Beckman Looking for Site—J. E. Beckman, of Chicago, Ill., president of a company producing transmissions and gears for automobiles and trucks, is in Kenosha, Wis., to look over the ground with a view to establishing a factory. The company is capitalized at $100,000, and is employing from 50 to 75 men in its temporary factory at Chicago.

Cumberland Equipping Factory—The Cumberland Motor Company, Pineville, Ky., recently incorporated for $50,000, will equip a factory to manufacture a patented spring motor. The machinery required includes automatic gear-cutting machines, lathes, scrapers, screw machines, drills and spring coilers.

Timken's Offices Installed—The offices of the Timken-Detroit Axle Company, Detroit, Mich., will soon be installed in the new office building recently erected by the company at the plant. The new office building is about 60 feet by 200 feet and four stories high. It will give the company a frontage of 750 feet on Clark street. The parent company, the Timken Roller Bearing Company, has completed a new grinding room at the Canton, O., plant.



The Prest-O-Lite Company's new plant at Indianapolis, Ind., costing over $500,000 with four times the capacity of the present factory. There are ten buildings in the group occupying 15 acres of ground

Testimonial banquet tendered to Past-President W. H. Blood, Jr., at Delmonico's January 16 by the Electric Vehicle Association of America

WOULD Change Show Dates—Harry Fosdick, director of sales for the Hupp Motor Car Company, Detroit, Mich., recently asserted himself in regard to the time of automobile shows, stating that the dates are too late now for the manufacturer who has his entire output sold at the time the shows come along and that September would be a much more preferable month.

Five Fords for Columbus—The post office at Columbus, O., has installed five Fords in its parcel post service.

Hobron McGraw Manager—The McGraw Tire & Rubber Company's New York City branch is now under the management of R. F. Hobron.

Hoyme Philadelphia Alco Manager—C. R. Hoyme has been appointed manager of Alco trucks and cars in Philadelphia, Pa., and in charge of both sales and service.

Clark & Hubbell Handle Alco—V. L. Clark and G. C. Hubbell have formed a company in Des Moines, Ia., known as the Commercial Motors Company, and will handle Alco trucks.

KisselKar for Stockton—The Kissel Motor Car Company, Hartford, Wis., has just delivered a 50-horsepower police patrol to the city of Stockton, Cal. In test this car developed 46 miles an hour.

Rayfield Service Branch in New York—The Findeisen & Kropf Company, manufacturers of the Rayfield carbureter, has established its own sales and service branch in New York City at 1902 Broadway.

Overland's Quarterly Dividend—It is officially stated that the dividend of 1.5 per cent. recently declared on Willys-Overland common stock is a quarterly dividend, thereby placing the stock on a 6 per cent. basis.

Sanders Abbott Sales Manager—The Abbott Motor Company, Detroit, Mich., has appointed L. B. Sanders sales manager. Mr. Sanders formerly occupied a like position with the Lion Motor Car Company, Adrian, Mich.

Davis King Manager—Archie B. Davis, formerly assistant manager and sales manager for the United Motors Detroit Company, has become manager of the Michigan branch of the King Motor Car Company, with headquarters at Detroit, Mich.

Credit to Wire Wheels—The detachable wire wheels on which speeds from 84 to 92 miles per hour were made on Brooklands track in England, as mentioned on page 270 of the January 23 issue of THE AUTOMOBILE, were of the Rudge-Whitworth type.

Columbus Aims for Safety—The Columbus Automobile Club, through President N. J. Ruggles and its legislative committee, will seek for several laws before the Ohio General Assembly which will tend to make the operation of an automobile on the streets and highways of the country more safe.

Bosch Appoints Three Distributors—The Bosch Magneto Company, New York City, has appointed the Doubleday-Hill Electric Company, Pittsburgh, Pa.; the Phœnix Automobile Supply Company, St. Louis, Mo., and The Motor Parts Company, Boston, Mass., as distributors of its product in their territories.

Philadelphia Forbids Loud Siren—In an order issued by Superintendent of Police Robinson of Philadelphia, Pa., automobilists are prohibited from using high power siren horns. The order states that as the new automobile fire apparatus is equipped with the high power sirens private automobilists are prohibited from using the warning signal.

Michelin Granted Drawback—The treasury department at Washington, D. C., has issued a ruling allowing drawback, under section 25 of the tariff act of 1909, on tire containers manufactured by the Michelin Tire Company, Milltown, N. J., with the use of imported special wrapping paper in conjunction with domestic corrugated paper. The allowance shall not exceed the quantity of imported special wrapping paper used.

Liquor Revenue for Roads—The idea of applying one-half of the total moneys collected by towns, villages and cities of Wisconsin for retail liquor, or saloon licenses, to the state aid for highway improvement fund, has come before the Wisconsin Legislature in the form of a bill by Senator Howard Teasdale, of Sparta. He believes about $1,000,000 can be raised for permanent road work in Wisconsin every year by this means.

Crude Oil Supply Diminished—Wisconsin municipalities which have been using oil for laying dust and preserving macadam streets and roadways, are wondering if the recent action of the Standard Oil Company in greatly diminishing the supply of crude oil and sending the price from $2.50 and $3.50 to $5.50 and $6 will affect that grade of oil used for street work. The material is the final residue of petroleum after distillation. New contracts are being delayed by common councils until the situation clarifies.

New Agencies Established During the Week

PLEASURE CARS

Place	Car	Agent
Baltimore, Md.	Moon	Cooper & Sinclair
Belleville, Ill.	Moon	Geo. W. Sahlender
Bishops Hill, Ill.	Moon	P. L. Johnson
Carmi, Ill.	Moon	T. H. Land
Davenport, Iowa	Lozier	Meinert Bros.
Evansville, Wis.	Ford	Townsend & Hyne
Edwardsville, Ill.	Moon	C. A. Keller Co.
Franklin, Ill.	Moon	C. F. Whitlock
Harrisburg, Ill.	Moon	Chas. V. Parker
Kankakee, Ill.	Moon	W. H. Ohde
Long Branch, N. J.	Pullman	C. D. McFadden
Louisville, Ky.	Regal	Standard Automobile Co.
Louisville, Ky.	Paige	Louisville Lozier Co.
Louisville, Ky.	Pierce-Arrow	Hite D. Bowman
Louisville, Ky.	Detroiter	Inter State Motor Sales Co.
Manitowoc, Wis.	Ford	Pauly & Olson
Naples, Italy	Pullman	Achille Scognamillo
Niobrara, Neb.	Moon	E. L. Gillham
North Attleboro, Mass.	Moon	Elmer Rhodes
Oyster Bay, N. Y.	Pullman	Sagamore Garage Co.
Providenee, R. I.	Pullman	R. J. Davis
Plankington, S. Dak.	Moon	J. S. Barton
Pander, Neb.	Moon	H. D. Rixon
Sunbury, Pa.	Pullman	I. J. Reitz
Syracuse, N. Y.	Paige	Syracuse Motor Car Co.
Sioux City, Ia.	Pullman	Southwick & Maxfield
Washington, D. C.	Pathfinder	John S. Berryman
Washington, D. C.	Winton	Burr Bros.
Washington, D. C.	Case	R. C. Creyke
Washington, D. C.	Knox	Burr Bros.
Washington, D. C.	Moon	Frederic Newburgh

COMMERCIAL VEHICLES

Place	Car	Agent
Bowling Green, O.	Modern Truck	Twin City Motor Car Co.
Louisville, Ky.	Mack	Commercial Motors Co.
Louisville, Ky.	Saurer	Commercial Motors Co.

ELECTRIC VEHICLES

Place	Car	Agent
Milwaukee, Wis.	Baker Electric	Kopmeier Motor Car Co.

Chattanooga's Two Automobiles—In order to handle the increased business of the Chattanooga, Tenn., post office two automobiles have been added to the delivery equipment of the office.

Each County to Draw $2,000—Every one of the sixty-seven counties in Alabama has been authorized to draw $2,000 as its share of the first installment of the state road assistance fund.

Knight Tire in Baltimore—The Knight Tire & Rubber Company, Baltimore, Md., has opened offices and salesrooms at 1417 North Charles street. W. T. Kuhns and C. B. Chambers are in charge.

Spitzley Resigns—Carl J. Spitzley, who has been connected with the sales branch of the Abbott Motor Company at Detroit, Mich., for a long time, has resigned his position to enter the real estate business in that city.

Venezuela's Good Roads—Due to the government appropriation of 1,000,000 bolivars for the improvement of highways near the capital city of Venezuela, a much greater demand for automobiles is expected.

Acquits Mayor Shank—A jury in a justice of the peace court at Oakland, Ind., has acquitted Mayor Shank of Indianapolis, Ind., on the charge of fast driving while he was catching and arresting another speeder.

Moyer Brings Out Car—H. A. Moyer, a pleasure car manufacturer in Syracuse, N. Y., has brought out a new two-passenger roadster equipped with a 4 1-2 by 5-inch motor, combination electrical self-starter, ignition and a lighting device.

Glover's New Quarters—Permanent quarters on the third floor of a new building in Indianapolis, Ind., have been taken by the Glover Equipment Company of that city, manufacturers of the Antidam radiator protector, tops, dust hoods and seat covers.

Wabash Club Formed—An automobile club has been formed at Wabash, Ind., with C. H. La Salle as president and William Dixon as secretary. There is a large number of charter members. Particular attention is to be paid to obtaining better roads.

New Electric Service Station—There is to be included in the Syracuse, N. Y., agency for Baker electric pleasure and commercial cars a large garage and public service station equipped with the latest type of General Electric Company's charging apparatus in charge of experts.

Kelly Baltimore Branch Discontinued—The Baltimore, Md., branch of the Kelly-Springfield Motor Truck Company has been discontinued and hereafter the Kelly truck will be handled in Maryland and the District of Columbia territories by the C. B. B. Motor Company, Baltimore.

Sheen Purchasing Agent—Frank J. Sheen has been appointed purchasing agent of the Abbott Motor Company, Detroit, Mich. Until his new appointment Mr. Sheen was in charge of the stores and tracing department of that company, with which he has been connected for several years.

Seagrave's Fire Apparatus—The city of Madison, Wis., state capital, has just placed in service its first motor fire-fighting apparatus, a six-cylinder Seagrave flying squadron car manufactured according to the Madison departmental specifications by the Seagrave Company, of Columbus, O.

Henderson in Indianapolis Race—The Henderson Motor Car Company, Indianapolis, Ind., has confirmed a report that it expects to enter a car in the 500-mile race to be held at the Indianapolis Motor Speedway, Memorial Day. Bill Knipper is to be nominated as driver. Details concerning the car to be entered are not forthcoming at this time, but it is reported that the entry will be a four-cylinder machine.

New Indiana Light Bill—Another bill of interest to automobile owners has been introduced in the Indiana Legislature. This provides that the tail lamp shall be arranged to illuminate the registration numbers after night. The bill is the result of several instances where pedestrians have been run down after night and the drivers have not stopped, and it has been impossible to identify either the car or driver.

Indianapolis' New Show Space—It is regarded as likely that the Indianapolis, Ind., Automobile Trade Association will decide to hold its annual automobile show, which is to be held in March, in the downtown district. Last year the show was held in a huge tent near the business district, but this year a plan to hold it at the coliseum at the state fair grounds north of the city has been discussed. It has now been suggested that the show be held in the first three stories of the Murphy power building in Georgia street, which is a fireproof structure and within one square of the center of the business district.

La France truck with hydraulic transmission hauling boiler weighing 23 tons. Truck weighs 12.5 tons

Building a road in the desert near Phoenix, Ariz., showing what the builders faced when they started work on the Arrow Weed Road

The first stage in the building of the Arrow Weed Road, showing Mexicans shovelling sand from the road bed

Nashville to Hold Show—Nashville, Tenn., automobile dealers have decided to hold a show in March. The date is to be selected later.

Washington Firm Moves—The Commercial Auto & Supply Company, Studebaker agents, will remove in the near future to 817 Fourteenth street.

Fire Wagon for Malden—The Boston, Mass., branch of the White Automobile Company has just delivered to the fire department of Malden, Mass., a combination hose and chemical wagon, and it has gone into commission right away. It is mounted on the 40-horsepower chassis and has a number of features new to fire vehicles.

To Motorize Fire Department—Complete motorization of the Hartford, Conn., fire department is desired by the board of fire commissioners. About $200,000 is needed to accomplish the end. Four-wheel drive tractors, combination chemicals to replace the present horse wagons, and various other pieces of apparatus are considered in the budget.

Automobile Incorporations

AUTOMOBILES AND PARTS

Detroit, Mich.—Standard Tool & Manufacturing Company; capital, $20,000; to manufacture tools. Incorporators: J. G. Heal, R. C. Dorman, T. P. Penniman.

Hamilton, O.—George Automatic Roller Bearing Company; capital, $550,000; to manufacture and deal in roller bearings and parts of vehicles and automobiles. Incorporators: Walter H. Miller, Geo. T. Reise, Chas. E. Heiser, Edward Ritchie, C. R. Greer.

Indianapolis, Ind.—John Brothers' Motor Company; capital, $70,000; to manufacture motor car, marine and aeroplane motors and monoplanes. Incorporators: Louis J. Johnson, Harry Johnson, Julius Johnson, J. W. Sackrider, Demas Deming, Chas. Minshall, Ora D. Davis.

Massillon, O.—Massillon Rubber Company; capital, $25,000. Incorporators: Robert R. Hess, Albert Geis, F. McLain, W. Arnold, Harry V. Hess.

New York City.—Safety Auto Control Corporation; capital, $500; to manufacture devices for automobiles. Incorporators: Howard K. Wood, H. O. Coughlan, Joseph F. Curtin.

New York City.—Eureka Machine Company, Incorporated; capital, $5,000; to manufacture automobile accessories. Incorporators: Joseph Prosky, Philip Frankel, Frank A. Dillingham.

New York City.—The Club Garage, Inc.; capital, $5,000. Incorporators: Jerome L. Davis, Thos. A. Kilfoil, Samuel I. Goldberg.

St. Louis, Mo.—T. J. Moss Motor Car Company; capital, $10,000; to establish a garage and repair shop. Incorporators: T. J. Moss, J. W. Fristoe, E. J. Dykstra.

Waco, Tex.—Waco Auto Supply Company; capital, $5,000; to deal in accessories. Incorporators: W. H. Montz, H. B. Lyne, James Harrison.

Yoakum, Tex.—Yoakum Machine Shop & Garage; capital, $10,000; to do a general garage business. Incorporators: W. L. Orth, L. A. Orth, M. S. Orth.

Yonkers, N. Y.—Ralph B. Hibbard, Incorporated; capital, $5,000; to do a general garage business. Incorporators: Ralph B. Hibbard, Louise P. Hibbard, Elliott W. Pitkin.

GARAGES AND ACCESSORIES

Brooklyn, N. Y.—Williamsburg Plaza Garage, Inc.; capital, $1,000. Incorporators: Louis Cantoni, Frank Furnell, Adolph Furnell.

Buffalo, N. Y.—F. A. M. Auto Supply Company; capital, $20,000. Incorporators: Frank A. Marburg, R. A. Felthousen, John B. Green, Geo. D. Shaw, R. T. Templeton.

Chicago, Ill.—Burgess-Hovey Company; capital, $25,000; to manufacture automobile accessories. Incorporators: F. O. Koepke, F. W. Bigelow.

Cincinnati, O.—Model Garage Company; capital, $10,000; to operate a garage and repair shop and to run a taxicab business. Incorporators: Edward Hine, Martin Fette, Carl Riechelman, Clara Hine, Della Cottrell.

Cleveland, O.—Coronet Mfg. Company; capital, $60,000; to manufacture a speedometer for automobiles. Incorporators: Harry W. Garberson and others.

Cleveland, O.—Universal Accessories Company; capital, $5,000; to deal in automobile accessories and machinery of all kinds. Incorporators: Carl Spero, T. W. Rutlege, R. E. Vernes, H. C. Roth, F. C. Baisch, Jr., J. J. Ripner, H. C. Clarke.

Cleveland, O.—Krankless Starter & Mfg. Company; capital, $25,000. Incorporators: A. G. Freeman, F. A. Sweet, Fred H. Gerher, J. B. Label, R. E. Andrews.

Detroit, Mich.—Detroit Flash Curtain Company; capital, $25,000; to manufacture automobile curtains, windshields and other accessories. Incorporators: F. J. Schaffer, W. H. Goodfellow, H. M. Vaughn.

Hudson Falls, N. Y.—Kingsbury Motor Sales Company; capital, $10,000; to deal in autos. Incorporators: Earle H. Wells, Esther L. Wells, Leonard Wetsell.

Indianapolis, Ind.—Ray Harroun Company; capital, $30,000; to manufacture and sell automobiles and automobile parts. Incorporators: Ray W. Harroun, L. R. Townsley, U. G. Baker.

Louisville, Ky.—Standard Auto Company; capital, $25,000. Incorporators: George A. Dunham, Clifford L. Alderson, J. H. Alderson.

Muskogee, Okla.—Pioneer Motor Company; capital, $5,000; to manufacture automobiles. Incorporators: G. S. Waddell, H. G. Butts, M. L. Waddell.

New York City.—Bell & Waring Steam Vehicle Company; capital, $25,000; to deal in automobiles. Incorporators: Harry G. Waring, Harvey W. Bell, Howard G. Phillips.

New York City.—Brown Car Corporation; capital, $30,000; to deal in automobiles. Incorporators: W. P. Fargo, H. W. Torney, E. E. Beyer.

New York City.—Duplex Gasoline Motor Company; capital, $200,000; to manufacture motors, etc. Incorporators: G. W. Woodruff, A. B. Nevin, T. U. Parker.

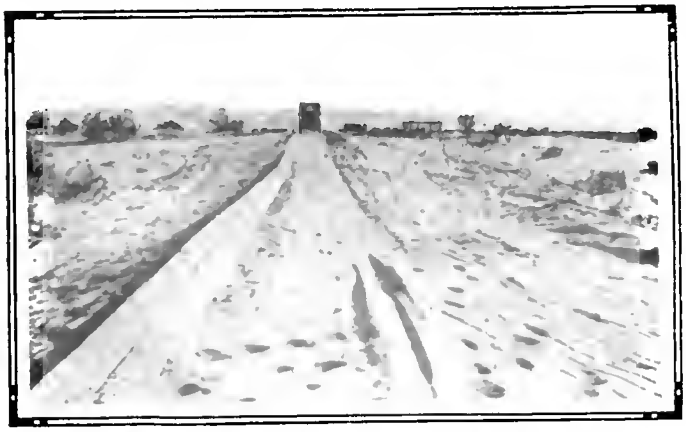
New York City.—Favary Tire Company; capital, $300,000; to deal in automobile tires. Incorporators: E. Favaary, M. W. Brashears, C. S. Boyd.

New York City.—Gildale Motor Corporation; capital, $30,000; to deal in automobiles. Incorporators: R. W. Strauch, T. P. Gilman, E. S. Peck.

New York City.—Owners Purchasing Association, Inc.; capital, $5,000; to do a general automobile business. Incorporators: Leonard J. Field and Irving P. Regensburger, Charles Olsen.

Akron, O.—Mohawk Rubber Company; capital, $30,000; to manufacture and deal in automobile tires and rubber goods of all kinds. Incorporators: R. M. Pillmore, J. K. Williams, S. S. Miller, F. J. Mishler, Francis Sieberling.

Aledo, Ill.—Aledo Machine Company; capital, $50,000; to do a general automobile business. Incorporators: C. A. Miller, G. D. Venable, R. D. Watson.



Showing the completed Arrow Weed Road

Second stage in the building of the Arrow Weed Road. Filling in the sand between the boards and ties

How the lumber road appeared just after boards were laid on the ties and before the road bed had been filled in

BROOKLYN, N. Y.—Newkirk Avenue Automobile Company, Inc.; capital, $5,000. Incorporators: Wm. Backus, Jennie Hunton, W. D. Maxwell.

BUFFALO, N. Y.—Glide Sales Company; capital, $10,000; to deal in autos. Incorporators: J. Francis Lyncb, Louis P. Fuhrmann, Edward T. Danaby.

CAMDEN, N. J.—United States Tire Filler Company; capital, $125,000; to deal in automobile tires, automobiles, etc. Incorporators: R. B. Patton, H. E. Patton, H. R. Gorman.

CLEVELAND, O.—Automohile Clearing House Company; capital, $2,500; to deal in new and second hand motor cars. Incorporators: Tbos. A. Reilly, Ed. P. Bernardi, Samuel P. Bromley, Arthur N. Hirscb, Jobn B. Bromley, Jr.

CLEVELAND, O.—Ohio Auto Carriage Company; capital, $10,000; to manufacture automohile bodies. Incorporators: Alfred A. Benescb, Ralph Goldsworthy, F. A. Federman, Reuben Shapiro, E. H. Chaloupka.

CLEVELAND, O.—Obio Cutting Sales Company; capital, $10,000; to deal in motor vehicles and accessories. Incorporators: W. K. Stanley, John C. Koepke, J. N. Wolfinger, E. D. Tanner, A. V. Kindel.

COLUMBUS, O.—Park Motors Company; capital, $30,000; to manufacture and deal in electrically propelled vehicles of all kinds. Incorporators: Scott Van Etten, Chas. Parkison, Amelia Van Etten, Wm. C. Horton, Chas. F. Hodge.

CONNERSVILLE, IND.—Central Car Company; capital, $100,000; to manufacture automobiles. Incorporators: J. E. Huston, J. W. Burk, E. W. Ensted, R. T. Huston, F. I. Barrows, J. M. Heron.

CONNERSVILLE, IND.—Howard Motor Car Co.; capital, $10,000. Incorporators: Guilford C. Babcock, Harry Tuttle, Clarence Millard.

DETROIT, MICH.—Kessler Detroit Motor Car Company; capital, $10,000; to manufacture automobiles. Incorporators: H. C. Brooks, Jr., Robert McCormick.

DETROIT, MICH.—Detroit Motor & Machine Company; capital, $150,000; to manufacture motors, etc. Incorporators: H. J. Hayes, H. H. Smith.

DUQUESNE, PA.—Duquesne Automobile & Wagon Company; capital, $5,000; to deal in automobiles and trucks. Incorporators: J. J. McCloskey, Jr., Walter Gray, J. F. Walton, R. P. Morrow.

NEW YORK CITY.—Maxim Tricar Manufacturing Corporation; capital, $100,000; to manufacture and deal in automobiles. Incorporators: Otto Kuhneman, Chas. F. Novotny, A. A. Meschutt.

NEW YORK CITY.—F. W. Ofeldt & Sons; capital, $20,000; to manufacture motor trucks. Incorporators: E. G. Ofeldt, F. A. Ofeldt, E. Y. Eltonhead.

NEW YORK CITY.—Mills Motor Radiator Corporation; capital, $650,000; to manufacture and deal in radiators. Incorporators: H. R. Bingham, A. F. Carbe, C. A. Cole.

NEW YORK CITY.—Shepherd Auto Company; capital, $5,000; Incorporators: Irving R. Shepherd, Fannie E. Shepherd, Joseph A. Shepherd.

NEW YORK CITY.—Webster-McGowan, Incorporated; capital, $50,000; to manufacture motors, engines, etc. Incorporators: G. H. McGowan, Wm. H. Webster, H. F. Monroe.

NEW YORK CITY.—Western Vebicle Company, Inc.; capital, $1,000; to manufacture motor vehicles. Incorporators: Harry Davis, Wm. R. Williams, Chas. M. Frost.

PITTSBURGH, PA.—Kline Car Motor Company; capital, $5,000; to deal in automohiles. Incorporators: J. D. Kerr, S. E. Kerr, R. N. Gibson.

RICHMOND BORO.—K. & K. Motor Car Company; capital, $10,000; to deal in automobiles. Incorporators: Lillian E. Killian, Agnes E. Killian, Frank B. Killian.

ROCHESTER, N. Y.—Ball-Washburne Motor Company, Incorporated; capital, $25,000. Incorporators: Ward H. Ball, Cbas. H. Washburne, Asa R. Ball.

SALT LAKE CITY, UTAH.—Alkire-Smith Auto Company; capital, $25,000. Incorporators: Fred W. Alkire, Raymond B. Smith, Myron L. Smith.

SOUTH ORANGE, N. J.—K-W Garage, Incorporated; capital, $25,000; to do a general automobile business. Incorporators: G. E. Krug, T. R. Were, C. L. Krug.

ST. LOUIS, MO.—Coller-Reitz Motor Car Company; capital, $5,000; to do a general motor car business. Incorporators: Anthony Coller, Frank G. Reitz, Edwin Oldendorph.

ST. LOUIS, MO.—Pioneer Steel Block Tire Company; capital, $25,000; to manufacture a patented tire for use on automobile trucks. Incorporators: Wm. Dee Becker, J. Geo. Ganahl, Nicholas Le Brun, Fred A. Gerher.

TARRYTOWN, N. Y.—J. D. Maxwell Motor Corporation; capital, $10,000. Incorporators: Jonathan D. Maxwell, James P. McManus, Leander F. Sniffen.

TOLEDO, O.—Maumee Motor Car Company; capital, $10,000; to deal in automobiles. Incorporators: Richard D. Logan, A. J. Gallagher, R. E. Frankberger.

INCREASE OF CAPITAL

AKRON, O.—American Tire & Ruhher Company; capital increase from $200,000 to $500,000.

Taylor with Erie Supply—W. O. Taylor has joined the Erie Supply Company, Toledo, O., as secretary and treasurer. He will manage the tire department.

U. S. Tire's Agency—The U. S. Tire Company has opened a branch agency at 218 North Erie street, Toledo, O., for an E. & W. tire treatment agency. The E. & W. treatment, it is claimed, seals punctures automatically and reduces tire expense 75 per cent.

Washington Club's Election—The Washington Motorists' Association, Washington, D. C., which succeeds the Automobile Club of Washington, has elected the following officers: President, Harrington Mills; vice-president, W. W. Chiswell, and secretary-treasurer, John K. Heyl.

Goodyear's Banquet—O. A. Richards, of the U. S. Tire Company, was the guest of honor and principal speaker at the annual banquet given by the Goodyear Rubber Company, Milwaukee, Wis., to department heads, salesmen and traveling representatives at the Hotel Pfister recently.

Automobile Incorporations

DETROIT, MICH.—Ely Auto Parts Company; capital increased from $25,000 to $45,000.

DETROIT, MICH.—Federal Motor Truck Co.; capital increased from $100,000 to $200,000.

LOUISVILLE, KY.—Brenner Motor Car Company; capital increased from $25,000 to $35,000.

LOUISVILLE, KY.—Rommel Motor Car Company; capital increased from $15,000 to $25,000.

MOLINE, ILL.—Velie Motor Vehicle Company; increase of capital from $400,000 to $600,000.

NASHVILLE, TENN.—E. O. Elliot & Company; capital increased to $50,000.

ROSSLYN, VA.—District Automobile Service Corporation; capital, $35,000 to $50,000. Incorporators: Geo. R. Cowie, Edmund S. Wolfe, L. Bert Nye.

SYRACUSE, N. Y.—H. H. Franklin Manufacturing Company; capital increased from $300,000 to $1,500,000.

One of the road builders' trucks in the heart of the desert

SPRING-TIRE Construction—Helical springs arranged in two planes dished relatively to the wheel plane.

Fig. 1 shows the subject matter of this patent, a wheel in which helical spoke springs S take the place of the solid spokes and make possible the use of a solid tire. The wheel consists of a rim and a hub to which the helical-spring spokes are attached with their ends. These springs are arranged in two series extending radially from the center of the wheel under a slight angle, to both sides of the wheelplane. The springs lie in radial indentations R of face plates P, which inclose the spokes and are attached to the rim and hub, by means of opposed peripheral flanges. The indentations on one plate are approximately flat at their inner ends, while those on the other face plate at their inner ends have a depth which is substantially equal to the coil diameter of the springs.

No. 1,051,178—to Thomas Whitehead, Blackpool, Eng. Granted January 21, 1913; filed December 12, 1911.

Automobile Cushion Tire—Constructed with two air spaces, one of which is made up of sections and the other continuous.

The tire described in this patent consists of a resilient casing formed with two annular air spaces in it, one of which is nearer to the rim than the other and is separated from the other by independently yieldable walls. The tire is constructed of transverse abutting sections S which are independently removable and have their places formed with interlocking projections and recesses; one of the projections surrounds the outer annular space and the other projections are located at either side thereof.

No. 1,050,861—to Andrew Minetree Smith, Petersburg, Va. Granted January 21, 1913; filed July 27, 1912.

Automobile Suspension Spring—Consisting of a semi-circular leaf spring supplementary to a full elliptical spring.

This patent refers to a spring construction shown in Fig. 3, S being a full elliptical leaf spring to which an auxiliary spring T, shaped in a semi-circle, is attached. Spring T is attached at its center to the center of the lower half of the main spring S and at its ends to points halfway between the center of the upper spring and its respective ends, there being a sliding connection between the spring ends of T and the leaves of the spring S. Due to its shape and the peculiar method of mounting the spring T does not interfere with a normal working of S, but checks extreme deflection and rebound on part of the latter.

No. 1,050,863—to Walter O. Smith, Petaluma, Cal. Granted January 21, 1913; filed October 16, 1912.

Pneumatic Automobile Tire—Which is automatically inflated by the rolling motion of the car, air being forced into an inner tube through a check valve.

The self-filling tire, Fig. 4, includes a main inner tube T around which a collapsible tube S is arranged; these two tubes are separated by a stiffening device M, which prevents air pressure in the tube T from collapsing the outer tube S. The tube T is equipped with a valve device V, which normally holds the collapsible tube open to the atmosphere and suitable means is used for preventing a back flow of air from tube T to the tube S. The means M is sufficiently yielding to permit of being forced outward by the expansion of the tube T and to operate V so as to close the tube S to the atmosphere when the pressure inside the tube T becomes sufficiently high.

No. 1,050,886—to Anson B. Wetherell, Pittsburgh, Pa. Granted January 21, 1913; filed February 23, 1910.

Electric Horn—Consisting of a motor-driven ratchet which strikes a button mounted eccentrically on a diaphragm.

This horn is of the motor-driven type, the shell of the motor being shaped as a cup with an open end over which fits a removable cover. The latter has a bearing for the motor shaft and the fields are wound about projections of the motor case. An amplifying projection extends beyond the closed end of the cup and to this amplifier the diaphragm and the projector are attached. A toothed disk for ratchet, which is attached to the front end of the motor shaft, strikes a button mounted eccentrically on this diaphragm when the motor revolves, thereby producing a signalling sound.

No. 1,048,466—to William Sparks, Jackson, Mich. Granted December 24, 1912; filed May 9, 1912.

Regulator for Leaf Springs—Consisting of mechanism for adjusting the flexibility of laminated springs by separating the blades.

Wedges are introduced for this purpose between the leaves and means for clamping the whole after adjustment is provided. A short shaft with oppositely screwed ends is arranged immediately under the axle, and by turning this the clamping shackles at each side of the axle are brought down firmly on the springs. The wedges are carried on disks and the action just referred to simultaneously operates them.

No. 1,050,138—to Maurice Houdaille, Paris, France. Granted January 21, 1913; filed July 24, 1911.

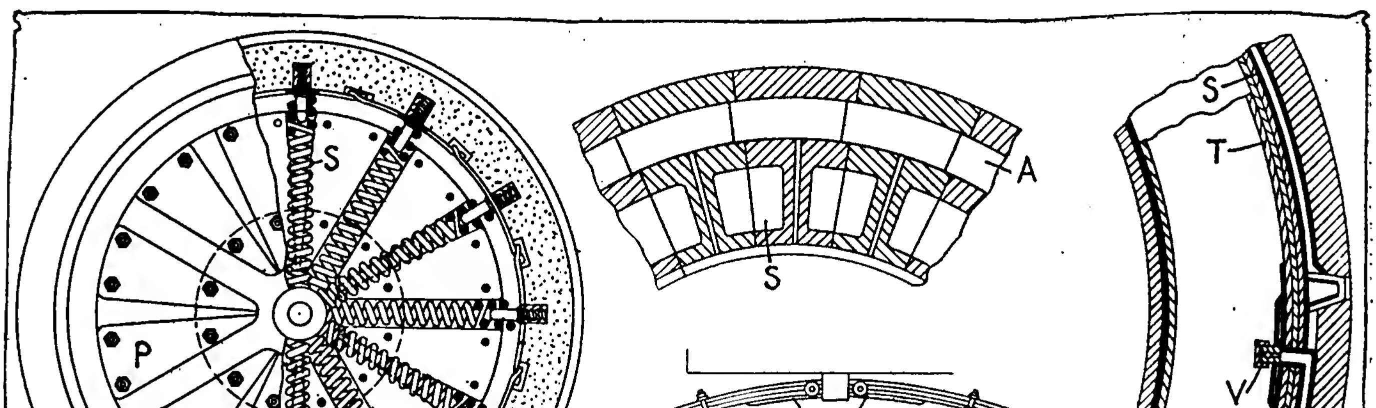


Fig. 1—Whitehead wheel. Fig. 2—Smith tire. Fig. 3—Smith spring. Fig. 4—Whetherell tire

Vol. XXVIII New York—Thursday, February 6, 1913—Chicago No. 6

View of main floor of Coliseum, Chicago automobile show which opened last Saturday. Looking toward the south end

Chicago the Automobile Mecca

Thirteenth Annual Exhibit Surpasses Any Previous Exhibition
Biggest Automobile Show Held in this Country

CHICAGO, ILL., Feb. 3—Thirteen is a lucky number for automobile Chicago. The Thirteenth Annual Automobile Show, held in 1913, which opened its doors last Saturday night is the biggest exhibition of motor vehicles the city of Chicago, or the entire country for that matter, has ever known, on a total floor space of 147,990 square feet. The passenger car exhibits outnumber those at the recent great national show at New York by eleven makes, Chicago having a total of ninety-nine to New York's eighty-eight. This year's Chicago show surpasses that of 1912 in the matter of passenger car exhibits by three. For the second week of the show there will be seventy-six makes of commercial vehicles on exhibition, seventy-two gasoline trucks and six electric vehicles. As compared with the New York show this indicates a total numerical superiority of eleven makes for the Windy City. At New York there were six exhibitors of electric trucks though there were only fifty-nine makers of gasoline-propelled machines. Chicago is to have eleven trucks more this year than in the 1912 show which had a total of sixty-five, or the same as in New York in 1913. The increase in commercial vehicles at Chicago, which is justly considered as the distributing center of the Middle West, might be taken to indicate that the manufacturers of these vehicles expect a still greater market for their product in the growing cities of the western states than in the crowded municipalities of the East.

In the way of accessory exhibits, there are 205 makers of accessories represented during the first week of the show, as compared with 340 which had space in New York. Probably this difference in favor of the Metropolitan exhibition is due to the large number of small accessory in the vicinity of New York and in New England which considered the trip to Chicago too great an expense in time and money to pay for the advantage of being represented at the show. During the second week of the Chicago exhibition there will be 133 accessory exhibitors, twenty-four of whom were not present the first week of the show. There were 141 makers represented in New York which did not show in Chicago.

The show is held in the Coliseum proper, the Coliseum annex, the basement of the Coliseum and the Wilson building, which form one group, being practically under one roof, and the First Regiment Armory. To reach the latter from the Coliseum, it is

View across the Coliseum, showing arrangement of the cars on the main floor, accessory exhibits in the gallery, decorative scheme and lighting of the gigantic exhibition hall

necessary to traverse an alleyway about 100 yards long but the management has protected this from the weather by roofing it over with canvas.

The show is held under the auspices of the National Association of Automobile Manufacturers and is under the immediate direction of Major Samuel A. Miles, who has so successfully staged the greatest American automobile shows since the inception of the custom of holding annual national displays of motor vehicles.

The show was opened to members of the trade at 1 o'clock Saturday afternoon, but the general public was not admitted until 6.30 when a steady stream of humanity poured into the Coliseum and from there down the canvas-roofed alley-way to the armory in spite of the weather, which was by far the coldest of the winter, the thermometer standing only a few degrees above zero all day and dropping a little in the evening.

There were a great many first-nighters, of course, people who came to see the show purely and simply as a spectacle, but there were also a goodly representation of the class which comes to see and to learn. These inspected the cars intelligently and their inquiries showed a considerable interest in their construction and some understanding of the present trends and the developments of the past year.

The main features of design in which the cars shown at Chicago differ from those of 1912 are the same as those which attracted attention at the New York shows, and have been fully reviewed in THE AUTOMOBILE for January 9 and for January 16. The public in Chicago, or at least that part of it which attended the opening of the show, took the same interest in these tentative indications of the car of the future and asked the same questions which were in the mouths of the show public in New York. The same curiosity was manifested in the cranking devices, the greatest interest centering in the electric types, wire wheels excited the same comments and inquiries while remarks on the improvements in body design were frequent. A few observed the tendency toward standardization of the medium-sized wheel and a great many commented on the large proportion of six-cylinder cars shown as compared with last year. The six seems a universal favorite, from the sentiments expressed by the majority of the people on attending the opening night

One of the panels above the accessory gallery, showing the leaded glass effect, somewhat similar to the appearance of old cathedral windows

The Decoration Scheme

THE dominant idea in the decoration of the Chicago Automobile Show which opened last Saturday night is that of cathedral glass and stained window effects. This theme is carried out consistently throughout the decorations, even the lighting giving a somewhat dim and semi-religious atmosphere which is exceedingly novel for an automobile show, but which bestows upon it an air of quiet simplicity enriched by the artistic quality of the mural decorations. In fact, this year's effects are especially welcome as a change from the extremely ornate decorative scheme employed last year. The principal features at the Coliseum are found in the ceiling and on the balcony front.

Great arches of lights strung across ceiling produce a very pleasing effect. The numerous bulbs suspended from the ceiling may be readily seen in the above illustration

of the show. Many of the people showed an interest in the unit power plant, the position of the gear-box, type of suspension of motor and gear-box, drive of magneto and lighting generator and other details. Some were interested in the adoption of left drive, generally expressing a liking for center control, though a great many were indifferent as to these details. Demountable rims as standard equipment seemed to be generally in favor.

A canvass of the exhibitors as to whether or not they expected many of their dealers to come to Chicago for the show revealed a considerable diversity of opinion, some of the exhibitors saying that they expected a great many established dealers, some in special excursions, while others stated that most of their dealers are so far from Chicago that probably comparatively few would make their appearance. As for the appointment of new agents, a number of the exhibitors stated that their territory is all closed up, while others expect to appoint a number of new representatives.

It is still too early in the show week to determine whether many sales will be made during the week but from the optimistic reports of some of the exhibitors there may be a great many sales consummated before the close of the show. One exhibitor stated that he sold a car within 2 minutes of the opening of the doors.

The decoration scheme employed is described in full on pages 400 and 401. A band furnishes music while the show is in progress in the Coliseum while orchestras drown the shuffling of feet as the crowds throng through the other buildings.

Chicago has greater floor-space for the annual automobile show this year than ever before, the Coliseum, Coliseum annex and basement, the Wilson building and the First Regiment Armory giving a total available space of 147,990 square feet as compared with 89,000 square feet available last year. Only 135,615 square feet will be required during the second week as the makers of commercial vehicles are still fewer in number than the manufacturers of passenger cars. In the number of exhibits, this year's show comprises ninety-nine displays of passenger cars and 244 accessory stands. There will be seventy-six makes of commercial vehicles represented during the second show week and 200 makers of accessories. All in all, Chicago's

Each of the many panels of this description shows a tremendous amount of painstaking care not usually found in ephemeral decorations

The Decoration Scheme

THE balcony front in itself produces an extremely pleasing effect the full length of 1000 feet being beautified by panels depicting rural scenes, three of these being shown in each of the 26 sections between the girders of the building. The settings of these pictures are massive, much like the old-fashioned frames of pictures to be seen in ancient buildings in Europe. The general impression produced is one of dignity and beauty. The center of the building is decorated in a very simple manner, practically all of the space being given up to the cars. Ornamental posts bound the various exhibits, each post supports a cluster of large milk-white light globes as well as a number of cathedral lanterns.

1913 exhibition is the largest, as regards the number of cars on view, that has ever been held in America.

An idea of the compactness of the exhibits can be gained by a comparison with the recent New York show at which eighty-eight passenger car and 379 motorcycle and accessory exhibits occupied some 275,000 square feet of floor-space, or nearly twice the total floor-space available at the Chicago exhibition. The New York show, as a matter of fact, exceeded the great Paris display in floor-space by some 15,000 square feet. In Chicago, of course, it must be taken into consideration that the motorcycle manufacturers and dealers are conducting a separate show in the Furniture Exposition building on South Michigan avenue, whereas in New York these machines helped to swell the grand total of exhibitors.

Of course, there are several companies, which from failure to get space or for some other reason, decided to hold separate shows of their respective lines in their own showrooms during the 2 weeks of the show. The same plan was adopted in New York by about ten makes. Among those conducting individual shows in this manner in Chicago there are the Apperson, Empire, Marion, Detroiter, Ford and the Howard six. The latter is a new car, introduced to the public during the past week.

One of the great features of the Chicago show is the fact that a goodly representation of the electric cars is gathered together, sixteen makes in all, or 57.1 per cent. of the industry, twelve makes being housed together in the armory, while four others are given space in the basement of the Coliseum. Those in the armory are: Anderson, Argo, Baker, Borland-Grannis, Broc, Buffalo, Columbus, Ohio, Rauch & Lang, R. C. H., Waverley and Woods. In the Coliseum basement are: Century, Chicago, Church-Field and Standard.

One of the combination light posts and exhibit name plates. The name of the exhibitor is on a leaded glass transparency and stands forth clearly against the background

Twelve of these makes of electric were not exhibited at the New York show, the only manufacturers showing there being those of the Buffalo, Church-Field, Columbus, Hupp-Yeats and Standard. This shows the pre-eminence of Chicago as a city for electrics, 42.7 per cent. of the electric passenger vehicle industry being represented at the Chicago show while only 18.5 per cent. of the makers thought it worth while to display their lines at New York. Of course, it must be remembered that one reason for the small number of electric exhibits at the metropolitan show was the fact that many of the makers had space at the big electrical show held there October 9-19 and that, still later, the dealers held a litte electric pleasure vehicle show of their own.

A new feature of the electric car displays this year is the exhibition of chassis. Heretofore, the makers and dealers said that there was no use in exhibiting electric car chassis as the chief buyers of this type of vehicles are women, who are interested in body fittings and appointments rather than in mechanical features of construction. Apparently either the women are beginning to take an interest in something besides the mere external appearance and comfort of the electric passenger vehicle or else the many advantages of these cars for city use, combined with the rising price of gasoline, have begun to make a strong appeal to the masculine element of the population. The interest manifested in these electric chassis at the show and the appreciation evinced by the people inspecting them indicated that the innovation is of value and that it will be a feature of future exhibitions.

Curiously enough, the number of makes of gasoline cars exhibited at Chicago which

South end of the Coliseum giving an idea of the decoration at the end of the hall and depicting a grand stairway in keeping with the rest of the decorative scheme

Quarter view across center aisle of the Coliseum, showing how compactly the cars are arranged and giving an idea of the lighting scheme and the arrangement of the cars

did not appear at the New York show is exactly the same as the number which were represented at New York but which do not have space in Chicago. These cars, it is interesting to note, are all of different makes, that is, each list is made up of different names. Those shown at Chicago which did not appear in New York are: Austin, Colby, Crow-Elkhart, Glide, Great Western, McIntyre, Midland, Pratt-Elkhart and Staver. On the other hand, those present at the New York show which are not represented at the Windy City exhibition are: Detroiter, Empire, Havers, Keeton (the Canadian car), King, Lenox, Marion, Only and Cunningham.

It is significant to observe that for the first time the old-time line of demarcation between the products of the East and those of the West is not to be found this year at the Chicago show. In former years it was, for the most part, the cars of the East for the East but the cars of the West for the West. Now, however, with the standardization of automobile construction made possible to a large extent by the greatly improved condition of the roads throughout the country, there is no longer any necessity for embodying different principles in cars for the West from those followed in designing cars for any other part of the country. A study of the list of the cars which did not show at New York but which are represented at Chicago would seem to indicate that, as most of them are cars made in the Middle West, there would be some difference in construction, but while these cars are apparently built for Western rather than Eastern trade an inspection reveals no radically different ideas applied to the mechanical details. As a matter of fact, great numbers of these cars are sold in the East. Looking at the list of makes which were represented in New York but which are not found at the Chicago exhibition, we find a mixed assemblage of several cars made in the East, about as many in the Middle West and one Canadian make. All of the cars, both those which appeared in New York and those which are on view in Chicago were fully described in the January 9 issue of THE AUTOMOBILE.

One of the lighting posts placed between the exhibit spaces, showing milk colored glass globes and cathedral lantern lights throwing soft glow about the neighboring exhibits and at the same time fitting in well with the general decorative scheme of the exhibition room

One respect in which the Chicago show of 1913 differs from that of last year is in the absence of foreign-made cars. In the 1912 exhibition several of these were represented, among them the Renault and the Darracq. This year the Renault, Metallurgique and other foreign creations are to be seen only at their respective salesrooms. Chicago has never been a very good market for the machines built across the ocean but apparently the stability and value of the American-made automobile are making more and more of the people of the Windy City ask "What is the use of buying a European car when you can get a good car built in a factory nearer to the purchaser than the width of the Atlantic Ocean?"

Manufacturers can do much more by way of accessibility of grease cups, brake adjustments and other adjustments than they are doing at present, this being particularly so in respect to brakes and grease cups. The most inaccessible grease cups are those around the rear axle and universal joints of the propeller shafts. On some chassis eight to ten grease cups have been counted on a rear axle and of these not a solitary one is accessible in some makes of cars. It is a prima facie case of where the designing engineer does not drive his own car, or, if he drives, then the grease cups are always prepared for him by some mechanic, so that so far as he is concerned he does not know that grease cups exist. There are half a dozen makers who are now fitting grease

(*Continued on page* 436.)

Pennsy To Reduce Fees

Quakers May Draft City Regulation To Formulate Own Speed Limit—Badgers for Rigid Law

Findlay Works May Be Changed—Buffalo Companies Accused of Violating Tax Law

PHILADELPHIA, PA., Feb. 3—A number of proposed bills have been prepared and are ready for introduction before the Pennsylvania legislature making new regulations for motor trucks. It is proposed to increase the license fees on trucks, because of their greater wear and tear on streets and roads. They now pay $5, $10 or $15 according to their horsepower, the same as pleasure vehicles.

The city of Philadelphia will ask the right to make its own rules for motor cars, irrespective of the uniform state law. Organized motorists will fight this. Under the present law the speed limit in the country is 24 miles an hour and in built-up sections 12, and no municipality can enforce other limits.

There is prospect of a fight over the licensing of drivers. The present law requires a license of every person desiring to operate a motor vehicle as a chauffeur or paid operator. The State highway department contends that this includes every one driving a car except the owner who has paid a license fee for the car. The Pennsylvania Motor Federation got a decision from the Philadelphia courts that "chauffeur" and "paid operator" were one and the same. The department sticks to its requirement that members of an owner's family or other who wish to drive must obtain drivers' licenses. The Federation has advised its members to disregard the department's requirement.

The Federation is prepared to amend the law to provide beyond question that only paid drivers require licenses. On the other hand an effort will probably be made to prohibit any one from operating an automobile except after examination and licensing as in Massachusetts. All motor organizations will oppose this.

The motorists will renew their efforts of previous sessions to get a law compelling all vehicles to carry lights at night. The Grangers have succeeded in beating this bill in the past. On the other hand the automobilists anticipate having to fight an effort to raise the fees on pleasure vehicles. Their organization had a hard fight 2 years ago to defeat a bill to increase the minimum from $5 to $25 and the maximum from $15 to $75. The present rates bring in a revenue of nearly $1,000,000 a year.

Omnibus Bill Proposed in Wisconsin

MILWAUKEE, WIS., Feb. 3—Stirred to action by the unusual flood of bills in the present Wisconsin legislature, which relate to the use and operation of motor cars, the various organizations of Milwaukee and Wisconsin representing dealers, manufacturers and private owners, held a conference at the Hotel Pfister in Milwaukee on February 1, and outlined plans for a determined fight against such bills as are deemed bad and indifferent. It is believed that the outcome of the conference will be the presentation to the Legislature of an omnibus bill covering every possible angle of the question. In fact, a special committee was appointed, with James T. Drought, secretary of the Wisconsin State A. A., and counsel of the Milwaukee A. C. and W. S. A. A., as chairman, to frame the omnibus bill and see to it that it is introduced in the regular form and note made of the fact that the bill has the solid backing of the motoring interests of Milwaukee. The principal demands will be for a universal light law: uniform signal law: a single annual registration and license fee for every owner, instead of one for each car owned at any time during one year; jail sentence for thieves; more severe penalty for joy riders, and more considerate laws covering the liability of motorists in cases of accidents.

A noteworthy bill, already introduced, and which will be made an amendment in the proposed omnibus bill, is that of Assemblyman I. N. Stewart, of Appleton, who proposes to make the punishment for the theft of a motor car for any purpose not less than 1 nor more than 15 years in prison. This makes the penalty for motor car stealing equal to that for horse stealing.

Assemblyman Conway has a bill which provides that a motor car passing any vehicle on the public highway at a closer distance than 6 feet must slow down to a speed of 10 miles per hour.

The proposed section covering signals, in the omnibus bill, will attempt to require every owner to equip his car with a horn sounding a harsh, abrupt tone, which will thenceforth be distinctive of motor vehicles. The bulb-horn will be made illegal by the proposed statute.

May Reorganize Findlay Company

FINDLAY, O., Feb. 3—J. G. Cleary, of Milwaukee, Wis., who recently purchased the Findlay Motor Works for $50,000, which was sold under direction of the United States Court, is in the city talking about reorganizing the company and beginning operations at once. At first he contemplated removing the machinery to Milwaukee.

Suits Against Buffalo Concerns

BUFFALO, N. Y., Feb. 4—John Lord O'Brian, United States Attorney, filed the past week suits for $10,000 each against four automobile concerns of Buffalo. The motor firms are charged with violating the federal corporation tax law, which requires a statement from all corporations, giving also the amount of business done. This statement is used as a basis for levying a tax. In the papers filed by Mr. O'Brian it is charged that the defendants have neglected to file a statement since 1910. Mr. O'Brian intends to prosecute several other companies for violation of the corporation tax law. Following are local motor firms against which Attorney O'Brian has filed suits: Buffalo Electric Vulcanizers Company, 1219 Main street; the Glidden Garage, 1114 Elmwood avenue; Dixon Motor Car Company, Edward and Main streets, and Werick Brothers, of Cheektowaga, N. Y.

Minnesota Association Directors' Meeting

MINNEAPOLIS, Feb. 3.—The directors of the Minnesota State Automobile Association will clear up a lot of work at their annual meeting February 11 at the Hotel Radisson. In the evening they will be entertained by the Automobile Club of Minneapolis at a dinner. Asa Paine, vice-president of the A. A. A., will be in charge of the dinner. The officers are to report, and good roads and pending automobile legislation will be discussed. The question of road signs and the annual tour will arise. Having completed posting the road to Watertown, S. D., from the Twin Cities for connection at Watertown with the Meridian road, other sections will be taken care of. The association at present has thirty-seven club memberships and 3,178 by individuals.

The trustees of the Automobile Club of Minneapolis will meet February 11 at the Hotel Radisson. Pending state legislation on automobile matters will be taken up.

Howard Motor Car on Market

CHICAGO, Feb. 1—Manufactured by the Central Motor Car Company, Connersville, Ind., and marketed by the Howard Motor Car Company, also of Connersville, the Howard Six has just been placed upon the market. After the demise of the Lexington Motor Car Company the old Lexington plant was leased by the Central interests and the manufacture of motor cars commenced. The first car to be delivered was a demonstrator received two days ago by the McDuffee Automobile Company, Chicago. The McDuffee concern has been appointed distributor for the states of Illinois, Indiana, Michigan, Wisconsin and Iowa. Howard L. Babcock, G. C. Babcock, Harry Tuttle, and C. L. Millard are officers of the sales company. But one model will be turned out for the first series of 500 cars.

St. Louis Studebaker Center

St. Louis, Feb. 1—The Studebaker Corporation will make this city a central distributing point for all of its automobile lines by establishing a large branch house here. The new branch house will be in charge of Carl G. Simon, and will take in Missouri, Illinois, Tennessee, Arkansas, Mississippi, Louisiana, and a part of Kentucky, Oklahoma and Texas.

Atlas Foreclosure Affects Merger

Springfield, Mass., Feb. 4—*Special Telegram*—With the execution of the foreclosure recently of a second mortgage for $19,400, held by the Union Trust Company of Springfield, Mass., against the Atlas Motor Car Company, also of this city, and the subsequent purchase at public sale of the Atlas plant by C. D. Whitney, manager of the Victor Sporting Goods Company, a new development in the Orson merger proceedings was brought to light. Negotiations have been under way for some time leading to the combining of several Springfield concerns, namely, the Atlas company, the Springfield Metal Body Company, the Brightwood Manufacturing Company and others by the monied interests which fathered the Orson Automobile Company, and which interests are centered around the National City Bank, New York. The Atlas plant, which is about 200 feet deep and three stories in height, was particularly desirable to the promoters of the project since it is conveniently located with respect to the other holdings. Accordingly, the Orson interests put in a bid for the plant, but were outbid by Whitney, who bought it for $55,000, the payment down being very small, it is stated. Since the location and size of the plant were the principal reasons for the New York capital's smiling upon the Atlas Motor Car Company, the Whitney move has put a different face on the matter and it is probable that the merger will not include the Atlas company.

However, the merger plans are very indefinite at present, according to H. M. Kilborn, of the National City Bank, and may not even include the Springfield Metal Body Company, for reasons which are kept under cover. Whitney states that it is the intention of his concern to convert the Atlas factory into a plant for the manufacture of sporting goods, although the Atlas people will be given a reasonable amount of time to remove from the building.

Smith, Sales Manager of Lozier

Detroit, Mich., Feb. 3—Paul Smith, former sales manager of the Flanders Motor Company, has been engaged as sales manager of the Lozier Motor Company to succeed C. A. Emise, resigned. Mr. Smith will have full charge of branches and dealers. The announcement is made by President H. M. Jewett, who also denies a rumor which has been current that the interests of the Lozier and the Paige-Detroit concerns were to be merged in the near future.

Michigan Magneto Creditors Meet

Detroit, Mich., Feb. 3—Referee in Bankruptcy, Lee M. Joslyn, has sold the property of the Michigan Magneto Company, which recently filed a petition in bankruptcy in the federal court, to Louis Duscoff, of Detroit, for $4,600. The first meeting of the creditors was held last Thursday and a dividend of 7 per cent. was declared.

Maxwell Plan Announced

Four Maxwell Models To Be Built and Five Models of Old U. S. Motor Continued

Heir to U. S. Motor and Flanders Has $21,000,000 Operating Capital and No Liabilities

A FORMAL statement announcing that the Maxwell Motor Company, Incorporated, has taken over property and assets of the U. S. Motor Company, Maxwell-Briscoe Motor Company, Dayton Motor Car Company, Columbia Motor Car Company, Alden-Sampson Manufacturing Company and Brush Runabout Company, has been issued by the New York office of the Maxwell concern, over the name of Carl Tucker, treasurer of the company. In addition to this, the combination of the former U. S. Motor with the Flanders interests is announced.

In this statement, it is declared that the Tarrytown, N. Y., Auburn, Ind., Newcastle, Ind., Detroit, Mich., factories of the two former corporations will now be all operated by the Maxwell company. Four models of Maxwell cars will be built at these plants, as follows: The Maxwell Six, model 50, formerly known as Flanders, being a seven-passenger car and selling for $2,350; the Maxwell Six, model 40, formerly Flanders, a five-passenger touring design which sells for $1,550; Maxwell, model 35, four-cylinder, five-passenger touring car, $1,085; and the Maxwell, model 25, a four-cylinder, five-passenger touring car, the price of which has not been announced yet. All these cars, which cover a range of from 25 to 50 horsepower, will be fully equipped, and the sixes will have electric self-starters fitted to them. For the present season, the Maxwell designs known as models 22—three-passenger roadster—and 40—five-passenger touring car—are being built to fill orders on hand and to respond to the public demand. The Stoddard-Dayton models 30, 38 and 48 will also be continued for the near future. The latter model will be equipped with the Gray & Davis electric starting and lighting system at the option of the purchaser.

The officers of the company, whose names appear on the statement, are: Walter E. Flanders, president; W. F. McGuire, vice-president; W. B. Anthony, comptroller; C. A. Forster, commercial manager; Carl Tucker, treasurer; Jas. C. Brady, Harry Bronner, Eugene Meyer, Jr., Henry Sanderson, Wm. E. Potter, George H. Burr, W. Catchings, Wm. J. Maloney, W. F. McGuire and Walter E. Flanders.

Besides the free property of the affiliated U. S. Motor and Flanders companies, worth $18,000,000, the new Maxwell company, has on hand $3,000,000 cash with which to carry on its manufacturing, selling and service operations. Service departments will be operated at New York City, Chicago, Boston, Philadelphia, San Francisco, Pittsburgh, Los Angeles, Minneapolis, Omaha, Kansas City, Dallas, Atlanta, St. Louis, Indianapolis, Denver, Memphis, Portland, Ore., and Charlotte, N. C. It is understood that the guarantee written by the older companies on their products will be respected by the Maxwell company.

The Maxwell Motor Company, Incorporated, in its statement by Mr. Tucker, announced that it will pay promptly the receiver's obligations for any unpaid invoices dated January 11, 1913, or prior, for shipment received by the following companies:

United States Motor Company, Maxwell-Briscoe Motor Company, Dayton Motor Car Company, Columbia Motor Car Company, Alden-Sampson Manufacturing Company and Brush Runabout Company.

Invoices dated January 13, 1913, and subsequent, will also be paid by the Maxwell Motor Car Company, Incorporated, upon proper advice that the goods have been received and accepted.

Prest-O-Lite Dismissed

New York Court Rules Trademark Invalid on Technicality—Prest-O-Lite Has Filed Application

Will Continue Fight with New Mark Registered—Radical Automobile Law Proposed for Ohio—Colorado Boosters Busy.

JUSTICE SPIEGELBERG, in the Municipal Court of New York City, Borough of Manhattan, Ninth District, dismissed a bill of complaint brought by the Prest-O-Lite Company against the American Auto Supply Company, New York City, claiming violation of section 367 of article 34 of the general business law of the State of New York. This article imposes a penalty of $100 on any person violating the following regulation:

"Any person or corporation engaged in manufacturing, packing, bottling or selling any article of merchandise, put up by him, for sale in any bottle, vessel, box, package or other receptacle, with his name, trademark, label or private mark appearing in any way thereon, or branded, stamped, affixed, blown or impressed thereon, may file in the office of the Secretary of State and in the office of the County Clerk."

The defendant was stated to have filled empty Prest-O-Lite tanks with acetylene gas produced in searchlight generators, being a customer of the Searchlight Gas Company, and to have sold a tank thus filled to an employee of the plaintiff. Before, however, selling the tank the defendant pasted a label over the word "Prest-O-Lite" on the tank, stating that the tank contained Searchlight gas and not Prest-O-Lite gas.

The essence of the opinon of Justice Spiegelberg is as follows:

The Prest-O-Lite trademark and name were registered in 1898, and when the new trademark regulations were brought out in 1909 the Prest-O-Lite Company did not take any further steps, assuming that under section 367 of the business law its trademark and the use of the tanks made by it for Prest-O-Lite gas exclusively were protected by the following passage of that section:

"Any person or corporation that has heretofore filed in the offices mentioned in sections 360 or 361 a description of the name or names, marks or devices upon his or its property, therein mentioned, and has caused the same to be published according to the law existing at the time of such filing and publication, shall not be required to again file and publish such descriptions to be entitled to the benefit of this article."

The regulations referred to in this section deal with the registration of trademarks only for such products as soda and mineral waters, porter, beer and other beverages, without mentioning in any clear way such compounds as the solution of acetylene gas in acetone.

During November last the Prest-O-Lite Company filed an application for registration of its tradename and trademark under the new law.

The Prest-O-Lite Company was represented in court by Winter & Winter, while Lewis F. and Jacob Lande represented the defendant.

The Prest-O-Lite Company has filed four more cases which will come up in the Municipal Court of New York before Judge Spiegelberg on February 14, the defendants being Smith-Haines; Richards Auto Supply Company; Economical Tire & Supply Company; Brickner's Auto Garage, all of New York City.

Colorado Road Boosters to Meet

COLORADO SPRINGS, COL., Feb. 1—The second annual convention of the Lincoln Highway Association of Colorado will be held at Colorado Springs on Wednesday, February 12. The official call for the meeting has been issued by President Leonard E. Curtis and Secretary-Treasurer A. W. Henderson.

The counties holding membership in the association are: Kit Carson, Lincoln, Elbert, El Paso, Teller, Park, Chaffee, Lake, Eagle, Pitkin, Garfield and Mesa, and delegates may be appointed by mayors, county commissioners, commercial, good roads, automobile, agricultural and stock growers' associations, as well as by editors and proprietors of newspapers.

Plans for the next year's work, the election of officers and the reports of the first year's accomplishments will be taken up at the meeting, and in view of the fact that it comes on Lincoln's birthday, special ceremonies appropriate to the day will be arranged.

The recent annual convention of the association, held in Denver, occupied itself with discussion and action on the problem of legislation which will make available for use on the roads of the state the internal improvement fund, which now amounts to about $750,000. The convention recommended to the Legislature the adoption of a bill creating a highway commission with an advisory board composed of the governor and representatives of various sections of the state, and placing in the hands of this commission the internal improvement fund.

DENVER, COL., Jan. 31—If Colorado will build a good automobile road across the state to the Utah line, along the route of the Midland trail as recently marked out by A. L. Westgard of the American Automobile Association, Salt Lake City will provide a fund of $1,500,000 to carry the highway across Utah. This challenging proposition has just been made to the motorists and other good roads promoters of Colorado by President B. F. Redman of the Salt Lake City Automobile Club, who has been visiting in Denver.

DENVER, COL., Jan. 30—Two measures of vital interest to motorists have been introduced in the Colorado Legislature by Senator Tobin. The first provides for the appropriation and use of funds for building and maintaining a system of good roads throughout the state, and the second provides for the state registration of motor vehicles and the licensing of operators and all drivers.

Proposed Ohio Speed Law Radical

TOLEDO, O., Feb. 1—Heavy fine and long imprisonment will face automobile speeders if a bill drawn by City Solicitor Schrieber and which he will have introduced in the Legislature becomes a law. A fine of not more than $500 or not more than 6 months in the workhouse is provided for the first offense. A fine of $500 and 6 months' imprisonment is the penalty for any subsequent offense. The owner or master who knowingly consents to high speed is made equally culpable with the driver. The new law would make the owner and operator of any motor vehicle violating the provisions of the act jointly liable in damages for any injuries inflicted. The fact of excessive speed would be prima facie evidence of negligence and would throw the burden of defense on the owner and operator of the car. The bill provides that where anyone is struck by a motor vehicle the offense shall be construed as assaut and battery unless the injuries warrant a more serious charge.

No More Roads for Hardin County

TOLEDO, O., Feb. 1—According to a decision handed down by the Court of Appeals in the case of William Gibson, a farmer, against the Hardin County Auditor and others, all pikes which have been built in this county for the past 30 years have been illegally constructed. The decision has stopped $70,000 worth of road work now under way in that county.

Marylanders to Pay D. C. Fees

WASHINGTON, D. C., Feb. 1—Beginning February 16 the district authorities will begin a strict enforcement of the new regulation imposing upon motor car owners of Maryland the same license fees as are assessed Washington motorists by

Maryland. The law is now in effect but no penalty can be enforced until February 15.

Residents of Maryland who live just over the boundary line between the District of Columbia and that state, but are engaged in business in Washington and pay taxes here, claim that the hardship of the new law will fall principally upon them. Through a committee they have asked the district officials to make an exception in their case but the commissioners, while realizing the hardships that will be imposed in individual cases, point out that the best remedy for them is to obtain an amendment to the Maryland motor car law providing for reciprocal relations between the District and Maryland.

Texas Road to Be Rebuilt

AUSTIN, TEX., Feb. 1—Steps have been taken to rehabilitate what is known as the King's Highway which runs from San Antonio to Nacogdoches, Tex., a distance of 300 miles. At a meeting just held in Austin of a number of men who are interested in this movement preliminary arrangements were made for effecting a permanent organization to carry on the restoration work. Among those attending this meeting were J. W. Young, mayor; J. C. Miller, L. A. Daniel, John Legory, all of Crockett, Tex.; J. C. Hesslit, of Caldwell; Paul D. Page, of Bastrop; J. W. Warren and D. E. Colp, of San Antonio. George D. Marshall, federal highway engineer, who is also president of the State Good Roads Association, attended the meeting. It was decided at this meeting to log the highway throughout its length. The loggers are to be accompanied by Prof. R. J. Potts of the State Agricultural and Mechanical College, and Mr. Marshall. It is estimated that the road can be rehabilitated and placed in first-class condition for approximately $2,500 a mile.

Onondaga May Use Convicts

SYRACUSE, N. Y., Feb. 3—Dr. Sargent F. Snow, chairman of the highway committee of the Automobile Club of Syracuse, today presented before the Board of Supervisors of Onondaga County the advantages of employing convict labor in the county construction of state highways, following the progressive ideas advanced by County Superintendent Frank E. Bogardus. The recommendation follows some experiments in employing convicts from the penitentiary at Jamesville in road building in that vicinity.

As the result of numerous complaints by members of the Automobile Club of Syracuse against construction and maintenance of highways in Onondaga County the club has decided to appoint a grievance committee of three members to investigate the complaints. It is claimed much of the contractors' work on new stretches of state road is extremely poor.

Gov. Baldwin Against MacDonald

HARTFORD, CONN., Feb. 3—Governon Simeon E. Baldwin desires the removal from office of Connecticut State Highway Commissioner James H. MacDonald. He filed this week with Attorney-General John H. Light charges alleging incompetence. The charges will be formulated by the attorney general and service will be made on the commissioner, who must appear before a judge of the Superior Court. Just who that judge will be is at present a matter of speculation. Governor Baldwin has filed twenty-one specific charges against the commissioner and these, it is said, cover the commissioner's entire term of office.

The Governor has been opposed to the commissioner ever since he assumed office two years back. He endeavored to have him ousted. MacDonald remained. The Governor has named William H. Cadwell, of New Britain, as Highway Commissioner. MacDonald's term of office expired July 1, 1911, but the commissioner held over, under the provision of the law that he should remain in office until his successor was duly appointed. He has not yet been appointed.

Hartford Writ Is Denied

Republic Rubber Company Re-elects Old Officers at End of Fiscal Year—Closes Successful Season

American Tire and Rubber Increases Its Capitalization—Dorian Remountable Rim Company Sold at Auction

HARTFORD, CONN., Feb. 3—The United States Supreme Court denied a writ of certiorari filed by the Hartford Rubber Works in which the second circuit upholding the validity of the Adams' patent be set aside and a new trial ordered. The Hartford Rubber Works took this step in patent litigation to attack the validity of the patent granted to Adams and controlled by the Metallic Rubber Tire Company which, it is claimed, was infringed by the Hartford Midgeley tread tires. The Connecticut District Court had decided in favor of the Hartford Rubber Works, while the Circuit Court reversed the decision. The refusal of the United States Supreme Court to issue the writ of certiorari signifies the final closing of the litigation.

Republic Rubber Had Banner Year

YOUNGSTOWN, O., Feb. 3—At the annual meeting of the Republic Tire & Rubber Company recently at Youngstown, O., all the old officers and directors were re-elected. The year 1912 was a banner one and a number of improvements were made, including a new shop, which greatly increases the capacity of the plant. The officers and directors chosen follow: President, T. L. Robinson; first vice-president and sales manager, J. H. Kelly; second vice-president, L. T. Peterson; secretary, C. F. Garrison; treasurer, M. I. Arms; general superintendent, A. H. Harris; directors, John and David Tod, J. C. Wick, H. K. Wick, M. I. Arms, C. H. Booth, Robert Bentley, J. H. Kelley, A. H. Harris, L. T. Peterson and T. L. Robinson.

American Tire and Rubber Capital Increased

AKRON, O., Feb. 3—The annual stockholders' meeting of the American Tire & Rubber Company, of Akron, O., was held recently when the following directors were elected: Adam Duncan, Charles F. Fosnight, F. L. Kryder, F. M. Lapp, Frank Pfeiffer, James Shaw, Gus Seiberling, C. M. Wertz and G. C. Waltz. Adam Duncan was elected president, G. C. Waltz vice-president, Frank Pfeiffer treasurer, and F. E. Rowe secretary and assistant treasurer.

The stockholders authorized the board of directors to increase the capital stock from $200,000 to $500,000, of which but $50,000 will be issued at this time. The company is waiting for final patent papers before following their intention of placing a solid tire upon the market.

Dorian Property Sold at Auction

The Dorian Remountable Rim Company, New York City, which went into the hands of the receivers some time ago, is not to be reorganized, according to Olcott, Gruber, Bonyinge & MacManus, who ordered the receiver's sale. The company's property, consisting of rims, nuts, bolts and similar paraphernalia, was disposed of at three sales, the last of which was held on February 3. The amounts received at these were $6,100 at the first, $3,447 at the second and $70 at the final sale, making a total of $9,617 realized from the proceedings.

Champion Plug Features In Patent Litigation

Thirty-Five Per Cent. Automobile Company Sued by Bernard Morgan Who Claims Infringement of His Patent

Plug in Question is of the So-Called Priming Type with Threaded Inclined Passageway Containing Priming Cup

THE Thirty-five Per Cent. Automobile Company, New York has been sued by Bernard Morgan, of Newport, R. I., the latter claiming infringement of his patent on priming cocks by the act of the defendant selling Champion plugs, made by the Champion Spark Plug Company, Toledo, Ohio. The Champion plug in question is of the so-called priming type, consisting of a plug, the shell of which is threaded with an inclined passageway, into which fits a priming cup, screwing into the bored portion of the plug. When the cup member is screwed tight into the thread in the plug, a needle formed on the end of the cup member makes a tight fit against the plug shell, keeping gases from leaking out through the passage.

The principal point of the complainants patent No. 982,009, filed March 1, 1910 and granted January 17, 1911, lies in the following claims:

A test or priming cock, comprising a cylinder plug having a seat, and a closing plug screwing in the said cylinder plug and adapted to be seated on the said seat to close the cylinder plug, one of the plugs having a reservoir for the explosive fluid, and an outlet port leading from the bottom of the reservoir to discharge the fluid into the cylinder plug on unseating the said closing plug.

Munn & Munn, New York City, represent the plaintiff.

Hitchcock Takes Bids for Trucks

WASHINGTON, D. C., Feb. 1—the most important purchase of motor cars ever made by the United Sates Government is about to be consummated. Postmaster General Hitchcock today opened bids for furnishing as they may be ordered during the fiscal year ending June 30, 1913, approximately 100 motor vehicles. suitable for the rapid delivery of parcels in cities. It is expected the contract will be awarded within the next 30 days.

Tom Hay with Staver Carriage

CHICAGO, ILL., Feb. 1—Tom Hay has taken over the Staver line for northern Illinois, eastern Iowa, all of Indiana and southern Michigan. For years Tom Hay has been one of the most talked about men in the automobile business. He holds a record, perhaps unequaled, of the sale of from 15,000 to 16,000 cars in a territory practically parallel to the one he will handle for the Staver Carriage Company. Mr. Hay will make his headquarters, as well as the retail selling headquarters for Staver automobiles. at 1725 Michigan avenue.

Willys Buys Hexter Company

T. K. Hexter, formerly connected with the Hexter Motor Truck Company, New York City, which has handled the Gramm line of trucks for years in the Metropolitan district, has resigned his position with the company, having sold his entire interest in the concern to John North Willys. It is being rumored that the Overland company will transform the Hexter concern into a service department of the manufacturing corporation, further details being held back at present until all details are settled.

Mr Hexter, while refraining from announcing his plans in detail, is intending to manufacture a new make of freight automobile operating on principles original in motor truck manufacture. The name of the company which he will found in the near future has not been decided upon, but the enterprise will probably bear his name as soon as a certain period has elapsed, as Mr. Hexter's arrangement with the Overland interest prevents him from making use of his name in the truck manufacturing business within the next six months.

The present Overland service department is located at the Silver sales agency which handles all the Overland cars, both pleasure and commercial at present. Whether the new plant will supplant the Silver agency or not has not been stated at present.

London Taxis May Decrease

LONDON, Jan. 25—The police have not been slow to make note, during the present strike, of the difference in the regulation of the traffic with some 9,000 taxicabs off the streets, and it is quite probable that when the trouble is finished with that something new will be awaiting the drivers in the form of a limitation of the numbers of motor cabs allowed on the streets. It is in the congestion that the danger of accidents arise, and the motor-omnibuses, which are easily discernible, have proved to be of no such danger as was generally supposed. The public have also noticed the difference of the condition of traffic, and now darts across the roads hurriedly as it is quite capable of avoiding danger now that the taxicabs, that dodge in and out of the traffic, and sometimes appearing from "nowhere," are idly locked in the garages. In this way what little inconvenience there has been in hailing a motor-cab has been amply made up for.

Market Changes for the Week

There was considerable activity in tin in the local market yesterday, following the break in prices on the previous day to $49.25 per 100 pounds, a decline of $.90. Copper showed no improvement in demand from either domestic or foreign consumers, and the tone of the market was weaker, with a sympathetic decline of $.00 1-8 and $.00 1-4 in electrolytic and lake. Oil Petroleum, Pa., still continued to climb with predictions of higher prices. After resting a few days the advance of $2.47 per barrel came yesterday bringing it $.03 of the goal for which oil producers have long sought, $2.05. Cottonseed oil remained firm, due to a little more active trading conditions, following a general demand, colsing at $6.31 a barrel at an advance of $.03.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, per lb...	.08¼	.08¼	.08¼	.08¼	.08¼	.08¼	....
Beams & Channels, per 100 lb.......	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	28.50	28.50	28.50	28.50	28.50	28.50	....
Copper Elec., lb...	.16⅛	.16⅛	.16	.16	.16	.16	—.00⅛
Copper Lake, lb...	.16⅜	.16⅜	.16⅛	.16⅛	.16⅛	.16⅛	—.00¼
Cottonseed Oil, Feb., bbl........	6.28	6.28	6.28	6.24	6.27	6.31	+.03
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil, Menbaden Brown	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 gal.........	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime...	.90	.90	.90	.90	.90	.90	....
Lard, 100 lb......	4.30	4.30	4.30	4.30	4.30	4.30	....
Linseed Oil........	.49	.49	.49	.49	.49	.49	....
Open-Hearth Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Petroleum, bbl., Kansas crude...	.88	.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa. crude	2.33	2.33	2.40	2.40	2.40	2.47	+.14
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	....
Silk, Raw Italy...	....	4.35	....	....	4.35	....	....
Silk, Raw Japan..	....	3.72½	....	....	3.72½	....	....
Sulphuric Acid, 60 Beaumé	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb........	50.15	50.12½	50.20	50.10	49.50	49.25	—.90
Tire Scrap......	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	....

Zenith Brings Suit Against Stromberg

Refutes Stromberg's Abara and Richard Patent Basic Claims on Plain Tube Carbureters

Counter Action Alleges Infringement of Francois Bavery Patent Assigned to French Zenith Company

DETROIT, Feb. 3—The Zenith Carbureter Co. of this city has begun suit in the Federal courts here against the Stromberg Motor Devices Co., Chicago, maker of the Stromberg carbureter, for infringement of the Baverey patent, No. 907,953, under which patent the Zenith company is building its present type of Zenith carbureter. This suit is of unusual interest in that on December 24, 1912, the Stromberg Motor Devices Co. filed suit in the Federal court of this city against the Zenith company asking that an injunction be granted prohibiting the Zenith company from making the Zenith carbureter on the ground that it was an infringement of two patents owned by the Stromberg company, namely, the Ahara patent, No. 684,662, and the Richard patent, No. 791,501.

The situation is perhaps one of the most unusual on record to date in that both Stromberg and Zenith companies consider that they control respectively basic patents covering a type of carbureter without moving parts and operating upon a principle of atmospheric control in which two nozzles are used, one a conventional nozzle fed direct from the float chamber, as in the standard type of carbureter today, and the other a compensating supply nozzle. Apparently each concern has every confidence in its patents and it will be up to the courts to decide which really owns the basic one. The Zenith company has been manufacturing its carbureter for some time and the Stromberg concern has been exhibiting at the shows its model E, which it believes to be in accordance with the Ahara and Richard's patents.

In order that the respective merits of the patents may be understood, the following digest of each sets forth the features.

F. Baverey secured his patent, No. 907,953, December 29, 1908. The object aimed at in this patent is outlined as follows: "With ordinary spray carbureters the proportion of fuel in the mixture increases with the speed of the motor, the passage of fuel (gasoline) through the orifice heading into the suction conduit being not uniformly proportional to the quantity of air sucked into the conduit, but increasing on its acceleration of the motor at a higher rate than the quantity of air owing to the higher degree of vacuum produced at high speeds. The purpose of the present invention is to remove this disadvantage and to render the proportions of the mixture constant at all speeds of the motor * * * there is used a supply nozzle for gasoline, the feed of which increases too rapidly with increasing motor speed, and in conjunction a compensating supply nozzle, the flow of gasoline through which increases either at a lower than a normal rate or preferably not at all. These nozzles can be so regulated that the aggregate amount of fuel passing through them increases in the same proportion as the quantity of air sucked in, so that the richness of the mixture remains constant.

In construction there are two nozzles side by side in the venturi mixing chamber. One communicates direct with the gasoline in the float chamber. The other communicates with a vertical standpipe at the side of the float chamber and into this standpipe gasoline flows through a regulated valve, so that the flow through this valve is constant for any setting of it. The standpipe is of larger diameter than the nozzle and gasoline collects in it so that when starting the motor there is a surplus supply of fuel available, but as soon as the fuel in the standpipe is exhausted, which happens with higher motor speeds, then the supply is fixed so that bubbles of air pass through the compensating nozzle instead of gasoline. By this compensating arrangement it is claimed to obtain a mixture weaker in gasoline as the engine speed increases.

G. V. Ahara obtained his patent, No. 684,662, October 15, 1901, and it was acquired during the past fall by the Stromberg company. The object aimed at in the patent is set forth as follows: "The purpose of this invention is to avoid varying the mixture of fuel and air by providing for an excess of fuel in relation to the quantity of air for the first explosions occuring after a cut-out to compensate for the greater quantity of air at present in the cylinder. * * * Also, to provide means by which the quantity of fuel to be drawn into the cylinder after a cut-out may be varied, depending upon the length of the time during which the suction, or feed of fuel to the engine, is omitted or cut-out."

In construction the Ahara patent has two nozzles located side by side in the same mixing chamber. The main nozzle feeds direct from a fuel chamber having a controlling cone-type regulating valve in the passage between the float chamber and the nozzle. The compensating nozzle is supplied from the main nozzle and has a collector tube, the upper end of which is open to the atmosphere. This collector tube fills from the main nozzle and affords a ready volume of gasoline for starting purposes, irrespective of the regulation of the cone valve which controls the flow between the float chamber and the two nozzles.

F. Baverey claims as follows: Fig. 4. In a carbureter the combination of a suction control fuel gap with an additional fuel feed regulated to give a constant supply per unit of time, the two jets being relatively proportioned so that their combined supply is proportional to the air supply.

1—In a carbureter the combination of a suction controlled fuel feed jet with an additional fuel feed regulated to give a constant supply per unit of time.

G. V. Ahara claims in his patent:

1—A feeder for explosive engines comprising a fuel reservoir having a feed outlet below the fuel level therein, to affect a continuous feed. a passage communicating with the atmosphere and with said outlet from said reservoir to receive fuel therefrom, and means adapted to control the communication between said reservoir and said passage.

7—In a feeder for explosive engines, a casing having a fuel reservoir therein provided with a continuously-open gravity-feed outlet in its lower portion, and a passage having a portion communicating with the atmosphere and with said reservoir-outlet, whereby fuel is adapted to collect by gravity in said passage.

Automobile Securities Quotations

The stock market during this week showed a general strength, in response to the healthy condition of the industry which expressed itself by a number of dividends declared during the past month. Notable advances were made by several issues, especially rubber stocks, Goodyear common rising 15 points, and Miller 35. Garford preferred also displayed great strength and advanced 5 points over last week's closing figure, on account of rumors of changes in management.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	165	185
Ajax-Grieb Rubber Co., pfd	..	..	95	100
Aluminum Castings Co., pfd	..	..	98	100
American Locomotive, com	33	33½	40	40½
American Locomotive, pfd	103	103½	104	105½
Chalmers Motor Company	..	..	135	145
Consolidated Rubber Tire Co., com	8	12	20	23
Consolidated Rubber Tire Co., pfd	15	30	70	80
Firestone Tire & Rubber Co., com	200	204	355	360
Firestone Tire & Rubber Co., pfd	108	110	106½	107½
Garford Company, preferred	..	..	105	107
General Motors Company, com	34½	36	34¼	34¾
General Motors Company, pfd	74½	76	78	79
B. F. Goodrich Company, com	..	..	62½	63½
B. F. Goodrich Company, pfd	..	..	103¾	104¼
Goodyear Tire & Rubber Co., com	330	335	460	470
Goodyear Tire & Rubber Co., pfd	104	106½	104½	105½
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	5	15
International Motor Co., pfd	..	..	25	50
Lozier Motor Company	..	..	..	32
Miller Rubber Company	..	..	160	170
Packard Motor Company, pfd	104	107	103	105
Peerless Motor Company	..	..	120	125
Pope Manufacturing Co., com	38	41	30	32
Pope Manufacturing Co., pfd	68	70	77½	79½
Reo Motor Truck Company	8	10	11½	12¼
Reo Motor Car Company	23	25	20½	21¼
Studebaker Company, common	..	..	34	35
Studebaker Company, preferred	..	..	92	93
Swinehart Tire Company	..	..	110	112
Rubber Goods Mfg. Company, pfd	100	105	105	107
U. S. Motor Company, com	..	..	..	10
U. S. Motor Company, 1st pfd	..	..	..	35
U. S. Motor Company, 2nd pfd	..	..	..	75
White Company, preferred	..	..	105	108
Willys-Overland Company, com	..	..	70	70½
Willys-Overland Company, pfd	..	..	98	99½

January Record for Incorporations

The month of January, 1913, was a record period for incorporations, the capitalization for the new charters taken out in the states of Delaware, Pennsylvania, New Jersey, New York, Rhode Island, Massachusetts and Maine totalling $749,927,500, as compared with $452,400,000 in December, 1912, and $541,399,000 in January, 1912. The increase for the past month over December last is therefore 66 per cent., and over January, 1912, 20 per cent. The total automobile incorporations and their relation to the total charters of the several states stands as follows:

State	Total Incorporations	Automobile Incorporations	Per Cent.
Delaware	$94,595,000	$37,450,000	39.4
New Jersey	100,560,000	1,300,000	1.29
New York	77,492,500	3,600,000	4.65
Massachusetts	39,105,000	27,500,000	70.5
Maine	57,800,000	3,000,000	5.7
Miscellaneous	29,000,000	2,500,000	8.65

Average per cent., $21.69.

The average total percentage of automobile charters in the states considered is 21.69, or more than one-fifth.

Value of Recuperating Gas Ovens for Forging and Heat-Treatment Greatly Advanced by Modified Construction—Principle of Mixing Air with the Fuel in the Jet Illustrated in New Carbureter—How the Germans Build for 1913

RECENT Improvement in Gas Furnaces.—Complete combustion accomplished with a minimum of air is the first condition for fuel economy in a furnace. This is one of the reasons why coal or coke furnaces, in which the great surplus of air needed for the combustion of the solid fuel carries a very large percentage of the heat away with it through the flues, have given way to gas or oil furnaces in most well-organized metal-working establishments. In the case of gas furnaces, either the coal is first turned into gas in a generator furnace or gas from an independent source is used, but under both conditions the exhaust gases of the furnace are utilized for pre-heating the air, and frequently also the gas, before it is admitted. As, furthermore, the amount of air may be regulated to a nicety and can be held down to just what is required for burning the gas, the economy is decisive, while the distribution of the heat or its concentration, if desired, can also be accomplished with great facility.

According to the nature of the pre-heating system such furnaces or ovens are classified as (1) regenerative, if the direction of the flame and the draft alternates, and (2) recuperative, if the flame does not change direction and either the air or both the gas and the air is pre-heated in socalled recuperators. The regenerative system is mainly used for very high temperatures which are not usually required for the heat-treatment or forging of metals. Its installation is relatively expensive, and unremitting attention is called for in the operation of its alternating-mechanism.

The recuperative system is inexpensive in the first place and automatic in the general features of its operation, but the recuperators used with it have been deficient in some respects. They were usually built in the form of flues for exhaust gas and for air in alternating layers separated by fireproof partitions or cast-iron plates, the gases traveling from the furnace downward—imparting their heat to the partition walls, and the air rising from below and receiving heat from the opposite sides of the same walls. The trouble experienced with this construction was that the partitions were liable to leak at the joints and the resulting mixing of the exhaust gas and the air currents led to considerable irregularities in the draft and the heat generation. Moreover, repairs could not be made while the furnace was in operation and involved considerable work.

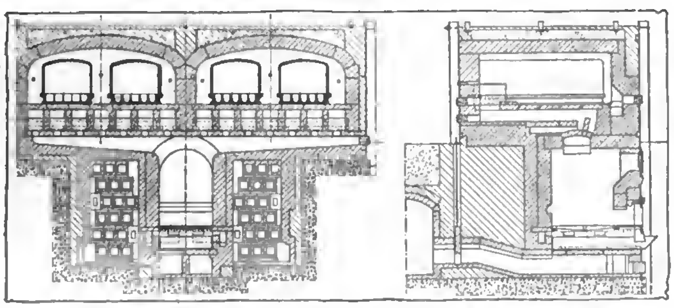


Fig. 1—Recuperating gas ovens, Hermansen system

Important progress in this respect is now effected by building recuperators according to the Hermansen patent. The novelty of the construction lies mainly in the form of the bricks used in building them. They are hollow fireclay bricks with transverse grooves on the upper and lower surfaces. The square hollow spaces in the bricks form the exhaust gas channels, while the grooves come together with corresponding grooves in bricks above and below to form the air channels. The ends of each brick are tenoned to engage the adjoining one, and the bricks are so laid that the gases follow a zig-zag course from top to bottom and longitudinally of the furnace, while the air rises from one layer of transverse channels to the next higher one. To this end, the bricks of each layer are offset transversely one-half brick with relation to the layers above and below, so that riser-spaces one-half brick wide are created alternately to the left and right of the structure between the recuperator tubes and the furnace walls. As the joints of the bricks are also staggered longitudinally, all mingling of air and gas is excluded.

Another important advantage attained by this construction lies in the easy access to the flues for purposes of inspection and cleaning. The front wall and, if the generator gas is pre-heated, also the side walls of the recuperator are built of similar precisely-shaped bricks, so that there is an end-opening for each flue, and this is closed with a fireclay stopper which is perforated and provided with a window.

As a recuperator of this design demands but very little room, the oven, the generator and the recuperator can readily be built as one unit, and the open or muffle ovens used with this equipment need not differ in arrangement from those usually employed with direct coal or coke firing or with mixed direct and gas firing.

The author, Engineer L. Kentnowski, describes and illustrates a number of installations in which the Hermansen design is incorporated and in all of which the gas generator is built into the plant below the service floor from which the ovens are operated. One of these plants, built for the *Deutsche Waffen und Munitions Fabriken* at Karlsruhe, for the heating of ammunition material, is shown in transverse and longitudinal sections in Fig. 1. It comprises 4 ovens with 16 cast-iron retorts, and each of the ovens is served with fuel gas from a separate generator.

If the gas is taken from public conduits or an isolated generator, as usual in the iron and steel industry, two independent recuperators are built under the ovens, one to pre-heat the air and the other the gas.—From *Metall und Erz*, January 8.

FROM Carbureter to Vaporizer—What is the use of having large inlet valves in a motor for the sake of getting the benefit of its full range of power if there is a throttling action in the Venturi tube or the air admission of the carbureter? Some such question, as well as the relatively new idea in carbureter design of leading air into the jet itself at the high motor speeds for the purpose of reducing the proportion of fuel in the mixture, and atomizing the fuel at the same time, seems to have actuated the makers of the Gobbi carbureter, a newcomer in an apparently crowded field. The features first noted in the construction, are a jet with concentric channels four to five times as large as the conduits in ordinary jets, a mantle coming down over the outer annular channel and, in the float chamber, the absence of the customary weights and levers to regulate the admission of the fuel. The dimensions of the jet are in reality considerably larger than the drawing, Fig. 2, shows. Continued inspection brings it to one's attention that the mouth 2 of the jet is unusually close to the throttle valve, whose under-surface, by the way, is of a special formation determined by experiments, and that the outer annular channel is not really a channel at all, so as to constitute a second jet communicating directly with the gasoline supply from the float chamber, but is merely a sort of elongated cup receiving overflow from the central jet through the perforations 3 and 4 and communicating with the atmosphere under the mantle P. The level of gasoline before the starting of the motor is of course identical with the float level in the cup as well as in the jet.

When the start is made, the suction draws air from around the mantle P and gasoline from the mouth 2 together with some air bubbles through perforation 4. These bubbles help to vaporize the first charges. If the motor is allowed to speed up, the increasing suction in the jet soon exhausts the gasoline supply in the cup, because the atmospheric depression is communicated through the perforations 3 and 4 and air is sucked in under the mantle. That the mantle acts in this manner is a matter of experimental demonstration. The more rapid the suction from the motor, the more air finds its way not only around the mantle but also under it and into the cup, and at a certain motor speed it begins to penetrate at perforation 3 and to mingle with the ascending column of gasoline in the jet, holding the flow of the fuel down to the proper proportionality of 1 to 18 weight parts of gasoline and air respectively. [While 1 to 9 weight parts is the proportion theoretically required for perfect combustion, 1 to 18 is the proportion found most suitable in actual motor practice at high speed—tending toward 1 to 16 at low speeds—owing to the short time available for effecting a completely gasified mixture and to the amount of oxygen needed for the unavoidable combustion of lubricating oil. The possible effects of special lubricating systems, such as admixture of graphite with the oil, to modify the desirable proportions between fuel and air, have not, so far as known, been ascertained.—Ed.]

The construction thus involves no other variation of the air channels than that which is caused by the operation of the butterfly throttle valve. The position of the latter alone determines whether the charges drawn into the cylinders at a given motor speed shall be small or large, in proportion to the load of the vehicle, the same as with other carbureters, while the vaporizing jet alone takes care of the mixture by causing more or less air to be mixed with the ascending column of gasoline, according to the speed of the motor. It is not stated how this construction is adapted to different types and sizes of motors.

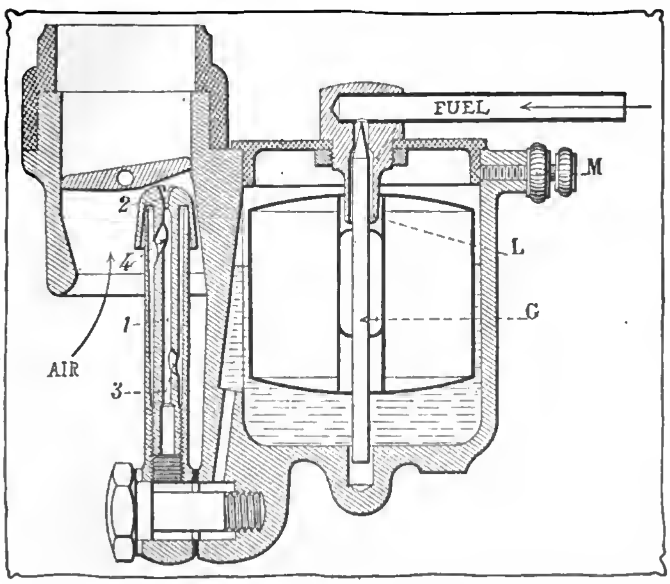


Fig. 2—Gobbi carbureter, atomizing the fuel in the jet

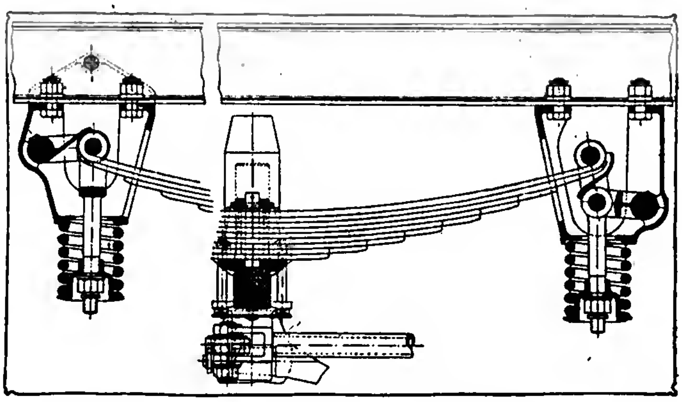


Fig. 3—Front spring construction in the Büssing heavy truck

In the mechanical construction it is noted that the needle valve G is fitted tightly in the axis of the float, so that the level can be changed by pushing it up or down, and that the tube L, in which the gasoline arrives by top feed, is extended so as to telescope into the bore of the float and is supposed to regulate the feed as effectively as this may be done by the leverage system generally employed, while also guarding especially against the tendency to overfeeding to which the top-feed system is said to be liable.—From *La Vie Automobile*, January 18.

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NOTES from the German Industry—From a review of the automobile situation in Germany with reference to construction and commerce it is noticed that the universal aim is mass-manufacture by the most economical methods but that the home market is scarcely sufficiently large to permit the realization of the intention. The popular demand runs now mostly to cars of less than 10 horsepowers, as the taxation becomes considerably higher when this power is exceeded and the speed regulations in the cities render higher power useless under most circumstances. The formula applied for determining the tax gives a low rating, however. Every manufacturer has given special attention to this type of car in his schedule of production for 1913, and most of the new models are designed in the semblance of the larger cars whose vogue is passing—though they are still preferred by all who can indulge in grand touring—and, while smaller and lighter, are equipped in the same style, mechanically and otherwise.

For light trucks, delivery wagons and omnibuses the chassis are usually the same that are used for pleasure cars of the same power, this being the result of attempting series-manufacture for a limited market.

The production of heavy trucks, on the other hand, is assuming large dimensions, by reason of the state-subsidy system. Nearly 20 manufacturers are turning out this class of vehicles, practically all of them conforming to the rules for loads and dimensions which have been laid down by the army authorities as conditioning the payment of the subsidy. The new rules call for a lighter type than was formerly specified, and the trials made with the new vehicles last October have justified the change, which was occasioned by road difficulties arising from heavy loads.

While the great majority of three-wheeled vehicles are used for merchandise delivery, an increasing number of the three-wheel chassis are now fitted with open or even closed carriage bodies with more than two seats and are finding favor for use in the cities.

In the general industry the enhancement of motor efficiency and silence is the principal achievement of the past year, the sleeve-valve motor having exerted a strong influence to this effect. Practically all other conspicuous changes, in Germany as elsewhere, relate to the equipment. Motor starters and electric lighting of cars by means of generators run by the motor are engaging widespread attention.

The 1913 models give evidence of great care in the improvement of the spring suspension for all classes of vehicles, the trucks included. Broader and longer leaf springs are the rule as compared with 1912. Shock-absorbers are widely adopted in a profusion of varieties. Platform springs are no longer uncommon, and here and there semi-elliptic springs are used in pairs, side by side (which gives more freedom for torsion than a single broader spring). The rear springs are in some instances adapted to transmit the traction thrust.

The grouping of all valves on the same side of the motor has become universal, partly by reason of the cheaper manufacture and the reduction of parts secured by this design. The carbureter is nearly always located on the opposite side from the valves and is secured to a simple flange on the monoblock motor casting, the induction pipe being cast into this between the two middle cylinders and terminating in an enlarged chamber from which short conduits lead to the inlet valves. The exhaust pipe, on the other hand, is never cast in the block or inclosed, as experiments in this direction showed very unfavorable results in the way of keeping cylinders hot on one side and causing strong local tensions in the materials.

All the different arrangements of the valves—poppet valves—are represented in the 1913 models, each firm holding on to the style once adopted, more for the sake of preserving the individuality of its product than for strong technical reasons.

The tendency to a long stroke is pronounced and an offset crankshaft is not uncommon. Valves and, in so far as possible, all other moving motor parts are as a rule boxed in to secure silence as well as protection from dust. Cooling by the thermo-siphon system has gained several new adherents, even for large touring cars, the monoblock castings giving an opportunity for the large pipe sections required with this system, while the saving of the pump and the automatic adaptation of the system to varying outside temperatures are appreciated features. The motor lubrication is now in nearly all instances automatic, so that little more is required of the car owner than to keep the reservoir filled.

The suspension of the motor in the frame is now usually effected without the use of a false frame, and it is in act the general tendency to compose the frame of as few parts as possible. As a rule the front portion of the main frame is narrowed so that it can be reached on both sides by the brackets of the crankcasing. Only in a few instances is the upper half of the crankcasing extended bodily to the frame, though this construction affords great convenience for the mounting of magneto, water pump and lighting dynamo as well as for adjustments and repairs, doing away with all chance for having tools dropped into a drip pan through dispensing entirely with the pan itself. In contradistinction to this rigid suspension, three-point suspension is numerously represented, for the gear box as well as for the motor. In heavy trucks the false frame is still used, but it is suspended from the main frame by very substantial lubricated joints.

The cone clutch is more than holding its own against the multiple disk clutch. The Hele-Shaw clutch is seldom seen in the German cars. The cone clutch is, however, considerably improved. Its inertia is reduced by using sheet steel for its manufacture or by using two oppositely inclined cones of reduced diameter and in which of course all end-thrusts are absorbed. Special small brakes to take up the rotary inertia of the clutch and gears have been taken up again, after a rest of a few years, but they still do not seem to work to entire satisfaction.

The unit construction, by which motor, clutch and gear box are built into one casing, is making very slow progress, though it has been employed successfully for several years by one of the leading German manufacturers.

Hydraulic transmissions are still in the embryonic stage. Their weight and the chance of leakage at th ebearings is against them, and it is understood that they do not respond well when unusual demands are made upon the power. Their low cost does not yet, in the general opinion, compensate for these disadvantages. [Only one type of hydraulic transmission is in operation in German cars.—Ed.]

Though silence is sought, silent chains are not meeting with much favor, mostly because their use involves additional cost of production and larger, and therefore heavier, casings than are required for gears. Great efforts, on the other hand, are made to render gears silent by painstaking milling of the teeth.

Horizontal division of the gear box is being avoided more and more. A casing cast in one piece with a large top-opening is preferred, giving lighter construction with fewer bolts and nuts, and offers no difficulties to the assembling of the gears. This is especially the case now, since ball bearings are becoming universally used in the gear box and necessitate large end-openings in the casings. The really oil-tight gear box is, however, still an exception.—From *Allgemeine Automobil-Zeitung*, January 10 and 17.

The care given to spring suspensions, as referred to in the foregoing, is exemplified in the double front springs used for the heavy Büssing motor truck. The construction, which is shown plainly in Fig. 3, affords a progressive spring resistance and permits the front axle to work in practically straight up and down movements in such manner that the relation of the steering rod to the wheel is affected very little by road shocks; a provision which makes the steering easy and secure and reduces tire wear. The illustration is taken from *Der Motorwagen*, of January 10.

Larger Middle Transverses.—Among the changes in the construction of frames, it is notable that the middle cross-member is everywhere increased in depth and robustness and is opened centrally to pass the transmission.

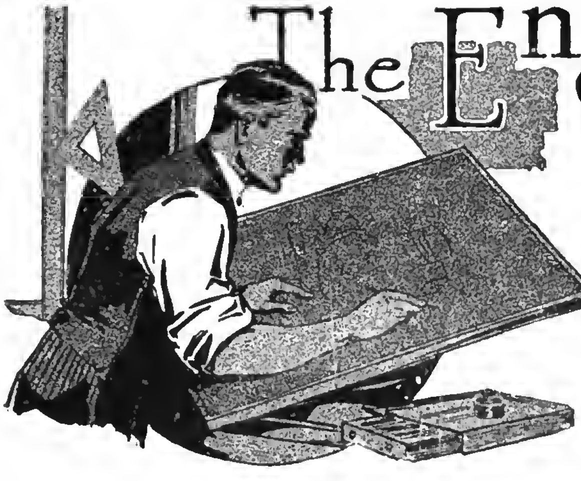
[It is also in some cases, for example in the Mercedes-Knight, developed as an elongated X, giving a much increased rigidity in the transverse plane midway between the wheel axles while localizing torsion of materials in the middle lognitudinal plane.—Ed.]

The large transverse offers a rational support for thrust and torsion rods as well as far the attachment of the drip pan if one is used.—From show review in *Omnia*, January 4.

Testing Aluminum Solder.—Among the many aluminum solders in the market there are several which disintegrate after a relatively short exposure to the weather. Otto Nicolai of Bonn, Germany, mentions a simple method for determining whether any given aluminum solder will prove durable or not. A sample of soldered work is placed under water, and, if within 48 hours small bubbles—which are hydrogen bubbles—appear either on the sample or upon the surface of the water, the solder will disintegrate in two weeks under water and in a few months by mere exposure to the atmosphere. Nicolai markets an aluminum solder himself, but the method is considered reliable. —From *Metall-Technik*, January 11.

Voiding of French Patents.—With reference to the danger of having French patents forfeited in case patents on the same subject are forfeited in any other country (see The Automobile of January 9, page 162) it has been brought to notice that Germany and Austria-Hungary joined the Convention of December 14, 1900, at a later date and that therefore patents taken out by subjects of these two countries enjoy the same immunity from the danger referred to as patents taken out by Americans or other citizens of a country participating in the convention.—From a communication to *Le Génie Civil*, January 11.

The Engineers' Forum



Exhaust Gas Analysis

Engineers Discuss Value of Analyzing Exhaust Gases To Determine Engine and Carbureter Efficiency

E. R. Hewitt Favors Analysis and Gives Results of Years of Tests

Part I

Note—These discussions by leading engineers are from stenographic notes taken during the recent session of the Society of Automobile Engineers in New York City, when this pertinent subject proved one of the most interesting of the meeting.

NEW YORK CITY—I began work on exhaust analysis about 1898, I think, and I have been following it through pretty thoroughly ever since, and in addition to the ordinary work in the laboratory on test matters I had an exhaust gas apparatus rigged up, and when running my car I have been able to take samples under all the different conditions of road running using the ordinary Orsat apparatus. I hang it up with rubber, so it does not get too dirty in running the car, and have one man drive the car and the other man draws in a sample by drawing in five or six volumes of about 50 cubic centimeters each through the apparatus, then shutting off, so you get a good average sample, I should think, under the ordinary running of the motor. While drawing in 50 cubic centimeters you would probably have 100 or 200 cylinder explosions, so you get a good sample.

I noticed while driving merely at 20 miles an hour on the road the car would run 300 or 400 yards in drawing the 50 cubic centimeters, and in comparing these analyses in running I had very curious things develop. It was 2 or 3 years before I could understand what they meant. Now I have had to repeat those experiments on the road. The result was not the same as you would get if you had the motor set under load to produce 13 1-2 per cent. CO_2 and 1 to 2 CO and a trifle of free oxygen. You take it out on the road and you will not get those same conditions at all. I took a car and blocked it up on the back axle and put the brake against the rear brake drums and got the road conditions and made a note of the whole range and then took it out on the road without altering the carbureter and tested the thing up thoroughly **and the road conditions were not the same as the practical conditions in the shop. The reason for that seems to be that the jar of the motor affects the level in the carbureter considerably and that affects the mixture somewhat.** The difference in temperature inside the bonnet under different conditions affects the carburetion very much more than is generally understood. Carburetion is affected to the extent of about 15 per cent., as near as I can make it, by 100 degrees variation Fahrenheit. Now those variations occur every 100 degrees quite often, running over the road various times during the same ride. For instance, I ran with a thermometer in the radiator cap when I tried this experiment and got the temperature of the circulating water; and if the circulating water is, say, 120 to 130 degrees running on a level and you start to climb a steep hill, your circulating water will climb up to 160, 180 or even 200, and your exhaust gas analysis will change very materially without altering the carbureter at all. It will immediately become very much richer. It is leaner when it is cold and it is richer when it is hot, and it varies materially. **That is, if one were to give any opinion, your motor heats up when it climbs a hill and your temperature rises in your bonnet and the mixture becomes richer and you get a little more power.** You want a trace of CO in it, and I will explain to you in a moment why that is so; and you want a trace of free oxygen. You will evidently get in running on the road both free oxygen and CO, provided the CO does not exceed .5 per cent. In fact, you can have—under road conditions I frequently had as much as 1.5 and 2 per cent. CO and as much as 2 per cent. or 4 per cent. of free oxygen at the same time; and naturally I thought my apparatus was wrong and devoted a good deal of time to finding out where the trouble was. I spent the whole season fooling with that and could not discover where the trouble was.

The next season, when I got more time to spare with it, I went over it, and found there was no trouble with the apparatus whatever, and still continued to get free oxygen and free hydrogen at the same time. Then I tried some experiments in the shop, where we could observe the exhaust carefully, and I noticed by getting up close to the exhaust pipe and watching the engine when it was running slowly under very heavy loads, and putting a piece of colored glass so I could get right close to the exhaust flame, I noticed that where the flame came out over the port **you would notice a blue flame inside the valve, when you looked up inside. When it passed over the port you would notice it changed to yellow; and you would always notice a difference in color where the gas turned the corner around the valve.** That was noticed particularly where the mixture was imperfect, small globules remained in the air entering the engine.

Now what occurs is that you get your explosion in the cylinder; each individual globule of gasoline in the engine is burned up by the little molecules of oxygen around it as far as they can get at it. They burn off the outside shell of this thing and there is not time enough for them to burn that up. These other molecules of oxygen cannot get inside there and therefore they leave the core of gasoline in there, which is more or less broken up by the heat. The intense heat generated around this gasoline then practically mixes up all the free oxygen and hydrogen and when it explodes over the valve side all these things are stirred up tremendously with the high velocity over here, and then this core gets burned up by the excess of oxygen which is inside.

It first comes through the valve, it gets below the burning point outside the valve, and those things are carried outside through the valve and form free oxygen and free hydrogen and the other compounds. So when you get a very queer analysis like that yon may make up your mind that the gasoline is entering in the form of globules and not in the mixture.

Now it can enter the engine in two ways. Suppose your mixture is either rich or badly mixed inside the carbureter. What occurs is this: the gas rises from the carbureter and is thrown against the outside wall of the intake pipe on the first curve, and after it is condensed against the wall of the intake pipe it falls right along it. Now if you have a four-cylinder engine and an intake pipe of that type you will invariably find that is the solution. But I am sure that the solution of that is because of the uneven mixture in these various solutions. Now if you tap off the explosion gases from these different solutions you will find a difference in the analysis of it. And this will not solve the queer analysis, it will not solve the normal analysis of more or less complete combustion; but they will vary very much. You can get tremendous variation between two solutions run on the same mixture, and it is entirely dne to the centrifugal effect in the intake pipe. As you cannot get an intake pipe without curves you have got a complete mixture at the carbureter. The problem of getting that was one I worked on a good while. The first thing was to bring up hot air, and where you can get hot enough air yon vaporize the thing. So I ran the air up to 1,150 degrees Fahrenheit, tying an electric heater to it to get it practically up to the combustion point of the gasoline. When I mix that hot air in the venturi tnbe, as the air exceeds 800 degrees Fahrenheit, I can get practically a complete mixture, so there would be no story of queer analysis, but the analysis would remain normal; but the amount of oxygen was so much increased by having that air at that temperature that you would have too much air in your intake pipe and it would spread materially and fill your cylinder full, because the friction would increase greatly, so you would cut down your maximum power very greatly. That made it impossible to work that system out, although I tried it and had it in operation for a considerable time.

Then I experimented to get the maximum velocity inside the venturi tube, and got velocities as high as 1,700 or 1,800 feet a minute and ran them singly and in tandem; but the intake pipe turns were very narrow and they could not get aronnd with the intake mixture and made it impossible to work it out. Then there remained to use a combination of both. **You want hot air and a good mixing chamber at the same time to get the proper gas analysis.**

I made glass Venturi tubes and glass intake pipes so I could find out exactly what was going on inside the engine, and I found that with any form of carbureter, I don't care what it is—I don't believe anybody can make a form of carbureter in which when the velocity in the intake tube goes below 5,000 feet a minute you will not get a condensation in here. I have been unable to find any one that would not do it. I do not mean in the intake, I mean in the carbureter itself. You cannot drop below 5,000. To get the best results you should have about 15,000. **The object of the whole problem is to design a carbureter to give you a high velocity in there and at the same time do it with the least expenditure of power, and that has been done in several commercial forms. There are several of them that are pretty good.**

Now the object I had was to find out what was theoretically possible in the engine. In the first place, how little gasoline can you run with, how many cubic inches of cylinder capacity can you make per pound? That is the question under the very best possible conditions that are obtainable. I worked it out with light conditions, the engine running idle and on the road and found there was very little difference. I found the engine would make very little difference, and use the same amount running idle as under 10 per cent. load. You can run down to the same point, run the oxygen up and then run it down to a certain point in decreasing the volume in the cylinder. I found that you could run down to one-fourth cylinder volume; and when I got below full cylinder, to one-fourth cylinder full, then I would begin to get a mixture that is too lean, and on running your oxygen up to 6 per cent. and your CO np to 8 per cent. you can get a maximum lean mixture that you can run on, but yon would not run as well as you would with the oxygen around 12 and the CO around 2. Then by running the volume down so that it will take in as little of the stuff as possible you get the very best that was obtainable.

Then taking these conditions out on the road I used them as a standard for what is obtainable on the oxygen. For instance, I figured out the gearing, the number of cubic inches of cylinder capacity per mile; then I know theoretically what it ought to take to run that car, and then I find out what the car is really doing under ordinary road conditions, and in that way you can tell whether the carbureter is really any good or not. And, as far as I know, that is the only way to tell; and until I got those facts I could not really test the carbureter and could not tell what I got. I would get 10 miles on one and 15 miles on another, and I know that when I got 15 I did not know whether I was getting all it was giving or not, and whether I could get more yet; and having those facts in mind I do not think that you can get any more running an engine under load on the road than yon can get running it idle, **but you can run a car at 20 miles an hour on the level, on a macadam road, with exactly the same amount of gasoline per cubic inch of cylinder capacity that you can run it idle.** For instance, the car I have now, the theoretical amount it should take is 15.2 miles to the gallon, running straightaway, and I operated it last summer in Europe at 14 miles during the whole season, and very often operated it for a whole day's run as high as 15 miles; and if I ran long grades and coasted down high grades, for instance, around Central Park, I can drive around Central Park, New York, within the theoretical amount; that is, I can drive around Central Park with less gasoline than I can run the engine idle, but that is upgrade, long grades and shutting off the motor.

Now, what are the best mixtures? I found them afterwards; that would be approximately the mixture and maximum efficiency of power.

For greatest power efficiency on the road the following analysis is desirable:

CO_2	13.5 per cent.
O	.1 per cent.
CO	.2 to .3 per cent.

The maximum efficiency mixture gives an exhaust analysis as follows:

CO_2	12.5 per cent.
O	2. per cent.
CO	0.

In the best power mixture, sometimes, CO can run even a little higher than that given. The reason that you have CO is because you cannot get a perfect mixture in your intake pipe and carbureter, and if you do get a perfect mixture and the motor is throttled down a little you have an explosion here after it passes the throttle, and you have a suction on the intake pipe. If you have a suction in the mixture in the carbureter it need not be in the intake pipe, and that will increase the temperature. And if it was right when it passed that carbureter you would have a vacuum caused there by the suction. For instance, I have a suction on the intake pipe and it operates on the road about 15 inches of mercury suction running at 20 miles an hour, and running idle it runs from 3 to 4 inches of mercury suction, and when it is pulling, say, a 5 per cent. grade, with full load of passengers at high speed, it will run probably 10 inches of mercury, and when I cut down the full power of the motor, driving, say, 10 miles an hour, at full engine power, the suction will drop to 2 inches.

I tried a very long series of experiments on the subject to find out what the effect of the suction on the intake pipe was, both in gas analysis and on the power, and I found, roughly, about 1 inch of mercury suction would affect the car 10 per cent. That is approximately the loss; that is about 3 inches of mercury suction. So if you could cut it down to nothing you would increase your power by 30 per cent. That is on three or four different engines, and I suppose they are engines that would vary on account of friction in the pipe. If you do not have a high suction you do not have high speed. You do not have 5,000 feet there unless you have a mercury suction to draw it through, and that comes from the centrifugal blower. And I think in that way that you can increase your power over 30 per cent. for any commercial vehicle to-day; but then your heat would go so high on your cylinders that it would not work. In my tests I used two cars, a four-cylinder that averaged 21 to 24 miles per gallon and a six that averaged 14.5 to 15. You cannot make a carbureter which will start the engine cold and be running satisfactorily when the engine is running hot. That is, there is a difference of 15 per cent. in gasoline mixtures between cold and hot air. You have got to compensate that in some way, and the way the ordinary man compensates for it is by setting the thing so it runs too rich all the time.

Regarding the relative merits of rough and smooth intake passages I found at my works I gained three-quarters of a mile sometimes when I made the thing rough. In other words, I get a better mixture of the gasoline thrown against the walls of the rough surface than with the smooth, and the exhaust gas analysis showed up much better with the rough intake manifold. As far as I am concerned, I want them just as rough as I can get them, but not with sharp corners, without any interruptions to the flow of the gases. But the rougher the surface is the better you are off, the better mixture you get, the better exhaust analysis you get.

The best method for breaking up the globules in an intake manifold is a series of plates, perforated with holes, five or six or seven of them. The gasoline will drop over the top of the plate and drop through the holes, and the draft pouring up through the holes tears the gas all to pieces on the edge of the holes. That is much better than by suction and with the screen. It breaks it up better and offers much less resistance. It is better than anything on the market with screw propellers and so on.

The question of properly filling the combustion chamber is an important one in carburetion. I had a truck engine which was operating very satisfactorily. The crank over the compression was exactly 78 pounds. In the revising of the same engine I changed the valves, changed the lift and the position of the cams, altered the intake pipe and carbureter resistance and left the compression and speed the same. When I first put the engine on the blocks it knocked very badly at about 700 or 800 revolutions, carrying the full load, and after working with it a few days I found out that the compression was too high. So I lowered the compression and had 72 pounds crank over and the knocks disappeared. In other words, the old engine did not fill the cylinders full. The design was such that it did not get the full 78 pounds running. After I got at it I went over it and tested it and I found only two points it knocked, one was 66 and the other was 76. When it was 76 it was knocking and when I got down to 72 it would not knock. In other words, about 72 pounds is about all you can safely carry.

But the advantage of putting gas in under compression would be only at high speed. You can design an engine up to 1,000 revolutions, which will practically fill itself full. But if you design one up to 12,000 your friction on the intake pipe is going to increase by the square of the speed and decrease with the square of the volume. If you have one of 72 pounds up to 2,000 revolutions, if you get up to 1,600 you would probably be down to 60 pounds on your volumetric efficiency.

Edward R. Hewitt.

Discussing Three-Point Suspension

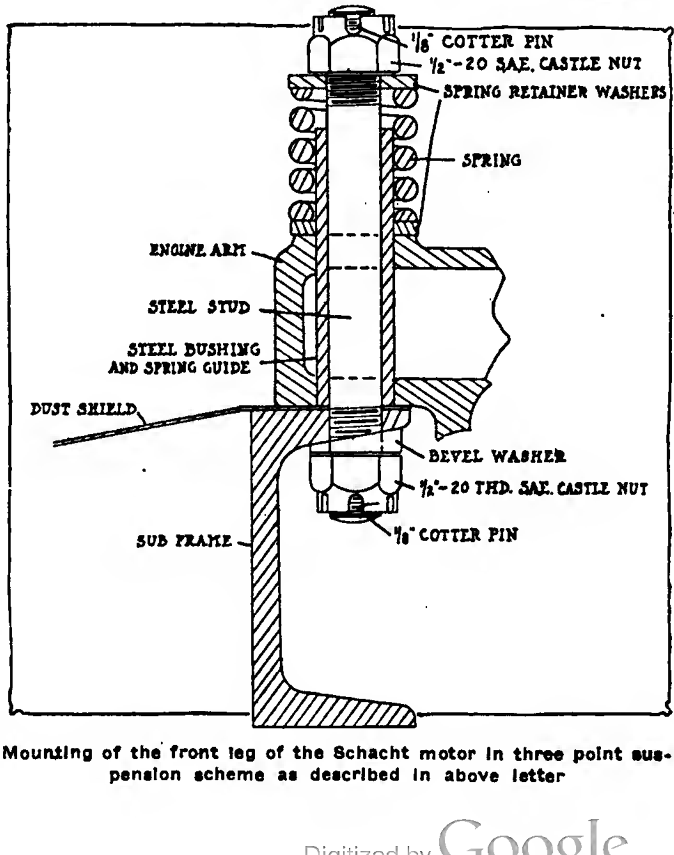
Boston, Mass.—Editor The Automobile:—In regard to the three-point vs. four-point suspension controversy which I have noted from time to time in your Engineer's Forum columns, I would like to say that I believe many of the so-called three-point suspensions are in reality four-point suspensions. The reason for that is the fact that the single member has often two points of support which though close together are still wide enough apart to form four members. This construction cannot by any stretch of the imagination be called a three-point suspension and is bad from a standpoint of rigidity as well as flexibility. I am a firm believer in the three-point suspension when it is really such and not a misnamed four-point affair. I sincerely trust discussion on this subject will go on as I believe there still remains a great amount to be said and as far as I have seen I do not believe the heart of the matter has as yet been reached.

A. P. Stein.

New York City—Editor The Automobile:—With further reference to the article in issue of December 19, 1912, Automobile, page 1277, "3-point vs. 4-point," etc., would advise that we have had quite a little success in tests of the spring under the engine stud nut.

It has occurred to the writer that it might be of interest to the readers as to how this construction was arranged and we are enclosing a sketch, which is reproduced in the illustration shown at the bottom of this page. We are placing this at the two front legs of engine only and the action is wonderful. It certainly relieves the motor and frame of heavy twists and strains and we feel quite certain that we are to reap some benefits from this type of construction.

A. Schimpff



Mounting of the front leg of the Schacht motor in three point suspension scheme as described in above letter

Electric Cranking and Lighting

Part IV.

Telling the Story of the Storage Battery Required for the Electric System of a Car and Outlining Its Care and Construction—Calculating Candlepower and Correct Wiring

Subject Digest

¶ The lighting battery is not capable of taking care of the sudden load imposed by the cranking motor. The ignition battery is incapable of handling lighting or starting, therefore the batteries must be redesigned when a cranking system is fitted.

¶ The principal difference between batteries designed to give a slow discharge and those intended for a sudden and rapid current flow is in the plates. For slow discharge a few thick plates are used, for sudden discharge many thin plates.

¶ The electric cranking motor is generally more efficient in higher voltages, but the weight of a 6-volt storage battery is less for a given capacity than any other. With an increase in battery weight, there is an increase in cost.

¶ One of the first duties of a user of a storage battery is to see that it is kept filled with water. This means attention at least once a month. The batteries for this reason must be mounted accessibly.

STORAGE batteries used for lighting, igniting and starting while they resemble one another externally are quite different in their internal construction. This particularly applies to batteries which have to be used in conjunction with an electric cranking motor on an automobile.

The lighting battery which has been extensively used during the past two seasons is very similar to the one which is now supplied for electric starting. It lacks capacity more than anything else to make it applicable to the latter duty. On the other hand the ignition battery is inapplicable to either lighting or starting duty. Just as the lighting battery lacks capacity for starting purposes so does the one used for ignition purposes only that the latter is lacking in a greater degree than the former.

For example just compare the capacity of three batteries, one for starting, one for lighting and one for igniting purposes. If we make the comparison with 6-volt batteries the capacity will then depend only on the number of amperes discharged continuously. A starting battery is rated at 100-ampere-hour capacity when it will discharge at the rate of 5 amperes for 20 hours continuously. A lighting battery with a rating of 80 ampere-hours capacity will give 5 amperes for 16 hours continuously. The ignition battery rated at 40 ampere-hour capacity will give only 0.5 ampere but will deliver this for 80 hours continuously. For lighting, a battery should always be able to deliver at least 5 amperes continuously for 10 hours. This would easily be accomplished by the lighting and starting battery but would be impossible with the ignition battery. The latter is not designed to give such a high rate of discharge.

There is little difference in the construction of lighting and and starting batteries. The greatest difference in these is the capacity. Capacity in this case only means a greater factor of safety. Therefore, it may be said, that the construction of the ignition battery prohibits its use for starting purposes but that a large lighting battery may be used for starting because it is of the same general construction as that generally used with electric cranking motors.

Difference in Battery Construction

The principal difference between batteries designed to give a slow discharge and a quick discharge is found in the plates, the ignition type of battery having a few thick plates while the lighting and cranking battery has many thin plates.

The essential requirement for rapid discharging is large plate area per ampere discharged. This is just what is accomplished by the use of thin plates, for when two plates replace one the effective area is doubled.

In practice this doubling of area is accompanied by the reduction in thickness of plate in order to keep the size of the battery about the same as before. It also has an important bearing on the discharge rate which may be obtained from a battery and also the capacity or length of time that the battery will give this discharge. The gain is due to the shortening of the distance which the electrolyte has to travel to reach the center of the plate.

The difficulty which accompanies the thin plate is to prevent the active material from falling out of the grids during rapid charging. This in the past has been one of the weaknesses of this construction. It has been largely overcome in the latest batteries of the thin plate type. But less fear need be had of such difficulties in the average electric lighting and starting system as applied to automobiles because the rate at which the batteries are usually charged is far under that which would be likely to cause disintegration of the active material and the grids. Hence, the automobile user enjoys the advantages of high discharge rates, inherent in the thin plate battery and at the same time is insured against short battery life whih comes from too rapid charging, a common occurrence in power house work.

A brief examination of the battery construction will explain why the thin plate is so much more efficient when a high discharge rate is desired. The battery plate or grid pasted with active material can be compared to a sponge. In order that the electrical discharge may take place it is necessary to have the sulphuric acid solution, H_2SO_4, or the electrolyte throughout the plate just as the water fills the pores of the sponge. As the electrical discharge takes place the sulphuric acid in the interstices of the plate becomes changed to water and hence diluted. With this dilution of the electrolyte the output of the battery will fall off. If the discharge is stopped for a short time the acid will penetrate into the plate and bring up the specific gravity again to normal and the same high rate of discharge may be continued until the renewed solution is diluted.

What this has to do with thin plates will now be considered. Note the section of the two plates, A and B, in Fig. 2. The distance from the center of the plate to the outside in the case of B is twice the distance of that in B, that is, the distance, L, is twice the distance, D. The time that it takes the acid to penetrate to the center of the plate A will probably be twice as long as is the case with B. In short the replacement of the electrolyte is about twice as fast in B as in the A and so that a much higher rate of discharge can be taken from B without the dilution of the electrolyte affecting it. This is the secret of the starting battery now used.

For a short time or until the electrolyte is diluted so as to bring down the output, a very high discharge can be obtained from almost any battery. To illustrate this a very interesting experiment was performed many times a day at the booth of the Electric Storage Battery Company, during the New York shows. The apparatus is shown in Fig. 4. It consisted of a single cell taken from a 3-cell, 6-volt starting and lighting battery. It therefore, gave 2 volts approximately. This was connected up across a shunt so that the amperes used could be measured with an ammeter. A switch was also placed in the circuit and very large wires were used everywhere in order to reduce the loss of voltage and current. Across two binding posts in the circuit was clamped an ordinary eight penny wire nail. This was about 1-8 inch in diameter. When the switch was closed and the circuit completed, through the wire nail the latter began to heat up immediately. To do this about 1,000 amperes were demanded from the battery, as the ammeter faithfully recorded. That so heavy a discharge could be obtained from so small a battery was surprising to many people. It proved that the ability of any electric cranking system depends on the size of the cranking motor, the gear ratio employed and the gauge of the wire connecting the motor, the gear ratio employed and the gauge of the wire connecting the motor and battery. It also proved that the only limit to the discharge rate in any system is the resistance of the outside circuit and the voltage of the battery.

Capacity of Storage Batteries

The rate at which a battery may be discharged is almost without limit as shown by the preceding illustration. The length of time which a battery will keep this discharge rate up is another question. This depends upon two factors: first, the number of plates in the battery and also upon the temperature of the battery. The capacity is also dependent upon the rate at which the battery is discharged.

The effect of the temperature upon the capacity of the battery is quite important. To better show the effect of a curve, Fig. 8 has been given. From this it will be seen that the increase in temperature above 80 degrees Fahrenheit has little effect upon the battery. On the contrary, when the temperature falls below 70 degrees the capacity of the battery steadily falls off. This decrease in efficiency of the battery is in direct proportion to the drop in the mercury. At 20 degrees below zero it will be noted that the per cent. of rated capacity is about 33 or the battery has only about one-third its normal capacity.

The next consideration of importance is the rate at which a battery is discharged. The number of ampere-hours which may be obtained from any battery varies directly as the number of hours taken to discharge that battery. In other words the slower we take the electricity from the battery the longer we can continue to take it. Also the number of ampere hours will be greater.

Take some specific examples to illustrate this point: first, note the curve, Fig. 11, which gives the Percentage of Rated Capacity, for any number of Hours Discharge Rate. This shows how rapidly the capacity of the battery falls off as the time in which it is fully discharged, is reduced. Also that if a battery is discharged at a rate slower than that at which it is rated, the capacity of that battery is much increased.

In Fig. 1 a comparison is made between the capacity of various batteries and the time each will burn under varying loads. A 6-volt battery is used in each case: one, of 80 ampere-hour capacity; another of 100 ampere-hour capacity and a third of 120 ampere-hour capacity. The lighting system is representative of that found on many small electrically lighted and cranked cars. The tail light gives 2 candlepower, the sides, 3 candlepower each and the headlights 21 candlepower each. This gives a total of 8 candlepower when the sides and tail are burning. With only the head and tail lights burning 44 candlepower is obtained and with all lamps lighted 50 candlepower is produced. The current required in each case is respectively, 1.68, 7.42 and 8.68 amperes.

With these lamp loads the 80 ampere-hour battery will keep

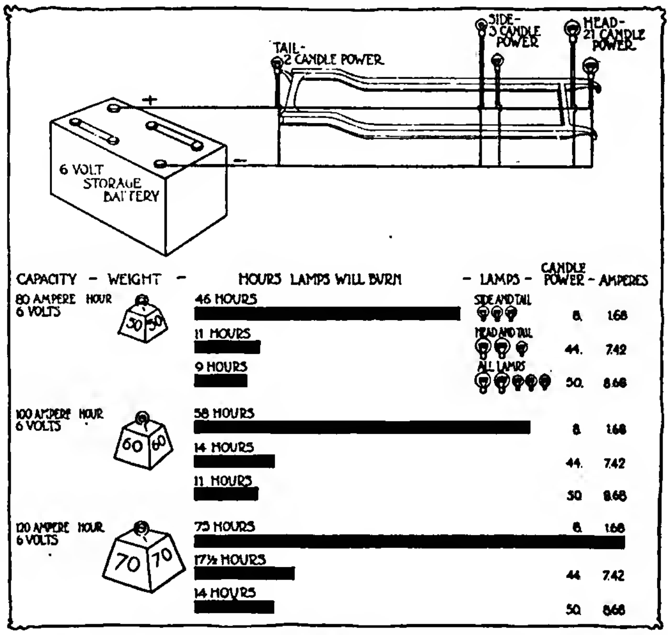


Fig. 1—Showing how long the lamps will burn with batteries of 80, 100 and 120 ampere-hours capacity

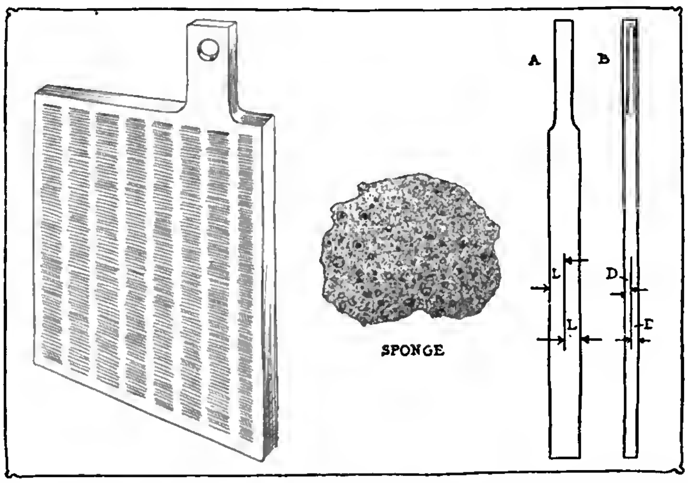


Fig. 2—Comparison of grid and a sponge, thick and thin plates

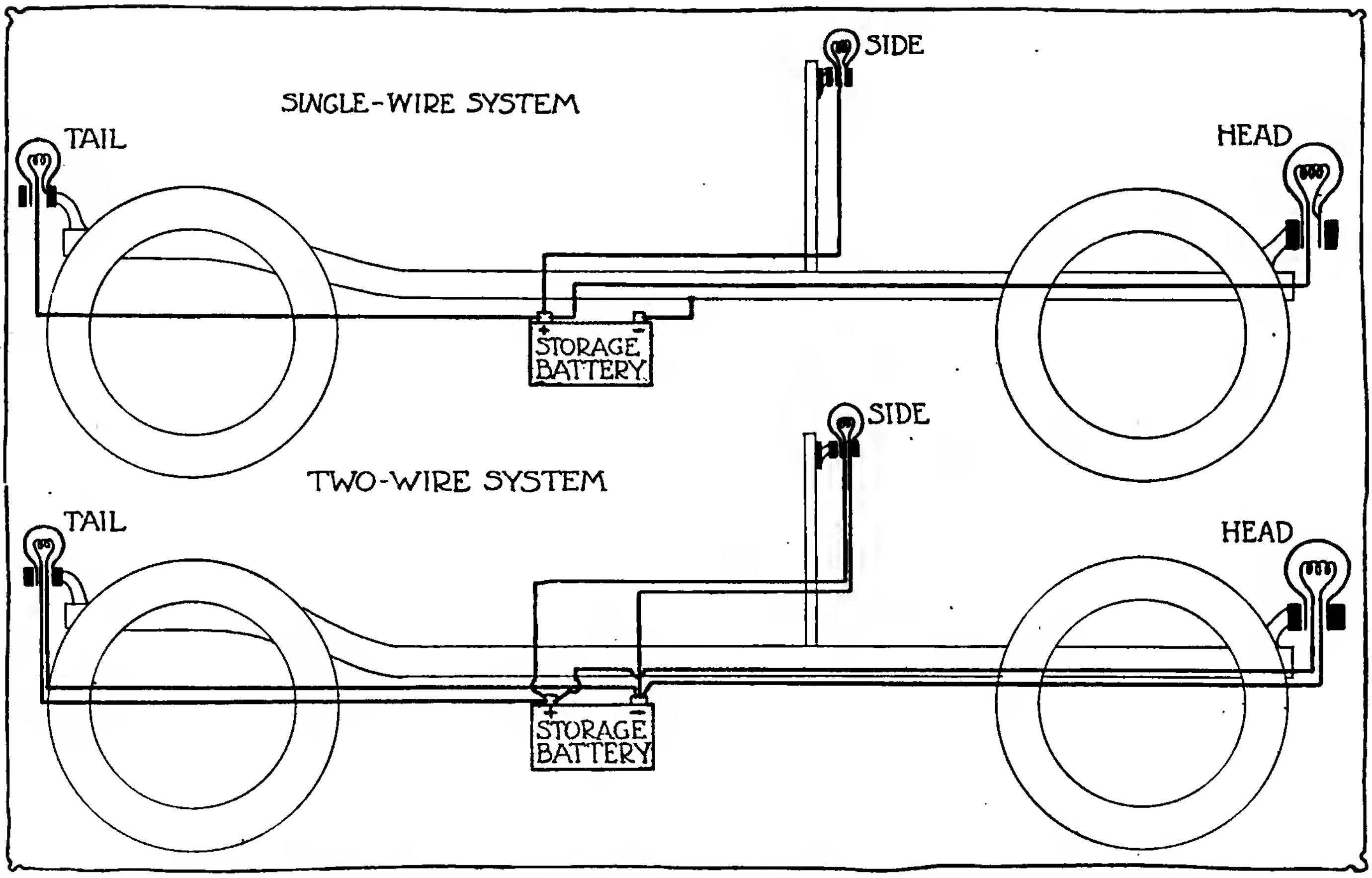


Fig. 3—Diagrammatic layout of the single-wire system as compared with the two-wire system of lighting

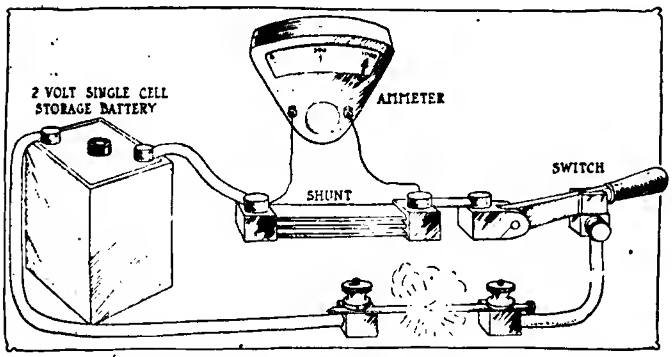


Fig. 4—Apparatus for rapid exhaustion of a cell

the lamps burning continuously for the following periods of time respectively; 46 hours, 11 hours and 9 hours. In short, the battery will keep the side and tail lamps lit five times as long as it will furnish current for all the lamps. This is very important to note because it means that the turning off of the head lamps when you stop the car will greatly increase the life of the battery and reduce the work it will have to do.

For comparison peruse the table below which gives the number of hours which each battery will burn the lamps.

Voltage	Battery Capacity	Hours Lamps will Burn Continuously	Lamps	Amperes Drawn
6	80	46	Side and tail	1.68
		11	Head and tail	7.42
		9	All lamps	8.68
6	100	58	Side and tail	
		14	Head and tail	
		11	All lamps	
6	120	75	Side and tail	
		17.5	Head and tail	
		14	All lamps	

Comparative Weights of Batteries

There is serious consideration of the question of voltage in lighting and cranking batteries. That which is most commonly used has 6 volts, although batteries which deliver, 12, 16 and 18 volts are also used to some extent. The 24-volt system is not mentioned here because it applies to the starting operation of two or three systems only and does not affect the lighting system at all. The lighting system in all 24-volt starting systems will be found to be only 6 volts. Where the higher voltage is used it is determined not by the lighting conditions but by the electric cranking motor which is usually more efficient under higher voltage. Higher voltage also means less loss of power or voltage head in transmitting the electricity from the battery to the electric motor. This brief digression is only to explain why a higher voltage than 6 is frequently used.

The weight of a 6-volt battery is less for a given capacity than any other. This is clearly shown in the curves which are plotted in Fig. 7. These curves were obtained from data on the weights of batteries furnished by one of the largest producers of lead plate batteries used for electric lighting and cranking. The solid curves show the weight of batteries in each of the four voltage systems, 6, 12, 16 and 18. The capacity being given with the weight in each case. The dotted curves, A, B and C give the direct comparison of the different size of batteries with the 6-volt ones. The curves, A, B and C being respectively for 12, 16 and 18-volt batteries. From this we can make a direct comparison. Take the 160 ampere-hour capacity. The weights will be as follows:

Voltage	Weight	Percentage Greater Weight. 6-Volt Battery Assumed as 100 Per Cent.
6	80	0
12	95	18.75
16	103	28.75
18	122	52.50

With the increase in weight there is a corresponding increase in cost of the battery. Hence both from the standpoint of cost and extra weight the higher voltage battery it seems would be less likely to be standard. As it is the 6-volt battery is used more widely than any other and the above comparison is really an explanation of this trend.

The method of obtaining the curves A, B and C should be stated. It was assumed that the energy from a 12-volt battery was the same as from a 6-volt battery. If so, a 12-volt battery of 35 ampere-hour capacity is equivalent to a 6-volt battery of 70 ampere-hour capacity. In other words divide the voltage by 6 and multiply the ampere-hour rating by the quotient so obtained. This was done in each case.

Battery Under Operating Conditions

In order to illustrate the conditions of battery operation when starting the curves, Fig. 10. are given. These were taken from a 6-cylinder 4.5 by 5.5 inch motor. They show the load amperes required to turn this large motor over for 34 minutes continuously. They show in addition how the voltage of the battery is affected, how the temperature of the battery rises, how the specific gravity of the electrolyte falls off and the sudden drop in the revolutions per minute at the latter part of the run.

How closely the speed of the cranking motor and also that of the gasoline engine depends upon the voltage of the system can be very clearly noticed. The voltage curve and the revolution per minute curves are almost parallel to one another.

As a battery is discharged the electrolyte is gradually diluted and the specific gravity drops steadily. This is very nicely shown by the specific gravity curve in Fig. 10.

The temperature of any battery is raised quite a little during any continuous discharge of this character. This it is stated by different authorities will help to pull up the efficiency of a battery in cold weather if that is found necessary. But as was proven by the experiment wherein 1,000 amperes were drawn from a 2-volt cell, little difficulty will be found in getting enough amperes into the electric motor even under the worst temperature conditions. In connection with this it should be mentioned that the average 6-volt starting motor if locked so that it cannot start up will seldom draw more than 400 to 500 amperes. This is the condition in practice where the motor is frozen and can not be turned. This is enough to prove that other conditions rather than lack of current are going to prevent an electric cranker from operating in cold weather.

Standard Electric Lamp Sizes

The size of the lamps used in the systems now prevailing does not vary greatly. The 6, 8, and 12-volt lamps being interchangeable in the sockets provided, but a 6-volt lamp cannot be put in a 12-volt circuit. Four styles of lamps are furnished, these being shown full size in Fig. 6. The lamps all have the same size of Ediswan socket. The diameter of the bulb varying in each case. Another point which is not generally known is that the size of the bulb is no criterion of the candlepower of the lamps within a certain range. For example the 2.0625-inch lamp may be 24, 21, 18 or 15 candlepower, the only difference being in the size of the filament. In buying lamps the maker's stamp would be on the outside and the purchaser should carefully see that this is correct.

Two difficulties arise from not using the right size of lamp: first, you do not have uniform lighting due to the fact that the new lamp is of higher or lower candlepower than the one it replaces and second it may take more current than the old lamp,

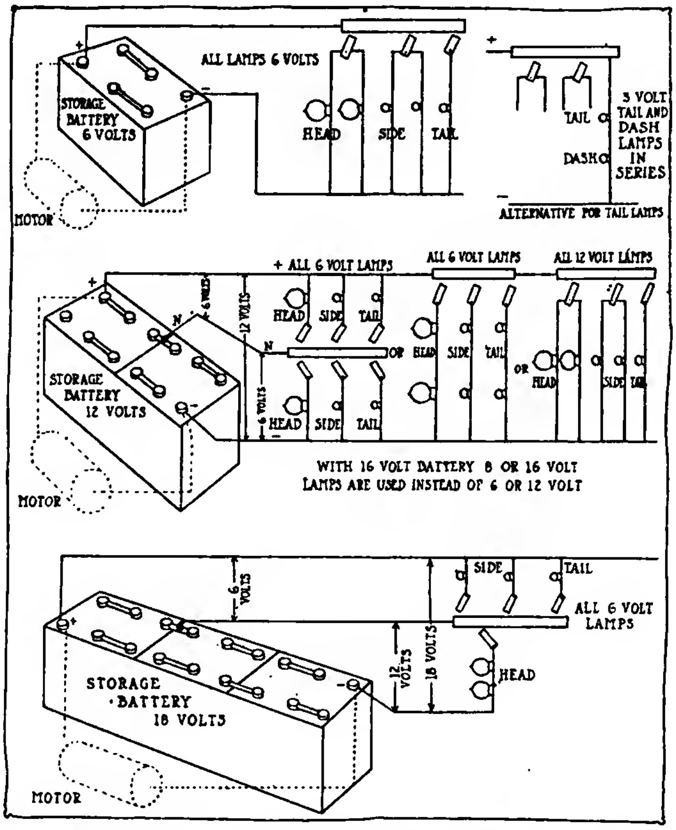


Fig. 5—Method of wiring lamps and motor on a 6, 12 and 18-volt storage battery

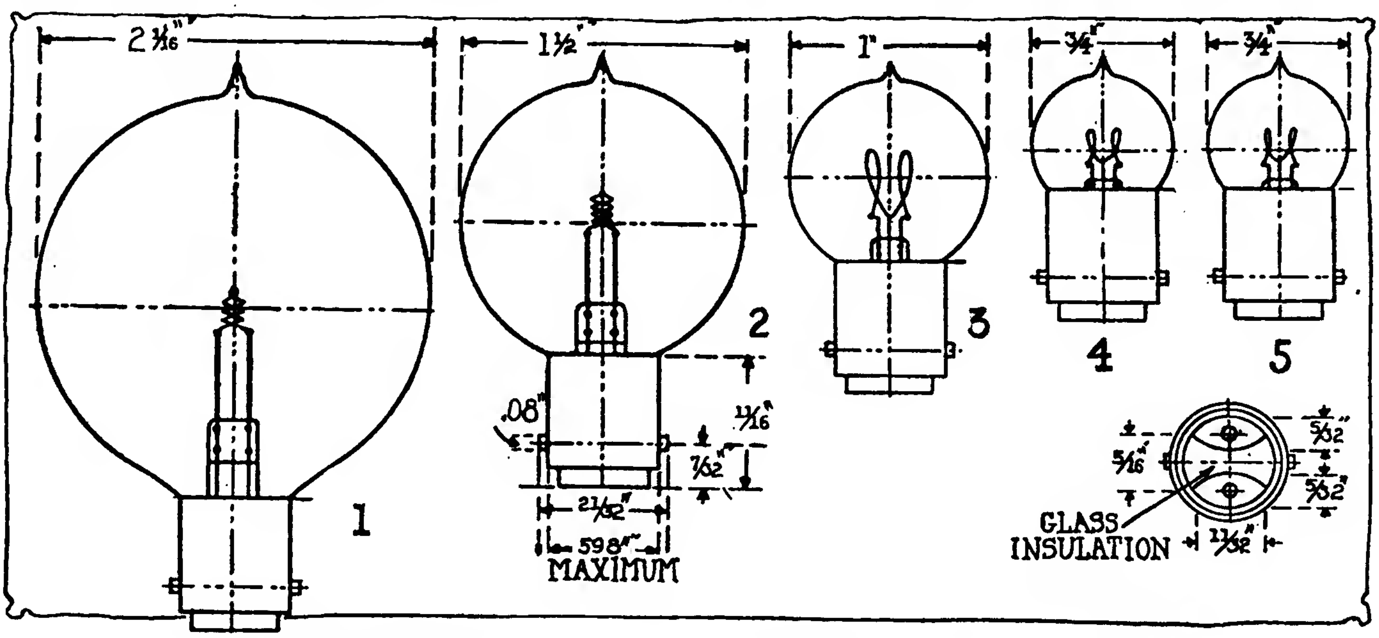


Fig. 6—Actual size of lamps now in use, showing the full size dimensions of the bulb and sockets

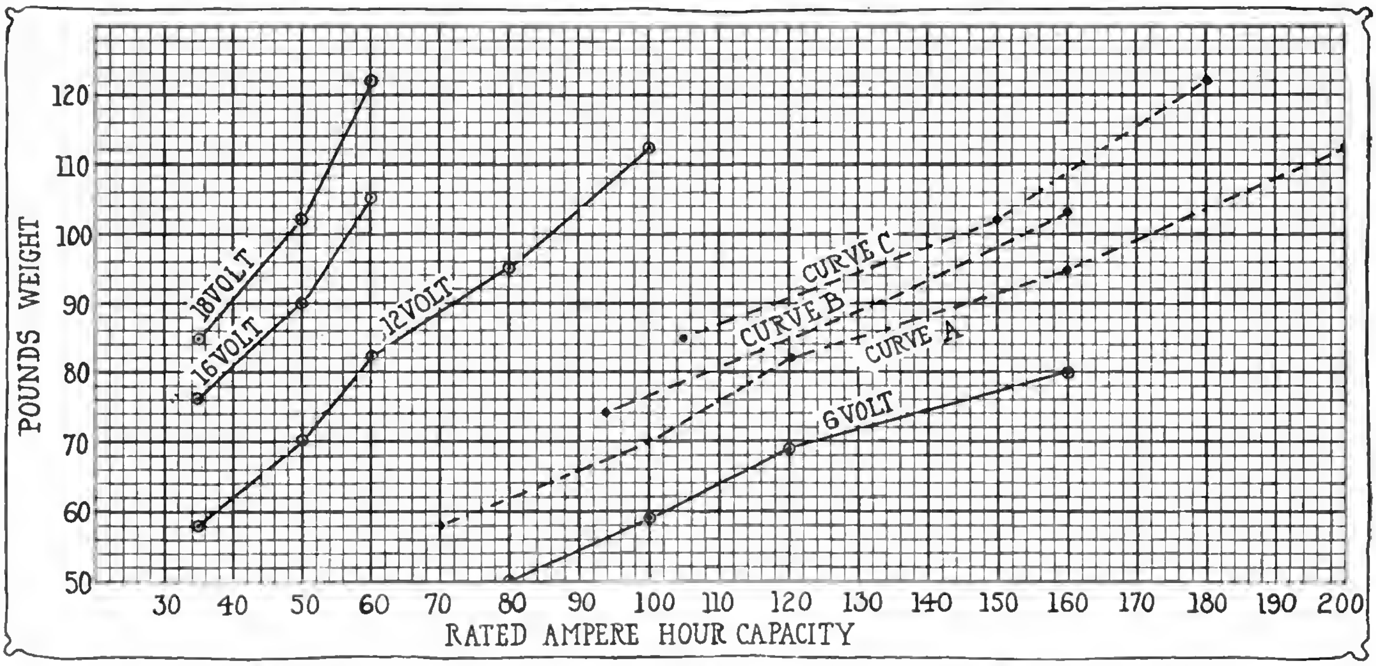


Fig. 7—Capacity against weight, showing the number of ampere hours capacity in 6, 12, 16 and 18-volt batteries per pound

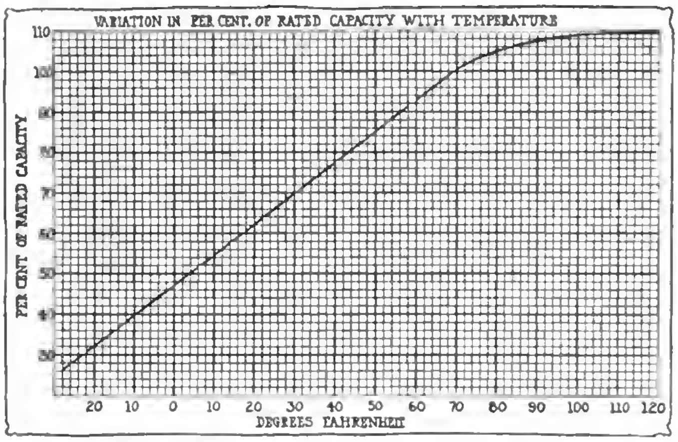


Fig. 8—Percentage of rated capacity secured at different temperatures

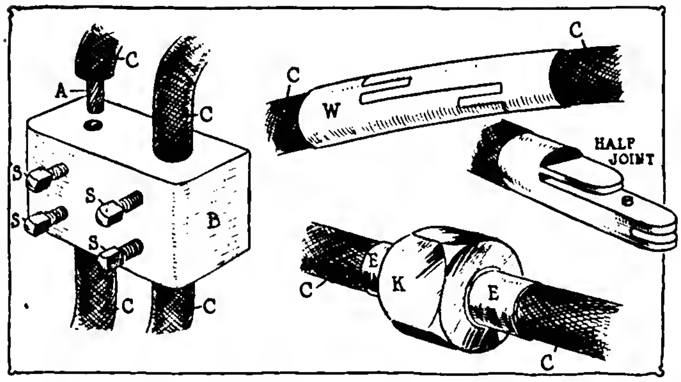


Fig. 9—Types of connections and joints used on heavy wires

provided it is of higher candlepower, in which case it may take more current than that for which the manufacturer designed the system. In the latter case the drain on both the battery and the over demand on the generator may ruin your battery through no fault in the design of the system.

Figuring Candle Power of Lamps

A very simple rule for figuring out the amperes taken by the lamps is as follows: Divide the candlepower by the voltage of the system. This only applies to the lamps giving more than 9 candlepower. For example take a 21-candlepower bulb. This will take 21 divided by 6, giving the result of 3.5 amperes.

Conversely you can judge very closely the candlepower of a new lamp after purchasing it if you will measure the amperes which it takes to burn it. The table which is given here will assist you in finding out. The easiest way is to turn off all lamps except the one which you want to test. Do not have the motor running. The ammeter with which your system is probably supplied will then register several amperes on the discharge side. This reading is the amperes which the lamp takes. To turn the other lamps off you only need to unfasten them in their sockets. A test like this is not difficult and is frequently very valuable as it prevents your using too large bulbs in your system.

Methods of Wiring Lights

Three methods of wiring are most in practice. In these it will be noted that the systems, whatever their voltage for charging may be, try to so arrange their wiring that 6-volt lamps may be used by the customer. This is due probably to the fact that 6-volt battery lighting systems have been used for some time and that 6-volt lamps can be obtained so much more easily than any others. Other reasons for the 6-volt system were given in connection with batteries. Fig. 5 has been prepared to compare these systems graphically and as simply as possible. Note that the 6-24-volt system used by some manufacturers is not shown here because in that system the lighting is all 6-volt and comes under the condition shown first in Fig. 5.

Treating each system briefly we find the following novelty in the 6-volt system. The standard wiring is shown in the first part of the cut. All the lamps are in parallel or across the line. One switch throws both headlights on, likewise only one switch is used for the side lamps. This is common practice on most cars although some provide a separate switch for each side lamp. By so doing the operator is permitted to leave the car standing at the curb with only one of the side lamps and the tail burning. This permits a slight economy in electricity.

The novelty in the straight 6-volt system is in connecting up the dash or speedometer light in series with the tail lamp. By so doing the operator is warned instantly by the extinguishing of the dash lamp if the tail lamp burns out. This also works vice versa and might force the operator to drive home without either tail or dash lamp. Where the tail lamp is independent and it burns out another bulb taken anywhere in the car may be put in place of the extinct bulb. This is not true of the two-lamp system mentioned first. In that the lamps are in series across a 6-volt circuit so that it is necessary to use 3-volt lamps. If one of these burns out a 6-volt lamp will not replace it very well. It, however, only means that a 3-volt lamp must always be carried in reserve with this system.

The 12 and 16-volt systems are similar in all respects to one another except in the voltage and the number of cells possessed by each, the 16-volt battery having 8 instead of 6 cells. There are three possible ways of connecting up this system to the lamps: By the three-wire system with all lamps in parallel and using 6 volts; second, by putting 6-volt lamps in series across the line or by using 12-volt lamps. Note that in the above discussion 8 may be substituted for 6 and 16 for 12 volts. The only difficulty with the series connection of the lamps is that if one of the two burn out the other one goes also. With the parallel wiring each lamp is independent of the other and the burning out of one has no effect whatever on the other.

The 18-volt battery is used on only one lighting and cranking system. The connections are very simple. The small lamps are in multiple across one-third of the battery and operate at 6 volts. The headlights are on the other two-thirds of the battery which gives 12 volts, but as the lamps are connected in series they are ordinary 6-volt bulbs.

When the battery is divided as in the case of the 18-volt system or as in the first example of the 12-volt system it is very important that the current drawn from both sides of the battery be equal. For example, the 12-battery has one headlight burning on one-half the battery and the head on the other half. This gives perfect balance but it should be observed that if either one of these lamps is burned out and is not replaced for a considerable period, the battery will be rather unbalanced. For this reason in any system where lights are connected to the battery in this fashion it is especially important to replace a burned out bulb as soon as possible. This of course, holds true in any system, but more especially to this particular combination.

Single vs. Two-Wire System

A greatly mooted question at the present time is whether to use the two- or single-wire wiring system. Both have their champions and their points of superiority. The greatest point in favor of the single-wire system is the saving which it effects in the wire. The connectors used are not those which are shown in the cut of the bulbs, Fig. 6. In the lamps used in the single-wire system one side of the filament is grounded to the base of the lamp and the other electrode is in the center of the plug. The idea of the two systems is diagrammatically represented in Fig. 3.

The two-wire system is the most used one today and for that reason is most standard. However, one cannot overlook the single-wire system because it has decided merits and only needs support from the lamp and connector manufacturers to become more popular.

Couplings for Motor Leads

The wires from the battery to the electric cranking motor have to be very large especially in the 6-volt system in order to keep down the resistance. On this account there is some difficulty in making connections with them. As the current carried is very high, often reaching 300 amperes, it is important that these terminals be burned onto the battery and sweated into the switches, or other connecting points. In Fig. 11 some characteristic connectors used for this purpose are shown. Binding post connectors cannot be used because the wire used is too big. Take No. 00, very commonly used, and it will be found that it measures 0.4 inches in diameter over the copper strands, not over the insulation.

One method of connecting this is to remove the insulation from the wire. Clean and tin the ends thus uncovered and dip the end into molten solder. When this end is put into the hole of a junction box, B, and the set screw, S, brought down against it, perfect contact will obtain. This joint is far superior to one obtained by a solid copper wire in a junction box of this kind because the set screw squeezes into the soft soldered strands of the copper and will hardly work loose under any conditions.

The Westinghouse joint, W, is another one which is very neat and clean as well as serviceable. When it is connected it is protected by slipping a rubber tube over it and taping the ends down to prevent moisture working inside. The joint is exactly like an air brake hose coupling and because of the angle through which it is necessary to bend it in unfastening some difficulty may be experienced in installing it on some cars.

Every factory making automobiles has pipe couplings for their gasoline, oil lines, etc. These can very easily be used to good advantage as connectors for the main feed wires. They are very easy to handle in a small space. In Fig. 11 one of these is shown at K. The two halves of the coupling, B and E, have the ends of the wires, C and C, sweated into them. This coupling on account of the edges presented coupling must be well protected, otherwise it will soon chafe the insulation off and cause a short circuit.

Some Battery Box Pointers

The battery boxes for housing the battery of the lighting and cranking system must be so placed that it can be easily reached. This is important because one of the first duties of the user of storage batteries is to see that they are filled up with water. This should be looked after monthly. Two locations are now utilized for the battery, one under the tonneau floor between the frame and the propeller shaft; the other a location on the runboard.

The battery boxes in either case must be carefully enameled to prevent the fumes from the sulphuric acid from attacking them. The lining which is usually of wood should be thoroughly boiled in paraffine to protect them and increase their life. The box cannot be ventilated too well. It must also be carefully drained in order to get rid of any electrolyte which may be spilled.

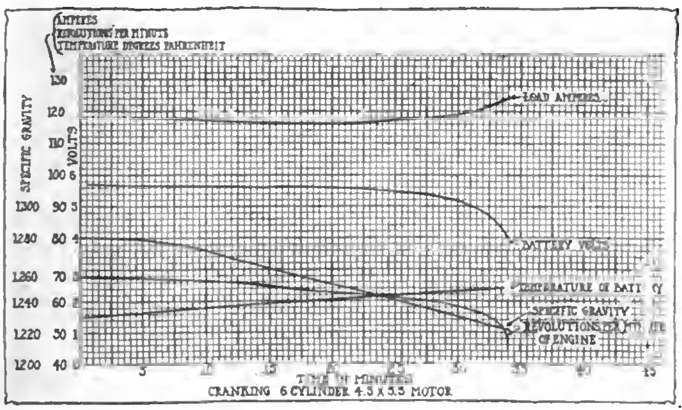


Fig. 10—Showing what happens to a 6-volt battery when cranking a motor

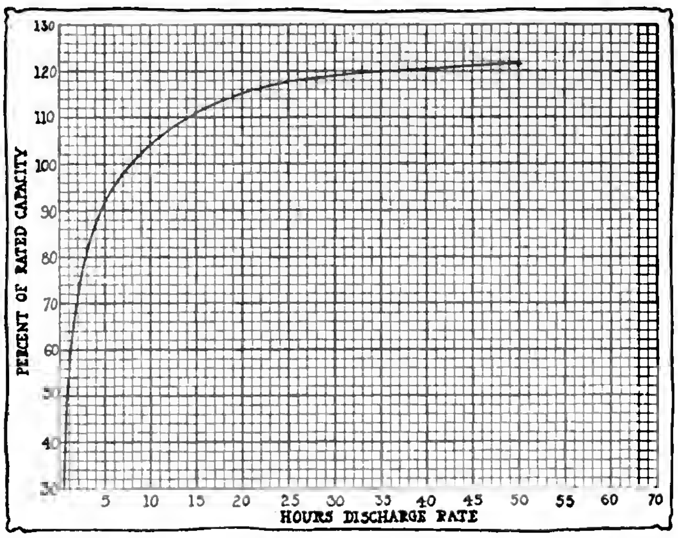


Fig. 11—Percentage of capacity obtained at different discharge rates

Electric Lighting of the Gasoline Car

Electricity now the Predominant Method of Car Illumination—Two Methods of Control in Use, Mechanical and Electrical—Field Strength Regulated by Differential Windings—One Maker Uses Magnetic Shunt

THE widespread adoption of electricity as a means of illumination is one of the noteworthy features of the 1913 cars. With the exception of some of the smaller and cheaper models practically all the cars on view at this year's shows were fitted with electric lighting systems, a clear indication that the present-day motorist is demanding the advantages offered by electricity in this connection. Electricity is an absolutely safe method. By adopting it all danger of exposed flame and lighted match, associated with the older lighting systems is avoided. Its extreme cleanliness and the fact that the lamps can be lighted without making it necessary that the driver leave his seat are also highly important points in its favor.

The chief essential of a satisfactory electric lighting system is that it can provide a uniform current at all times irrespective of the speed of the car, without the need of attention on the part of the user, and the variety of means by which this automatic regulation of current is effected forms an interesting basis of study. Broadly these methods may be divided into two classes: those in which the control is accomplished by mechanical means, i.e., by regulating the speed of the dynamo, and those where the current is maintained at a constant voltage through the electrical control of the generating power of the dynamo.

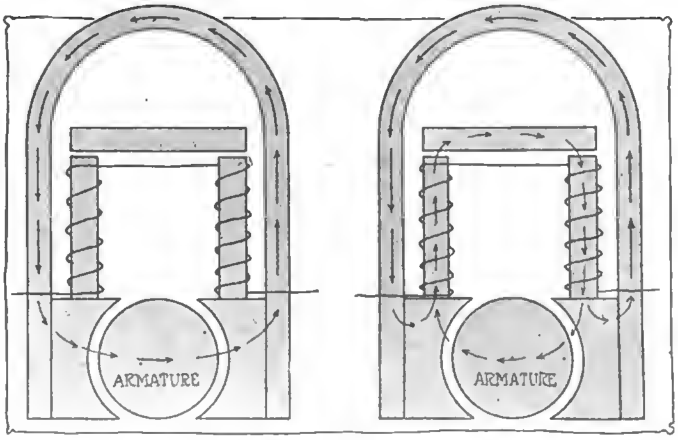


Fig. 1—Magnetic flux diagram of Splitdorf lighting generator

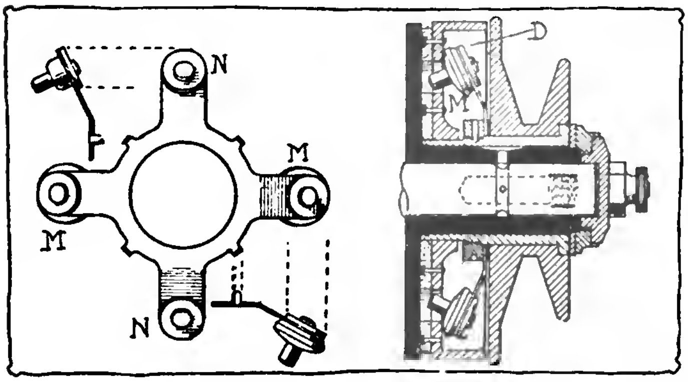


Fig. 2—Centrifugal clutch in Dynalux generator

In the first class some form of centrifugal clutch is the means employed. In the latter class the method generally adopted is that of varying the strength of the field magnets, by the use of a differential coil. This is a field winding so connected as to oppose the main energizing coil, and only comes into action when the generator is running at such a speed that the current developed would have an injurious effect on the lamps and battery. When running slowly the machine can furnish its full output by reason of the unimpeded power of its main field winding.

Dynalux—Controls by Speed

One of the simplest electric lighting systems is that manufactured by the Dean Electric Company, and called the Dynalux System. In this the generator has only two outside terminals from which wires extend directly to the battery without any intervening switches or regulators, all regulation being effected by devices contained within the generator casing.

The generator itself is of the cylindrical type with two poles, but differs from ordinary practice in that the magnet casing is built up from steel stampings clamped between two end rings. The poles form part of the stampings, and these are provided with a lip on one side only so as to facilitate the fitting of the wound field coils. Better commutation is also obtained by this one-sided extension of the pole face.

The armature is of the conventional slotted drum type run on ball bearings. A speed governor is fitted to one end of the shaft and an automatic cut-out at the other. Both these devices are mechanical in action, that is, they depend solely on the speed at which the generator is run. The cut-in is shown clearly in Fig. 3, the end cover being removed for the purpose. It consists of a disk D permanently attached to the armature shaft,

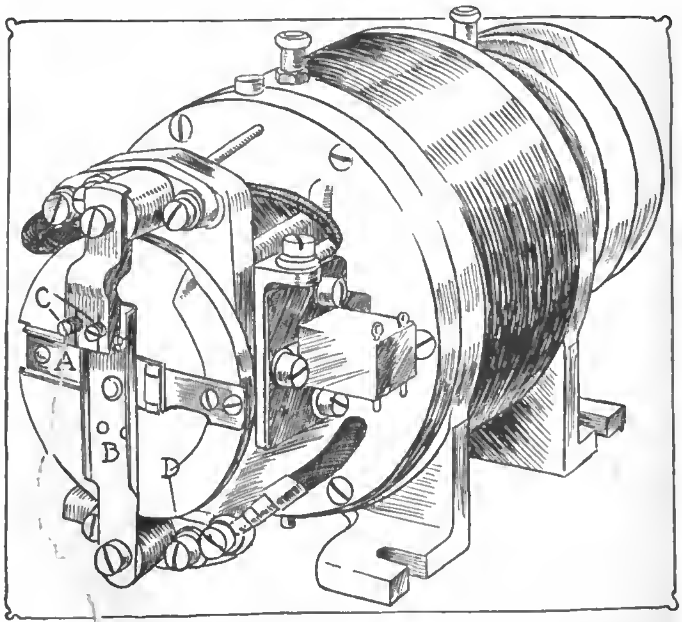


Fig. 3—Dynalux generator with cover removed, showing cut-in

on which is fitted the spring A. This spring is fixed at one end, but is free to move through a short distance at the other, which is provided with a light weight extending backwards in such a way that an increase in the speed of rotation causes the weighted end of the spring to move away from the face of the disk. In doing so the spring A carries with it the vertical spring B by means of an intervening fiber buffer at the center, bringing two tungsten contact pieces at the top in electrical contact with the corresponding screws C. These contacts carry the main current to the battery and lamp circuit, and are arranged to operate at 1,100 revolutions per minute, at which speed the generator is furnishing enough current to overcome the battery voltage, and supply the lamps. When the speed of the car is such that the current generated by the dynamo is greater than required, the centrifugal declutching device, Fig. 2, comes into operation, disconnecting the machine from its driving shaft. It will readily be seen that the same action also disconnects the generator electrically from the battery circuit through the agency of the cut-in just described, so that there is no possibility of the battery discharging through the windings. In the declutching device, four weights are arranged on a spider formed of spring material carried positively by the pulley. Two of these, M M, are slightly heavier than the remaining couple NN. At rest, and on low speeds, all of them force together the clutch faces. When the speed, however, reaches 3,500 the arms M and N let go, the former before the latter, and allow the pulley to run free. The lamps are then supplied from the battery. It should be understood that this only takes place during the short periods when the car is "speeding" above its average rate.

Splitdorf—Has Field Regulation

The Splitdorf "Triplex" generator belongs to that class in which the main field is produced by a combination of permanent and electromagnets. Its general appearance and the arrangement of the coils is shown in Fig. 6. The construction follows the lines of the ordinary magneto with the exception that only two pairs of permanent magnets are placed over the pole pieces F, the third being replaced by an electromagnet E. This magnet has compound energizing coils C consisting of a long shunt winding and a small number of series turns, both being connected so as to augment the existing permanent magnet field. This is a rather important point. They are not differentially wound so that the effect of one coil can be made to neutralize that of the other. Besides the field windings proper there are two coils D wound on short cores bolted to the upper face of the pole pieces. Their function is to reduce the output of the generator at high speeds by causing, or tending to cause a reverse flow of the magnetic lines of the field through the armature. This peculiar action and the ingenious arrangement by which it is obtained without demagnetizing the field magnets will be made clear by reference to the flux diagrams, Fig. 1. The diagram on the left shows the normal state of the magnetic flux, when no current is passing round the coils. The other diagram shows the passage of the flux when the differential coils are energized in a direction to oppose the permanent magnetization. It will be seen that although a reversal has taken place in the direction of the lines passing through the armature, the original flux throughout the main portion of the magnet is unchanged, and therefore the magnets are not being demagnetized.

The regulating principle of the system, as shown in the outline diagram, Fig. 5, is as follows: When starting up, the permanent magnetic field is sufficient to generate a quick supply of current at the brushes, and through the shunt field coil. The main contact A then closes, connecting up the generator to the outer circuit, first passing through the few series turns of the main field. As the speed increases the contacts B are opened by a further pull on the armature G, Fig. 6, cutting out the shunt windings and reducing the main field to such an extent that the generator is virtually running as a permanent magnet machine. Any further increase of the speed of rotation, and the consequent tendency to oversupply is taken care of by the differential windings D, which decrease the field strength as explained above. The nature of the output is given in the curves, Fig. 4. It will be observed that over a speed of 1,500 revolutions per minute there is a surplus of roughly 1.5 amperes over the lamp load, passing into the battery The readings here shown were taken with a full lamp load of 8 amperes and a 100 ampere-hour battery floating on the line as in the diagram of wiring.

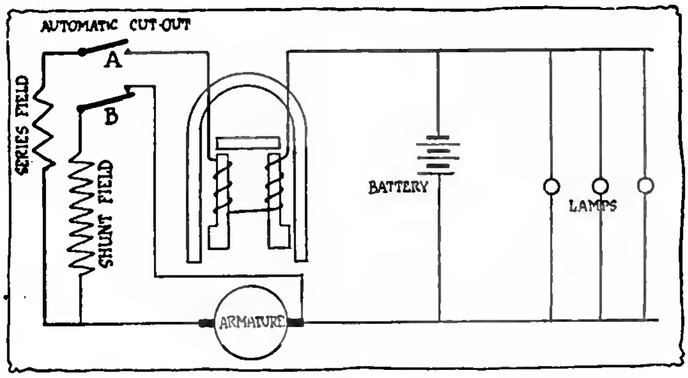


Fig. 5—Wiring diagram of Splitdorf lighting system

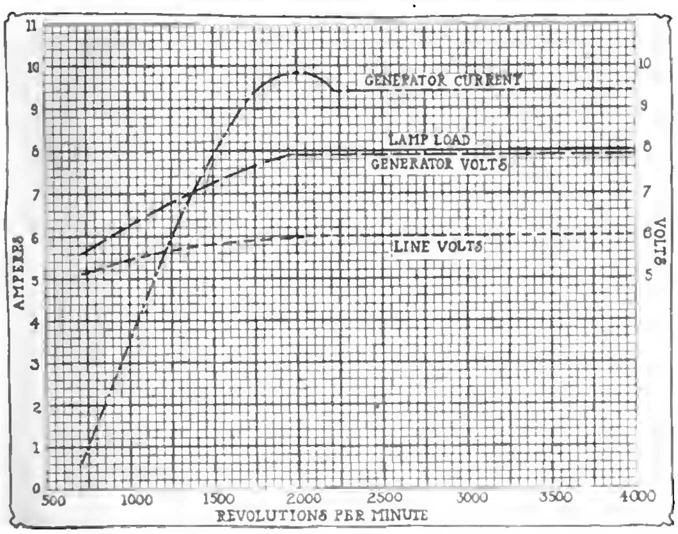


Fig. 4—Volt and ampere curves of Splitdorf generator at various armature speeds

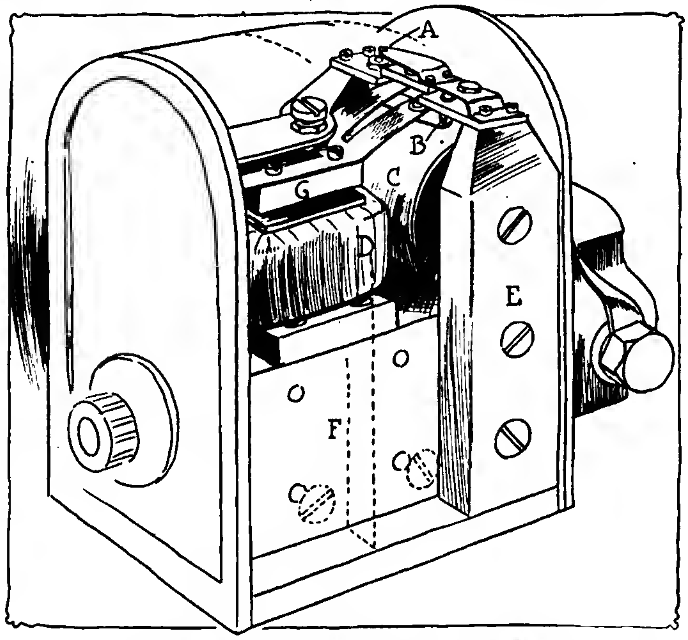


Fig. 6—View of Splitdorf generator with permanent magnets removed, showing current regulating device

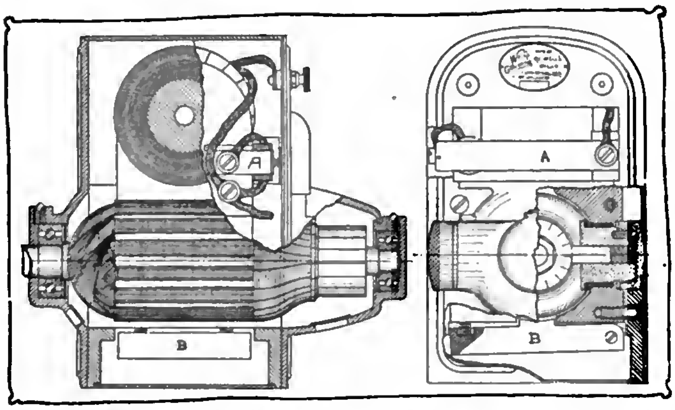


Fig. 7—Sectional views of Wells generator, showing magnetic shunt across poles

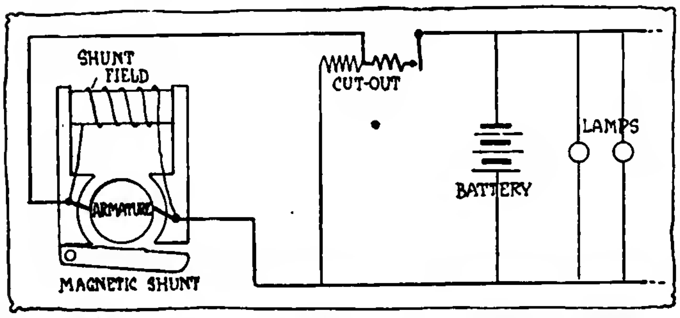


Fig. 8—Diagram of connections of Wells lighting system

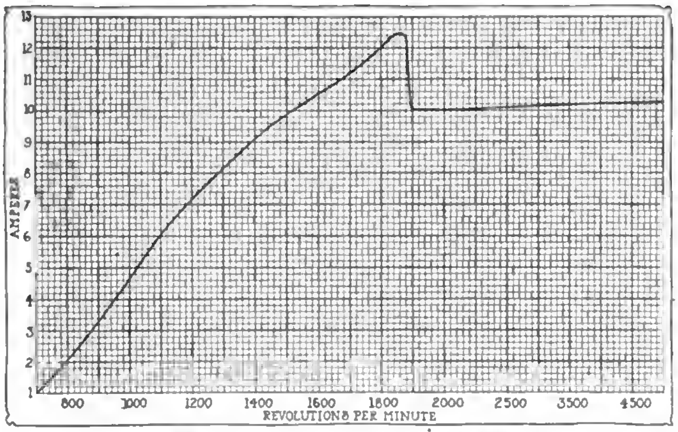


Fig. 9—Output curve of Wells generator

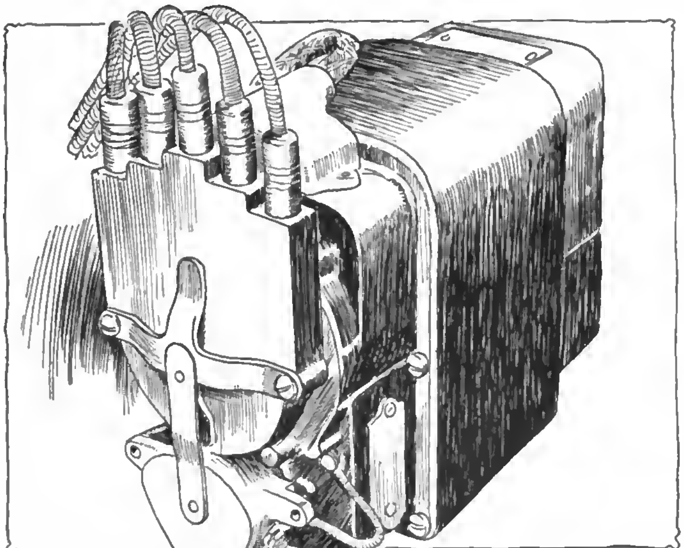


Fig. 10—View of Gould combined lighting and ignition generator

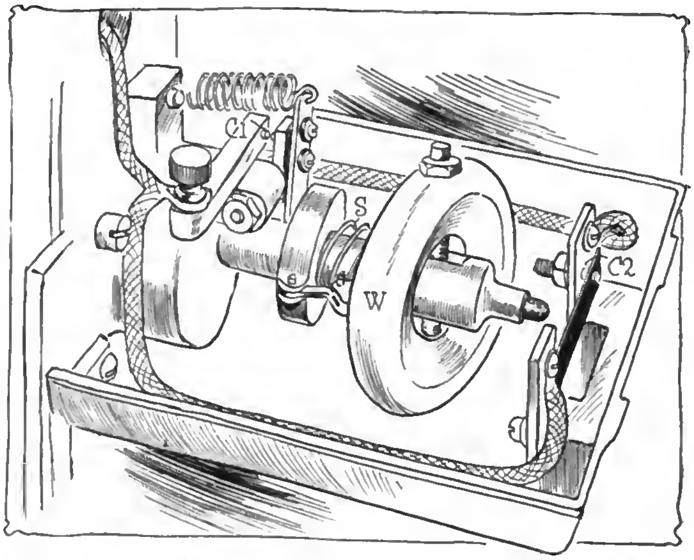


Fig. 11—Automatic cut-out and regulator on Vesta generator

The equipment comprises a fuse box containing a separate fuse for each lighting circuit, so that in the event of a possible short circuit the fuse of the particular line will blow out, eliminating the faulty circuit and preventing injury to the lamps. The fuse panel is designed to take the ordinary enclosed fuses and may be fitted in any convenient place, preferably on the dash under the hood. An ammeter is also included in the system. The dial is calibrated to show the amount of current being utilized for lighting and also the charging rate up to 20 amperes. On the discharge side of the scale readings can be taken up to 10 amperes.

The Splitdorf Company also manufactures a four-pole lighting dynamo of the electromagnetic type, with a cylindrical casing.

Gould—Employs Differential Windings

In the Gould system, current for both ignition and lighting is generated in a single unit, alternating current being delivered at one end of the armature and direct current for lighting at the other. Fig. 10 shows the external appearance of the dual machine, which is designed to run at engine speed. It will be noticed that the ignition end presents the characteristics of the ordinary magneto. The magnets are of the two-pole type in soft steel, but an unusual feature of their construction is that the core on which is mounted the field coils is made from hard steel. This is done so that there is always a sufficient amount of residual magnetism to ensure a prompt generation of current when starting up. It is not, however, enough to give the machine the operating characteristics of a permanent magnet generator.

The magnets are wound differentially, that is, there are two field coils, one being a shunt winding and the other a differential or bucking coil for the purpose of controlling the magnetizing power of the shunt coil. These are mounted on the hard steel core located horizontally above the armature. The pole pieces are made with extending lips in the direction of rotation in order to improve the commutation.

The armature, which runs on ball bearings, is of the drum type and carries two distinct windings, the first being connected to a collector ring from which alternating current is taken for ignition, and the second to a commutator at the other end of the shaft, furnishing direct current for the lighting and battery-charging circuit. Special care is taken to insure perfect insulation of the two windings. In a severe test the makers found that it was even possible to burn out one of the windings without impairing the function of the other.

The regulating devices of the Gould lighting system are contained in the upper half of the rectangular end cover at the commutator end. This half, being easily removable, permits a

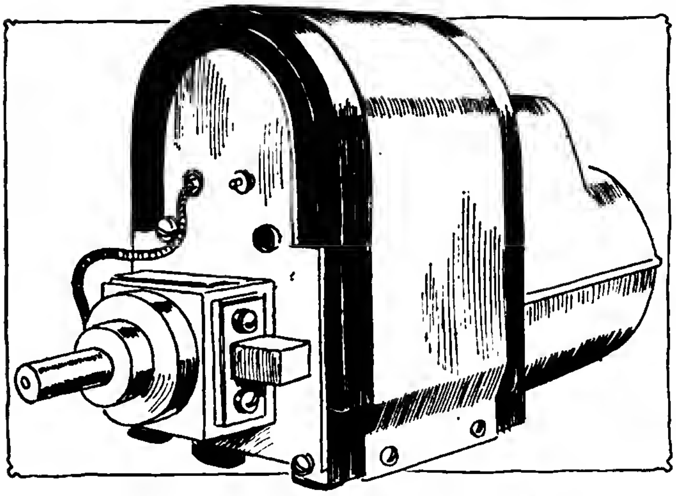


Fig. 12—Vesta permanent magnet lighting generator

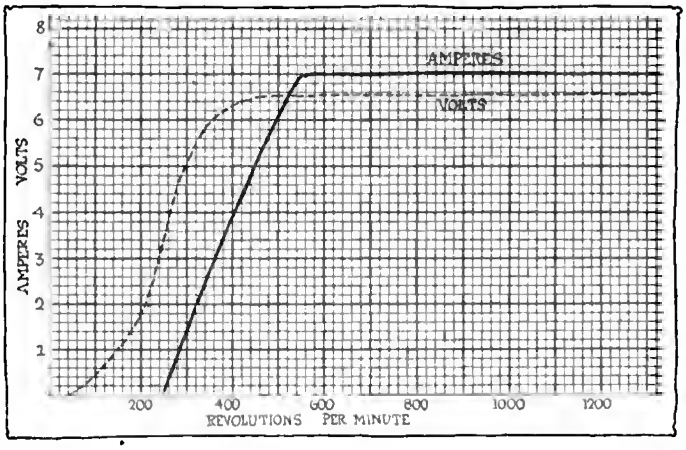


Fig. 13—Voltage and amperage curves of Gould generator, showing constant delivery above speed of 550 revolutions per minute

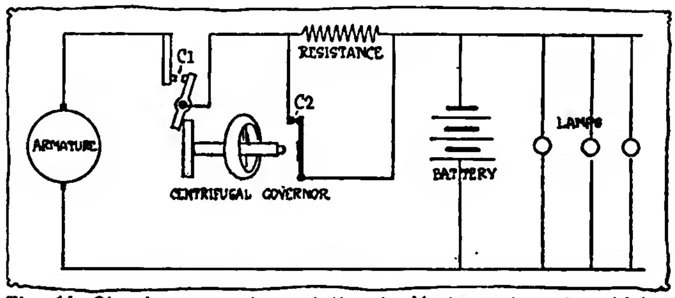


Fig. 14—Showing current regulation in Vesta system, in which a single step of resistance is inserted at high speeds

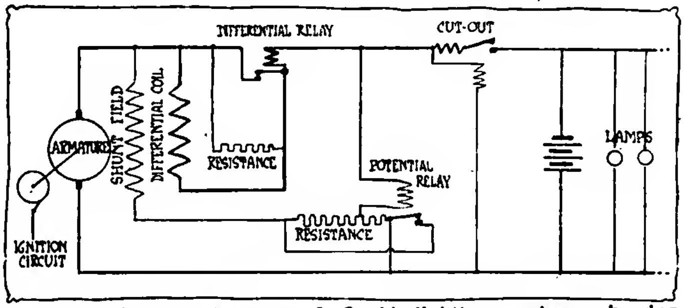


Fig. 15—Wiring diagram of Gould lighting system, showing the differential field winding and the use of a resistance to control the voltage

full inspection of the control parts as well as access to the brush gear. Fig. 16 shows the details of the regulator removed from the generator. Three magnetic control units A, B and C are arranged vertically within the cover. Located above them are two resistances of the enclosed type, D and E, which are used in connection with the regulation of the field coils. Each of the control units has a hinged armature; that of B normally rests in such a position that its contact points are open, while the armatures on A and C normally keep their respective contacts closed. Their action may be followed by referring to the diagram of wiring, Fig. 15, in which A is the differential relay, B the cut-out and C the potential relay. The two resistances represent D and E respectively. The operation of the system is as follows: When starting up from a condition of rest the current delivered at the brushes passes round the shunt field, augmenting the slight existing permanent magnetism of the field magnets. As the speed increases, current is generated at a sufficient voltage to actuate the cut-out through the fine winding shunted across the mains. This takes place at the comparatively low speed of 250 revolutions per minute, when the car is traveling approximately 7 miles an hour. The generator is then acting as a simple shunt machine, delivering current by way of the cut-out to the battery and lamps. At this time the differential field coil is not in circuit, being shorted by the closed contacts of the differential relay. But this device is so wound that when the full output is passing round its coil the armature lifts, opening the contacts and thus including the differential field winding in the main circuit. This weakens the power of the shunt field and holds the current output at a constant figure of 7 amperes on full load, as shown in the curve, Fig. 13, at all speeds above 550 revolutions per minute. The same figure also shows the constant voltage characteristic of the generator. This is accomplished at the higher speeds by alternately inserting and cutting out a resistance in the shunt field circuit, by means of the potential controlling device, as shown in the wiring diagram. In practice this action resolves itself into a constant vibration of the contact arm, but its effect is imperceptible in the lamps.

Wells—Uses Magnetic Shunt

A unique method of regulating the current supply is that incorporated in the Wells lighting generator shown in section, Fig. 7. The main field is produced by a shunt wound two polar magnet furnished with a single coil. Hinged to the base of one of the pole pieces is a magnetic shunt, B which normally is held away from the other pole by a pair of light springs. These springs are so proportioned that when the machine is tending to generate more current than is necessary the magnetic strength of the main field is such as to draw up the iron shunt and so permit a large portion of the magnetic flux to pass through it instead of the armature, thereby weakening the generating

(Continued on page 441)

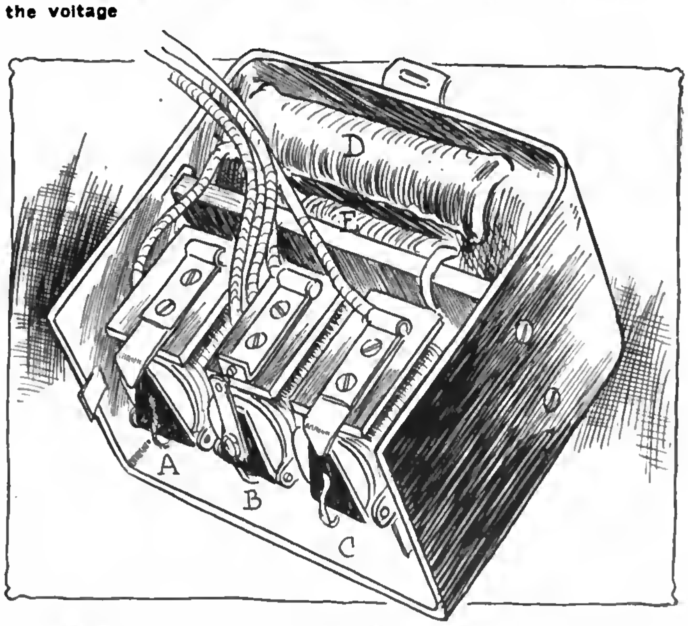


Fig. 16—Automatic regulating devices of the Gould system contained in removable portion of generator end cover

Mixing Kerosene and Ether—Changing From Detachables to Demountables—Cost of Ether—Good Selling Territory—Gasoline Burns Quickly—Using Natural Gas—Speedometer Deranged—Cylinder Design—Beck Motor Criticised

Wants To Use Kerosene and Ether

EDITOR THE AUTOMOBILE:—What proportion of washed ether or any other kind could I use with kerosene oil for fuel purposes?

For starting on cold days I have used fifteen drops of ether to a pint of gasoline. In December last on a day when the temperature was 10 above zero, I started the engine on the second turn, using the above mixture. It was necessary to prime a second time, as the engine became so cold in standing in a shed over night the gasoline would not vaporize until the engine became warmed up. Now, this mixture of gasoline and ether I know will do the work; but what proportion of kerosene and ether will be required?

Is kerosene heavier than gasoline? What air adjustment of a Stromberg carbureter would be necessary? Also, approximate cost of correct mixture, kerosene and ether, should be used to insure satisfactory results?

I can bear out what the correspondent says in your January 16 issue, page 241, under the heading Engineer on Ether, only I used unwashed ether and he used washed ether. His was one-half gas and one-half ether.

Please state the difference between washed and unwashed ether.

Albany, N. Y. FRANK DEWITT BROWN.

—THE AUTOMOBILE has no record of anyone using a mixture of kerosene and ether for running, and it appears that the cost of ether and kerosene combined would be more than the cost of gasoline alone. Therefore, it would hardly pay to operate on a mixed fuel of this nature, as the trouble of mixing, combined with the high price, renders it impracticable.

Kerosene is heavier than gasoline. If you used a fuel of this nature you would probably need a wider jet opening and about the same air opening. Washed ether is the commercial product as distinguished from the chemically pure product. It generally contains a slight amount of water and minor impurities.

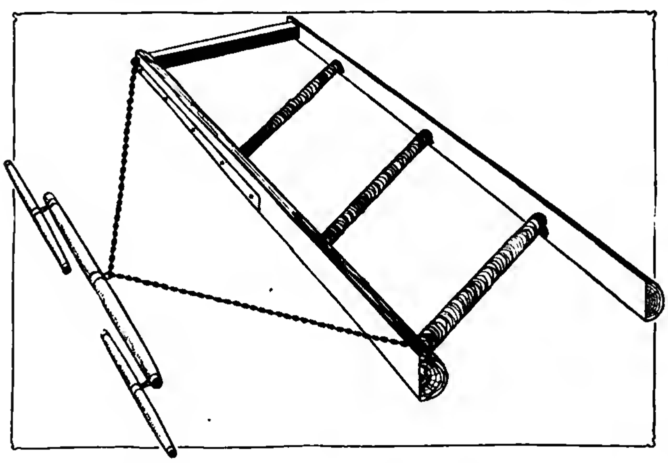


Fig. 1—Diagram of split-log drag, showing construction

Changing Over to Demountables

Editor THE AUTOMOBILE:—There is one subject which I have not noticed in the discussions in the Letters Answered and Discussed, which I think would interest a great many automobilists, and that is the advisability and cost of changing from the Q. D. to demountable rim, say in a 34 by 4-inch size.

What is the best method to use to prevent the sticking between the bead of an automobile tire and the Q. D. rims? It took me about 3 hours to remove two of my tires in preparing the car for its period of hibernation.

New York City, N. Y. T. D. MARTIN.

—There are many automobilists who are having this change made. The advantage, according to the views expressed by these people, is that it is possible to carry an extra tire, already on the rim and pumped to the proper pressure. This considerably lessens the time and trouble of a tire change on the road. The cost of making a change on the size you mention is $15 in the average case. The work required means sawing off the spokes for an inch and putting a new felloe band in place. It takes about 24 hours to get the job done.

If you will paint the rims with graphite paint you will prevent any tendency to stick. This sticking is due to rust, and can be prevented by using the paint, which is an effective rust preventive.

Use of Split Log Drag

Editor THE AUTOMOBILE:—I have before me a story on the split drag which you published some time ago. Would you tell me if the drag is of any use in heavy country?

2—Are there any axles which are composed of all roller or all ball bearings? I am referring to rear axles. Are both a necessity?

Richmond, Va. CHAS. KRUMP.

—The split drag is of practical use. In Fig. 1 is shown the form of the drag and Fig. 2 tells better than words what it can do.

2—The roller bearing axle is often fitted with a ball thrust as in Fig. 5, although the Timken axles use only taper rollers and other axles fitted with roller bearings capable of taking a thrust strain. All ball-bearing axles are common. One of this type is shown in Fig. 6.

Nearly Any Territory Good

Editor THE AUTOMOBILE:—Would you kindly tell me in what part of the country there is a good opening for a garage or sales agency? Also, what priced cars are favorites there, provided you know?

Akron, O. GILBERT E. WELLS.

—A study of the first seven pages of THE AUTOMOBILE for last week will show just where the cars are being used. A good medium-priced car can be sold in nearly any part of the country with success if the car is one that can be backed by a proof of good materials and service on the part of the factory. Any part of the United States where the roads are good and the touring season is open for the major part of the year would promise success if combined with businesslike methods of selling the cars. According to statistics prepared by THE AUTOMOBILE, there is one car for every forty-four people in one state, while in another there is but one car for 700 people. Figuring the other states on this basis, as on page 329 of the issue of January 30, and combining that information with the population of the state and the number of automobiles in use in the state might give you an idea as to where to start an agency.

Does Gasoline Explode?

Editor THE AUTOMOBILE:—As a reader of your magazine, I take the liberty of asking you a question regarding gasoline vapor. Does it explode in the combustion chamber or is it a rapid-burning substance?

Youngstown, O. LEO LINBERGER.

—Gasoline burns very rapidly. It is impossible to draw a line between an explosion and exceedingly rapid combustion. The mixture in the cylinders of an automobile motor may be put in the latter class, however.

Running on Natural Gas

Editor THE AUTOMOBILE:—1—Please state what changes should be made so that an ordinary 4 by 4.5 motor will run on natural gas for fuel. It is a four-cylinder motor fitted with a Shebler carbureter.

2—How many cubic inches of gas would such a motor use per hour under average load?

3—The cubical contents of a steel tank is 9,240 cubic inches. How many cubic inches of gas will this tank hold at 100 pounds pressure per square inch?

—4—Is distillate a practical fuel for automobile motors?

Mondoc, Ind. T. C. KABEL.

—1—No changes will have to be made in the engine. The carbureter should be removed, however, and a mixing valve which can be secured from Lunkenheimer or any other valve manufacturer put on.

2—This would depend on the revolutions per minute. Assuming that the engine has a volumetric efficiency of 100 per cent, the approximate number of cubic inches used per hour would be the number of revolutions per hour multiplied by the piston displacement and divided by 10.

3—About 62,857 cubic inches at atmospheric pressure could be put into the 9,240 cubic inch tank at a pressure of 100 pounds.

4—This has not as yet been determined.

Horsepower of the Hupmobile

Editor THE AUTOMOBILE:—We note that in your January 9 issue you quote the S. A. E. rating horsepower for the Hupmobile 32 as 16.90, while the company's claim is 32 horsepower. Does the 5.50-inch stroke give the engine more horsepower than a 5-inch stroke?

La Feria, Texas. B. H. DUNLAP.

—The S. A. E. rating of the Hupmobile 32 motor is undoubtedly low. The motor should readily develop 32 horsepower on the block. It must be remembered that the stroke factor is not directly considered in the S. A. E. rating. A motor of 5.5-inch stroke would develop more power than one with a 5-inch stroke at the same number of revolutions per minute.

Speedometer Out of Order

Editor THE AUTOMOBILE:—I cannot speed my car, which is a 36 "Special" Maxwell 1912, higher than 35 miles per hour. The compression is good; valves had been recently ground; carbureter works well; there is no skip in the ignition from a foul spark plug, and the engine does not heat up. In fact, the car runs better after I have driven it 20 miles or so. I have taken off the fan belt in order to get the engine hotter. I have a hot air tube from exhaust pipe to carbureter. The car picks up to 30 miles very quickly, but in order to reach the 35-mile-

Fig. 2—Top: A drag in use. The man driving stands on the drag and adds his weight to the weight of the latter to get a better effect

Right: This shows a stretch of the same road after the drag had passed over it. When aided by a good sun this road was hard enough to stand travel for some time without rutting

Left: A stretch of road before dragging. This road was covered with a soft clay mud to the depth of about 5 inches

These three illustrations show actual work on the roads of one of our Southern states. The road in this instance was composed of a soft dirt or clay which made an excellent roadbed in dry weather, but which became a morass almost at the first touch of rain. By the use of the drag the community was able to keep the roads in a fairly good condition even in the rainy season. In winter the ruts which froze solid prevented satisfactory touring through this particular section

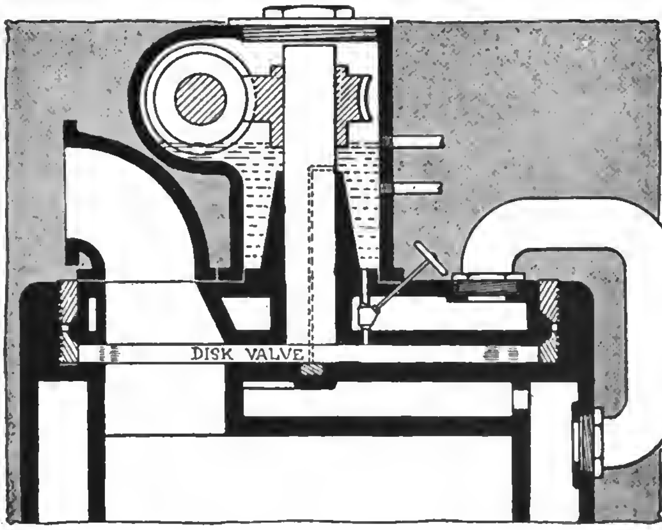


Fig. 3—Section through the disk valve of a Beck motor

an-hour mark the momentum of the car seems to be the greatest factor.

My own idea is that the gasoline which the oil companies are now putting out is inferior or that the gasoline does not vaporize enough. But this cannot be so, as the car works fine on any speed on any gear from 0 up to 30 miles.

It may be the speedometer, which I notice is somewhat worn in the small wheel member meshing with gear attached to wheel. It is rather difficult to tell in driving a car, as I have no chauffeur, whether I am going 30, 40 or 45 miles an hour except by the speedometer.

Albany, N. Y. FRANK DEWITT BROWN.

—You should replace the small gear on the speedometer. These are made softer than the large gear on the wheel so they will wear out first, making the replacement inexpensive. Where you have lost motion in the speedometer gearing it is impossible to tell how fast you are going. With the Maxwell "Special" you should be able to get up to 45 miles an hour without very much trouble. As a matter of fact, after you once start you can run faster on a low-grade fuel than you can on a high grade. There are more heat units in the fuel. Keep the radiator covered in cold weather and see that your carbureter gets plenty of air at high speeds.

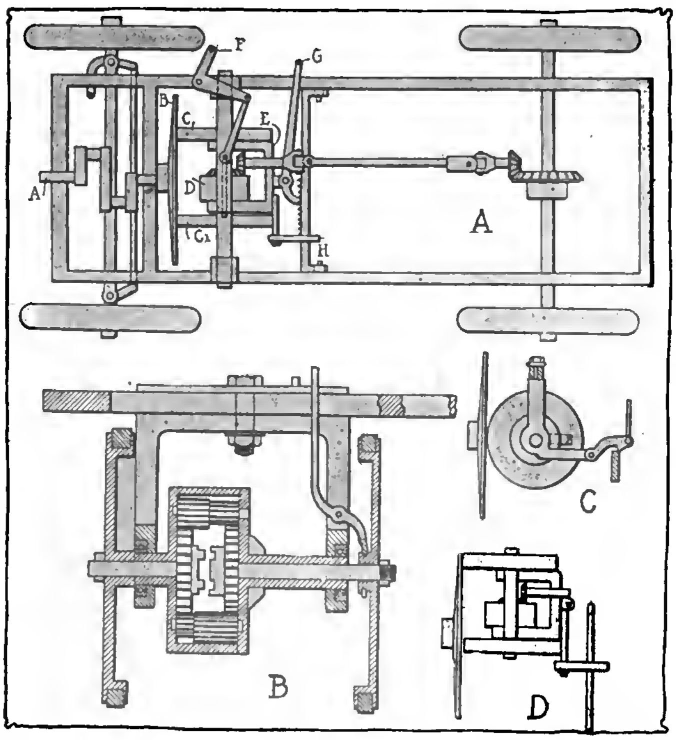


Fig. 4—The Trufant friction drive which has lately been invented

—

Get in Touch with Manufacturers

Editor THE AUTOMOBILE:—We have a Kelly 3-ton truck equipped with Frayer-Miller fan blower air-cooled motor. It is necessary that we change the power plant to water-cooled, and we wish to hear from engine manufacturers who have no doubt already furnished motors, and also from radiator manufacturers who could furnish either the dash type or the front type radiator.

Of course, we realize that we will have to make some changes in the chassis frame-work in front, and it is our idea to extend same sufficiently to carry the motor under a hood instead of under the seat, as at present. The present subframe for the engine is 19 inches in the clear, and, because of the steering gear and gearshift mechanism at the side, it will not be feasible to widen same over a couple of inches at most. Is this plan practical? E. C. JENKINS.

Cleveland, O.

—The scheme is practical, but when you take it up with the motor manufacturers you will no doubt find that it is expensive.

Questions of Cylinder Design

Editor THE AUTOMOBILE:—I am making drawings for an engine, bore 4.5 inches, stroke 8 inches, compression about 110 or 115 pounds. I would like to know if a .25-inch wall is thick enough to withstand the pressure. The casting being made of finest iron obtainable. I would also like to know if steel could not be used as well as iron for cylinders. Are there any advantages contained in iron which are absent in steel? What is considered the best angle for valve seats on a high speed gas engine?

New York City. F. A. KUPER.

A formula which applies in practice for the thickness of small bore cylinders is as follows:

$$t = D \div 30 + .125 \text{ inch.}$$

—In this formula t, is the thickness; D, the cylinder diameter, and .125 inch is added to make the cylinders thick enough for good shop practice. This would make the cylinder you are designing work out as follows:

$$t = 4.5 \div 30 + .125 \text{ inch} = .15 + .125 \text{ inch} = .275 \text{ inch.}$$

A thickness of .275 inch would be plenty, and .25 inch would probably suffice.

Steel castings are not successful in motor cylinders. Steel cut from solid blocks would be too expensive. Therefore steel is not used. The nearest to steel is semi-steel or vanadium iron.

A seat angle of 45 degrees is the most common for poppet valves.

Interested in Beck Motor

Editor THE AUTOMOBILE:—Being a reader of your paper and very much interested in your article on non-poppet valve engines, I would like to ask a few questions on the Beck motor.

In your article you state that the pressure is somewhat removed. Taking for granted that the disk is, say, .001 or .002 smaller than the ported faces, will not the pressure between the faces equal that of the cylinder? Or is it that the speed of a gas engine is so fast as not to allow the pressure to get in such a small space in such a short time?

Taking for granted again that the gases do get there, would they not ignite? Then if they ignite, would that cause a carbon deposit between the ported faces?

New York City. S. E. FAMSON.

—Referring to Fig. 3, which is a reproduction of that given in the issue of December 19, it will be seen that the pressure is only exposed to a small area and therefore the total pressure on the disk is relatively small. The amount of effort required to turn the disk is not at present known, as the motors are now in a more or less experimental stage.

Even if such an explosion occurred it would probably do no harm. The gases probably ignite at the point you mention, but as far as a carbon deposit is concerned it is doubtful if trouble will develop in that direction.

Has Invented Friction Drive

Editor THE AUTOMOBILE:—Not being familiar with any type of friction transmission as used on automobiles, excepting the Cartercar, Lambert, Metz and Patiel, will you kindly describe any other types there may be on the market? The reason I am asking is that I have a model of my own invention in which friction is applied differently and with more efficiency than the above-named.

Windsor, Mo. GEORGE P. JAMES.

—THE AUTOMOBILE has no further list of friction drives. There was one described in the issue of April 25, 1912. It is the invention of W. E. Trufant, who stated in part:

"It is well known that in the usual type of friction drive for automobiles there is difficulty in starting and in running at very slow speed because the velocity of the contacting friction surfaces is so slow. To overcome this, great pressure must be applied and the wear and strain are excessive. When the roll is in the high-speed position and the operator carelessly applies the same pressure as was necessary on low speed the strain, wear and loss of power are very great.

"To overcome all this and get almost unlimited power on the slowest speeds with little strain or wear of the parts two rolls are employed mounted on a yoke one on each side of the center of the disk with a differential gear between them and a bevel gear on the differential case to transmit power to the jackshaft or rear axle. In this construction, when the rolls are an equal distance from the center of the disk there will be a high velocity of the friction surfaces, but no movement transmitted to the differential case as the gears in case are idle because one roll rotates in one direction at the same speed that the other rotates in the opposite direction. Now if the yoke and rolls are moved a little to the right so that one roll will be farther from the center of the disk than the other, you will still have a high velocity of the friction surfaces and a forward movement will be transmitted to the differential case at a speed equal to one-half the difference in the speed of the rolls. When one roll is at the edge of the disk and the other near the center the speed will be nearly one-half the speed of the fastest running roll.

"The reverse is obtained by moving the yoke so that the roll at the left rotates faster than the other and so controls the direction of rotation of the differential case.

"To insure equal pressure on each roll the pressure is applied to the yoke at a point between the rolls, and the yoke is hung on a pivot.

"To get a higher speed forward than the differential motion will allow the differential is locked and one roll held out of contact with the disk.

"On account of the great power at low speeds this drive is particularly adapted to motor trucks.

"In Fig. 4 A is the engine shaft; B the friction disk; C and C1 the rolls; D the differential case, and E is the yoke which carries the rolls; F the lever to move the yoke and rolls along the face of the disk; G the lever to press the rolls against the disk, and H a latch to hold the left-hand roll away from the disk when the differential is locked.

"More of the details showing how simple the construction is are given in Figs B, C and D. As will be noticed in these figures all that is necessary to lock the differential is to move one of the rolls and its shaft axially until the differential gears, engage each other."

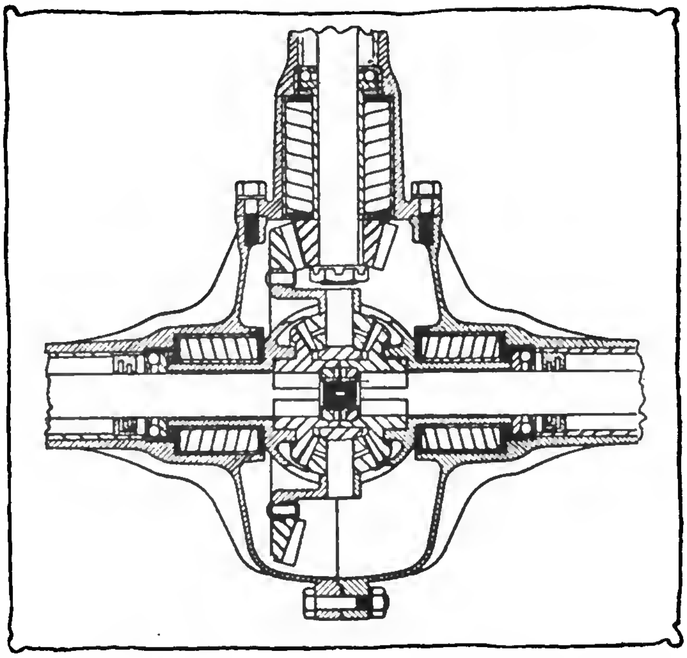


Fig. 5—Rear axle, using nothing but roller bearings with ball thrust

The Editor of this department is holding numerous letters signed Reader, Subscriber and by various initials which cannot be answered until the name of the sender be known. Owing to the large number of inquiries received many letters are answered by mail instead of through these columns; those of general interest being selected for the latter purpose. Anyone may receive a direct reply by mail by stating their desire and enclosing postage.

Cleaning Out Old Oil

Editor THE AUTOMOBILE:—I have a splash system for oiling my car. I have drained all oil from crankcase and desire to clean it thoroughly. Some oil will remain in bottom of crankcase where the over supply of oil goes. How can I clean with kerosene without removing lower half of crankcase, and how can I remove all the kerosene.

Anderson, Ind. W. W. ROGERS.

—You do not mention the name of the car you are using so no specific information can be given. Pour 3 quarts of kerosene through the breather pipe. Run motor for 15 seconds. Let stand 24 hours. Open drains in bottom of crankcase and pour in new lubricating oil.

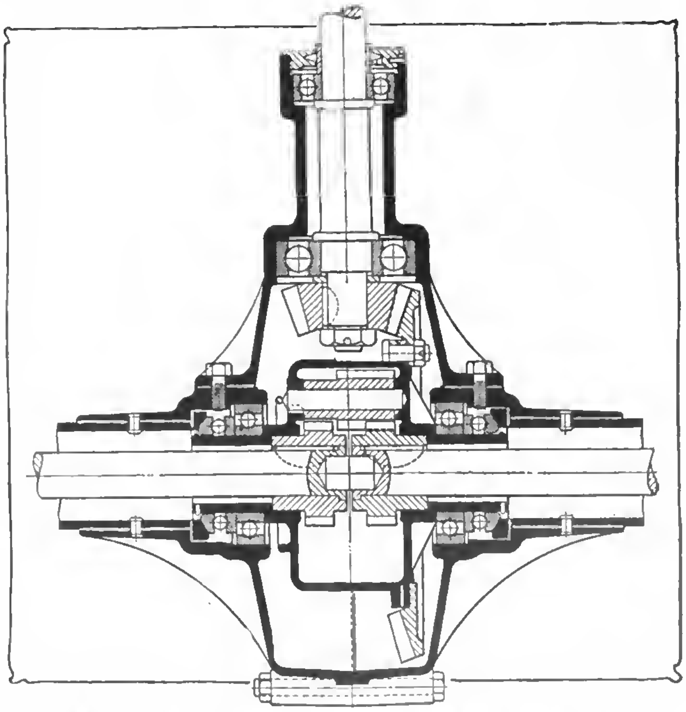


Fig. 6—Ball bearing rear axle with radial and axial bearings

The Automobile

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Entering Wedges

TO the automobile manufacturer the New York shows of 2 weeks ago and the Chicago shows running this week have had a far-reaching value in that the maker has had an opportunity of gauging the public pulse on many of the innovations incorporated in 1913 models, whether these innovations are found in his own car or in those of his rivals. In a word, the maker knows better today where he stands than he did 3 weeks ago. This is a valuable asset. It is imperative to know where you stand, so that if on the right road you can push ahead and if on the wrong road you can retrace and start anew.

To be on the right road does not always mean to be most in accord with the imagined whims of the public, but rather to be on the road along which the saner public demands may be found. This is particularly apparent at the present show. To be explicit: In the matter of cranking motors there are several makers with certain types of cranking motors. which types are hopelessly in the minority so far as public inquiry is concerned. but who believe they are right and are convincing the public that their apparatus is as successful as the more popular types and has certain advantages in spite of some disadvantages. It is always a good balance wheel when some manufacturers have minds of their own and set out valiantly to set their principles graphically and sensibly before the public. More of this individual concern stamina is needed.

The desires of the buyers at Chicago are practically the same as those in New York. Years ago there was an apparent difference between the requirements of the two national shows. In those days the motor-buggy was a Chicago characteristic, the makers of these vehicles imagining that Western roads and Western people demanded such, but the end of them was quicker than the rise, and since those days the cars of Chicago are the same as those of the East, excepting for the larger following of foreign machines in the Eastern metropolis. Three years ago there were over a score of Central West manufacturers who did not show in New York, but presented their wares first at Chicago. Now this is largely changed so that less than a dozen concerns miss the New York show and make their annual bow at the Chicago exposition. On the other hand, there are only about the same number seen at New York who are not exhibiting this week in Chicago. This new order of things is but one more example of the nation-wide influence of the car, which has attained such enormous proportions during the past years, so that today, **whether a car is built in Iowa or Pennsylvania, it is known alike from coast to coast.** This holds true with the exception of half a dozen concerns who operate quite locally and confine themselves largely to special order work. During the last year there has been a steady elimination of those companies that have been entirely local in their operation.

From the general inquiries of the public at the metropolitan shows to date, interest centers around a score of car features. **Everybody wants electric lighting.** So general is the demand that where it is not stock the inquirer not infrequently walks away, a fact which is also true with respect to cranking motors. When cranking motors are inquired about the first questions are for the electric type, but if the concern makes a pneumatic or other type it is generally reported not to be a difficult problem to convince the prospect that the air or mechanical type gives entire satisfaction and generally the salesman does not fail to point out the disadvantages of the rival systems. **The general public generally fails to recognize the differences between the various types of electrics and in scores of cases seem to be as satisfied with one make as with another.** There has not been sufficient educational work on the pros and cons of electric starters.

Salesmen Need Education

It is imperative that foolhardy performances be avoided with electric starters, and in this respect those dealers who are showing how many hours their starter will run the motor continuously and how far the cranking motor will propel the car along the streets with a load of passengers, are working a great injury to the cranking motor business. They are themselves setting a bad example, an example which will be taken up by prospects and made imperative some months hence as a demonstration feature. **Nothing could be more absurd and unnecessary that these foolish performances and equally foolish arguments which the poorly-informed salesmen are putting forth.**

The cranking motor demands educated salesmen and unfortunately at New York City as well as at Chicago many of the salesmen were entirely ignorant of the real features of their equipments. About all they knew was how to operate the cranking motor and they generally were able to say how long it would keep the motor turning over and at what speeds, but they were absolutely inadequate to give that commonsense advice on the use of a cranking motor which the buying public is in such need of today. Cranking motors are here to stay and makers should prepare their salesmen to make the early operation of them as successful and cheap as possible. Unless rational caution is used there will be much battery trouble with many owners, because of the large initial current draw by the cranking motor.

Left Control Is Coming

There are more than a score of other entering wedges in addition to cranking motors and electric lighting: Left-hand location of steering wheels is one, yet it is quite an unsettled question with several makers to date. One of the leading Western distributors handling cars with right-hand wheels claims few if any inquiries for the left-hand wheel, whereas his rival with a right-hand wheel openly announces that he has lost several sales because of not having cars for sale fitted with the left-hand wheel. Like all other new questions there are two sides to it, and while it seems certain that the left-hand wheel is slowly on the gain it will be some time before several concerns adopt it. There are many arguments being cited pro and con on the wheel position and naturally drivers who have been used to the right-side wheel are strongly in favor of it. For city driving there is a more general demand for the left-side wheel, chiefly in large cities where the huge motor truck with its high body is coming into more general use and also where the closed type of passenger car is so general for winter use. Where chauffeurs drive cars the question of right or left-side wheel is not of so much importance.

Wire wheels are going to be a most important 1914 factor. They cannot come in numbers before that date because the makers cannot supply the demand. The old arguments that the public would not take to their appearance have been exploded as have also those of washing, etc.; and now the wise maker is putting forward those important arguments of greater tire wear, increased motor flexibility in driving the car and reduced stress on motor bearings.

The precipitation of carbureter interest brought about by the increased prices in gasoline will have a far-reaching effect before the 1914 models are announced. One leading car company getting but 12 miles per gallon at present has, with a new carbureter design, been able to average over 20 miles to the gallon. Similar reports come from many other concerns. Doubling the fuel mileage will not be general next season; this is too much of a jump and if it is apparently so easily obtained it would have been on hand before this. **There will be greater fuel economy next year, because of improved carbureters and more efficient motors.** The car makers must co-operate with the carbureter makers in bringing this about. Carbureter makers are getting away from moving parts, such as auxiliary air valves in several instances; they are also improving starting by the gasoline by-pass from the float chamber to the intake manifold above the throttle, thereby enabling the throttle being closed to start and insuring plenty of fuel through the bypass; and the general use of the hot-air horn, the shutter valve on the air intake and the hot water or air jacketing are most important.

Next year will witness more unit motor and gearbox construction than seen this season. In a few cases this will be at the expense of the unit rear axle and gearbox, because a few concerns with 1914 models at present on the road are contemplating such alterations. With left-hand steering wheel the unit motor and gearbox given ideal arrangements for center levers, a construction which eliminates cross shafts for these levers and keeps them entirely free from the body.

A few concerns, and they are pioneers and leaders, are going to use lighter pistons for 1914. Some are already placing orders for steel pistons and a few are working with magnalium. With steel the weight is cut from 4.5 or 5 pounds to 2.5 or 3 pounds, and this weight reduction shows almost unexpected increases in horsepower, the increases in some dynamometer tests being as high as 45 per cent. Those makers who are planning to use a few of these lighter reciprocating parts are going carefully and have had them under test for several months. The question of clearance is one of the big ones with both steel and magnalium and every caution is needed with either. The more the weight of reciprocating parts can be reduced the better, because vibration is cut down and possible motor speeds increased. **Last year's racing experience aided in showing the increased speeds possible with lighter pistons as well as how it assists in producing a smoother running vehicle.**

Increased Efficiency Now

With motor improvement by way of a more general use of block casting, longer strokes and higher piston speeds in lineal feet and higher crankshaft revolutions with consequent greater motor efficiency, there is a demand for improved lubrication. The adoption of forced feed to the bearings with pressures as high as 40 pounds is exhibiting in leading makes. More oil when needed at the various motor parts is essential because of higher explosive pressures with the higher crankshaft speeds, and not infrequently the reduced waterjacket space between cylinders in block casting makes the demand for more adequate oiling still greater. Foreign makers have discovered that the higher explosive pressures at high speeds call for higher oil pressure to the bearings. Racing has taught them this lesson, in which the oil pressure has been carried to beyond the 200-pound mark with a few makers, and with this really enormous pressure there has been a noticeable loose fitting of the bearings crankshaft, these being so loose as to practically pound on low speeds and idling.

A continuation of several other motor trends is promised in 1914: With six-cylinder motors the use of block and triple castings will increase, the makers already have their plans laid in these respects. Intake manifolds will be abbreviated where either the triple or block casting type is used. The seven-bearing crankshaft is being weighed very carefully by both European and American builders and the feeling is gaining ground that four **bearings of good length hold the oil film better in these high speed motors than seven shorter bearings.** In this same regard the three-bearing crankshaft for four-cylinder motors gives promise of displacing the five-bearing type. Not a few makers of six-cylinder motors with the long aluminum crankcase have noticed the weaving of the case up and down in the center. This weaving is naturally transmitted to the crankshaft and must impose a strain on it. With the shortening of motors this is being avoided, although some have worked against it with the heavier crankshaft. A few use metal other than aluminum for the top of the crankcase and another solution is casting the cylinders with top of the case integrally, a construction possible with block cylinders. When this is done the separate cylinder head receives attention, it having the merit of affording ready removal of carbon and also allowing the machining of the cylinder head in manufacture as well as making the boring and grinding of the cylinders an easier operation. Next season will witness progress in motor design along these various lines.

The movement started in Europe a few years ago for lighter rear axles is growing. Lighter rear axles means reduction in unsprung weight and consequently longer tire life. The moving of the gearbox from the axle to the motor is one means of accomplishing this and other means are by mounting the springs so that their weight is carried on the frame and not on the axle, and also the mounting of the differential on the car frame and using a combination stationary and live rear axle. The axle housings are being lightened by not a few makers, and there is a tendency to eliminate unnecessarily expensive axle constructions and use more standardized forms. The use of die-cast aluminum for differential housings in the axle has not yet made its appearance in America. Close in touch with improved rear axle design is that of underslinging the rear springs. Where either elliptic or three-quarter elliptic springs are used clipping them beneath the axle gives a lower body carriage.

The more general use of pressure feed for gasoline and the consequent mounting of gasoline tanks on the chassis in rear calls for adequate provisions for supporting the gasoline tanks and those concerns who have redesigned the frame side members to meet the new conditions are accomplishing the neatest jobs. The side members are in such cases curved downwards around the end of the tank providing a neat and most adequate support and one which eliminates the necessity of several additional parts. Some improvements must be made in filling arrangements for these tanks because of the growing practice of carrying the spare tires in the rear of the car. Where wire wheels are used this difficulty is increased. The new conditions will call for a change in position of the filler cap.

Death Takes I. A. Mekeel

Prominent Publisher Dies After an Illness of One Week—Was Connected With Several Prominent Trade Papers

Sterling Qualities of Self-Made Man Won the Esteem of All His Associates

I. A. MEKEEL, vice-president and treasurer of the Textile Publishing Co., publishers of the Dry Goods Economist, died at midnight on Sunday of this week at the East Orange, N. J., home of D. R. Caldwell, president of the Wells-Fargo Express Company. Mr. Mekeel had been stricken just a week previously on the afternoon of January 26 with indigestion so acute as to affect the heart, and had continued in such a condition that he could not be removed to his own home at 80 Upper Mountain avenue, Montclair, N. J. Towards the close of last week his condition showed decided improvement, but on Sunday, the 2d inst., he suffered a relapse and at midnight the end came.

Mr. Mekeel was born in Clinton, Ia., September 25, 1870, the son of George M. and Maria Haviland Mekeel. He was educated at the Friends' Academy at Union Springs, N. Y., and at the age of seventeen became a school teacher in the vicinity of that place. Two years later he removed to St. Louis and connected himself with a brother, the owner of *Mekeel's Weekly Stamp News,* a paper published in the interests of philately. He gave proof of the business ability which afterwards became so marked when, at the age of twenty-one, he went to Europe to effect the sale of rare stamps. Subsequently he became the owner of *Mekeel's Weekly,* which is now published in Boston and in which Mr. Mekeel was interested up to the time of his death.

Mr. Mekeel connected himself with the Textile Publishing Co., in 1900, as a solicitor on the Dry Goods Economist in the New York market. In about a year he was appointed one of the special representatives not only for the *Economist,* but also of its allied papers in the Root Newspaper Association. So successful was he in this work that in 1904 he was elected a director and secretary of the Textile Publishing Company and treasurer and general manager of the R. N. A.

His marked executive abilities and his power of constructive work were particularly displayed in his management of the first convention of the business and editorial staffs of the Root Newspaper Association papers, which was held in Cleveland, O., in June, 1906. This is but one of the many evidences of Mr. Mekeel's ability in creating greater co-operation and broader interchange of ideas among all the various R. N. A. interests.

On May 1, 1911, principally through the work of Mr.

Mekeel, there were brought together, under the name of the United Publishers' Corporation, a large number of prominent business papers, including the *Dry Goods Economist* and its allied publications in the Root Newspaper Association, also *The Iron Age, Iron Age-Hardware, The Metal Worker, The Building Age, The Automobile, The Motor Age, The Automobile Blue Book, The Auto Trade Directory* and *The Commercial Vehicle*. Of this parent corporation Mr. Mekeel became vice-president and treasurer.

He was also president of the Boot and Shoe Recorder Publishing Co. and the Atlantic Printing Co., Boston, and of the Mekeel-Severn-Wylie Co. He was vice-president of the David Williams Co. and of the McGraw Realty Co., and first vice-president of the Federal Printing Co. He was treasurer of the Root Securities Co., the Pacific Coast Publishing Co., the Tri-State Realty Co., and also of the Commercial Bulletin Co., Minneapolis and St. Paul He was also a director of the Dry Goods Reporter Co., Chicago, and of the Dixie Printing Co. and the Tradesmen's Publishing Co., St. Louis. He was a member of the Lotus and Engineers Clubs and of the Aldine Club.

Mr. Mekeel married on October 29, 1896, Elizabeth M. Schureman, a member of a prominent St. Louis family. He is survived by Mrs. Mekeel and three young sons, by his aged father and by his two brothers, of whom the younger, G. D. Mekeel is president of the Commercial Bulletin Co., publishers of the *Twin City Commercial Bulletin*.

Mr. Mekeel's sudden death, in the prime of life and when he seemed to be at the zenith of his powers, is sincerely mourned by a great number of business and social friends. He was well known in many centers other than New York and St. Louis, among these being Boston, Chicago, Minneapolis and St. Paul, and wherever known he was both admired and respected. Of splendid physique, highly attractive personality and apparently unbounded vigor and energy, he at once won all with whom he came into contact. His shrewd business sense, though always at his command, never warped nor unduly influenced his mental breadth or lessened his sterling qualities, derived from a Quaker ancestry. He was a magnificent example of the highest American type of the present day—full of life, of humor, of comradeship, and yet ever intent on the interests of the great business to which he had dedicated his career and in behalf of which he spent himself with all too great devotion and utmost self-sacrifice.

To his immediate associates his death is a shock whose force cannot be put into words, all the more so because hope of his recovery was high and until near the end there seemed no ground for serious alarm. His activity, his optimism, his sound yet prompt judgment, his invariable good humor and the dynamic force with which he put through important matters will be sadly missed. He was a twentieth-century man in every sense of the word. Had he been spared it is hard to say what heights of efficiency he would not have scaled.

But he was more than all this; he was honest, clean-minded, upright; he took no unfair advantage.

To all of his immediate business associates he was more than a fellow-worker. To have known him, to have worked with him, but to have had him as a friend is more. And it is as a friend, a loved and valued friend, that his associates most deeply mourn him.

Albany Legislature Busy

At Meeting of Club Representatives and Owners Opposition to Rigid Laws Shown—Need for Innovations

General Licensing of Automobile Operators Proposed and Opposed by Clubs

ALBANY, N. Y., Feb. 5—(*Special Telegram*)—At a meeting called in by the Secretary of State Mitchell May, to which automobile owners and representatives of clubs and associations were invited, a fairly general opposition to the changes proposed for the safety of the pedestrian public was expressed.

Secretary May, impressed by the insufficient protection given by the apparently effective Callan law, had called in the meeting to discuss the questions of general licensing of automobile operators, including owners and their family members, after an examination demonstrating that the individuals in question were fit to drive an automobile. This sane proposal, however, which has been successfully introduced in a number of European countries, was opposed by most of the automobilists present. While several owners remarked that it would be just to license owners and their sons, to forbid the driving of cars by people less than 21 years of age and such whose eyesight were bad, other owners were emphatic in stating that the present laws, not only of New York state, but also of other states were more than adequate.

A letter, addressed to Secretary May by the New York City Coroner, George P. Le Brun, which brings out some very interesting facts, follows, in extract:

There were 234 fatal accidents in New York City during 1912, being an increase of 40 per cent. over 1911. This increase indicates necessity amendments to the present law governing the operation of automobiles.

Of the 234 fatal cases, forty-three were caused by automobile trucks; five by taxicabs; three by hospital motor ambulances, leaving 182 by pleasure cars. As far as could be learned about twenty-five of these cars were operated by owners, and the balance, 157, by licensed chauffeurs.

Investigation into the cause of these accidents made by the Coroner's office revealed that 75 per cent. occurred at or near street corners, that the cars were going at from the rate of 25 to 50 miles an hour, and operated by experienced chauffeurs. Therefore, in my opinion, excessive speed in operating automobiles in the City of New York is the cause of the majority of accidents, and the fact that there seems to be no punishment for running over pedestrians; as of the 234 fatal cases, I am not aware of an operator being sent to jail, fined or punished in any way. This is well known among operators of cars, as in the majority of cases they are not even arrested. The records last year show but 30 per cent. of arrests in fatal cases. Naturally they become careless and disregard the rights of pedestrians. I believe the revocation of the license would be the means of making the operator of a car more careful, and the suspension of the car license for a stated period when it was operated by the owner, or when he was in the car with the chauffeur at the time the law was violated.

I would suggest another means to avoid accident and that is an ordinance prohibiting pedestrians from crossing busy streets other than at crossings.

All operators of cars should be licensed and no license issued without the applicant being examined as to his fitness to operate a car.

In every runover the police should notify the Secretary of State, who should have the power to suspend operators' licenses pending an investigation, and if after an investigation it is shown that the operator violated the law by excessive speeding or otherwise in causing the accident, the license should be forfeited.

As to speed limit in the City of New York, it should not exceed fifteen miles an hour.

The coroner's office has been vigorously opposed to the lax automobile law and the apparent inefficiency of previous legislation. The letter was provocative of much comment.

Blackman with Commercial Vehicle

Charles W. Blackman, who has been identified for several years with manufacturing enterprises of the automobile industry, has become connected with the *Commercial Vehicle*, and has accepted the post of general manager of that publication, which had formerly been held by Robert Wolfers. Besides the experience gained in the practical field of manufacture, Mr. Blackman has accumulated such as his long previous connection with automobile publication could bring him. Besides attending to the general management of the publication named above, Mr. Blackman will supervise the policy of the paper.

Four New Manufacturers at Detroit Exhibition

Forty-Two Makes of Pleasure Cars Totaling 300 Exhibits on View—Good Attendance

Philadelphia Closes Successful Pleasure Car Show—Will Now Show Trucks—56,000 See Buffalo Show

DETROIT, MICH., Feb. 3—Detroit's twelfth annual automobile show closed its doors on February 1, after having submitted to the people of Michigan a representative array of makes of pleasure cars, electric and commercial vehicles. In addition to the Wayne pavilion the large number of exhibitors made necessary the use of the Annex this year. This will probably remain one of the city's show buildings. It is 173 by 124 feet across Front street from the main building and gave the exhibit 10,000 more feet of floor space than could be boasted of in 1912.

Forty-two makes of pleasure cars were exhibited, each manufacturer showing several models, thus bringing the total number of show cars to something like 300. The show marks the entry of Detroit into the national show circuit, which now, in addition to Detroit, comprises eleven large cities. For this reason many of the exhbits were brought direct from the New York exhibition.

Four new cars made their first bow at the Detroit show. These were the Traveler pleasure car and the Hercules, Standard and Star commercials.

The Traveler is the product of the Traveler Motor Car Company, Detroit. It is an assembling proposition and features the Traveler-Detroit 36 at $1,080, fully equipped. The specifications include left-hand drive, center control; wheelbase, 120 inches; Beaver motor, 3 3-4 x 5; unit power plant; cylinders cast in pairs; multiple disk clutch; chrome nickel gears, selective sliding gear transmission; semi-elliptic springs, front and three-quarters elliptic rear; Timken axles, full floating rear axle; 34 x 4 Goodyear tires, non-skid all around; Bosch dual ignition; Gray & Davis lighting system; 18-gallon gasoline tank, and full electric equipment.

The Star truck is made by the Star Motor Car Company, of Ann Arbor, Mich., which has succeeded the Huron River Manufacturing Company, of Ann Arbor. Standard parts are used, the body being built at the factory on orders from the purchaser. This new Star line is made in two types, model A being a 1-ton proposition, while model B has a rated capacity of 1,500 pounds. Continental motors are used, the model A having a bore of 4 1-8 inches and a stroke of 5 1-4 inches. The other model has a motor of dimensions of 3 3-4 by 5 1-4 inches. The cylinders of the latter are cast in pairs while those of the former are monoblock-cast. For the type A chassis with 130 inches wheelbase, $1,800 is asked, while type B is priced at $1,200. The wheelbase of this model is 110 inches. The two machines are conventional in most respects and reflect standard practice as it applies to commercial car construction.

The Standard truck, made by the Standard Motor Truck Company, of Detroit, is in four lengths of wheelbase, twelve lengths of frame back of seat for loading space. Eight different gear ratios are available between motor and rear wheel, permitting gearing the truck to suit the services to which it is to be used. The chassis is a complete unit, including seat, to which any type of body may be attached. The short chassis has 10 feet wheelbase, the standard has 12 feet wheelbase, the long 14 feet, and the extra long 16 feet. The Standard chassis is $2,750 and the others $50 additional. The car has a four-cylinder Continental motor, L-head type, 4 1-2-inch bore, 5 1-2-inch stroke, and has 40 horsepower. It has a capacity of 3 tons and sells for $2,750.

The Hercules 1-ton truck, manufactured by the Alma Manufacturing Company, of Alma, Mich., is made in two types, one with engine under hood and the other with engine under seat. Following are some of the specifications for engine-under-hood type:

Loading capacity, 2,000 pounds; speed, maximum 15 miles per hour; Continental 30-horsepower motor, four-cylinder, L-head type; 3 3-4-inch bore, 5 1-4-inch stroke; carbureter, Schebler model L; ignition, Bosch magneto, set spark.

The price of this Hercules, including standard equipment and stake or express body, is $1.775.

Quakers Saw 80 Motor Trucks

PHILADELPHIA, PA., Jan. 31—Philadelphia's twelfth annual automobile show, conducted under the auspices of the Philadelphia Automobile Trade Association, came to a close tonight. Staged in the new mammoth garage of the Automobile Club of Philadelphia, Twenty-third and Market streets, the exhibition of gasoline and electric pleasure cars and commercial vehicles was the most successful, financially and socially, ever held in this city.

All told, some 300 cars were shown during the first week, which was devoted solely to pleasure cars, consisting of sixty-nine different makes. Part II, or the commercial vehicle section, which wound up the show tonight, consisted of about eighty motor trucks, the product of thirty-five manufacturers, the exhibits ranging in size from 500 pounds' capacity to 10 tons, and showing bodies adaptable to every conceivable form of transportation. Some were entire strangers to Philadelphians, notably the Velie, Blair and Smith-Milwaukee, which were not installed until Tuesday.

The commercial vehicle exhibit this week, together with the hold-over accessories dealers, occupied two floors. Although a representative display was presented when Part II opened on Monday, it was not until Tuesday that the show got under way and was filled with spectators.

Buffalo Show Successful

BUFFALO, N. Y., Feb. 4—With an average daily attendance of 8,000 people, Buffalo's eleventh annual motor show came to a close Saturday night. In point of sales and attendance the exhibition just closed proved the greatest in local automobile history. In fact local motorists say it would be hard to duplicate. Thursday night broke the record for attendance during the week. The night was "Society" night, and fully 12,000 people were present. The lowest attendance of the week was registered on the closing day when 5,000 were present. The door prize, an Empire touring car, was won by A. G. Mead.

View of Wayne Pavilion, Detroit, showing exhibits in place before opening night

Metropolitan Engineers Discuss Motor Testing

Various Types of Brake Testing Mechanism and Manograph Work Discussed Informally

Hugo Gibson Presents Paper on Manograph and Dwells on Its Operation—Montreal Show Closes

TWO papers were on the schedule for the January meeting of the metropolitan section of the Society of Automobile Engineers, held last Thursday evening. The first of these papers was by Herbert Chase, of the testing laboratory of the Automobile Club of America, entitled Motor and Carbureter Testing. The second was by Hugo Gibson on the Manograph. Both papers were illustrated by lantern slides and the discussion was taken by dictaphone.

A running discussion was carried on while Herbert Chase showed his slides on the various kinds of apparatus used in testing work. Slide 1 depicted the Brony brake and the rope form of brake. The principles of resistance upon which all brakes work was discussed. The rope brake was criticised owing to the fact that it had a marked tendency to seize and also because of the difficulty in regulating the load. The fan dynamometer was also shown on this slide and various methods of changing the load suggested. It was brought out, however, that owing to the difficulty in correctly calibrating for all conditions, inaccuracies were bound to creep in.

Slides 2 and 3 showed further particulars of the rope brake and water brake. The small size required for the absorption of a given amount of power is one of the advantages of the latter type of brake. The fourth slide showed the Garland brake, which has recently come into prominence for automobile motor testing. Briefly, this device works upon the principle of an increased load through the means of an increased electric field resistance due to the cutting of magnetic flux by copper. The brake is cooled by water without the use of any piping connections. At 3.5 amperes a load of 100 horsepower is held at 2,000 revolutions per minute.

The fifth slide showed the electric cradle type of brake. This was stated by Mr. Chase to be expensive but ideal. It is small for the amount of power consumed, it is accurate and can be used for the measurement of power of fractional loss.

The next series of curves touched upon the results secured by exhaust gas analysis. Mr. Chase stated that it was evident if both CO (carbon monoxide) and free oxygen were present in the exhaust gas that combustion had not been complete and that a percentage of the fuel was being thrown away in the exhaust instead of being of use for propelling the vehicle. The correct proportion of air to gas for forming a mixture which showed the best results as far as combustion went was stated to be in the neighborhood of 12.5 parts of air by weight to one of gasoline. The results in this case gave no carbon monoxide and a maximum of CO_2 (carbon dioxide). This meant that all the carbon on the charge had been burnt and the highest possible efficiency secured from the fuel.

The losses of heat in exhaust temperature and through the cooling water, it was stated, were unavoidable. It was shown that the losses through the cooling water on an average motor were about 30 per cent. of the total power in the fuel put into the motor. This could not be cut down with our present methods of cooling, Mr. Chase stated, and was to be expected.

Some typical manograph cards were thrown upon the screen. The effect of late and early ignition was noted. Some discussion regarding the waves often found in the expansion line ensued. It was the theory of some of the members that this was due to stratification of the charge. Others stated that they had noted the fluctuations in the curve whenever the motor was operated with too rich a mixture. Following the discussion on the manograph cards a description of the testing apparatus at the Automobile Club of America was given.

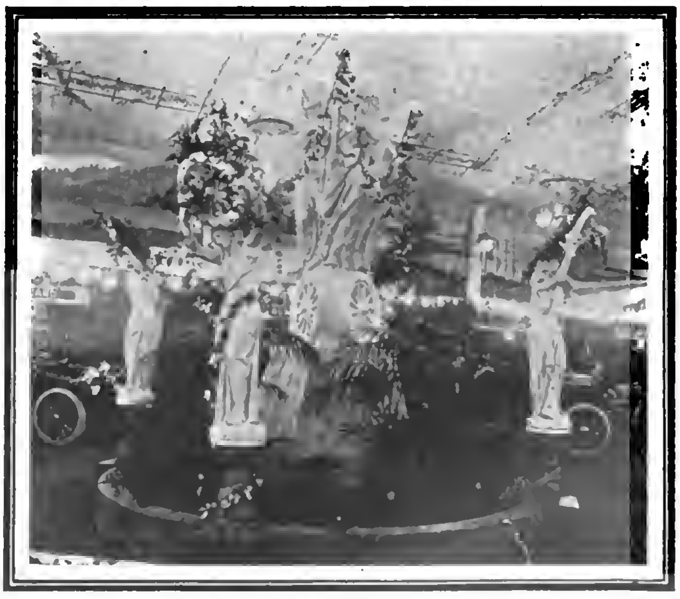
After a short recess Hugo Gibson's paper on the manograph was given. He spoke on the rapidity at which the beam of reflected light crossed over the ground glass. He spoke of the light weight of the moving parts in the manograph and the fact that there was no lag to the beam of light which was large enough to be appreciable. The total weight of the moving parts in the manograph as he used it measured 3.5 grams.

A discussion on the diaphragm showed that it generally lost some of its resiliency after it had been in use for some time. This necessitated a recalibration of the instrument in order to take care of the change in the diagram due to the change in resiliency of the diaphragm. It was brought out, however, that the change in the resiliency was so slight that the recalibration showed very little change over the former readings.

The necessity of using a pressure pipe at all was regretted by Mr. Gibson. He stated that a certain loss resulted which would not be the case if the diaphragm could be part of the cylinder wall. This was found to be impossible owing to heat and other conditions under which the diaphragm would be compelled to work. He also stated that the same manograph should be used for each cylinder where the diagrams were taken of a six-cylinder motor. If different manographs were used for each cylinder the curves would be on a different basis and would be hard to compare. For this reason he used a series of water-cooled cocks which could be employed to connect each cylinder with the manograph in turn. It was shown also in Mr. Gibson's discussion of the manograph that the arc light is a necessity; for, as he stated, the time of each exposure is only .000,004 second and the acetylene light is not powerful enough for this work.

Montreal Has 178 Exhibitors

MONTREAL, Feb. 2—The second automobile show was successfully brought to a close February 1. There were 178 automobiles and trucks in the exhibition. Of these, 124 were touring cars, and 51 delivery trucks. The total sales and prospective sales were much greater than ever before. Undoubtedly the show was a monster success from every point of view.



Part of the elaborate decorations of Detroit's Twelfth Annual Automobile Show

East aisle of Coliseum looking northeast

(*Continued from page 403.*)

cups with long tubes attached so that the cup can be accessibly mounted, the tube leading the grease or oil to the part to be lubricated. These improvements are generally on the higher-priced machines, those driven by chauffeurs, so that those driven by owners, are poorly provided for in this respect.

During the opening evening of the show one salesman in conversation with a group of prospectives was heard to remark, "We cannot get our owners to even fill the grease cups and we have to inspect many of our cars periodically to insure that they are cared for." A hurried glance at the chassis, which this salesman was representing, showed that not a solitary one of the rear axle grease cups could be reached without getting under the car and lying on your back on the ground. Is there any wonder that with such lack of accessibility that owners do not give attention to such parts? There is more injury done by failure to fill grease cups and give the parts supposed to be protected by them proper attention than there is by such parts wearing out.

At the exhibit space of another concern, which makes a speciality of having accessible grease cups, it was learned that grease cups on universal joints had to be taken off and new types of joints fitted, because the destruction of the joints was due to lack of attention rather than to normal wear. These are actual conditions, and although many salesmen remark, "They only have to be screwed down every 500 miles," yet the engineer says that they should receive attention after every century of running.

The difficulty of caring for rear axle grease cups has increased with the placing of gasoline tanks under the rear of the chassis, and still more so by carrying tire and demountable wheels on the rear, but in spite of these changes there has not, in scores of cases, been any attempt to add to the accessibility of these important parts of the car.

The use of flexible tubing in connection with grease cups is gaining more prominence, and by its use grease cups can be brought out to some accessible position. Much more can be done in this respect, and there is great need for it.

Several examples of accessibility of lubrication measures are seen and any cited herewith are cited merely as examples, and others could be cited as fulfilling the same requirements. The Haynes motor carries a large filler pipe with a funnel ending, which funnel is carried high up and well out, leaving it entirely accessible and yet not interfering with any of the other motor appurtenances. On the Packard the brake rocker shaft, carried in front of the rear axle, is lubricated by a grease cup carried back of the axle and fitted with a long tubular stem reaching to the rocker shaft bearing. On the Stevens-Duryea six a long vertical pipe is fitted to one of the rear axle brake oilers, solely to bring the oiler head to a position where it can be filled with entire ease. On the Peerless chassis is a similar provision. The Premier chassis uses a very large grease cup at the forward end of the torque tube and this grease cup inclines forward so as to be reached when the floor boards are raised. On the Cadillac the grease cup for the forward end of each rear spring is a long stem allowing the grease cup to hang much lower than the spring eye and so make it accessible from underneath the fender. On the White motors exceptionally large filler caps are used on the motor oil reservoirs so as to make filling easy. The fan and water pump shafts also carry large grease cups. On the Locomobile chassis the differential portion of the axle is entirely free from grease cups, which gets away entirely from the inaccessible feature.

An improvement that can be imitated to advantage is that of fitting leather boots for the steering connections between the cross tie rod and the steering knuckle parts and having the grease cups extend through these boots so that the screwing down or filling of these is not molested and is the same whether the boot is in place or not.

One of the most inaccessible grease cups is that on the clutch cone, and yet it is one that merits every attention. From factory representatives it was generally learned that it is frequently neglected, yet it is on a rapidly rotating part and should receive the major share of attention. The clutch thrust collar can be lubricated by a grease cup located on the outside of the chassis frame and connecting with the collar through a flexible tubing. This construction could be well imitated by not a few makers.

One of the most inaccessible grease cups is that on the forward end of the torque rod or torque tube, as the case may be. This location generally comes underneath the front seat, a point inaccessible when the forward floor boards are raised and nearly as inaccessible when the tonneau floor is raised. There is not any reason why a long flexible tube could not be connected to this grease cup and the cup placed to be reached from under the forward floor boards.

As soon as designers have decided on what type of generator they will use for electric lighting and what form of cranking motor will be used, it will be imperative for them to set about arranging the various motor appurtenances such as magneto, carbureter, water pump, electric generator, tire pump and cranking motor with some form of symmetry, and so get away from the mussed up appearances that so many carry today. Since the New York show the new Mitchell chassis has been cleaned up considerably in this respect, in that now the lighting generator is located at the right side of the gear-box and the cranking motor at the left side, both specially accessible by raising the floor boards. This arrangement, coupled with the use of a transverse shaft at the forward end of the motor driving the magneto at one end and the water pump at the other, gives one of the cleanest and most accessible outfits seen. It leaves both sides of the motor clean, the carbureter occupying one side and the other side having but the exhaust manifold.

The coming of wire wheels for this season and next will necessitate some changes in fender design, because the conventional falt-top fender, so well suitaed for the straight spoke artillery wood wheel, is not best suited for the wire wheel, when appearances are considered. The convex top lends itself more to the irregular shape of the wire wheel, particularly the coned appearance caused by the radiating spokes meeting the hub end.

Taft Opens Washington Show

WASHINGTON, D. C., Feb. 4—President Taft last night officially opened the Washington, D. C., automobile show by pressing a button at the White House that turned on lights in Convention Hall and unfurled a big flag. This is the first time in history a President of the United States has opened an automobile show. There are forty six exhibitors.

French Grand Prix May Be a Two-Day Event

On July 12 Will Be the Big Car Race Under the Fuel Limitation Rules of 14.1 Miles to the Gallon

Motorcycles and Cyclecars Will Feature the Second Day's Races With the Course Shortened to 12 Miles

PARIS, Jan. 24—It has been practically decided that the Grand Prix race at Amiens next July will be a 2-day event. On Saturday, July 12, there will be the big car race under the fuel limitation rules calling for 14.1 miles to the gallon, and on the following day a race will be held for motorcycles and cyclecars (machines with a cylinder capacity of not more than 67 cubic inches and a maximum weight of 672 pounds). For the small cars the course will be shortened to about 12 miles instead of 19, thus avoiding two of the right-angle turns which must necessarily be cut up after the passage of the high-speed racers. The same grandstands and pits will be used for both events and the cement surfaced hairpin turn in front of the grandstands will also be used by the motorcycles and sidecars.

Several of the French Grand Prix racers will go on the road next month. Delage has already completed the bench tests of his motors, the dimensions of which are 4 by 7 inches bore and stroke. These two cars will be driven by Bablot, the winner of the 3-liter race for Delage in 1910, and by Albert Guyot, who is scheduled to drive the record breaking six-cylinder Sunbeam at Indianapolis next May. Guyot has made arrangements by which he can drive in the American classics on the English car and get home in time to handle the French car on the Amiens course. Peugeot will have Boillot, Goux and Zuccarelli as their drivers. The new racing motors are well advanced, but all particulars of them are being kept secret. It is believed that their bore and stroke will approximate 4 by 7. Sunbeam is at present making experiments with two different types of motors, one set being of small size and running at a high speed, and the second set having a big cylinder area and running comparatively slowly. The Sunbeam drivers will be Victor Rigal, the winner in the 3-liter class at Dieppe last year; Darius Resta, Gustave Caillois, and W. Lee-Guinness, brother of the owner of the famous 200-horsepower Darracq of Florida fame. Christiaens will handle a six-cylinder Excelsior in the French race, this doubtless being the only six-cylinder car taking part. Champoiseau will be one of the Schneider drivers. No other drivers have yet been appointed. As several of the French cracks, among them Duray, Wagner and Hemery, are still without engagements, it is probable that they will be secured for the foreign cars entered in the race.

Seek to Offer Trophies at Indianapolis

INDIANAPOLIS, IND., Feb. 3—The management of the Indianapolis Motor Speedway is trying to arrange to offer the Remy Brassard, the Prest-O-Lite trophy and the Wheeler and Schebler cup in connection with the 500-mile race to be given at the local speedway, May 30. These would be given in addition to the cash prizes aggregating $50,000 which are to be hung up.

It is proposed that the Remy Brassard, which carries with it a weekly salary of $75 a week shall go to the driver making the best time for the first 100 miles; the Prest-O-Lite trophy, which is a brick of silver valued at $1,500 to the driver making the best time for the first 200 miles and that the $10,000 Wheeler and Schebler cup shall be given to the driver making the best time for 300 miles.

It is thought that the offering of these trophies might have the effect of forcing the National and Marmon companies into the race. The Prest-O-Lite trophy was won by Howard Wilcox driving a National and the Wheeler and Schebler cup by Ray Harroun, driving a Marmon. An effort is being made to find a suitable trophy to be hung up for the driver making the best time for 400 miles. Bob Burman has held the Remy Brassard most of the time since it was first offered, and he has already entered the coming race.

The management expects an excellent list of entries, many prominent firms stating that they will enter.

Chandler Motor Car Company Its Name

CHICAGO, Feb. 4—The Chandler six makes its debut during the Chicago show. It was not in the show proper but is being displayed in a private garage to agents who are looking into its merits. The Chandler six is the product of the newly formed Chandler Motor Car Company, which is made up of former officials of the Lozier company. During the New York show it was reported that the concern was to be known as the Emise Motor Car Company, and that it would build the Emise six. Instead of that, it is named in honor of F. C. Chandler, former vice-president and general manager of the Lozier Motor Company, now president of the Chandler company.

Other officials include C. A. Emise, former sales manager of the Lozier, as vice-president and sales manager; Samuel Regar, former Lozier treasurer, as treasurer; W. S. M. Mead, secretary; J. V. Whitbeck, engineer and J. R. Hall, superintendent. The company is capitalized at $250,000 and incorporated under the laws of Ohio. A definite location has not yet been secured but a Cleveland proposition is being considered.

Mr. Emise's resignation from the Lozier company has just gone into effect, and Mr. Chandler and Mr. Regar state they retired several months ago.

It is planned to turn out 2,000 cars the first year. The new model is to list under $2,000 and its specifications include a six-cylinder motor, 3 3-8 by 5 inches, of the L-head type and cast in two blocks. The camshaft, pump and magneto are driven by inclosed silent chains and the valves are inclosed. A Bosch high-tension magneto is used and the cooling is by centrifugal pump, a square-tube radiator being fitted. A Westinghouse electric self-starter and lighting system are used. The clutch is a multiple disk and the gearset three-speed selective in unit with the motor and clutch. There is a floating rear axle, double internal expanding brakes, three-quarter elliptic rear springs, 34 by 4-inch wheels, left side drive and center control, while the car is fully equipped.

A view towards northeast corner of Coliseum

Floating Types Dominate Axle Field

Few Alterations of Any Consequence Made in the Rear Axles Offered to the Car Builder This Year—Quest for Silent-Running Gears

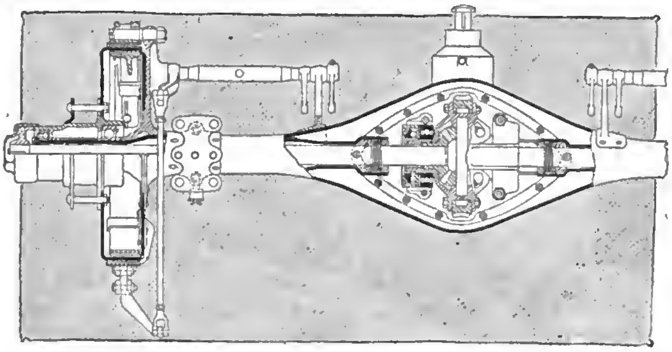


Fig. 1—Showing the general construction of the American worm-drive axle. In the design here shown the worm is carried below the wheel

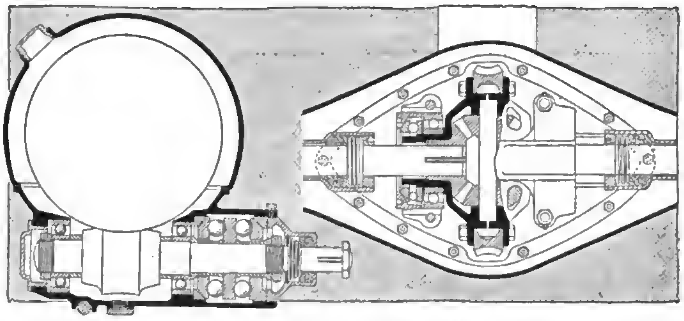


Fig. 2—Details of the mounting of the gears and differential of American Ball Bearing Company's underneath worm-drive axle

AXLE design and construction has been developed to such a degree that this part of the automobile now admits of but very little variation from year to year. Accordingly, in looking over the profusion of designs offered to the motor car manufacturer this year, we see but slight changes, if any at all, from that practice which is now regarded as standard. Nor should we look for radical alterations in products such as this which have gone through such a long process of evolution.

Here and there a manufacturer has added another size or two or another type to fill up gaps in his line, while several others have brought out worm-driven types in anticipation of a demand for them in the near future. Not a few of these makers believe that the public will soon demand worm drives just as it has dictated other changes.

Axle makers as a whole have sought to produce silent running gears, and methods of gear manufacture have necessarily been improved therefor. Pressed steel housings are well nigh universal now in pleasure car axles, these housings being made strong enough so that truss rods have been quite generally discarded. Changes if any have been in the nature of minor refinements, generally not coming to light except on close inspection. Oil packing rings tending to prevent oil leaking, adjustment features, and so on, have in some instances been slightly modified. Metals used for the manufacture of certain parts have in some instances been altered in composition. In other cases entirely different metals are now used for some of the parts.

Floating types are in evidence in nearly every pleasure car axle maker's list, although the semi-floating designs still hold their own for small car installations. Strictly speaking, the majority of floating axles really involve a feature of the semi-floating class in that their driving shafts bolt directly to the wheels through flanges or plates which are integral with the axle shafts.

American—Besides its bevel gear rear axles, which are of the floating type, the American Ball Bearing Company is manufacturing a floating worm-driven rear axle for gasoline pleasure cars, commercial cars and electric vehicles. This axle embodies the Lanchester-Daimler type of worm gear mechanism, the worm being of the hourglass type and partially embracing the circumference of the worm wheel. Considerable difference of opinion exists among automobile engineers as to the relative advantages of mounting the worm above or below the axle and for this reason the American company constructs these axles with the worm in either position.

Drawings showing the construction of this axle for pleasure car work with the worm below are reproduced in Figs. 1 and 2, the details of the mounting of the gears and of the differential are shown in Fig. 2. The housing is of pressed steel, 3-16 inch thick, while the entire driving mechanism, including the worm and worm wheel, together with the differential and all necessary bearings, is mounted on the gear carrier and inserted in the axle as a unit. This construction is also true of the bevel gear axles of this make. The drive shafts and the differential are carried on large annular ball bearings, while ample provision is made for end thrust through the use of thrust bearings at either side of the differential cage. The worm is carried on two annular ball bearings and it is also provided with a double thrust bearing. Provision for oiling is made through the tap hole at the top of the housing. To prevent oil leakage out of the housing, packing rings are fitted. These are held tight against the shoulders of the housing by springs, the tension in which may be adjusted by the nuts shown. The hubs, which are mounted on annulars, are driven through plates on the axle shafts.

Double internal, or external and internal, brakes are supplied. The axle tubes are riveted into the ends of the housing, and like the differential bevel gears are constructed of 3½ percent nickel steel. Drive and axle shafts are made of chrome vanadium steel. Hubs are cast steel, while brake drums and flanges are sheet steel.

Driggs-Seabury—The Driggs-Seabury Ordinance Corporation makes two designs of floating pleasure car rear axles in addition to its front axles. These rear axles consist of a type for cars weighing from 2500 to 3500 pounds and another for vehicles between the weights of 2700 and 3400 pounds. The first is constructed with driving flanges integral with the axle shafts. The housing of the differential gears and bevels is integral with the tubes which inclose the axle shafts, it being made of hydraulically pressed steel. A strong construction is obtained by the re-enforcing of the ends of the axle tubes by wrought steel members which carry the spring seats and the load. The differential unit and its cage are assembled within the housing through a suitable opening at the front, it then being securely fastened in place. At the rear there is a similar opening through which the differential mechanism and driving gears, together with bearings, may be removed without the dismounting of the rear wheels, the axle shafts being the only other portion of the axle which must be disturbed. With this type of axle, a torsion tube is provided which houses the propeller shaft. Throughout the axle suitable annular ball bearings and ball thrust bearings are used. The 2700 to 3400 pound design differs somewhat from the type mentioned above. The jaw clutches on the ends of the axle shafts are not secured to the hub flanges, while double row ball bearings carry the wheels. Throughout this design, double row annulars are used in place of the single row construction of the other type.

All brake operating rods and levers are located within the overall length of the axle, so that brake connections may all be made within the chassis frame. The operative parts of the brakes can be arranged along their shafts in practically any desired positions to meet the demands of any particular car design.

Hess—The Hess Spring and Axle Company's standard bevel gear drive rear axles are constructed in two sizes, a heavy type and one of lighter design. These are of the floating variety, the axle tubes being integrally constructed with the housings which inclose the differential and driving units. The wheel carriers of model 211 are constructed of nickel steel. Housings are strongly constructed of pressed steel, and the design is such that no truss rod is necessary for cars up to 4500 pounds empty weight. An opening at the rear permits of easy access to all internal mechanism. In this plate there is a tapped hole through which grease may be put into the gearing and bearings. In assembling the axle, the power transmitting unit containing the differential carrier and the pinion is put in through a suitable opening at the front of the housing. The entire driving unit, which is completely assembled before being put in the housing, is carried in hangers, which are integral with the front plate covering the front opening. The light type model 112 axle is especially adapted to electrics and to cars weighing empty up to 2750 pounds. The same general design characteristics hold for this axle as for model 211, except that the axle shafts have integral flanges which bolt to the hubs and that the wheel carriers and housing are pressed out integrally.

Fig. 3 gives an idea of the details of the worm-driven axle which is being produced by the Hess concern in addition to its bevel gear types. This is of the overhead worm design, and a notable feature is the construction of the pressed steel housing, which is so made that a liberal quantity of oil can be carried within it without any escaping. The worm used is of the straight type, better known as the David-Brown type, produced for the Hess Company by Brown & Sharpe. The housing will carry cars up to 4000 pounds empty weight without truss rods. The same general features are embodied in these worm axles as are used in the bevel types, and they are furnished with gear ratios ranging from 3 to 5 to 1.

Lewis—The Lewis Spring & Axle Company is on the market with a floating type of rear axle which is constructed of rolled steel in two halves, which are welded together. The axle tubes are an integral part of the differential housing. Like several other designs, the Lewis axle has its differential gears, bevel pinion and driving mechanism, together with bearings carrying these parts, mounted on a carrier on which all adjustments are provided. Thus if necessary to remove the entire assembly, the adjustments need not be disturbed. The gear carrier is made of cast steel, while the shafts and gears are constructed of heat treated 3 1-2 per cent. nickel steel. The tubes carrying the wheels are separate from the main housing and are carried back to within an inch of the differential cage. These reinforcing tubes are carried on plates and welded to the main housing so that the complete construction is practically a one-piece design.

McCue—The McCue Company offers a complete line of rear axles to meet the requirements of all weights of cars. There are six types of these McCues, one of which, model 7XW, is shown in Fig. 5. This particular type is equipped for wire wheels, the McCue company making a specialty of wire wheel constructions. In addition to the design here shown, the list includes models 6X, 9X, 29X, 17X and 19X, all of which are of the floating type, bevel geared. The axle housings are made of steel in one-piece construction, the metal tapering in thickness from 3-16 inch at the center to 5-16 inch at the ends. The shape of the housing is such that it is a truss within itself, no rods being employed. The wheel bearings are of ample sized annular type, mounted in the center of the wheel hub so as to be in direct line of the force. Driving flanges are fastened to the hubs by six 9-16 inch bolts each. Brakes are both expanding as shown in the figure. The drum diameters of this 7XW type are 10 inches for the emergency and 14 inches for the service brake. Spring seats are made adjustable from 35 to 42 inches center to center. Driving gears and differential mechanism are carried in a unit, bolting to the housing through flange at the forward end. Any of these McCue models is furnished to take either wire or wood wheels.

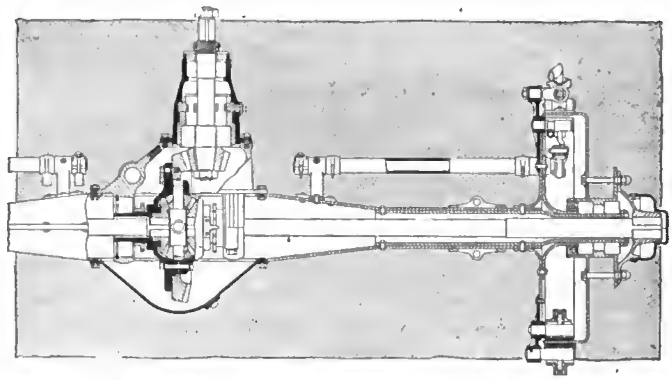


Fig. 4—The Metal Products Company's style 18 bevel-gear rear axle. The housing is made in two halves, riveted together along truss flanges

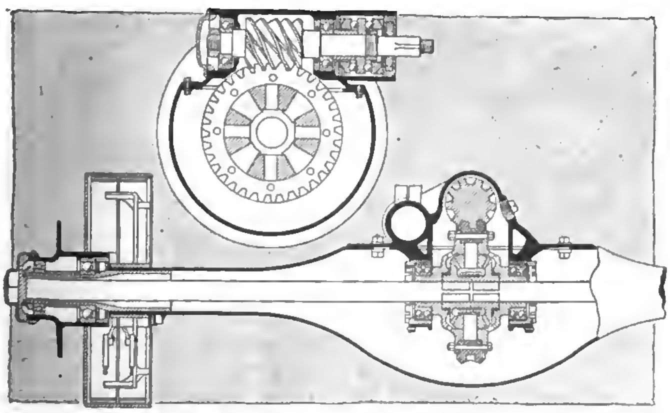


Fig. 3—Hess overhead worm-drive axle, showing the details of the worm and gear mounting on annular and thrust ball bearings

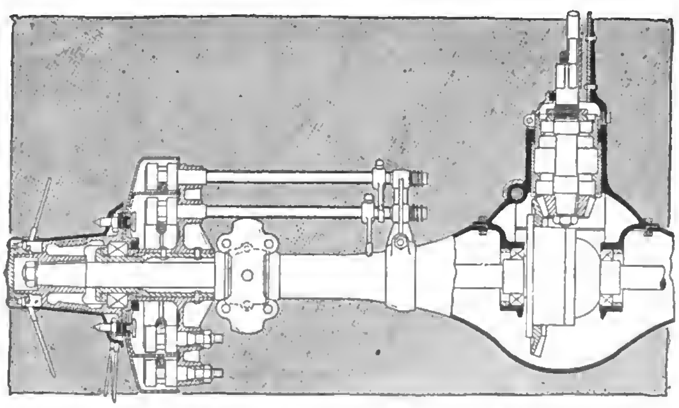


Fig. 5—The McCue Company's model 7XW rear axle of the floating type. This design is shown fitted for wire wheels of the McCue make

Metal Products—The Metal Products Company manufactures two sizes of rear axles of the floating type. These have pressed steel housings, and one of them, style 18, is shown in Fig. 4. The designs of the two are similar, the difference being principally in the load carrying capacity. The lighter type is designed for cars weighing from 2,800 to 3,100 pounds, while the heavier carries vehicles weighing from 3,500 to 3,800 pounds. The housing which integrally inclosed the driving axles as well as the differential and driving gear mechanism is constructed longitudinally in two halves which are riveted together along their edges, forming webs which act as strengthening elements. The usual mounting of driving gears and differential in a hanger removable from the front is present, while an opening at the rear is also provided. The Hudson, Chalmers & Woods electric concerns receive practically the entire output of this plant.

Merchant and Evans—The Evans transmission jackshaft for commercials is manufactured in two sizes, the medium design for vehicles equipped with engines up to 40 horsepower, four-cylinder, 4 3-4 inch bore, and the large type for cars carrying power plants up to 60 horsepower, four-cylinder, 5 1-2 inch bore. The design of the two sizes is practically the same. The differential and driving gear mechanism are made accessible from the top, a cover plate bolting in place and forming a portion of the upper half of the housing. Wheel bearings are double row annulars, while suitable annular ball and thrust ball bearings carry the various shafts throughout. There are three forward speeds provided with this assembly. Second and third speeds are direct.

Muncie—The Muncie Gear Works standard types of jackshafts for commercial cars range in size from the small model for light delivery wagons to carry from 500 to 1,500 pounds to the type for trucks to carry 2,000 to 2,500 pounds with a 30 to 35 horsepower motor. These jackshafts also vary in that some of them are designed to carry gear boxes bolted to them while others do not provide for the unit attachment of the gearset. Fig. 6 shows a model 503 outfit with unit transmission on gearset, giving an idea of the method of bolting the latter to the axle housing through flanges. This design is intended for trucks carrying from 1,000 to 1,500 pounds and equipped with power plants ranging in horsepower from 15 to 20. Annular ball bearings and thrust bearings are used for the differential and driving mechanism, while the sprocket ends of the driving shafts are mounted on Hyatt roller bearings, which are a spiral type, as shown. The jackshaft is geared 3.2 to 1. Gears have a pitch of 5, while the differential gears have 8 to 10 pitch. The frame hangers are adjustable as to distance from center to center within the range of 30 to 36 inches. The transmission provided two forward speeds and reverse, the high speed being direct. This jackshaft is typical of Muncie design.

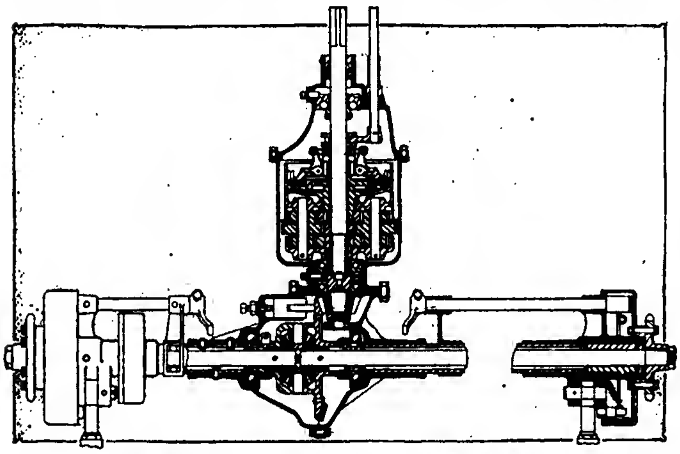


Fig. 6—The Muncie Gear Works' unit gearset and jackshaft for trucks of from 1.000 to 1,500 pounds. The axle shafts are carried on roller bearings

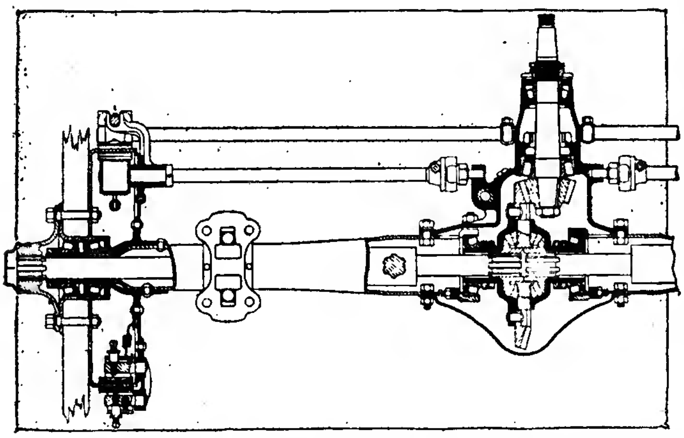


Fig. 7—A Timken-Detroit type of floating rear axle for cars of approximately 2,700 pounds total weight. Note the double roller bearings carrying wheels

Sheldon—In addition to its truck axle equipments, consisting of jackshafts with and without the gear boxes in unit and dead rear axles, the Sheldon Axle Company makes pleasure front and rear axles. With the latter we are specially interested here. A typical Sheldon rear pleasure car construction is the type 201-D, which is a three-quarter floating variety, with torque tube inclosing the propeller shaft and fastening to the differential housing at its front end. This model is for cars weighing not over 2,700 pounds empty. The axle shafts are constructed of nickel steel and have the driving flanges fixed to their ends, which flanges bolt to the wheels. The propeller shaft is also of nickel steel and is mounted on annular ball bearings at its forward end and at the pinion end. The differential is carried on Hyatt roller bearings in combination with straight ball thrust bearings on either side. The differential is so mounted as to be adjustable. The driving pinion, ring gear and pinions are all made of heat-treated nickel steel. The differential unit complete may be removed by taking off four nuts holding the differential bearing caps and taking out the axle shafts. The axle tubes are not internally constructed with the differential housing but are separate pieces which rivet to the housing. This may also be said of the propeller shaft tube. Brake drums are of pressed steel 14 inches in diameter. Brake levers may be optionally located at the drums or inside the frame.

A notable feature of Sheldon construction this year is that the hubs of all axles are made so as to take any make of standard annular bearings interchangeably, or any standard roller bearings in annular series.

The Sheldon company has also brought out a new worm driven axle employing an imported worm of the overhead type. The details of this new axle are not forthcoming at this time.

A. O. Smith—Besides producing pressed steel frames, clutches, steel stampings and various forgings for motor cars and trucks, the A. O. Smith company also makes axles front and rear, for pleasure cars and trucks. The pleasure car types are made in three sizes, model 4 for cars weighing up to 3,000 pounds, model 5 for those up to 4,000 pounds, and model 6 for heavy types having a maximum weight of 5,000 pounds. The rear designs are built on the unit principle, embodying simplicity and ease of adjustment. The housing used is of pressed steel of the integral truss type, the truss webs extending along the top and bottom. The ends are re-enforced by long swaged tubes, the outer ends of which form the bearing sleeves. These in turn are bridged across by the brake supports. These axles are equipped throughout with Whitney roller bearings, which are now manufactured by the Smith concern. There is the usual opening at the rear for inspection and adjustment of the gearing. The spring centers are variable within limits. External and internal brakes are supplied, and for model 4, the drum diameter is 14 inches. The other two models have 16 inch drums.

Salisbury—The Salisbury Wheel and Manufacturing Company manufactures floating rear axles which have pressed steel housings, the axle tubes being integrally formed with the housing for the gears and driving mechanism. The usual construction having the differential driving pinion, together with the necessary bearings in one unit, obtain in this construction, the entire unit bolting to the front of the housing through an integral flange, the extension of which forms the bearings for the differential and its parts. The driving shafts drive the wheels through clutches. Annular ball bearings are used throughout the construction, one single-row annular being mounted directly under the vertical center line of the spokes of each wheel, while suitable annulars carry the differential on either side. Ball thrust bearings take care of the end thrust. The brakes are in two sets, service and emergency, both internal expanding, and they are concentric. In connection with this axle a triangular torque rod is used, the mounting for the rear end of this being integral with the outer flange of the differential carrier.

Stutz—The Stutz Auto Parts Company is the maker of a transmission and rear system which consists of a rear axle, gearset, propeller shaft and torque tube in unit. The transmission gearset housing is of cast aluminum, while the greater part of the driving and differential housing is made in a single unit. New Departure ball bearings are used throughout the construction of the gearset and the driving gear unit, while the propeller shaft is mounted on Hyatt roller bearings. These unit systems are constructed in two sizes, the smaller for cars under 25 horsepower, and the larger for those ranging from 25 to 40 horsepower. The gears are of the bevel type.

Timken—The Timken-Detroit Axle Company's line is most complete for all types of vehicles, both pleasure and commercial. It includes both front and rear types. A typical pleasure car design is that shown in Fig. 7. This is a floating type for cars weighing completely equipped, less passengers, approximately 2,700 pounds. Special features embody a continuous pressed steel housing, with its ends swaged and ground for the bearings. The oil retainer tubes are welded into position and extend in close to the differential. The carrier embodies the complete power plant with all gears, bearings and differential integral. The drive shafts are of nickel chrome steel, both ends being six-splined to received the end flanges which bolt to the wheels. Timken adjustable roller bearings, which are combination thrust and annular types, are used throughout the construction. Each wheel is carried on two bearings, while one is placed on either side of the differential mechanism, one just back of the driving pinion and another at the end of the pinion shaft, where it connects to the propeller shaft proper. The rear cover plate is of pressed steel and provided with filling and oil level plugs. The brake drums are of pressed steel, 14 inches in diameter on the No. 5220 shown in Fig. 7. All operating parts of the brakes are provided with anti-rattling devices, while both brake levers are brought in to the center with standard construction. Option of levers at drums may be had. All gears are drop-forged. hardened and ground with the idea of making them as silent as possible. Gear ratios are from 2 13-21 to 1 to 3 13-14 to 1.

Torbensen—The Torbensen Gear and Axle Company manufactures internal gear drive truck axles, the design of which is radically different from that of conventional American rear axle practice. No changes in the product have been made within the past year, the line consisting of three models, viz., model R for vehicles of about 3-4 ton capacity, model R-1 for those of 1 ton capacity and model S for cars of from 1 1-2 to 2 tons capacity. These capacities refer to the loads. In the Torbensen design there are really two axles, one a solid continuous member of the dead type for carrying the load, and the other, placed just behind it, a driving member of the live type, which turns the wheels through pinions and internal spur gears Fig. 8 gives an idea of the design of the type S. The wheels are mounted on the ends of the dead member, which also carries the wheel gears. The spurs connecting with these gears are mounted on the supplementary axle, in which is also incorporated the differential mechanism. The main speed reduction takes place directly at the hubs of the wheels, hence the rotative speed of the engine is reduced but little until it reaches these wheels. The Torbensen concern is now prepared to furnish its axles with

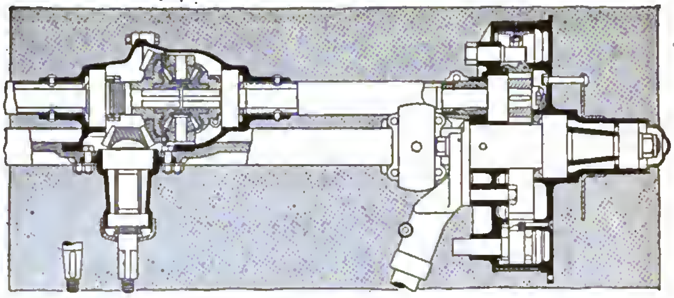


Fig. 8—The Torbensen type S rear axle for trucks which is of the internal gear type. The driving member is back of the dead-load member

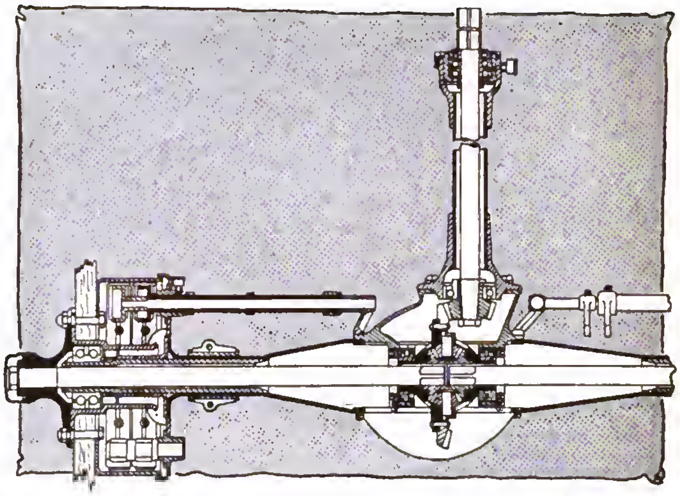


Fig. 9—An example of Weston-Mott construction. Model 950-L floating axle for cars weighing from 2,800 to 3,100 pounds. The housing is externally webbed

any bearings, domestic or imported, which may be specified. The dead member is now furnished in any desired alloy steel.

Warner-Toledo—The Warner Manufacturing Company includes in its product of various automobile parts, heavy duty truck and light delivery car jackshafts, which incorporate with the differential and axle driving members, the Warner gearsets, which are selective, sliding-gear types. The gears are accessible through cover plates, which inclose the upper part of the driving mechanism and differential gearing. For delivery wagons with capacities up to 1,500 pounds, the jackshaft is furnished with either a three-speed selective gearset or a planetary type. The brakes with this construction are 10 inch expanding.

Weston-Mott—The Weston-Mott Company is in the field with a complete line of bevel-gear rear axles, the models being fifteen in number and covering all maximum car weights from 1,500 pounds to 5,000 pounds. These are of three general types, namely, fixed hub, semi-floating; single-bearing floating, and double-bearing floating designs. The first of these is the simpler and in it the hubs are usually keyed or fixed to the outer ends of the shafts, the inner ends of which float in the differential. The single bearing floating types are constructed either with a roller bearing or a ball bearing placed durectly under the spokes of the wheels. The double bearing type carries two ball bearings in each hub, a large one to carry load and end thrust and a small one for load only. The shafts are made with integral driving clutches. A typical example of the latter class is the model 950-L, which is adapted to cars weighing from 2,800 to 3,100 pounds. It is shown in Fig. 9. It has a pressed steel housing of the externally flanged or webbed type.

In general all Weston-Mott axles have bevel rings and pinions cut with corrected teeth, which adds to the silence. High carbon or nickel steel is used in the driving shafts, while the bearings are either Hyatt rollers or New Departure ball bearings. Ball thrust bearings are of special Weston-Mott design.

Retainers Improved in Special Bearings

Although Conservative to the Highest Degree, the Makers of Bearings Have Made Minor Improvements—Some Other Interesting Accessories

CONSERVATISM is about the most marked quality in the bearing field for this year. Where the ball and roller bearing representatives were approached at the show it seemed to be the case that where a thing had only been on the market for 2 or 3 years it was regarded as new. The introduction of the automobile has presented but few added problems to the bearing manufacturer. Where changes have been made they have come but slowly and only after long periods of experiment. The big point in ball and roller practice seems to be to get a good retainer. With these few facts in mind, a brief survey of the field as represented at the New York show may be given.

Hess-Bright

No departures from standard design have been made by the Hess-Bright Manufacturing Company in the line of bearings brought forward for the consideration of the car manufacturer. The experimental laboratories of Wittenau, Germany, and the smaller one of Philadelphia, are constantly engaged in making detailed improvements and one of the most recent developments brought out by this concern is a retainer which is especially suitable for automobile installations. In order to keep manufacturers in touch with the latest improvements, the Hess-Bright company supplies data sheets in loose-leaf form. These are added to from time to time and are kept up to date.

J. S. Bretz

These imported bearings, made by Fichtel & Sachs, Schweinfurt a-M., Germany, and imported by J. S. Bretz, New York City, are made in every type of installation for automobiles. They are used by more than fifty American automobile manufacturers. The distinguishing feature of the F. & S. ball bearings is that by the use of a patent cage, 95 per cent. of the ball race is filled with balls and at the same time there is no inter-ball contact, each ball being guided separately and independently. The radial bearings are made principally in three series, A, B and C, the lightest being A and the heaviest C. A special magneto series under the name of type F is also made.

R. I. V.

The R. I. V. is an imported ball bearing made in all sizes and adopted on many of the standard American makes of automobiles. The series includes light, medium and heavy-weight models of radial and thrust types. A special line is made for ball bearing-equipped axles, for commercial or other heavy service. The latter is especially interesting in that a bronze auxiliary bearing is so fitted that it will not be in play under ordinary circumstances or service, but will come into effective use in case of extreme overload or other emergency. This extra bearing takes the form of a bronze bushing supported by two collars which withstand the lateral pressures used by making a steep turn out of a rut or around a corner at high speed. Special steering gear with combination rear axle and gearset installation are also specialized.

New Departure

The New Departure Manufacturing Company specializes on three distinct types of bearing, the double row, single row and Radax. The latter bearing is named from the fact that it is designed to withstand a combination of radial and axial load in one direction. The Radax bearing is made in the international standard metric sizes the same as the single-row bearing. In many respects this bearing is equivalent and the same as one-half of the double-row bearing. This is true especially of the radial load. In the axial or thrust load, however, it is the equivalent of the double row. A steel separator is used with this bearing.

American

Front and rear axles and the ball bearings used in their installation are made by the American Ball Bearing Company. This concern, which has had a steady growth since its organization in 1885, has started the manufacture of axles in 1900. Since then axles have been specialized. All the parts for the axles are assembled in the American Ball Bearing Company's assembly rooms and are shipped complete. The finishing of the ball-bearing cups and cones was done in the American plant by small abrading wheels and no water cooling is used. This is known as the dry grinding process. The wet grinding work is used on the larger material, such as axle parts, etc.

Rhineland

Rhineland is an imported ball bearing brought to this side by the Rhineland Machine Works and made at the home factory in Düsseldorf. Both tradial and thrust bearings are made and all the latter except those for light loads have a ball-shaped, stationary ring, which is designed to afford an equal distribution of load on all balls. The balls on all the thrust bearings are held in place by brass cages. The radial type will take 25 per cent. end load, but not more than 10 per cent. in the heavy series. Double-row bearings and others especially adapted to serve radial or combined radial and thrust loads are also manufactured by this company.

Atlas

The Atlas Company is an American concern making alloy steel balls guaranteed to be round and true within .0001 inch. The steel used in these balls is a chrome alloy manufactured abroad in the Girod electric furnace process. They are hot forged in specially constructed furnaces so designed that no direct flame can ever strike the field while they are being heated. The balls are forged in strings and then cut apart. After this they are annealed and allowed to rest before being rough ground. After thorough grinding they are sent through a smooth grinding process, which brings them within a few thousandths of 1 inch above the proper size. The heat treatment is then given the balls and they are hardened clear through. This is an advantage as compared with case hardening.

S K F

S K F radial bearings are made in a type which is especially designed to take care of misalignment of the shafting. The bearing is so designed that the balls can run out of line in any direction. They are held in place by a single-piece retainer without rivets of screws, with floats between the ball races and is practically frictionless. The bearing may rotate so much out of line that it produces the same effect as a ball and socket joint capable of adjusting itself automatically to any deflection in the shaft upon which it is mounted. No binding strains are introduced on the balls when the shaft is traveling out of line. In the case of the double row, the load is automatically distributed on both rows of balls. The steel used is what is known as a Swedish crucible alloy steel, the iron being taken from the Swedish mines. The S K F thrust bearings are made in single and double type and possess the same self-aligning features as the radial type.

Bantam

The Bantam Anti-Friction Company is one of the few that make both ball and roller bearings. These are made for all installations either of the thrust or radial type. The collars in the thrust ball bearings are made of tool steel and the cages of bronze. Thrust bearings with grooved collars are made with inside brass thimbles. Radial bearings of the all-ball type are also manufactured. Cup and cone bearings in all sizes can be furnished by this concern, while in the roller department an equally wide range of choice is offered.

S. R. O.

The S. R. O. is a bearing which is made in Switzerland by one of the largest European factories. The balls are cut from solid steel as compared to the tubular stock. Many of the foreign manufacturers are users of this bearing. The ball races in the S. R. O. bearing are specially featured. The notches for the balls are shallow and do not reach the bottom of the race This eliminates a common cause of trouble and makes for a minimum of wear. Al sizes of annular and thrust types are manufactured by this concern. All are fitted with a cage made from pressed-steel stamping riveted together.

Imperial

A full line of annular and thrust bearings is manufactured by this concern. The feature which is most prominent in Imperial design is the cage or ball retainer. This retainer has been designed to allow of as many balls as possible in the space provided, without permitting the inter-ball contact, which is highly detrimental. The Imperial retainer consists of a one-piece body with a closing ring. The Imperial balls are made in England and are guaranteed to .0001 inch. The bearings are made in light. intermediate and heavy series.

Schafer

Schafer ball bearings are imported by Barthel & Daley, of New York City. They are used on sixteen different makes of American cars. This line is the same as for the past year except that a new retainer has been brought out which tends to make the bearing more silent. The balls with this retainer are only in contact with the separator when the bearing is under heavy load. Both the radial and axial bearings are made by this concern as well as combination of annular and thrust. The latter bearing has a two-point contact as against the four-point contact of the cup and cone bearing.

Norma

The ball bearings of the Norma Company of America, New York City, have attained a very high reputation both in America and abroad. Two exclusive features distinguish the Norma ball bearing: the ball cage and the ball races. The former affords an elastic polar guiding of the balls, with minimum speed at point of contact, and the minimum of noise and internal friction. The inner race is ground to a circular ball seat with a radius slightly larger than that of the ball. The outer raec has a ball seat of similar radius, but at the normal contact line between balls and race, the curved race surface meets a tangent cylindrical surface. This makes the Norma an open-type bearing of unequaled accessibility. And the design of Norma cage and races permits the use of more balls, and larger balls, than any other construction having substantial uninterrupted race shoulders.

Outside of the line of ball bearings described for the Norma concern a full line of roller bearings is carried. These are distinguished by a crown outer race. The rollers themselves are cylindrical and run in free guide. The roller has a full bearing on the surface of the inner race, because this is also cylindrical. On a light load the bearing of the roller on the outer race is only at the point of crown on the outer race. Under heavy load the outer race flattens to the form of a true cylinder and gives a full bearing on this race also.

Timken

The Timken line of roller bearings is complete. Timken uses the tapered roller in long and short series. The short series is suitable for an annular replacement, should such be desired. It is made in the same sizes as ball bearings and is interchangeable with any of the standard makes. The Timken cages are of flat steel. Owing to the tapered form of the bearing it is not necessary to use a ball thrust with the roller bearing. The slope of the rollers is sufficient to render the bearing capable of withstanding a heavy thrust or axial load. The Timken axle line, fitted with bearings of the same make, is continued in all sizes for trucks and pleasure cars.

Standard

A new series of interchangeable bearings designed to be of the same size as the standard makes of ball bearings have been brought out by the Standard Roller Bearing Co. This type of roller bearing has cylindrical rollers with grooved centers. These bearings run on ribbed races, the rib running through the groove in the roller. Cup and cone roller bearings and straight roller types are made by this concern, while in the ball bearing field they manufacture a series of closed type in all sizes.

American

The American Roller Bearing is of the annular non-adjustable type. The rollers are cylindrical in shape and run between cylindrical races. Alternate rollers are smaller in size and all rollers bear upon each other. The smaller rollers act in the nature of a separator, while the large rollers carry the load. As the friction between the separating rollers and the load carrying rollers is independent of the load, it is very small. Ball and thrust and dust washers are fitted to these bearings, which are made in all sizes.

Bower

The Bower roller bearings are of two types, one in which a wedge shape enlargement takes the end thrust, and the other, which carries the end thrust on a groove cut in the roller. The rollers are cylindrical but carry, as explained above, both radial and thrust loads. When the thrust is carried on the wedge shaped enlargement, the roller runs in guide rings at each end with small diameter spindles. The other type of roller is carried by a thrust shoulder on the outer race. The guide ring in this case is in the form of a single slotted ring.

Gillette

The Gillette roller bearing is of the tapered cup-and-cone type. No cages are used, but a retaining ring is fitted to hold the rollers on the cone when the cup is removed. A thrust flange is fitted on the back of the cone to take up end play. A snap retaining ring on the small end of the bearing holds the cup in place. When the ring is removed the cup and rollers can be taken out.

Spark Plugs Not Yet Discussed

Below are given the descriptions of several prominent makes of spark-plugs which did not find space in the issue of January 30. They include the products of important companies in which the automobile public needs must be interested.

Oakes & Dow Company—The two types of spark-plug made by this Boston concern are well known as sootless mica plugs. None but pure Indian mica is used in these plugs. The

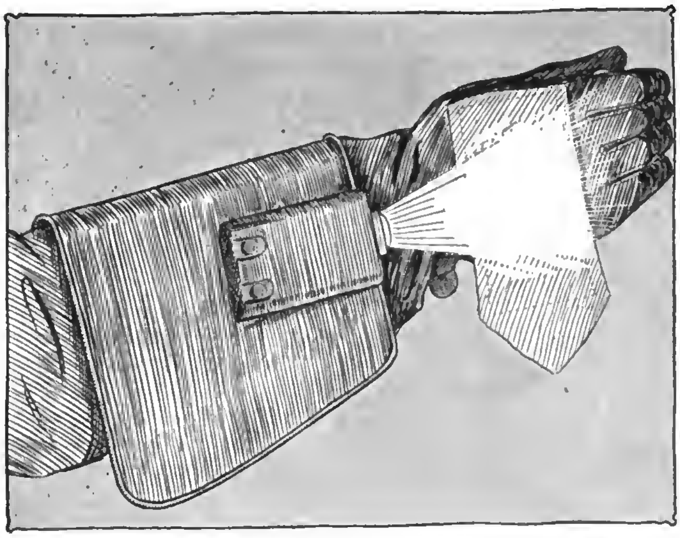


Fig. 1—Flashlight glove designed by Baroness Van Haeften-Hatch

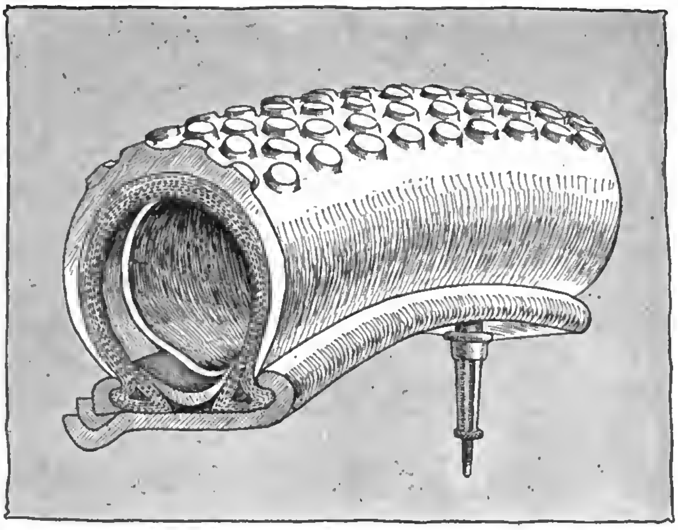


Fig. 2—Walpole tire with Bailey tread

positive electrode, in the manufacture of this accessory, is wrapped with sheet mica and driven into the plug shell with a blow of the hammer. Mica rings are threaded over the wrapping and fixed by a locking ring. The mica is then turned in a lathe and polished.

Rex Ignition Company—The Rex Spark plug made in New York City consists principally of three pieces, namely, the porcelain, the shell and the bushing against which the porcelain is packed by two rings. The electrode is of imported wire and claimed to be proof against burning out and the whole plug to be sootproof.

Ideal Switch Company, Incorporated—Five types of spark plugs are manufactured by this company at Plainville, Conn. The high tension and adjustable gap designs are said to be rust, soot and heatproof. The first type is or ordinary appearance with a straight positive electrode and a bent wire as negative point. The adjustable gap type is distinguished by the use of a special gland or bushing fitting between the shell and the porcelain and working in a thread of the latter, so that the porcelain may be raised or lowered. The central electrode in this case is bent toward the periphery of the shell. The porcelain and the shell are marked with one vertical arrow each and if these arrows are in alignment the shortest spark gap is obtained. The Ideal company also makes a conical type plug which has its name from the shape of the porcelain, a closed end case design with a contracted shell opening and a mica core plug.

Charles D. Shain—The Shain spark plug is distinguished by the shape of the positive electrode which is formed as a ball fitted with a peculiarly shaped head. The latter as the form of a downwardly diverging cone made of a special metal sheet into which deep corrugations have been cut to give the effect of an inverted crown. The points of the crown act as sparking points.

Accessories of Unusual Interest

Rose Manufacturing Company—This company, of Philadelphia, Pa., continues its line of lamp brackets and radiator heaters from last year. The first series of products comprises brackets which support both the tail light and the rear license number; besides, the well-known radiator license bracket is being made by this company. The radiator heater is made in two styles, both of which have the effect of keeping the cooling water at a temperature preventing its freezing. One style of the heater is adapted for illuminating gas and the other for oil; but the gas type may be also used with acetylene.

Walpole Tire & Rubber Company—The Boston company of this name manufactures both inner tubes and casings. The inner tubes are of red rubber, constructed heavily and claimed to contain the highest grade of up-river Para rubber. The casings of this company include clincher as well as Q. D. designs, and plain treads may be obtained as well as non-skid types. The non-skid treads are of the Bailey class and consist of rubber vulcanized to the ordinary degree on which truncated-cone projections are formed, there being alternate rows of three and four projections each. This construction provides a variable-width contact between the tire and the ground, making sidewise sliding very difficult.

Flashlight Signal Glove—The latest idea in accessories is the signal glove designed by Baroness Van Haeften-Hatch, of Newport, R. I. The purpose of this device, which is illustrated in Fig. 1, is to provide a clear signal to the driver of the following car whenever it is desired to stop or to turn a corner. The thick traffic of the city streets is not limited to daylight and many of the accidents which have evidenced themselves very clearly in the marked rise in automobile insurance rates have occurred after nightfall has rendered it impossible for the drivers to observe the signals made from surrounding cars. The glove is of best grade leather with stiff cuff. It is built along the regular gauntlet lines with a strap to fasten it securely to the hand. A lamp is mounted on the back of the wrist portion of the glove and a piece of heavy white kid on the back of the hand. The light is controlled by two brass contact points mounted one on the thumb and the other on the index finger of the glove. When these two points are pressed together a light is immediately flashed on the white cloth.

Peck Wheel Company—The Peck wheel is manufactured for both pleasure and light commercial cars. It consists of a solid outer rim which carries the solid rubber tire and to which are fastened twelve plungers or pistons equally spaced around the rim's inner circumference. Each plunger fits within one of the twelve cylinders which are attached at their lower ends to the wheel hub so as to have radial play. Thus the pistons and their mating cylinders form the spokes of the wheel when the parts are assembled. Interposed between each piston head and its cylinder head is a coiled spring which acts to force the piston out to its normal position when sufficient load force is not exerted to overcome the spring resistance. Thus the weight which the wheel must carry is carried by the upper arc of the wheel. In addition to the coil springs, there is an air cushion under each piston which adds to the resiliency when pistons are forced in. The free radial movement of the pistons and cylinders makes for flexibility of drive.

Sewell Cushion Wheel Company—Sewell cushion wheels are designed for gasoline and electric trucks, motor 'buses and motor-driven fire apparatus. The Sewell construction embodies a complete wooden inner wheel and an extra wooden felloe outside of this. The felloe carries any standard solid tire. Between the wooden wheel and the outer felloe is interposed a rubber cushion which appears in three forms, namely, a flat cushion for heavy trucks, rubber rolls for light commercials and zig-zag cushions for medium trucks. The two wheel parts are held together by side rubber flanges which thus preserve the resilient feature.

Ideal Steel Wheel Company—The Ideal wheel replaces the spokes of the ordinary wheel by ten elliptical steel springs, each of which is made of two strips of thin spring steel sprung between hub and rim to the proper tension. These strips fasten to both the rim and hub. When assembled the spring strips bear radially against one another, thus bracing and counterbracing. When assembled the springs are designed to give both lateral and radial support. In action, each spring carries a portion of the load.

Seaton Wheel Company—In the Seaton wheel there is an inner and an outer portion. Interconnecting these two is a series of tension coil springs, the supports for which are alternately connected to the inner and outer wheels. The springs are mounted horizontally between the segments. When a load is placed on the axle, the inner wheel sinks with relation to the outer, the center lines of the coil springs then being out of their horizontal position. This movement is provided for by the swivel mountings of the springs in the alternate segments, one of which is attached to the inner portion of the wheel and the other or mating segment to the outer on the opposite side.

Favary Wheel Company—The Favary construction is really a mechanical tire in which resilience is obtained by the flex action of a combintion embodying pliable bands under tension. There are three bands to each tire, and between each a series of aluminum blocks is interposed, these blocks being riveted to the fabric the layers of blocks being in staggard relation so that when one set of blocks is pressed inward it sinks between the blocks on the next lower layer, giving the resilient effect.

Schermack Wheel Company—The Schermack spring wheel is an all-steel type and consists of a hub section or inner wheel and an outer wheel carrying a standard solid tire. The two sections are provided circumferentially with aligned projecting flat steel springs or brackets fastened together in pairs by cross bolts. When assembled, the flat springs, one of each pair being fastened to the inner portion and the other to the outer part on the opposite side, are under tension, the resilient action being permitted by the ball and socket connections of the flat springs and the cross steel bars which are normally horizontal, but deflected under load.

Rajah Auto-Supply Company will continue the manufacture of their familiar line of Rajah spark plugs and terminals for the coming season, with the addition of the new Rajah starter and Rajah giant plugs that have recently been introduced to the trade. The Rajah starter plug is simple, easily adjusted, efficient and well designed for the purpose for which it is intended. The Rajah giant plug is a big, strong plug of extreme simplicity and durability.

(*Continued from page 425*)

power of the dynamo. This form of construction does away with the necessity of including any electrical controlling device other than the usual voltage and reverse current cut-out, as shown in the wiring diagram, Fig. 8. This device, in this particular case, is arranged alongside the magnet inside the cover. The armature is of the ordinary slotted drum type run on ball bearings. Carbon brushes are used and these are easily accessible by simply unscrewing a pair of caps on the side of the bearing end cover. The output curve, Fig. 9, shows clearly how the current increases with the speed until 12 amperes is reached, when it is cut down by the action of the magnetic shunt to an almost constant level of 10 amperes, irrespective of increase of speed.

Holtzer-Cabot—Uses Centrifugal Cut-in

The most notable feature of the Holtzer-Cabot lighting system is that regulation of the current at high speeds is obtained inherently by the special construction of the generator. A single centrifugal switch which cuts in the generator at the correct speed is the only controlling device with moving parts.

The generator is a two-pole machine with a cylindrical magnet casing of laminated iron. The pole pieces are of special design, having long extended tips, which so controls the action of current generation as to choke down the higher speed currents, owing to the self-induction set up in the armature.

An ingenious form of cut-out is employed, acting on the centrifugal principle. Its construction is shown diagrammatically in the plan of wiring, Fig. 17. The outer ring R is made up of three parts electrically insulated from each other, as in commutator construction. The large inner segments is in electrical connection with one of these parts. Two contact weights or segments W attached to springs extending from the large segment, are so arranged that when the device is rotating at a certain predetermined speed, they fly out due to centrifugal force and make contact with the adjacent parts of the outer ring. All three sections of the ring are then electrically connected. Two carbon brushes bearing on the outer surface of the ring at diametrically opposite points are wired to the generator and battery line respectively. It will be seen how this arrangement makes it impossible for current to flow until the segments W are in contact with the outer ring.

The generator is shunt wound and is connected up with the battery floating on the line as in most systems.

Vesta—Controls by Resistance

In the Vesta lighting system reliance is placed on the simple permanent-magnet generator, without any field adjustment of any kind. The output regulation is effected by the insertion at high speeds of a single step resistance in the main circuit. This method is a development, or rather a simplification of the Vesta generator of last year in which a small rheostatic resistance was used for the same purpose. It has been found that a single step affords ample control and at the same time avoids complication.

An external view of the generator is given in Fig. 12. The magnets are of the usual type, mounted in pairs as in magneto practice, and made to slip over the pole pieces. End covers are fitted rendering the machine dust-proof. One of these has a small rectangular extension which surrounds the commutator and supports the two brush-holders; the other forms a housing for a centrifugal governor shown in detail in Fig. 11. This device alone controls the output. A wheel W is mounted on an extension of the armature shaft in such a manner that while stationary it occupies a skew position owing to the action of a spring S, which exerts a pull on one side through a short connecting link attached to a collar on the shaft. The balance wheel and spring are so proportioned that when an armature speed of 200 revolutions per minute is reached the centrifugal action of the wheel withdraws the collar and permits the two contact points C1 to come together.

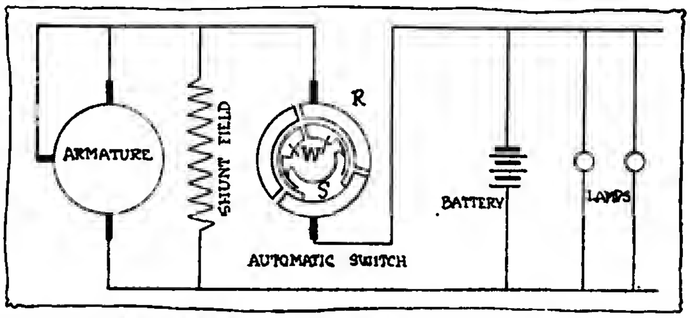
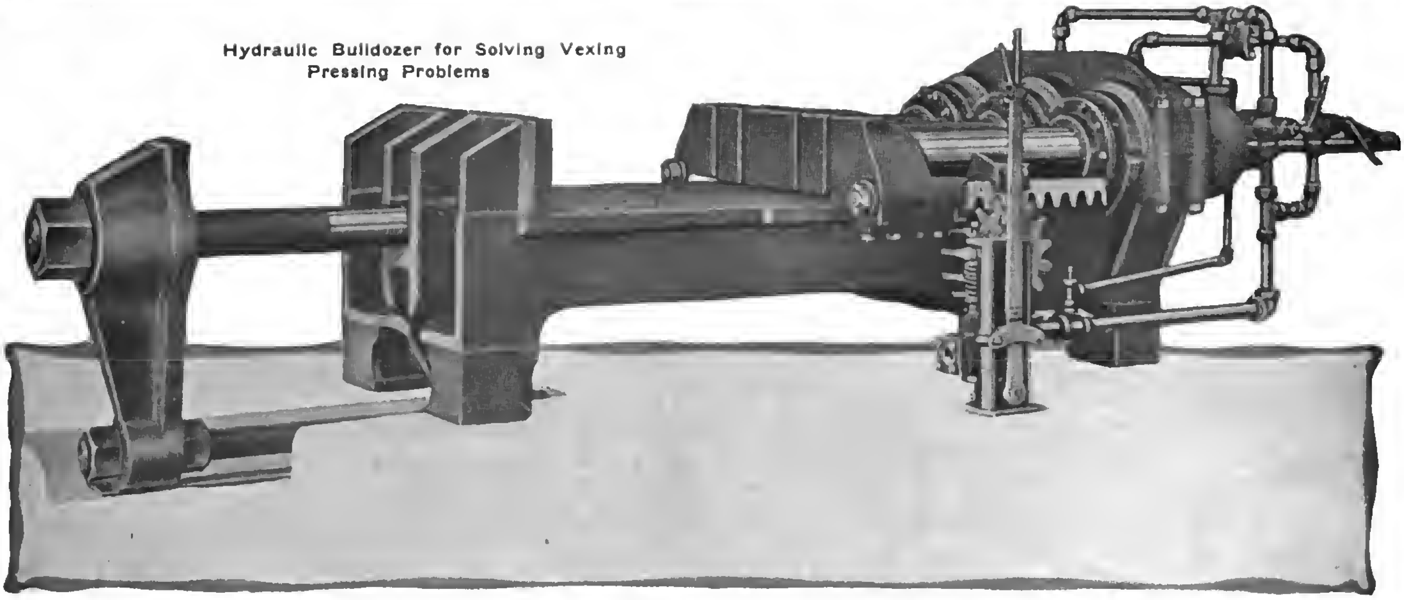


Fig. 17—Wiring diagram of Holtzer-Cabot lighting system, showing automatic switch

Factory Miscellany



Hydraulic Bulldozer for Solving Vexing Pressing Problems

The above illustration depicts an instrument known as a bulldozer. This is a heavy slow moving die which shapes large parts such as axles. The machine depicted was designed by the Watson Stillman Company of New York for manufacturers of heavy axles for automobile trucks. The bar which is to be upset, split or shaped is placed on the flat table or bed plate with the opposite end to that which has to be worked upon placed against the heavy upright beam shown at the extreme left. The bulldozer shown here is operated by hydraulic pressure.

The width of the bed plate is 44 inches; maximum opening between moving cross beam and rigid cross beam 48 inches; maximum opening between moving cross beam and adjustable stop, 90 inches; length of moving cross beam, 48 inches; diameter of rams, 11 inches; stroke, 15 inches; maximum liquid pressure per square inch, 1500 pounds; diameter of horizontal extension bolt, 6 inches. The weight of the complete machine is 20,000 pounds.

A notable feature of this machine is the arrangement of its three rams, all connected to the one head to permit the use of only one, of two, or of all three rams, depending on the pressure necessary. With one ram—the middle one—the capacity of the bull-dozer is 56 tons; with the two outside rams, 127 tons, and with the three cylinders in use simultaneously the capacity becomes 200 tons.

EASTERN Rubber's Factory—The Eastern Rubber Company, recently organized in Toronto, Ont., to manufacture automobile tires, etc., has secured a site of four acres. Two manufacturing buildings will be built—one three stories high, about 250 feet by 72 feet, and another 200 feet by 72 feet, one story. In addition there will be suitable warehouses and a power plant. The capacity of the company's plant, without any increase to the initial machinery equipment, will be approximately $2,225,000 per annum, and it expects that the business during the first year will amount to about $1,000,000.

Mayer Carbureter Builds—The Mayer Carbureter Company, Buffalo, N. Y., is planning the erection of a factory at Detroit, Mich.

Perkins, of Washington, Builds—W. A. Perkins, Seattle, Wash., will construct a $250,000 plant in Centralia, Wash., for the manufacture of automobiles and parts.

Canadian Firm Planning Factory—The Canada Standard Automobile & Tractor Engine Company, Moose Jaw, Sask., is having plans prepared for the construction of a new factory.

Pioneer Tire Equips Plant—The Pioneer Steel Block Tire Company, St. Louis, Mo., recently capitalized with a capital of $25,000, will in the near future equip a plant for the manufacture of a patented tire for use on automobile trucks.

Working Day and Night—The Speedwell Motor Car Company, Dayton, O., is now working both night and day shifts and the prospects for future business make it extremely likely that this condition will exist for several months to come.

Albion Establishes Factory Garage—The Albion Motor Car Company, Ltd., of Glasgow, Scotland, a large manufacturer of motor trucks, has arranged to establish a factory garage for assembling cars in Montreal, Que., and proposes in the near future to manufacture in Canada.

Doubles Space—The Oakes Fan Company, Indianapolis, Ind., recently doubled the floor space of its factory, increasing its force of men as well as its equipment of machinery. It has bought all the machinery and tools owned by the Enders Tool & Machine Company.

Fire in Buick Plant—The brass and aluminum foundry of the Buick Motor Car Company, Flint, Mich., was destroyed recently by fire with a loss of $40,000. The burned structure was only the frame building in the plant, and so it will be rebuilt. The drop forge department was saved.

Swinehart to Enlarge Factory—With the advent of commercial cars the solid tire business of the Swinehart Rubber Company, Akron, O., has increased until the capacity of its plant is taxed to its utmost and the company is now increasing its plant to add several million tires a year to its output.

Maroney Goodyear Manager—J. A. Maroney succeeds E. H. Parsons as manager of the St. Louis, Mo., branch house of the Goodyear Tire & Rubber Company. Mr. Parsons has been promoted to manager of the St. Louis district, which takes in cities in Missouri, Oklahoma and Texas. This transfer takes place at once.

Royal Factory in England—The Royal Motor Car Company, London, Eng., which was recently organized with a capitalization of $500,000, has concluded to erect its factory in Strathroy, this decision having been arrived at following negotiations with the Strathroy Council. The town makes a loan of $50,000, gives a free site and other inducements. It is the intention of the firm to start work as soon as possible on a factory 400 feet by 200 feet and two stories high.

Kenen Building Light Trucks—The Kenen Motor Company, Los Angeles, Cal., will in the near future produce light trucks. To fulfill this the company is at present enlarging its plant, which, when completed, will give a structure measuring 200 feet by 325 feet. A factory output of 30 trucks a month is expected when the addition is completed. Fixtures, jigs and machinery for the new factory are in process of construction in Detroit, Mich., and will arrive in Los Angeles by the time the addition is ready to receive them.

The Automobile Calendar

Shows, Conventions, Etc.

Jan. 27-Feb. 13....Troy, N. Y., Annual Show, State Armory, Troy Automobile Club.
Feb. 1-8...........Chicago, Ill., Annual Automobile Show, Coliseum and 7th Regiment Armory.
Feb. 3-8...........Washington, D. C., Annual Show.
Feb. 8-15..........Hartford, Conn., Annual Show, State Armory, Hartford Automobile Dealers' Association.
Feb. 8-15..........Minneapolis, Minn., Annual Automobile Show.
Feb. 10-15.........Chicago, Ill., Truck Show.
Feb. 10-15.........Winnipeg, Man., Show, A. C. Emmett.
Feb. 10-15.........Ottawa, Ont., Ottawa Motor Show, Howick Hall, Louis Blumenstein.
Feb. 11-15.........Binghamton, N. Y., Annual Show, State Armory, Dealers' Association, R. W. Whipple.
Feb. 15-22.........Albany, N. Y., Annual Show, State Armory, Dealers' Association.
Feb. 15-22.........Newark, N. J., Annual Automobile Show, First Regiment Armory, New Jersey Automobile Exhibition Company.
Feb. 16-23.........Richmond, Va., Annual Show.
Feb. 17-22.........Kansas City, Kan., Annual Automobile Show.
Feb. 18-19.........Madison, Wis., Annual Show, City Market Building, Dealers' Association.
Feb. 18-21.........Grand Forks, N. D., Annual Show, Auditorium, Dealers' Association.
Feb. 18-22.........Baltimore, Md., Annual Show, B. A. D. A.
Feb. 19-22.........Bloomington, Ill., Annual Show, Coliseum, McLean County Automobile Club.
Feb. 19-22.........Geneva, N. Y., Automobile Show, Armory, Louis Blumensteiu.
Feb. 19-22.........Kalamazoo, Mich., Annual Show.
Feb. 19-23.........New Orleans, La., Annual Show.
Feb. 19-27.........Topeka, Kan., Annnal Show.
Feb. 20-22.........Canandaigua, N. Y.. Automobile Show, Louis Blnmenstein.
Feb. 22-Mar. 1....Brooklyn, N. Y., Annual Show, 23rd Regiment Armory.
Feb. 24-27.........Kansas City, Mo., Truck Show.
Feb. 24-Mar. 1....St. Louis, Mo., Annual Show.
Feb. 24-Mar. 1....Memphis, Tenn., Annual Show.
Feb. 24-Mar. 1....Omaha, Neb., Annual Automobile Show.
Feb. 24-Mar. 1....Paterson, N. J., Annual Show, Paterson Automobile Trade Association.
Feb. 24-Mar. 5....Cincinnati, O., Annual Show, Music Hall, Cincinnati Automobile Dealers' Association.
Feb. 25-28.........Eau Claire, Wis., Annual Show, Armory, Dealers' Association.
Feb. 25-Mar. 1....Syracuse, N. Y., Annnal Show, Syracuse A. D. A.
Feb. 26-Mar. 1....Fort Dodge, Ia., Annual Show.
Feb. 26-Mar. 1....Glens Falls, N. Y., Antomobile Show, Louis Blumenstein, Manager.
Feb. 27-Mar. 1....Toronto, Ont., Annual Show, Toronto Automobile Trade Association.
March 3-8.........Bridgeport, Conn., Show, Park City Rink, B. B. Steiber.
March 3-8.........Denver, Col., Annual Show, Municipal Auditorium.
March 3-8.........Pittsburgh, Pa., Annual Antomobile Show.
March 3-8.........Springfield, Mass., Automobile Show, New Auditorium Building, United Amusement Compauy.
March 3-18........Des Moines, Ia., Annual Show, Pleasure Car Section, Coliseum, Dealers' Association.
March 5-8.........Tiffin, O., Annual Show, Tiffin *Daily Advertiser.*
March 5-8.........Louisville, Ky., Annual Show, Dealers' Association.
Mar. 5-8..........London, Ont., Annual Show, Drill Hall, Louis Blnmenstein.
March 8-15........Boston, Mass., Annual Automobile Show.
Mar. 8-15.........Columbus, O., Annual Show, Billy Sunday Tabernacle, Automobile Club and Trades' Association.
March 12-15.......Ogdensburg, N. Y., Automobile Show, Lonis Blumenstein, Manager.
March 19-26.......Boston, Mass., Annual Truck Show.
March 20-24.......New Orleans, La., Aunual Show, N. O. A. D. A.
March 24-29.......Indianapolis, Ind., Annual Automobile Show.
March.............Nashville, Tenn., Annual Show, Nashville Automobile Dealers' Association.

Race Meets, Runs, Hill Climbs, Etc.

May 30............Indianapolis, Ind., 500-Mile Race, Speedway.

Foreign

March.............France, Scaled Bonnet, 3000-Mile Run.
March 31..........Montevidio, Uruguay, International Competitiou of Agricultural Motor Vehicles.
April.............Barcelona, Spain, International Exhibition.
May...............St. Petersburg, Russia, International Automobile Exposition, building of Michael Maneze, Imperial Automobile Club of Russia.

Truck Factory for Nevada—An automobile truck factory will be built on a Nevada, Ia., site by the Nevada Manufacturing Company. Temporary quarters will be built at once on land recently leased.

Toledo Electric Company Builds—The Electric Auto Lite Company, Toledo, O., is building on addition to its plant on Michigan street, providing for 40,000 square feet of floor space. The company manufactures a new combined electric lighting and starting system for automobile equipment.

Diehl Adds New Building—The Diehl Manufacturing Company, Elizabethport, N. J., has taken title to 12 1-2 acres of property fronting on Newark avenue. The greater portion of this property lies in the city of Elizabeth, although there is a 16-foot frontage in the city of Newark. The frontage on Newark avenue measures 832 feet with a depth of 630 feet to the Pennsylvania Railroad.

Lewman's Tire Factory—H. L. Lewman, of the Fall City Construction Company, Louisville, Ky., is at the head of a company, which is being organized to establish a tire factory in that city. The exact location of the plant has not yet been determined, but construction details will be forthcoming shortly.

Floods Oakland Plant—Works Manager Humphries, of the Oakland Motor Car Company, Pontiac, Mich., says the company suffered a damage of $12,000 because of the recent flood which filled the basement of plant number 1 and caused a temporary shutdown of that building. Flood conditions have been overcome and the plant has resumed its manufacturing operations.

Tate Electric to Build—The Tate Electric, Ltd., organized by Montreal and Toronto, Ont., capitalists to build electric pleasure and commercial cars, will erect a plant at Walkerville, Ont. A site has been secured on St. Luke's Road, and a two-story building, covering 42,000 square feet of brick and steel construction, will be erected. Albert Kaltschmire is manager.

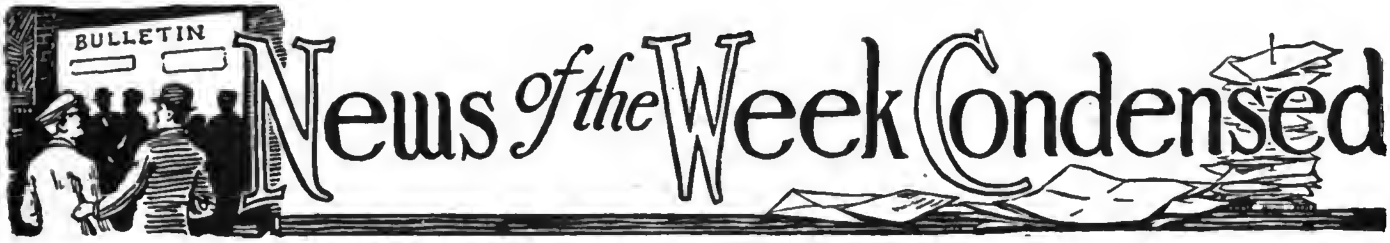
Lord Baltimore's Production 1,000—The Lord Baltimore Motor Car Company, Baltimore, Md., manufacturer of the Lord Baltimore commercial car, announces that it will produce this year 1,000 1,000-pound delivery wagons, 100 one-ton trucks, 100 one and a half-ton trucks and 100 two-ton trucks. The firm will erect a large factory so as to market and produce this quota of cars.

Spoerers Build Truck—The Carl Spoerers Sons Company, Baltimore, Md., has entered the commercial field and will market 1,500-pound light delivery wagons by May 1. The company expects to turn out fifty of these trucks this year. They will be of 30 horsepower, four cylinders and will have four speeds forward and reverse. The frame will be of pressed steel and the same materials as in all the Spoerer pleasure cars will be used. The wheelbase of this truck will be 150 inches.

Buicks Assembled in New Orleans—After February 1, all Buicks shipped to Central and South America and the West Indies will be assembled in New Orleans, La., specially crated for export and delivered on board by employees of the company, who will see that the machine is so placed in the cargo as to undergo the minimum chance of being damaged. A considerable saving in freight rates also is made as the cars are knocked down, as they reach there from the factory, and take a much lower rate.

Sanford Expands—The Sanford Motor Truck Company, Syracuse, N. Y., has purchased from the Syracuse Savings Bany a three-story brick building for purposes of expansion of its motor truck manufacture, and a force of fifty men will in consequence be increased to 300 before the end of the year. At least 300 trucks will be made this year, doubling the output. For three years the company has been making trucks at a small leased plant on Park street. The new plant will be equipped to turn out 1,000 trucks annually.

Adds 40,000 Square Feet—The Garford Company, Elyria, O., is adding nearly 40,000 square feet of floor space to its plant at that city, for the manufacture of its products. The new buildings consist of a warehouse, 60 feet by 300 feet, of reinforced concrete; a rear axle assembly shop, one-story high, 56 feet by 280 feet, also of reinforced concrete, and an addition to the main building, 45 feet by 45 feet and four stories high. The latter will be of steel and concrete construction, to conform with the style of the present main building of the plant. The improvements will allow for increased manufacturing facilities in the plant, removing several departments which now find themselves in cramped quarters. The stock and tool rooms, now housed in the main building, will be moved to the new assembly plant, allowing for the installation of a great deal of new machinery the company has had on hand for some time but has been unable to place.




Banquet of the New York Garage Association, recently held, at which the high cost of gasoline was discussed by the speakers

WESTERN Electric Salesmen Meet—The Western Electric Company, New York, recently held a conference of salesmen throughout the country in Chicago, Ill. The week was an extremely busy one, with a wide variety of entertainment, together with numerous talks by members of the manufacturing staff in explanation of the process and inspection methods pursued.

Maxwell Commercial Manager—C. A. Forster has been appointed commercial manager by the Maxwell Motor Company, Inc., Detroit, Mich.

Vancouver's Trucks Number 232—The number of trucks and delivery wagons in Vancouver, B. C., is 232. Of this number 107 are heavy trucks.

Kalish Resigns—D. F. Kalish, general manager of the Hartford Auto Parts Company, Hartford, Conn., has resigned to enter a new field of business.

Brooklyn Federal Moves—The Oriental Rubber and Supply Company, Brooklyn, N. Y., distributor of Federal automobile tires, has moved to 1166 Bedford Avenue.

Bourne Stearns Manager—The F. B. Stearns Company, Cleveland, O., announces the appointment of S. N. Bourne as resident manager of its Philadelphia, Pa., branch.

Shaw Heads American Tire—Adam Duncan has resigned from the presidency of the American Tire & Rubber Company, Akron, O., and has been succeeded by James Shaw.

Bosch to Exhibit—The Bosch Magneto Company, New York City, will exhibit its products at the motorcycle show in Chicago, Ill., during the week of February 3 at space 4.

Hoyme Philadelphia Alco Manager—C. R. Hoyme, formerly sales manager of the International Motor Company, was recently appointed Philadelphia, Pa., manager of the Alco.

Los Angeles Chalmers Moves—The Western Motor Car Company, Los Angeles, Cal., distributors of Chalmers cars, has moved into a four-story building at Tenth and Hope streets, that city.

Kline's Rochester Service Station—The Kline Motor Car Company, Rochester, N. Y., distributors for the Klinekars in that territory, recently opened up a new salesroom and service station in that city.

Beedon Goes to Keeton—Bert Beedon has resigned from the traveling force of the Olds Motor Works, Lansing, Mich., to become affiliated with the selling staff of the Keeton Motor Company, Detroit, Mich.

Two Hendersons in Tour—Two Henderson cars have been entered in the Indiana Automobile Manufacturers' Association's tour to the Pacific Coast, July 1, by the Henderson Motor Car Company, Indianapolis, Ind.

Shadel Kline Sales Manager—The Kline Motor Car Corporation, Richmond, Va., has appointed R. E. Shadel district sales manager for New York State and New England, excepting Connecticut, with headquarters at Rochester, N. Y.

Akron Rubber in Houston—The Akron Rubber Company has established a house in Houston, Tex., for dealing exclusively in automobile accessories. Mr. Fouse is manager. The company will represent the Swinehart Tire and Rubber Company, Akron, O.

Big G. V. Truck Order—The American Express Company in Boston, Mass., recently placed an order for twenty-five 2-ton General Vehicle trucks of the 1913 model. The delivery of these trucks commences in March, and approximately ten vehicles a week will be placed in operation.

Shaffer Invents Gasoline Economizer—W. A. Shaffer, of Waco, Tex., has been granted a patent on a contrivance for use on gasoline engines for automobiles. Mr. Shaffer claims that his invention reduces the consumption of gasoline to practically one-half, the motor being of the two-cycle type.

Lewis to Manage New Company—R. C. Lewis, general manager of the Beaver Manufacturing Company, Milwaukee, Wis., has resigned to assume management of the Lewis Motor and Engineering Company, recently formed to manufacture a line of monobloc motors. The new products will include several European features.

Vancouver Club's Road Doings—One important matter which the Vancouver Automobile Club, Vancouver, B. C., has taken, and which will be carried through to completion early in the spring, is the placing of a log drag on the main highways adjacent to the city. A fund is now being subscribed which will be used exclusively for this work.

Constructs New Furnace—The Milwaukee Gas Light Company, Milwaukee, Wis., has just completed the construction of a new type of furnace for the preparation of automobile springs for the oil tempering process for the W. R. Sherin Company, of that city. The furnace is heated by means of Solvay process gas and the idea is regarded as a real triumph.

Cadillac in New Quarters—The Cadillac agency in Birmingham, Ala., is soon to occupy a new building at the corner of Avenue D and Twentieth street.

New Baltimore Quarters—The Franklin Motor Company, Baltimore, Md., representing the Franklin car, has opened new headquarters on Charles street near North avenue.

Large White Truck Order—The Atlanta Ice & Coal Corporation, Atlanta, Ga., recently ordered 15 White trucks, six of them being 1.5-ton capacity, seven 3-ton and two 5-ton.

Harris with Firestone—R. G. Harris has accepted a position of assistant advertising manager, with headquarters in Akron, O., with the Firestone Tire and Rubber Company, that city.

Opens New Showroom—The French-Schutz Company has opened a showroom on North avenue and Calvert street, Baltimore, Md., where it is handling the Pratt car and Empire tire and Holley carburetor.

Bergstrom Establishes Garage—George H. Bergstrom of Depere, Wis., has established a garage in the McGeehan building, which will be formally opened on March 1. He has not yet selected all of his agency lines.

Join White Sales Force—Frank M. Olmstead, former branch manager in Baltimore, Md., for the Goodyear Rubber and Tire Company, and R. Bruce Hamilton have joined the sales force of the White Motor Company.

Dayton Leaves Columbia—F. E. Dayton has resigned as sales manager of the Columbia Motor Car division of the United States Motor Company, Hartford, Conn., to become general manager of a New York incinerating company.

Appointed Wells Lighting Distributor—The Auto Supply Company, Milwaukee, Wis., has been appointed state distributor for the Wells electric lighting system, manufactured by the R. C. Wells Manufacturing Company, Fond du Lac, Wis.

Bailey Appointed Manager—Henry C. Bailey has been appointed manager of the Hartford, Conn., Auto Parts Company to succeed David Kalish. The new manager was formerly superintendent of the Corbin Motor Vehicle Corporation.

Atwater Sales Manager Patterson—G. S. Atwater has resigned his position as eastern sales representative of the Hayes Manufacturing Company, Detroit, Mich., and has accepted the position of sales manager of the Patterson Rubber Company, Lowell, Mass.

Atlanta Club Elects—At the annual meeting of the Atlanta, Ga., Automobile and Accessory Association, held recently, the following officers were named: George W. Hanson, president; C. H. Johnson, first vice-president; Wylie West, second vice-president, and E. H. Elleby, secretary.

Missourians Meet—A number of members of the different automobile organizations of Missouri recently journeyed to Jefferson City, where a monster meeting was held. Good roads and other things of great interest to the automobilist were placed before the legislature, which was in session.

Brings Suit Against Petrel—County Judge J. M. Becker, of Monroe, Wis., has brought suit in the circuit court at Milwaukee, Wis., against the Petrel Motor Car Company of Milwaukee to recover the purchase price of a Petrel car, $775. and the sum of $197.80, which he declares he spent in bills.

Laxity in Registration—Only 7500 of the 25,000 motor cars in Wisconsin had been registered and licensed for 1913 at the close of business on January 31. While this number is larger than for the corresponding period a year ago it is known that there are hundreds of cars in use which still employ the 1912 license plates.

Abbott Treasurer Universal—M. J. Abbott has become treasurer of the recently organized Universal Farm Tractor Company, which is establishing a factory for the manufacture of motor-driven corn cultivators at Newcastle, Ind. Mr. Abbott was formerly assistant manager of the Newcastle plant of the Maxwell-Briscoe Motor Company.

Golder Appointed Trustee—C. E. Golder of Milwaukee, Wis., has been appointed trustee of the bankrupt estate of the Bates-Odenbrett Automobile Company, which recently failed with small assets. Officers of the concern were examined by the trustee on February 3. Trustee Golder formerly was president of the Curtis Auto Company of Milwaukee.

Two Indiana Bills Passed—Two more bills affecting auto interests have been passed by the lower House of the Indiana legislature. One forbids testing automobiles or motorcycles on any public highway or street, and the second provides where the highway is not visible for 100 feet in advance of a vehicle, frequent signals must be given by horn, bell or whistle.

Van Vliet Business Bought—The Central Iowa Motors Company, Des Moines, Ia., has purchased the business of the Van Vliet-Bradt Motor Company, agent for the Moon car. Mr. Van Vliet has retired from the automobile business, although he will manage the Des Moines show. Mr. Bradt is in charge of the accessories department of the Herring Motor Company, that city.

Middletown Equipping Fire Department—The fire department and council of Middletown, Pa., are considering the purchase of three automobile hose trucks for equipping their fire department. A special meeting was held recently, at which time a number of truck manufacturers were present who were asked to submit their bids before the next meeting of council, February 10.

Large Weaver Deal Closed—The consummating of a deal is reported between the Weaver Manufacturing Company, of Springfield, Ill., and Messrs. W. L. Owen and R. S. Rollman, by which the above-mentioned parties are given the exclusive sales right for Weaver automobile twin-jacks in Chicago, Ill., and northern Illinois, and also the entire state of New York, including New York City.

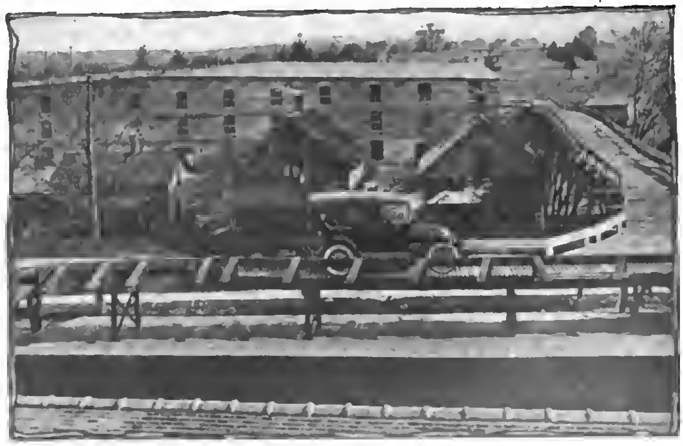
Milwaukee to Green Bay Road—An improved highway from Milwaukee, Wis., to Green Bay along the western shore of Lake Michigan, via Port Washington, Sheboygan, Manitowoc, Two Rivers and Denmark, is contemplated by a campaign put under way recently by Secretary L. E. Meyer of the Milwaukee Automobile Club and Secretary Arthur F. Raab of the Sheybogan Automobile Club.

Want Light Bill Passed—An effort will be made to secure the enactment of a law compelling the display of lights on all vehicles in Connecticut. A bill to this effect has been presented in the legislature by Mr. Pons of Roxbury. For several years motorists have tried to bring about such a law, but were nnsuccessful. It is said about the Capitol that there is more sentiment in favor of the bill this season than formerly.

Wolverine Club Elections—All of the old officers of the Wolverine Automobile Club, Detroit, Mich., retired from office recently with the exception of A. R. Miller. Directors were elected as follows: Leonard Davis, J. H. Armstrong, Len Mathews, C. A. Woodruff, F. N. Randall, A. J. Kinnucan and Edward Hines. A smoker was held in the banquet hall of the Tuller Hotel in the way of a grand opening of the new quarters.

Michigan Wisconsin Road Plans—One of the most extensive highway projects ever undertaken in Wisconsin and one which involves $350,000 is the proposed joint plant under consideration by the county boards of Marinette, Wis., and Menominee, Mich., whereby almost every roadway in the two counties will be permanently improved within five years. Marinette county proposed to issue bonds in the sum of $200,000 for the work on the Wisconsin side and Menominee will issue $150,000 for the Michigan side.

Six Months and $500 Fine—Heavy fine and a long term imprisonment will face automobile speeders if a bill drawn by a city solicitor, Schrieber, of Toledo, O., and which he will have introduced in the legislature becomes a law. A fine of not more than $500 or not more than 6 months in the workhouse is provided for the first offence. A fine of $500 and six months' imprisonment is the penalty for any subsequent offence. The new law would make the owner and operator of any automobile violating the provisions of the act jointly liable in damages for any injuries inflicted.



How cars are sent from the assembling plant to the shipping department at the Reo plant. This overhead runway connects the two departments and the cars are driven over into the shipping department under their own power

Opens Broadway Branch—The Twentieth Century Automobile Company, New York City, dealer in automobiles, has opened a branch at 1690 Broadway.

Securities on Chicago Exchange—At a meeting in New York City recently, directors of the B. F. Goodrich Company, Akron, O., decided to list the securities of the corporation on the Chicago, Ill., Stock Exchange.

Goodyear Outlook Excellent—The Goodyear Rubber and Tire Company, Akron, O., is expected to have a gross sale of $40,000,000 this year, as compared with about $25,000,000 for the fiscal year which closed November 1.

Franklin Conference in Chicago—A conference of Franklin dealers of central and middle western states was held at the show rooms of the Franklin Automobile Company, 1450 Michigan Avenue, Chicago, Ill., on Saturday, February 1.

Celina Automobile Company Elects—The board of directors of the Celina Automobile Company, Celina, O., recently organized by electing the following officers: President, Walter Mersman; vice-president, Ira Wagner; secretary and treasurer, Edmund Brandt.

New Speed Bill Introduced—Representative Thomas, of Waterbury, Conn., has introduced a bill setting speed limit for all vehicles, including electric cars, 30 miles an hour, and within the confines of a city or borough 12 miles an hour. Any occupant of the vehicle is subject to the same fine as the driver who violates the provisions—fine of $500, imprisonment for six months, or both.

Peerless Automobile Stock Taken—Announcement is made that all the stock offered to the shareholders of the Peerless Motor Car Company, Cleveland, O., under the plan for an exchange of one-half of common stock holdings for an equal amount of the newly authorized preferred stock has been taken, with the result that the company has now about $2,100,000 preferred stock, $2,100,000 common stock and $1,000,000 bonds outstanding.

State Road Maintenance Fund Advocated—A State road maintenance fund is being strongly advocated by the Tri-City Ocean-to-Ocean Official Highway Association and an effort will be made to have the Iowa State Legislature pass such a bill drafted on the same lines as the New York maintenance bill. Scott County has more miles of macadam road, outside of town and village limits, than any other Iowa county, totaling approximately 100 miles. These roads have cost at the low figure of $5,000 per mile.

New Agencies Established

PLEASURE CARS

Place	Car	Agent
Albany, N. Y.	Hudson	E. V. Stratton Co.
Auburn, Me.	Cole	Auburn Motor Co.
Bagdad, Fla.	Moon	C. M. Munson
Belleville, Ill.	Moon	G. W. Schlender
Boston, Mass.	Keeton	Keeton M. C. of N. E.
Boston, Mass.	Krit	Harrington M. C. Co.
Bridgeport, Conn.	Moon	Drucker, Klein & Co.
Columbus, O.	Great Western	Charles Ross
Evansville, Wis.	Ford	Townsend & Hyne
Hartford, Conn.	Keeton	Keeton M. C. of N. E.
Indianapolis, Ind.	Jackson	M. G. Beckner
Kingsley, Ia.	Moon	M. J. Foft
LaCrosse, Wis.	Detroiter	Arenz-Weihaupt Auto Co.
LaCrosse, Wis.	Marathon	Arenz-Weihaupt Auto Co.
Lodi, Wis.	Ford	J. I. McFarland
Lodi, Wis.	Studebaker	J. I. McFarland
Louisville, Ky.	Brighton	Howard Lothrop
Louisville, Ky.	McFarland	J. J. Caffrey
Milwaukee, Wis.	Case	J. M. Biddison
Minneapolis, Minn.	Chevrolet	Minnesota Motor Co.
Minneapolis, Minn.	R-C-H	Haynes Auto Co.
Montreal, Que.	Commer	J. B. Baileregon
Montreal, Que.	Henderson	International Car Agency
New Haven, Conn.	Moon	J. J. Laverty
Norwalk, O.	Hupmobile	J. V. Metz
Norwalk, O.	Mitchell	J. V. Metz
Norwalk, O.	Paige	J. V. Metz
Norwich, Conn.	Moon	Miss Paula E. Bauk
Peoria, Ill.	Moon	R. L. Collins
Petersburg, Va.	Kline Kar	W. L. Zimmer
Pomona, Cal.	Moon	A. L. Wood
Providence, R. I.	Keeton	Keeton M. C. of N. E.
Raleigh, N. C.	Kline Kar	The Capitol City Motor Co.
Shelbyville, Ky.	American	Hiter-Logan American Sales Co.
South Bend, Ind.	Hupmobile	H. V. Russel & W. M. Yoder
St. Augustine, Ill.	Moon	Sherman Babbitt
Virden, Ill.	Moon	Campbell Bros.
Washington, D. C.	Moon	Frederick Newburgh
Worcester, Mass.	Keeton	Keeton M. C. of N. E.

COMMERCIAL VEHICLES

Minneapolis, Minn.	Little Giant	Eng. Olson Auto Co.
Minneapolis, Minn.	Martin Tractor	Pence Auto Co.

Automobile Incorporations

AUTOMOBILES AND PARTS

ALLIANCE, O.—Alliance Motor Car Company; capital, $50,000; to manufacture automobiles. Incorporators: M. W. Geiger, G. K. Pritchard, R. M. Scranton, J. O. Ellis, C. G. Kline, E. P. Kinney.

BALTIMORE, MD.—Hall Seeley Motor Corporation; capital, $1,00,000; to manufacture motors. Incorporators: M. W. Hall, C. F. Seeley, L. S. Myers.

BOSTON, MASS.—Donovan Motor Car Company; capital, $50,000; to deal in automobiles. Incorporators: F. S. Donovan, A. D. Adams.

BOSTON, MASS.—Universal Truck Company of New York; capital, $25,000; to deal in motor trucks. Incorporators: M. Meyers, M. E. Crable, F. L. Hewitt.

BOWLING GREEN, KY.—Monroe Motor Company; capital, $2,590; to deal in automobiles. Incorporators: I. B. Monroe, H. G. Monroe, G. W. Monroe.

BROOKLYN, N. Y.—Royal Garage and Machine Works, Inc.; capital, $3,000; to manufacture automobile parts. Incorporators: William Schwenn, Louisa A. Schwenn.

CAMDEN, N. J.—The United States Tire Filler Company; capital, $125,000; to manufacture automobile tires and automobiles, etc. Incorporators: R. B. Patton, H. E. Patton, H. R. Gotman.

CLEVELAND, O.—Chandler Motor Car Company; capital, $20,000; to deal in automobiles. Incorporators: Isidor Grossman, Cland W. Shimen, Harry C. Cobn, E. L. Frazer, H. B. Howells.

CLEVELAND, O.—C. H. Tyler Motor Company; capital, $10,000; to deal in automobiles. Incorporator: C. H. Tyler.

COLUMBUS, GA.—Ingram-Joerg Company; capital, $3,000; to deal in automobiles. Incorporators: J. C. Ingram, Robert Joerg, Jr., C. E. Lawrence, R. F. Joerg.

CONNERSVILLE, IND.—Central Car Company; capital, $100,000; to manufacture automobiles. Incorporator: J. W. Burk.

ELMWOOD PLACE, O.—Highland Body Manufacturing Company; capital, $81,900; to manufacture automobiles. Incorporators: William Morrison, J. M. Morrison, R. E. Simons, Jr., George P. Stimson, J. Wilby.

MERCEDES, TEX.—Sterling Automobile Company; capital, $10,000; to deal in automobiles. Incorporators: A. G. Crawford, W. D. Chadwick, G. E. Simpson.

NEW YORK CITY—Brown Car Corporation; capital, $30,000; to manufacture automobiles. Incorporators: W. P. Fargo, H. W. Torney, E. E. Beyer.

NEW YORK CITY—Cortelyou Starter Company, Ind.; capital, $25,000; to manufacture starters for automobiles. Incorporators: J. H. Miller, I. B. Parker, Otto F. Ochs.

NEW YORK CITY—Gas Saver Sales Company; capital, $25,000; to deal in automobiles. Incorporators: C. Fisher, J. H. Miller, E. Cable.

NEW YORK CITY—Gildale Motor Corporation; capital, $30,000; to deal in automobiles. Incorporators: F. W. Strauch, T. P. Gilman, E. S. Peck.

NEW YORK CITY—Harvester Truck Company, Inc.; capital, $1,000; to deal in automobiles. Incorporators: H. B. Danziger, L. K. Schwartz, J. R. Rubin.

NEW YORK CITY—Manhattan Automobile Club, Inc.; capital, $100,000; to carry on an automobile club. Incorporators: F. D. Dorman, A. B. Cordner, E. E. Schwarzkopf.

NEW YORK CITY—Maxim Tricar Manufacturing Corporation; capital, $100,000; to deal in and manufacture automobiles. Incorporators: O. Kuhnenman, C. F. Novotny, A. A. Mesebutt.

SOMERVILLE, N. J.—Atlantic Motor & Supply Company; capital, $25,000; to deal in automobiles. Incorporators: A. G. Sleeper, F. A. Sleeper, H. B. Clements.

TARRYTOWN, N. Y.—Maxwell Motor Company; capital $10,000; to deal in automobiles. Incorporators: J. D. Maxwell, J. P. McManus, L. F. Sniffen.

TOLEDO, O.—General Motor Truck Company; capital, $50,000; to establish a system of heavy tonnage transportation via motor trucks by contract. Incorporators: G. R. Grandy, C. O. Morton, F. M. Morton.

TOLEDO, O.—Maumee Motor Car Co.; capital, $10,000. Incorporators: Richard D. Logan and others.

TRENTON, N. J.—Fitzgibbon & Crisp; capital, $100,000; to manufacture automobiles. Incorporator: L. L. Woodward.

WASHINGTON, D. C.—Express Spark Plug Company; capital, $200,000; to manufacture spark plugs. Incorporators: C. H. Duffy, John Loughran, Fred Plugge, John Keane.

GARAGES AND ACCESSORIES

BIRMINGHAM, ALA.—Drennen Motor Car Company; capital, $50,000; to carry on a garage business.

BUFFALO, N. Y.—Rub-On Manufacturing Company, Inc.; capital, $5,000; to manufacture automobile specialties. Incorporators: Otis Bower, W. A. Faxon, W. H. Faxon.

PERU, IND.—Peru Castings and Machine Company; capital, $25,000; to manufacture castings. Incorporators: R. M. Carter, C. E. McCampbell, I. H. Barbee.

PHILADELPHIA, PA.—Tension Tire Company; capital, $100,000; to manufacture and sell and deal in and with automobile tires and all accessories thereto. Incorporators: Robert G. Gregg, Howard F. Spellhouse, Geo. L. Townsend.

NEW YORK CITY—Morot Cycle Tire Company; capital, $10,000; to manufacture motor-cycle tires. Incorporators: H. W. Torney, E. E. Beyer, J. E. Beyer.

NEW YORK CITY—United Garage Company; capital, $14,000; to carry on a general garage business. Incorporators: K. Mynter, E. B. Smith, Samuel Ecker.

ONEIDA, N. Y.—Federation Supply Company; capital, $150,000; to deal in automobile supplies. Incorporators: H. D. Crim, Timothy Curtin, A. J. Seaton.

SPRINGFIELD, ILL.—White Garage Company; capital, $12,000; to carry on a garage business. Incorporators: G. W. Taylor, C. W. Luttrell, H. G. Colson.

ST. LOUIS, MO.—Pioneer Steel Block Tire Company; capital, $25,000; to manufacture a new steel motor tire, the invention of Fred W. Karches. Incorporators: W. D. Becker, J. G. Ganahl, Nicholas Le Brun, F. A. Gerber, F. W. Karches.

WASHINGTON, D. C.—District Automobile Service Company; capital, $50,000; to carry on a garage business. Incorporators: G. R. Cowle, L. Bert Nye.

CHANGES OF CAPITAL AND NAME

GREENSBORO, N. C.—Ford Garage Company changed name to McGlamery-Markham Auto Company.

GREENSBORO, N. C.—Ford Garage Company increased capital to $30,000.

WASHINGTON, D. C.—Peerless Motor Transfer Company; change of name to C. B. B. Motor Company.

The AUTOMOBILE

Commercial Section of 1913 Chicago Show Breaks All Previous Records

Seventy-Six Truck Makers Exhibit Their Product on Vast Floors of Coliseum, Armory and Wilson Building

CHICAGO, ILL., Feb. 10—The commercial vehicle section of the Thirteenth Annual Chicago Automobile Show was thrown open to members of the trade at 10 o'clock this morning and to the general public at 2 o'clock this afternoon. By the time the crowd had begun to press through the doors of the Coliseum and the Armory practically every exhibit was in place. There are seventy-six makes of commercial vehicles exhibited and 141 accessory booths. The trucks fill the main floor of the Coliseum, the Annex and the Wilson building as well as that of the First Regiment Armory. In the Coliseum thirty-six different makes of vehicles may be seen, in the Annex there are nine, in the Armory twenty, and in the Wilson building eleven. The accessories are shown in the gallery of the Coliseum, on the second floor of the Annex, and in the gallery of the Armory. The basement of the Coliseum, which was used for both cars and accessories during the pleasure car show, has been abandoned this week, the floor space occupied by the truck section being only 135,615 square feet as compared with 147,990 square feet required for the passenger vehicles. Sixty-seven of the commercial vehicles on display are of the gasoline type the other eight being electrics. At the recent New York show there were six makes of electrics shown but only fifty-nine makes of gasoline machines. The value of the truck and accessory exhibits is estimated at $1,000,000.

There are nineteen makes which did not appear at the New York exhibition. These are: Adams, Avery, Buffalo, Clark, Commerce, Diamond T, Four-Wheel Drive, Harder, Harwood-Barley, Harvey, Ideal, Mercury, Mogul, Natco, Old Reliable, Poyer, Rambler, United States and Urban. Naturally a considerable number of makers who had space in New York are not represented in Chicago. A few of the Chicago exhibitors are showing parts as well as chassis and complete trucks. Among these are International and Mais.

The decorative scheme used during the pleasure car week is continued throughout the commercial car section the only change being in the names of the various exhibitors and the arrangement of the spaces.

Quick action characterized the transformation of the pleasure car section into the commercial vehicle section. Promptly at closing time on Saturday night the pleasure cars and such accessories as did not exhibit during the second

Impressions at the Chicago Show

¶ *An offspring of the passenger car business, the commercial vehicle industry, has shown itself exceedingly precocious. In its early days no one paid much attention to its increasing stature and trucks were included in the passenger car exhibitions in a sort of tolerant way, almost as accessories.*

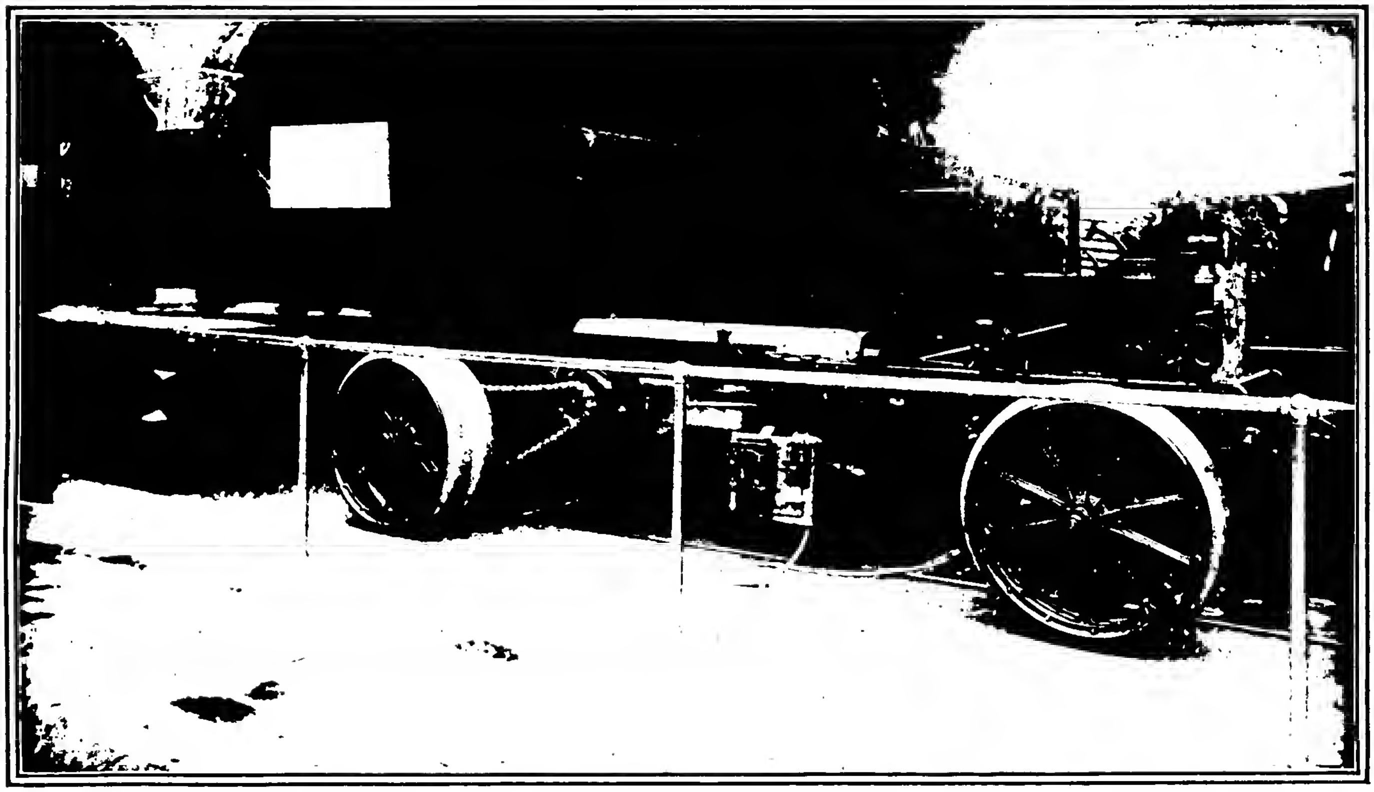
¶ *All this has been changed and changed very radically. For several years commercial vehicles have been recognized as products of an independent industry big enough and strong enough to take care of itself as such. Truck shows are held in conjunction with the passenger car exhibitions instead as a part of them.*

¶ *The show now in progress at Chicago typifies in its exhibits the common sense ideas which are coming into control in the motor truck field. The freak constructions are being eliminated, standardization is being broadened in scope and the result is a more highly finished and efficient product.*

¶ *One of the salient features of the present Chicago truck show is its wide scope. Here may be seen trucks of all sizes, from the little 500-pound delivery wagons to the tremendous 7 and 7.5-ton vehicles, massive and powerful as the mammoth or the mastodon, but infinitely more useful. The favorite sizes, however, judging from the exhibits, are the 2, 3 and 1-ton vehicles in the order named.*

Many men of many minds may well be suited in the selection of a type of body adapted to each particular line of work for there is a great variety on exhibition. There are dumping bodies of varying sizes to suit varied requirements, power or manually operated, as the buyer wills. There are all sorts of transfer bodies for all kinds of delivery service. In fact, the prospective truck buyer will be hard to suit who cannot find what he wants at the Chicago show.

Center of the Coliseum, showing the arrangement of trucks on the floor of the exhibition hall, with ample space between them to allow of inspection by visitors to the show



The 5-ton Locomobile automatic dumping body is actuated by an endless screw, and rollers tilt the body to the proper angle, holding it against the rear edge of the chassis

Two Dumping Bodies at the Chicago Show

The new White power dump body is operated by a nut traveling on a long endless screw extending along the center of the chassis from the back of the seat to above the jackshaft. To the traveling nut is attached two stout chains which pass over respective pulleys and attach to a V-shaped framework fastened to the underside of the body floor. As the traveling nut is carried forward on the endless screw the body is raised and traveling towards the rear allows the body to lower onto the frame. Automatic means are provided to cut out the power and stop the endless screw when the body reaches either the raised or lowered positions.

The Mack dumping body is operated by power of the motor. The mechanism consists of two vertical chains passing over upper and lower sprockets in rear of the driver's seat. Attached to a link of each chain is a link which also connects with two arc-shaped feet on the under side of the body. Driving the chains in one direction raises, and in the opposite direction lowers the body.

week were hurried into shape for removal from the buildings. Electric wagons were used for hauling the cars out of the building, the action thus being continuous, one electric going out at about the same time the other came back for another car. By 8 o'clock in the morning practically every vestige of the pleasure car show had been removed and the electrics began to move the trucks in. They were busy at this task until Sunday afternoon when most of the exhibits were in place. A few spaceholders were late in sending in their exhibits but these were practically all in place by opening time today.

The largest exhibits at the show were those of the Packard, White and G. M. C., each of which comprised eight vehicles. The Alco showed seven trucks and a trailer, and the International also showed seven machines. There were six exhibitors represented by one truck or chassis. The greatest number, however, exhibited three vehicles, although nearly as many exhibited two. Four machines were shown by a few more exhibitors than showed five.

The preponderant class at the show were of 2-ton capacity, although the 3-tonners ran them a close race followed by the 1-ton vehicles. The range varied from 500-pound capacity vehicles to 7.5-ton trucks.

One of the distinguishing features of truck design as exemplified in the vehicles exhibited at the Chicago show seems to be that of making the vehicle suitable to the work to be done rather than trying to make the work accommodate itself to the vehicle. This, of course, is shown more in body design and special fittings than in the chassis proper.

Special bodies for special services are coming to be the rule rather than the exception as they were formerly.

All are not like this, however: On a mercury wagon the driver occupies a single folding seat, the width of which is not more than one-third that of the body. He sits on the right side with the side door immediately in front of him. There are rear doors which are kept locked when delivering and are only used for loading. At the left of the single seat is an open space giving free access to the entire packages carried.

The Willys utility wagon, an express type with canopy top, is made to afford every facility for loading and unloading. It has a hinged side door at the right immediately back of the driver's seat. The tailboard is hinged and provided with chains to hold it at a practically horizontal position.

With small capacity vehicles for light package delivery work it is expected that the use of compartment for carrying fragile packages would be resorted to; and also that shelving hinged to the sides would come into more general use. Little is shown in this respect, one of the few examples, however, being the Menominee with shelving which practically increases the carrying capacity 100 per cent.

Open express wagons are perhaps shown in greater numbers than in any other type of vehicle as they are suited for so many lines of work such as grocery, express, produce, etc. There are a number of furniture models of the van type but they are practically standard in construction. They all use the padded rail to protect the furniture, one or two are made without side pillars between the wheels so that the load can be taken off from the right. This is most important for use in large cities with narrow streets, where there would not be sufficient street widths to back the truck up to the curb as is necessary for rear unloading.

The Clark delivery wagon is similarly designed for lumber trade, and has a flat framework extending forward at either end of the seat and at either side of the motor forward to the radiator. This allows of carrying practically any length of timber at either side with shorter lengths back of the seat. The flat framework extending forward alongside of the motor, serves as a fender for the front wheel, and beneath this framework and between the wheels is space for a large box for carrying tools, etc.

Another combination wagon which offers a wide field for usefulness, is the White combination farm wagon. It is an express type of body with canopy top. Two removable cross seats are shown in place in rear of the driver's seat. These are removable when produce or freight is to be carried. The vehicle is fitted with pneumatic tires.

As usual there is a big exhibit of dumping bodies suitable for all coal, sand, and gravel work. The use of the engine power for dumping these is becoming general, whereas a year ago, but few used such. The Pierce-Arrow and Kissel show hydraulic dump types; on the Locomobile an endless horizontal screw with traveling nut is used for the dump body and also for the removable body which is supposed to be placed on a standing platform. The Mack shows its motor-driven, chain-type dump and the Packard and Universal also show dumping types.

The types of bodies suitable for building construction trade are in greater numbers than ever before, a fact which demonstrates the interest this class of buyer is now taking in the motor vehicle. The Locomobile shows a quick-unloading lumber body. On the Mogul use is made of transverse steel rollers on which either a body or heavy building timbers can be rolled on or off.

There are not so many tank wagons for the oil trade as have been seen in other years due largely to the fact that oil concerns have adopted their standard body types and their business is largely repeat orders. The Avery company shows a large tank type with a commendable four-compartment cabinet at the rear end with hinged doors. These compartments contain the faucets in the lower part, and spaces for the cans and other necessaries in the upper. Along either side of the tank is a platform with iron railing, not unlike that along either side of a locomotive boiler for railroad work.

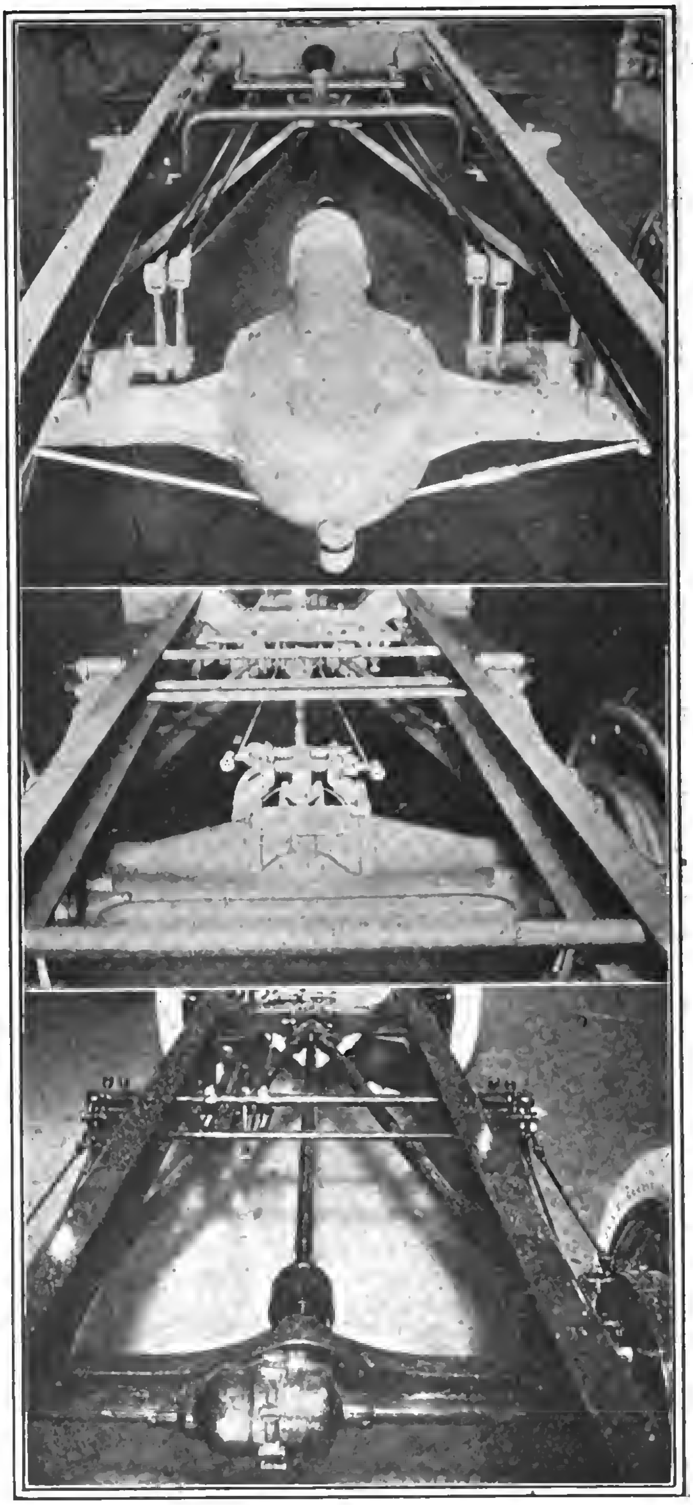
The fact that concerns are insisting upon standard body styles for their industry no matter what make of truck they may use is well shown in the three body types of the Schultz Bread Company. These are on three different chassis, a White, Walker electric and General Vehicle electric. The body designs are alike and are characterized by zinc flooring for cleanliness, and by a side door immediately in rear of the driver's seat, and on the right side of the vehicle. There are large rear doors but they are only used for loading purposes.

Another example of special body for the service is that of a florist wagon used for a 5-mile haul with a stop at each end. Rear doors only are used and the body is of a size to accommodate the packages most used by the concern.

There are fewer fire department vehicles than seen at any previous Chicago motor truck show. Not a few of the concerns prefer standard transportation trade to the fire department field which is so largely special order work to specifications drafted by the various municipalities. If sales of fire department vehicles are general on tender and are supposed to go to the lowest bidder, a fact which causes many makers to prefer confining their efforts to standard types of trucks for industrial fields. The fire department vehicles shown are manufactured by the White, Federal, KisselKar and Pope-Hartford companies.

The use of the trailer is well evidenced by the Knox company, which shows the Martin-Knox tractor pulling a large tank for oil purposes, and on another tractor is mounted the forward end of a body suited for the ice industry. This concern is now supplying the three-wheel tractor for practically all industries. The new Garford tractor is a four-wheel type which carries a horizontal fifth wheel on which the forward end of the trailer body rests.

The Chicago is well represented in the light delivery wagon field, but in all of the bodies shown there is a deplorable lack of versatility of interior arrangement. Some of these designs are open to every criticism in that not a solitary effort has been made to save time by facilitating the arrangement of packages or securing them by the driver or jumper boy when making house-to-house deliveries. There are several of them in which the driver's seat extends across the entire front of the body with a partition from the top of the seat to the roof so that it is necessary to walk to the rear doors in order to get any package, no matter if the package is lying immediately in rear of the driver's seat.



Three New Axles Seen at the Chicago Show

Worm-driven axle on new 1-ton Universal truck. The worm and worm wheel are assembled as a unit in the cover part of the axle housing to facilitate ready removal.

Combined live and stationary axle on new Studebaker trucks. The stationary axle is an I-beam piece, in front of which is carried the jackshaft portion. The ends of the jackshaft carry spur pinions which mesh with enclosed spur gears on the road wheels. It is possible to get any desired gear reduction between these pinions and gears so that the bevel gears in the center of the jackshaft construction are nearly the same size, giving a reduction of approximately 1.25 to 1. Note the radius rods which converge at their forward ends and attach to a frame member.

The small Brown delivery vehicle uses a combination stationary and live rear axle with the stationary portion in front. The live axle portion, or jackshaft portion, carries a spur pinion at each end for meshing with a spur gear on the road wheel.

Red Tail Light Menace to Railroad Employees

Alco Company Denies Reports of Segregation Into Parts—Cleveland Wants Better Tax Law

Creditors of the Columbus Buggy Company To Preserve Assets—Sparks-Withington Will Protect Customers

BOSTON, MASS., Feb. 8—The red light as a signal on the rear of motor cars to prevent rear end collisions on the road may be legislated out of existence within the next few years because of their being really dangerous to the operation of railroad trains.

That these lights have already caused trouble has just been brought out as a result of a committee representing the locomotive engineers operating trains in New England having sought some remedy through the Massachusetts Highway Commission.

The members of the committee made a plea that the red light on motor cars be changed to white or some other color not used in railroading and when Col. W. D. Sohier, chairman of the commission, heard what they had to say, he realized that it was an important matter.

Col. Sohier was told that there are many places in the Bay State, and in fact throughout New England, where the highway and the railroad tracks run parallel. And at some places, for example up near Andover and Gloucester, the tracks make a curve so that the highway runs within a few feet of the railroad roadbed.

On more than one occasion, it was stated, an engineer coming around a curve has seen a red light ahead, and jammed on his emergency brakes bringing the train to a quick stop, jolting the passengers of course, only to see the red light moving away, being the tail light of a motor car instead of a danger signal on the railroad tracks.

This has happened to some of the important trains, it was stated. Of course to an engineer the red light coming upon him suddenly out of the darkness and in close proximity left no alternative but to take precaution and after this happened a few times it got talked about among the engineers. So it seems that the matter was not one to be laughed about, but a real serious menace viewed by these men.

President Speare realized the fairness of the engineers' point of view, more so because motor cars are becoming far more numerous now and owners are making longer tours and are not afraid of using the highways at night. Colonel Sohier suggested that perhaps the Massachusetts State A. A. might introduce a bill in the legislature to change the color of the light to white, or anything but red or green.

Ohio Legislature Busy

COLUMBUS, O., Feb. 10—A bill introduced in the Ohio General Assembly to compel motormen of interurban cars, while passing motorists, to screen their glaring headlights was defeated recently after it had been reported out by the committee favorably. The Columbus Automobile Club fathered the measure and the members were much disappointed at the defeat.

Senator Lloyd, of Franklin County, has introduced a bill in the Ohio Legislature providing that motorists after running over or colliding with an individual must apply the brake at once and go to the aid of the injured. Failure to comply with the law is punishable by a fine of from $200 to $500 and imprisonment of 30 days to 6 months.

Senator William A. Weggandt, of the Ohio Legislature, is drafting a bill to have the state sell the abandoned canal lands and to have the money received from the sale of the lands applied towards the improvement of the highways of the state. The matter has been taken to Governor Cox for his approval. It is believed that at least $20,000,000 would be realized from the sale of the abandoned canal lands.

Alco Not To Split Into Parts

In a statement relating to the future of the automobile business of the American Locomotive Company, President W. H. Marshall, of the company, denied the reports which have been circulated recently with regard to this subject. These reports hinted that the automobile departments were to be incorporated as a separate company from the locomotive manufacturing concern, with separate officers, etc. According to Mr. Marshall, these reports are entirely unfounded. The automobile department will be continued as heretofore, as part of the principal organization, and under the special supervision of Leigh Best, vice-president of the company, who will take over this work in addition to his other duties.

J. W. Du B. Gould, whose arrangements with the company have been announced in last week's issue of THE AUTOMOBILE, is going to increase the operating efficiency of the company's automobile factory, applying the principles of scientific management to this end of the business. No sweeping changes of any nature are being looked toward, at least for the present.

Try To Preserve Columbus Assets

COLUMBUS, O., Feb. 7—A meeting of the creditors of the Columbus Buggy Company, of Columbus, O., which has been in the hands of Daniel McLarin as receiver for several weeks, was held Friday, February 7, at the office of Attorneys Sater, Seymour & Pease. The object of the meeting was to discuss ways and means to preserve the assets of the company. Many of the holders of the preferred stock of the company attended the meeting.

Cleveland Protests Against Tax

FINDLAY, O., Feb. 8—Complaints from the larger cities of the state are being made to Governor Cox relative to the proposed increase in the state license fee for automobiles. A committee of Clevelanders visited the governor a few days ago to protest against any change in the law unless there would be some compensatory changes that would interest the auto owners of the large cities. It is said that Cleveland pays one-fifth of the state auto license tax, and the county gets back but one-eighty-eighth of the fund. Under the increased fee proposed the total license fees from Cleveland would be about $180,000, while the county would have returned to it for road improvement about $10,000. If the proposed fee is imposed they want it pro rated to the counties on the basis of payments.

Sparks-Withington To Shield Clients

The Sparks-Withington Company, Jackson, Mich., who recently was sued by the Lovell-McConnell Manufacturing Company, Newark, N. J., for alleged infringement on the Klaxon patents, has announced that it proposes "to protect all our customers against any suits that may be brought against them to frighten on account of using Sparton horns."

Cannot Sell Perry Chains

CHICAGO, Feb. 6—The Parsons Non-Skid Company, Ltd., and the Weed Chain Grip Manufacturing Company yesterday secured a temporary injunction in the United States District Court against Emil J. Crimske, individual members of the E.Z On Chain Tire Protector Company, and Hartley Manufacturing Company, Manufacturers' Auto Tire Company and the Whitaker

Manufacturing Company restraining them from disposing of the stock of chains made by the Perry Chain Manufacturing Company, of Lansing, Mich., which they have in their possession. It is claimed that the Perry chain infringes the Parsons patents with the exception of a wire spring, which, it is said, is so frail as to be easily broken off; whicb, it is alleged, makes a Weed chain out of the Perry device that closely resembles the Weed.

Indiana Kills Hughes Bill

INDIANAPOLIS, IND., Feb. 10—Hope of obtaining good roads legislation at the present biennial session of the Indiana legislature has vanished. The House, by a vote of 79 to 13, has killed the Hughes good roads' bill, which was drafted by the Indiana Good Roads Association and indorsed by numerous organizations. It was also the administration good roads measure. The bill provided for the creation of a state highway commission and would have prevented farmers from working out their road taxes. It was the sentiment among the farmers against the bill that killed it.

One Mill Tax for Minnesota

W. H. Campbell, of New York, member of the good roads board of the Associated Motor clubs, is in St. Paul and Minneapolis pushing the good roads propaganda. The 1-mill tax amendment to the constitution was passed at the last election and the legislature is about to take up the consideration of how much of the tax will be ordered into effect. The mill is tbe maximum and the legislature may decide upon the limit of assessment for the next 2 years up to that amount. This full tax can produce about $1,000,000 a year. The bill for which the good roads people are working now has been introduced by R. C. Dunn, promoter of the mill tax, to centralize supervision policy, set aside a percentage for maintenance, and to build roads that will last. The bill divides state aid into four classes based on assessed valuations of counties. The counties with the lowest valuations are to be allowed 80 per cent. aid. The minimum is 50 per cent.

Indianapolis After Jay Walkers

INDIANAPOLIS, IND., Feb. 9—A rigid enforcement of the city traffic ordinance has been started in Indianapolis by the police. Although the ordinance has been in effect 2 years it has not heretofore been enforced against pedestrians. Under the present enforcement, pedestrians are permitted to cross the street only at right angles, and not diagonally.

Paul Smith Now with Lozier

DETROIT, MICH., Feb. 10—Paul Smith, formerly with the Flanders Motor Car Company, bas become connected with the Lozier Motor Company, of this city, in the capacity of manager. He will co-operate with Harry M. Jewett, president of the company, in evolving a big, efficient distribution campaign for the product of the Lozier works.

Roth-Murphy in Trouble

INDIANAPOLIS, IND., Feb. 10—Maynard E. Zepp, an employee, has brought suit in the circuit court asking that a receiver be appointed for the Roth-Murphy Engine Starter Company of this city. Zepp says the company is indebted to him for work, that he owns several shares of stock and that the company has $32,000 worth of capital stock outstanding.

Norwalk Declares Good Dividend

MARTINSBURG, W. VA., Feb. 10—The directors of the Norwalk Motor Car Company, Martinsburg, W. Va., have declared a dividend of 7 per cent. which is payable now.

Pennsylvania Road Report Now Ready

Bull Purchases Grabowsky Plant—Randolph Assets Exceed Liabilities—Midland Increases Capitalization

Delaware Laws Proposed to Inforce All Vehicles to Carry Lights—Fractional Year Law Also Provided

YORK, PA., Feb. 8—E. M. Bigelow, Pennsylvania state highway commissioner, submitted to the House of Representatives last Wednesday a statement of the work of his department, during tbe session of the legislature now convening at Harrisburg.

The report shows an expenditure of $4,401,413.24 from June 1, 1911, to January 1, 1913. The department has a balance of $1,221,667.82 on hand.

Of the general state highway appropriation of $3,000,000, $2,943,982.22 was expended for repairs, construction, surveys, maintenance, etc., leaving a balance of $56,017.78. In addition to this there is in the state treasury, $1,845,780.31, representing the receipts from automobile licenses.

For state-aid roads for which the legislature of 1911 appropriated $1,000,000 tbe department has expended $151,562.57, leaving a balance of $884,437.43. Under the state-aid acts of 1907 and 1909 the department has had available during the period of this report, $660,642.28 remaining from former appropriations and $345,438.78 returned by counties and townships, a total of $1,006,081.06, of which $906,233.02 has been expended, leaving a balance of $99,848.04.

The appropriation for the National or Cumberland road, amounting to $300,000 has been expended to the extent of $173,748.22, the balance on hand being $126,251.78. Of an experiment fund of $50,000, $24,276.95 was used, $25,723.05 remaining. The traveling expense fund of $88,000 was all used except $4,202.38. Out of the contingent fund of $79,000 the department expended $2,759.31, leaving a balance of $50,240.69. The appropriation to the automobile division was $100,000 and the expenditures $89,053.33, the remainder being $10,946.67.

Randolph Bankruptcy Not Justified

CHICAGO, Feb. 8—Affairs of the Randolph Motor Car Company were aired before Federal Judge Landis today when E. Goldman, president of the concern, took the stand and accused two former employees with wrecking the concern by taking action in bankruptcy when they had no just claims. The two salesmen claimed $1,300 was due them in commissions. Tbe assets of the company are placed at $100,000 by the concern's attorney while the liabilities are said to be $65,000.

Take Grabowsky Plant to Detroit

DETROIT, MICH., Feb. 8—The Edward G. Budd Manufacturing Company, of Philadelphia, is the real purchaser of the Grabowsky plant and will remove here with its entire office and manufacturing forces. The Budd company is a manufacturer of pressed steel bodies and when it locates here it will increase the capacity of the Grabowsky plant by 300 per cent.

Midland Increases Capital

MOLINE, ILL., Feb. 9—Stockholders of Midland Motor Company met last week and authorized advance in capital stock from $100,000 to $300,000. The increase is made necessary to permit carrying out a policy of expansion, aim of the company being to turn out 1,000 cars during 1913. All of the $200,000 additional stock has been subscribed.

Delaware Laws More Strict

WILMINGTON, DEL., Feb. 10—Two bills are pending in the Delaware Legislature which are of interest to motorists. One requires all vehicles on the roads and streets to carry lights at night and the other proposes the issuance of fractional licenses where persons buy cars during the latter part of a year.

States Give Good Roads Much Needed Attention

Canada Wants Good Roads—Connecticut Passes Improvement Bill

Automobile Laws in Various States Revamped—Minnesota and Connecticut Make Changes

HARRISBURG, PA., Feb. 10—Among the measures introduced at the session of the Legislature at Harrisburg this week is a bill to amend the state highway law. It provides that in the case of the highway commissioner deciding to take over a toll road he can do so before the damages have been fixed by the process of law. Under this bill the state can go ahead and make improvements and remove the toll gates before the courts have determined the damages the owners shall have. Another gives cities and boroughs the power to improve roads less than 1 mile beyond municipal limits, and the other levying a 1-mill tax for highway construction and maintenance in townships, the money to be distributed by the state highway commissioner.

May Change Minnesota Law

MINNEAPOLIS, MINN., Feb. 9—Prospects are good for a change in the automobile license law of Minnesota which now calls for a tax of $1.50 a car for 3 years' running. A horsepower tax bill was introduced, but met the opposition that it might be unconstitutional as taxation in Minnesota must be on an equal basis for all classes of property. The tax was to be in lieu of all assessments. Automobiles are now placed on the personal property tax lists. With the $10 tax the machines will be still subject to personal property tax. The license fees would be applied to roads. On the horsepower tax it is estimated $750,000 a year would be raised. The $10 tax would net about $500,000.

Want Iowa Highway Commission

DES MOINES, IA., Feb. 10—The sub-joint committee of the Iowa House of Representatives which is to present a good roads bill for adoption by the present Legislature has about decided on its program, and it is thought the bill will be presented to the House by February 15. As outlined now the bill will provide:

Establishment of a state highway commission of three members, with ample authority, these commissioners to select a highway engineer.

County engineers for every county in the state, to be employed by supervisors.

Classification of all highways into county and township roads.

All money expended on county roads to be in line of permanent work. No money to be spent except on approval of engineer.

Two mill levy to be placed in compulsory drag fund to be paid out only by superintendent of township roads.

A separate feature of the bill will provide for a 1 mill levy for state aid to be raised from all taxable property in the state, including all property in cities, but this money is to be used only on country roads for permanent highways.

Changes in Connecticut Law

HARTFORD, CONN., Feb. 8—Albert Philips, recently elected secretary of state has spent much of his time since assumption of the office in a revision of the Connecticut automobile law passed by the legislature 2 years ago. Automobilists do not care to see this law set aside for something else, but the secretary has some ideas of his own on the subject expressed in the revised law which has been brought to the attention of the Senate by Senator Johnson, of the Twentieth District.

An important change made by the secretary of state is the taking away from the town assessors the right to tax automobiles. The new bill provides that the owner shall pay at the time his vehicle is registered for the year, 10 mills on the value of the car at 75 per cent. list price for the first year, 55 per cent. of the list price for the second year, 35 per cent. for the third year and for the fourth and each succeeding year, 20 per cent. is to be charged.

Another change proposed affects commercial cars registered in other states. During the past 2 or 3 years much freighting has been done in Connecticut by New York and Massachusetts registered trucks. New York City cars are frequently seen in Hartford.

At present a foreign or outside registered motor truck is not compelled to bear a Connecticut license. The new secretary's bill provides that trucks operated more than 10 days in a year in this state shall be registered. This little piece of legislation is aimed at moving vans and the like.

Prevent Misuse of Dealers' License

DES MOINES, IOWA—In a bill in the House of Representatives it is provided that automobile dealers shall report sales and contracts for sales to the secretary of state. This is designed to prevent automobile owners from operating machines 3 to 6 months after purchase without taking a license. The author of the bill says hundreds of new owners run their cars for months under dealers' license. If the new bill is made a law the secretary of state will be able to collect the tax at once. Another bill provides that every dealer have a license number for each car which he is operating outside his place of business, instead of a general license number. A third bill provides that a car purchaser may get a license from the secretary of state for the unexpired time in the year, for half price. The present law requires payment of full amount no matter how much time remains.

Improving Connecticut Roads

Passage of a bill introduced in the state legislature will provide for a bond issue of $5,000,000 for the improvement of trunk line highways in Connecticut.

Connecticut Registrations High

HARTFORD, CONN., Feb. 8—Twenty-seven per cent. more cars were used in Connecticut in 1912 than the year previous, or 17,900 were registered as against 14,000 in 1911. Revenue from motor vehicle registration in Connecticut during the past season amounted to $255,124, or an increase of about 11 per cent. over the year previous. The receipts for 1912 represent in addition to private owners 10 manufacturers, 389 dealers, 25 motorcycle dealers, 486 livery cars, and 26,241 operators.

Comparison of cost of operation of the registry departments of the states of New York, Massachusetts and Connecticut is interesting. It cost New York state 16.2 per cent., Massachusetts 14.7 per cent., and Connecticut 5 per cent. of receipts to collect fees. These figures represent net office expenses exclusive of cost of markers or license plates.

Approximately $255,000 was expended in 1912 for Connecticut road improvement.

According to the above figures emanting from the secretary of state's office motorists in Connecticut contributed more than a quarter of a million dollars to operate their cars.

Canada Wants Good Roads

ST. JOHN, N. B., Feb. 10—At an enthusiastic convention of delegates from all over the province here last night, a Provincial Good Roads Association was formed, and resolutions were passed strongly urging the government to take the roads out of politics and to provide for three trunk lines stretching across the province from the Maine border; to abolish statute labor, and to provide for a patrol system; also to appoint a competent engineer under whom all road work would be carried on.

New Indianapolis Race Entries of Last Week

Root Succeeds Wagner as Starter—Several Additional Entries Assured

Albert Guyot with a Sunbeam Racing Car Has Sent His Entry In—Third Stutz Entered

INDIANAPOLIS, IND., Feb. 10—There have been important developments in the last week in the plans for the 500-mile race to be held at the Indianapolis Motor Speedway, May 30. Charles P. Root has been named as official starter and assurance has been given of several additional immediate entries.

Root will succeed Fred Wagner, who has been official starter of the local speedway since it was established. Wagner is more or less in disfavor with the speedway officials at the present time. Root had warm support from Chicago and Detroit friends for the appointment.

A cablegram has been received from Albert Guyot, a prominent French driver, that an entry for an English Sunbeam racing car has been forwarded by mail. The car will be driven by Guyot. He won the light car class in the French Grand Prix of 1908 and finished fourth in the three liter race at Boulogne in 1909. The Sunbeam is a six-cylinder car with 3.5-inch bore and 6.3-inch stroke.

The Ideal Motor Car Company has entered its third Stutz car in the event, nominating Don Herr as driver. It is reported that the company is negotiating with Joe Dawson, who won last year's 500-mile race, to drive in the coming event.

European Cars for Indianapolis

PARIS, Feb. 1—(*Special Cable*)—Indianapolis will obtain the finest racing cars Europe can provide for the 500-mile race to be run on the speedway on Decoration day. In addition to the six-cylinder Sunbeam now being fitted out in England for the French driver Albert Guyot, tbe Peugeot Company, has decided to send two of its 1912 racing cars across the Atlantic in charge of Jules Goux and L. Zuccarelli. One of the cars is the big racer which was driven into first place at Dieppe with Georges Boillot at the wheel; the other is an identical car with which Goux secured first place in the fall race at Le Mans. These cars are looked upon as the fastest road racers ever built. Boillot's Peugeot showed an average speed of 68.5 miles an hour over a distance of 956 miles in the two-day Dieppe race last year; the same car clipped nearly one second off the Mont Ventoux hill climb record which had been held for 4 years by a big Brasier; at the Boulogne meeting it secured all the prizes, covering 7 kilometers flying start over give and take roads at 101.5 miles an hour; the flying kilometer at 77.6 miles an hour and the 3-kilometers standing at 86.9 miles an hour.

The motors at present have a bore and stroke of 4.3 by 7.8 inches, which gives a cylinder area of slightly more than the 450 cubic inches allowed under the Indianapolis rules. Arrangements have already been made, however, to fit a new set of cylinders with a slightly smaller bore so as to bring the cars within the limits. All other features, comprising the special type of direct operating camshaft will be retained. During the past season no attempt was made to gain speed by decreasing head resistance, even the short distance races being run without wind cutters. With wind cutting bodies and a few detail improvements it is possible to make the cars 2 or 3 miles an hour faster than at present.

The Peugeot drivers, Goux and Zuccarelli have never driven in America. Jules Goux has had his entire racing experience with the Peugeot Company. After riding motorcycles he handled the firm's long-stroke single-cylinder racers, then their light cars, and finally the 175 horsepower racer built last year. At Dieppe he had to retire, like the late David Bruce Brown, for taking gasoline away from the official station. At Le Mans he got his chance and brought his big Peugeot in first.

Eight Entries for Chicago Non-Stop

CHICAGO, Feb. 10—Eight entries for the Chicago Automobile Club's day-and-night non-motor stop reliability to Boston were secured at the show last week—something remarkable when it is considered that the contest will not take place until the latter part of June. The first was a Packard six nominated by E. C. Patterson, a private owner, while the others are two Abbott-Detroits, two Stavers and three Imperials. In addition several other good prospects were discovered and it is thought that entries will be forthcoming from the Edwards-Knight, Speedwell, Lozier, Chevrolet, Case, Alco, De Dion, Cutting, Haynes, Mercer, KlineKar, Moline, Studebaker and Havers.

The sanction of the American Automobile Association has been secured by the club, following which the entry blanks were issued. Supplementary rules approved by the A. A. A. contest board are somewhat radical in that the contest is made a free-for-all without price classification; that no time will be added for tire trouble and that the affair will run continuously day and night.

Endurance Run for Sicily

PARIS, Feb. 1—Announcement is made by Chevalier Florio, the organizer and donator of the Targo Florio race that this event will take the form of an endurance contest round the Island of Sicily on May 11 and 12. Last year this was a non-stop run, the cars traveling day and night. Owing to the danger of sending high speed cars over the mountain roads at night time, it has been decided to make the race a 2-day event, the first day's run being from Palermo to Girgenti, and the second day's event the continuation of the run from Girgenti to Palermo. The race will be run under the rules of the Automobile Club of Italy. Last year the Targa Florio was won by an Englishman, Cecil Snipe, driving a Scat car.

Joscelyn Proposes Increased Garage Rates

Louis J. Joscelyn, the proprietor of the New York garage bearing his name and president of the New York Garage Owners' Association, has suggested in a letter to the garage trade that the storage rates on all automobiles be raised $5 per month. He maintains that at the present storage rate it is well nigh impossible to profit on the garage business proper, so that the owners are forced to make a relatively high profit on the gasoline sold by the garages. The proposed remedy, according to Captain Joscelyn, would enable the garage owners to make a sufficient profit on the cars storage and would work out to the advantage of owner and garage man alike in the long run.

A. C. A. Keeps Laboratory

At a meeting of the board of governors held last Thursday it was decided that in view of the fact that one of the objects of the club is to encourage research work, the laboratory of the Automobile Club of America will be continued. The laboratory will be run on a more economical scale. A large deficit caused by the laboratory being idle for a part of the time will be avoided in future and more effort will be put into commercial work. It had practically been decided that the laboratory was to be abandoned and turned over to the S. A. E. or some other institution —perhaps a university.

Chicago Show Half Over —Increase in Attendance

N. A. A. M. Decides Upon Holding 1914 Exhibition in That City

Also Discussed Merger with the Automobile Board of Trade, But No Action Was Taken

CHICAGO, Feb. 10—The first half of the Chicago Show, that devoted to the pleasure cars, came to a close Saturday night and it now is stated that the attendance showed an increase of something like 10 per cent. over the same week last year. The first two nights of the show brought out a smaller attendance than usual, just as it did at New York, but every night after that showed an increase over last year. The attendance of dealers was the remarkable part of it all, there being 3,800 agents registered, 800 more than last night, of these, fifteen or twenty came from as far away as New Zealand, Vancouver and Berlin.

The Chicago show will be held in 1914, although some makers have been against it. That has been officially decided upon by the executive committee of the national association of automobile manufacturers, which held a meeting last Wednesday and formally listed next year's event. This action was not precipitated by the letter sent out by Colonel Pope to the motor industry and that letter did not come before the meeting in a formal manner, although it was informally discussed. Colonel Popes' epistle was devoted to arguing against showing as being too expensive, the claim being made that shows in this country have outlived their usefulness.

The N. A. A. M. also discussed the merger with the automobile board of trade but no action was taken.

It looks as if the deal would go through and the Automobile Chamber of Commerce be the result. At the present time signatures of members are being secured. More than 70 out of 103 have been landed. The association appointed W. L. Day, of the General Motors, on the Commercial Vehicle Committee, and also made him its vice-chairman.

Edwards Gets Findlay Plant

FINDLAY, O., Feb. 8—Because J. G. Cleary, of Milwaukee, Wis., who bid in the plant at receiver's sale at $50,000, could not furnish the court's stipulations, the Findlay Motor Company plant has been transferred to W. W. Edwards, of Leipsic.

Rubber Market Continues Quiet

There was an absence of new developments of importance in the crude rubber situation yesterday either at home or abroad. The markets on both sides of the water were quiet. On the eve of the fortnightly auction of plantation rubber which opens in London February 12, consumers were generally holding aloof from the markets, while there was apparently little trading of a speculative character in progress. In London prices moved in a narrow groove. The ruling tone was fairly steady, the lack of any demand of importance being offset by an absence of pressure to sell. In New York City, the market was quiet, with the dealings apparently confined to a few small parcels. Fine upriver Para sold at $.99 1-2 a pound, and coarse at $.76.

New Car for Canada

ST. JOHN, N. B., Feb. 10—The Maritime Six has made its appearance. It has been specially designed to negotiate road conditions in Canada. The Maritime Motor Car Company, Ltd., plans on turning out between 200 and 300 of these cars this year. At first their factory will only be used to assemble and put together the parts of the car, which will be manufactured elsewhere, but it is intended as business develops to arrange for the manufacture of different parts until the whole car represents the product of the factory. The company's factory, covering 2 acres of ground, is the largest in Canada, and in its arrangements is one of the most up-to-date on the continent. It has a capacity of 1,000 cars per year. The management expects to have 100 men employed in the factory this year.

Twenty-Seven Makes at Madison

MADISON, WIS.—Twenty-seven different makes of cars will be on display at the third annual Madison motor show, which will be given by the Madison Automobile Dealers' Association in the New City Market building on February 18 and 19. This is the largest number of exhibits ever made here. Madison dealers are searching for a larger exhibition hall, but at present there is none in sight.

Denver Show Committee Busy

DENVER, COL., Feb. 10—Preparations for the twelfth annual Denver Automobile Show, which is scheduled for March 3-8, in the Municipal Auditorium, have reached a point where the success of the exhibition, both artistically and financially, is practically assured. Already the representatives of more than half of the cars handled in the Denver territory have signed for space on the main floor.

Manager N. H. Van Sicklen, Jr., who is now in Chicago attending the National Automobile Show, wires that several of the pleasure car exhibits now on display there will be transferred entire to Denver for the week of the show.

Automobile Securities Quotations

Among the principal developments of the week was the new advance of Miller Rubber, which rose 40 points. Consolidated preferred gained 28, closing at 106, while its common stock, like Firestone common rose 2 points. Swinehart fell off likewise, and the same applies to the price asked for U. S. Motor common and second preferred while the first preferred rose 30 points with no bid.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	165	185
Ajax-Grieb Rubber Co., pfd	..	..	95	100
Aluminum Castings Co., pfd	..	..	98	100
American Locomotive Co., com	33	33½	39	40
American Locomotive Co., pfd	104	104½	104½	105
Chalmers Motor Company	..	..	135	145
Consolidated Rubber Tire Co., com	10	15	23	25
Consolidated Rubber Tire Co., pfd	20	30	106	108
Firestone Tire & Rubber Co., com	200	205	355	362
Firestone Tire & Rubber Co., pfd	108	110	106	108
Garford Company, preferred	..	..	105	107
General Motors Company, com	34	36	34	35
General Motors Company, pfd	74½	76	78	79
B. F. Goodrich Company, com	..	..	55	56
B. F. Goodrich Company, Pfd	..	..	103	104½
Goodyear Tire & Rubber Co., com	330	335	460	470
Goodyear Tire & Rubber Co., Pfd	104	106½	104	105
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	5	15
International Motor Co., pfd	..	..	25	40
Lozier Motor Company	..	..	..	32
Miller Rubber Company	..	..	195	200
Packard Motor Company, pfd	104	107	103	105
Peerless Motor Company	..	..	120	125
Pope Manufacturing Co., com	38	40	29	32
Pope Manufacturing Co., pfd	68	70	75	78
Reo Motor Truck Company	8	10	11½	12¼
Reo Motor Car Company	23	25	20½	21¼
Studebaker Company, common	..	..	34	35
Studebaker Company, preferred	..	..	92	93
Swinehart Tire Company	..	..	104	105½
Rubber Goods Mfg. Co., pfd	100	105	105	108
U. S. Motor Company, com	..	..	..	8½
U. S. Motor Company, 1st pfd	..	..	..	65
U. S. Motor Company, 2nd pfd	..	..	..	35
White Company, preferred	..	..	105	108
Willys-Overland Company, com	..	..	70	71
Willys-Overland Company, pfd	..	..	98¾	99½
U. S. Rubber Co., com	..	..	67	67½
U. S. Rubber Co., 1st pfd	..	..	107	107½

Show Doings at Various Cities Throughout States

Many of the Smaller Shows Have Announced Their Opening Dates

Committee Decides Chicago 1914 Show Dates Will Be About Same As This Year

HARTFORD, CONN., Feb. 9—The sixth annual car show of the Hartford Automobile Dealers' Association, conducted under the auspices of the First Infantry, C. N. G., was officially opened at the State armory, Saturday evening by Mayor Cheney. Present indications are that the show will be larger and better than previously. There is more of a business aspect about this year's show than formerly. Thirty-five makes of gasoline pleasure cars are shown, nine of which are new comers, six different makes of pleasure electrics are displayed, three of these are new arrivals. Thirteen different makes of gasoline commercial cars are shown, several of these were never before shown in this city. The showing of electric trucks covering two different makes is most complete and one make of industrial electric truck is displayed.

Brooklyn Show to Be Splendid

The Brooklyn, N. Y., show, under the management of the Brooklyn Motor Vehicle Dealers' Association, will surpass in magnitude and splendor all previous exhibitions held in that city, unless indications cannot be trusted. The show will open on the evening of Washington's Birthday at the Twenty-third Regiment Armory, and so far seventy companies have leased spaces on which they will show a total of about 250 cars. The remaining spaces will probably be filled by the opening day, and it is expected that more cars will be seen than were at the Manhattan shows.

A unique decorative scheme will be used, the interior of the Armory being decorated as a Californian landscape, sunset effect, the entire building to be illuminated by concealed lights. The lobby will be lighted by tungsten lamps contained in transparent columns.

Ready for Richmond Show

RICHMOND, VA., Feb. 9—On Monday, February 17, the first annual automobile show in Richmond will be held in the Horseshow building and will continue for the entire week. The show will be given under the auspices of the Richmond Automobile Dealers' Show Association and more than 100 cars of all kinds and sizes will be on exhibition.

Spaces Alloted for Syracuse Show

SYRACUSE, N. Y., Feb. 8—The Syracuse Automobile Dealers' Association held a meeting Monday night to decide space allotments for the annual motor car show at the Armory late in the present month. There were 100 spaces to be sold, 75 per cent. of which had been applied for by exhibitors in this city and other parts of the state. However, manufacturers throughout the country will be represented in the exhibits. It has been decided to require all exhibitors desiring guest tickets to pay for them in advance and the money for all those not used will be refunded after the show.

Same Dates for 1914 Shows

CHICAGO, Feb. 7—At the regular monthly meeting of the executive committee of the National Association of Automobile Manufacturers, Inc., held at the First Regiment Armory, the members voted unanimously to hold the 1914 show on dates corresponding with those of the present season. The drawing takes place early in October.

The members of the committee present were:

Wm. E. Metzger, Metzger Motor Car Co.
S. T. Davis, Jr., Locomobile Co. of America.
H. H. Rice, Waverly Co.
H. O. Smith, Premier Motor Mfg. Co.
Charles Clifton, Pierce-Arrow Motor Car Co.
Hugh Chalmers, Chalmers Motor Co.
L. H. Kittredge, Peerless Motor Car Co.
W. C. Leland, Cadillac Motor Car Co.
S. A. Miles, General Manager, N. A. A. M.
J. S. Marvin, General Traffic Mgr., N. A. A. M.

W. L. Day, General Motors Company, was appointed a member of the commercial vehicle committee, and made its vice-chairman.

The association has undertaken to ascertain what manufacturers intend to exhibit at the Panama-Pacific Exposition in a separate building to be known as the Automobile Palace. It was reported at the meeting that a large number of members had already made favorable responses.

Harrisburg Show in March

HARRISBURG, PA., Feb. 8—Plans are in progress for the annual automobile show of the Harrisburg Dealers' Association, Harrisburg, to be held in the Rex garage and Arena theater, Third and Delaware streets, March 15 to 22. Prospects look bright for a good show and space has already been signed for nine different makes of car. The two spacious halls will provide 17,000 square feet of floor space for the various automobile and accessory exhibits. A feature of the show will be a truck exhibit, which will be held in the Rex garage building.

Market Changes for the Week

Tin was stronger in tone and again higher at London and sympathetically stronger in the local market. In the open market trading was light and spot tin was nominal at $49.63, a gain of $.93 for the week. Both coppers and cottonseed oil experienced changes, the former losses and the latter a gain. Lead remained quiet and easy, calling for $4.30 per hundred pounds. While there was an undercurrent of steadiness on the cottonseed oil market yesterday, it could not be said that the price changes were especially significant, rising $.01, closing at $6.33 per barrel.

Domestic scrap rubber remains in a steady position. Reclaimers are absorbing moderate quantities and fair clearances are noted from the seaboard for various foreign countries. Automobile tire scrap remained constant throughout the week closing at $.09 7-8. The market for refined petroleum continues strong, influenced by the recent advances in crude oil. The price of crude, Pennsylvania and Kansas wells, is $2.50 and $.88 resp.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Change
Antimony, per lb	.08¼	.08¼	.08¼	.08¼	.08¼	....
Beams & Channels, per 100 lbs	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	28.50	28.50	28.50	28.50	28.50	....
Copper Elec., lb	.16	.15¼	.15¼	.15¼	.15¼	—.00¾
Copper, Lake, per lb	.16	.15¾	.15¾	.15¾	.15¾	—.00¼
Cottonseed Oil, Feb., per bbl	6.32	6.32	6.32	6.32	6.33	+.01
Cyanide Potash, lb	.19	.19	.19	.19	.19	....
Fish Oil, Menbaden Brown	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 Gal	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime	.90	.90	.90	.90	.90	....
Lead, 100 lb	4.30	4.30	4.30	4.30	4.30	....
Linseed Oil	.50	.50	.50	.50	.50	....
Open-Hearth Steel, ton	29.00	29.00	29.00	29.00	29.00	....
Petroleum, bbl., Kansas crude	.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa. crude	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	....
Silk, Raw Italy	....	4.30	....	....	4.30	....
Silk, Raw Japan	....	3.75	....	....	3.75	....
Sulphuric Acid, 60 Beaumé	.90	.90	.90	.90	.90	....
Tin, 100 lbs	48.70	49.25	49.50	49.50	49.63	+.93
Tire Scrap	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	....

Threefold Advantages in Sight by Finishing Motor Vehicle Bodies by Schoop Method Rather Than with Paint and Varnish—New Charging Valve in Two-Cycle Motor—Another Convert to Mixing of Air and Fuel in the Jet—Wheels

SCHOOP'S Metallizing Method For Motor Vehicle Bodies—As automobiles travel farther and faster than ordinary carriages and are bespattered with mud and begrimed with dust in much higher degree, the problem of keeping them looking new and neat is one which presents grave difficulties so long as ordinary coach varnish, or any similar unmechanical substance which is soft and sensitive and can be renewed only in its entirety and by a costly and time-consuming process, is employed for the exterior coating of the vehicle body. In the case of motor trucks and delivery wagons, even ordinary paint is found unsuitable for the purpose, as it becomes shabby very quickly and a good fresh coat of paint cannot be put on over night, nor in patches, and it is expensive and inconvenient to take the vehicle out of commission—so much more expensive, as compared with former conditions, as each motor vehicle takes the place of two, three or four of the vehicles formerly used and also requires repainting three, four or five times as frequently in order to present a similar degree of neatness in appearance.

With these things in view, any new method for finishing the bodies of automobiles and commercial motor vehicles with a smooth and sightly substance, less sensitive to dirt and dust than paint and varnish, seems to command careful investigation of its possibilities, and the Schoop method for metallizing almost any surface by means of a hot metallic blast is prominent in this respect, partly because it has already attracted the widest attention in technical, industrial and financial circles and partly because its further development seems to hold out a promise that it will soon become possible by means of it not only to cover a wooden or metallic surface with a hard, smooth and non-rusting metallic coating, as now can be done with great rapidity, but also to mix coloring matter into such a coating and to obtain any desired color effect without additional labor or skill. Other applications of the method to finishing work and other purposes of interest in the automobile industry will be apparent from the following notes on the subject by Engineer Steinacker in *Elektrochemische Zeitschrift.* He writes in substance:

The idea of producing coatings by a spraying method is not altogether new. Coloring matter and mortar, for plastering, have been sprayed onto a surface by means of suitable apparatus and compressed air for some time past. The air brush device is in this class. The desire to do the same with metals was natural, but its realization met with practical difficulties, and the industrial world had to fall back upon electroplating for this class of work until U. M. Schoop, a well-known electrochemist of Zürich, Switzerland, devised a method which in the main consists in hurling finely comminuted metal against the object to be coated with great force and by means of gases or vapors which are either inert or at least not highly oxidizing. The manner in which the spray of metal is produced is not of importance, so long as it is fine enough and is thrown out with sufficient force. The speed with which the spray leaves the nozzle of his apparatus rises, with a working pressure of 20 atmospheres, to 1,500 meters per second and, as the particles of metal, when they strike the surface to be coated, are not yet fully solidified but remain plastic for a few moments, they are welded into a perfectly homogeneous and adhering film under the high pressure of the stream. It was the casual observation of the fact that a lead bullet when shot against a hard, smooth wall, forms a smooth and adhering film which led Schoop to the working principle of his invention.

Naturally, the easily fusible metals are most readily used with this process, if only because a moderate gas pressure is sufficient in handling them. But the chemical and physical properties of each metal are also to be considered, as well as the thickness of the intended coating and the nature of the surface to be coated. And therefore experiments extending over several years were necessary before the method could be declared industrially ripe.

Many interesting facts were ascertained during these experiments. It was shown that fused metal is cooled to 60 deg. C. or lower when atomized by certain highly compressed gases, and to this fact it is due that even substances which are readily ignitable, such as paper, wood, textiles, celluloid and dynamite can be so metallized. It was also found that the films have the same density as the normal metal and that tin, for example, when sprayed on in this manner, has a hardness of 14.2, by Brinell test, while cast tin has only 9.5. Furthermore, if the surface to be coated is properly prepared, the film adheres so closely that it can be worked as part and parcel of the substance itself.

It follows from these properties that the process is of interest to nearly all branches of industry, affording the means for protecting any finished article against rust, moisture and similar influences or giving it an ornamental coating in one of the art metals and also being particularly adapted for taking impressions for use in the making of matrices and dies. In the electroplating industry it renders it possible to do in a few minutes what has so far taken days.

As it has also recently become possible to produce convenient, simple and portable Schoop apparatus (see THE AUTOMOBILE of Jan. 9, page 163), any industry and any factory is enabled to take up the process.

It is one of its advantages that it renders it possible to apply coatings of aluminum, a metal which so far could not be used in this manner, and it can be used for purposes of soldering or welding, taking the place of autogenous welding in some instances, as in the production of seamless tubing from sheet metal.

The wide scope of the process has been recognized all over the world. The possibility of protecting wood which is to be exposed to the weather or moisture by a single treatment lasting for all time and of saving the paint in the case of bridges and ships has proved very attractive commercially, and large syndicates have been formed, first in France, then in Belgium and very recently in Mexico, which have acquired the inventor's patents for the respective countries and in turn dispose of apparatuses and license to use them within their territories. The license fee is scaled according to the number of apparatuses and their capacity in each instance, so that even concerns which are not vitally interested can make use of the method. Negotiations are already under way in all industrial countries looking to the exploitation of the method on a large scale, and it can therefore not be considered too early for any industry in which the process is needed, or in which it may be applicable in a modified form coming within its possibilities, to investigate these possibilities now.—From *Elektrochemische Zeitschrift*, January.

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Elegance of Lines—Even some of our greatest firms might derive some inspiration from studying the graceful lines which characterize the design of mechanical parts in all Italian cars.—From *Omnia*, (Paris).

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TWO-CYCLE Motors—No design of two-cycle motors has yet been accepted as standard by the industry or by the public, but the mere fact that they belong among valveless motors, in so far as no poppet valves are used in them, has pushed them into the technical limelight in Europe and has drawn attention to the performances in long-distance racing which stand to the credit of two two-cycle motor cars, the Koechlin and the Côte. Their reliability, under racing conditions at least, has been demonstrated, and those who promote sleeve-valve and rotary valve motors point to this among other developments in support of the contention that poppet valves can be dispensed with and that the mechanical resources for simplifying automobile motors have not by any means been exhausted. The great development which has taken place in two-cycle Diesel motors for stationary as well as for marine work has also tended in the same direction. On the other hand, the question of combining the rotary valve or the sleeve valve with the two-cycle mode of operation has come up for consideration and attempts have been made—one of them reported as successful—at applying the two-cycle principle in aviation motors with rotating cylinders. Under these circumstances an improvement recently introduced in the Côte motor and which relates directly to the distribution of the gases and the avoidance of fuel waste, gains timely interest. As drawings showing it incorporated in the motor are not available, this new device is shown separately in Fig. 2, while Fig. 1 shows two sectional views of the Côte motor to which it has now been applied. The operation of the Côte motor is described substantially as follows:

The pistons in this motor are of the two-story variety which has been generally adopted since the practice of first drawing the explosive charge into the crankchamber was abandoned (mainly to avoid leakage at the end-bearings of the shaft and exudation of lubricating oil at the same place), and an annular space between the lower portion of the piston and the wall of the enlarged cylinder serves for storing the gas charge until it can be transferred to the combustion chamber. When the piston descends, it causes a suction from this annular chamber which draws the gas mixture from the carbureter by way of the channel J and through the check valve K and pipe T. At the same time the upper portion of the piston has uncovered the exhaust port O, allowing the burnt gases to escape through pipe Q, and almost at the same moment it has also uncovered the port N which communicates with the reservoir M and the combustion chamber receives from it, while still exhausting through port O, a fresh charge of gas coming from the annular chamber of the other cylinder, in which the piston is just completing its upstroke, so as to drive the contents out of said annular chamber and into said reservoir M. The new charge in the first cylinder is guided toward the top of the combustion chamber by the deflector plate H on top of the piston, and the experience gained in the matter of shaping and dimensioning the deflector and the ports has advanced to such a point that the incoming charge assists in driving the burnt gas out without becoming mixed with it to any great extent at the normal or higher motor speeds. But at much reduced speeds it has never yet been found possible to avoid a loss in efficiency from this cause and a resulting smaller flexibility of the motor under the throttle, as compared with four-cycle motors. In the illustration B is lower portion of the piston surrounded by the annular suction and charging chamber, L and M concentric reservoirs connecting the two co-acting cylinders, R the port of entry for the cooling water, S a breather, *ef* helical gears controlling the magneto F, *d* the spark plug, *h* the return conduit for used lubricating oil.

The improvement by which the economy and flexibility of this motor are to be secured under all conditions of operation takes the form of a shuttle N, Fig. 2, comprising two steel plates *p* and *p'* connected by a rigid tubular bar and adapted to be moved to and fro in the cast cylinder F. This cylinder is closed at its two ends B and B' and is broken by three rows of circular openings O, O' and O'', so spaced apart that only two of them can be between the end-plates of the shuttle at the same time. The diameter of the openings equals the thickness of the plates. The middle row is connected with the carbureter by a circular conduit, while the two others are connected in the same manner with each of the motor pumps (the annular chambers in Fig. 1).

The operation is as follows: Suppose the motor starts from the position shown in Fig. 1, with the shuttle in its middle position and the pump to the right beginning to compress its charge. The shuttle is at once pushed to the left under the pressure of the gas and opens at the same time the channels O and O' so as to connect the pump in the other cylinder, which at that moment works at suction, with the carbureter. It also compresses the gas at M between its front plate and the bottom B of the distributor cylinder, and its motion continues until this compression equals that which drives the shuttle. Now, as soon as the motor piston uncovers the ports in the cylinder walls, the pressure in the corresponding pump falls at once and the air cushion at M expands and drives the shuttle back to its middle position. The work of the pumps is then reversed and the shuttle travels in the opposite direction under the pressure from the pump of the left cylinder.

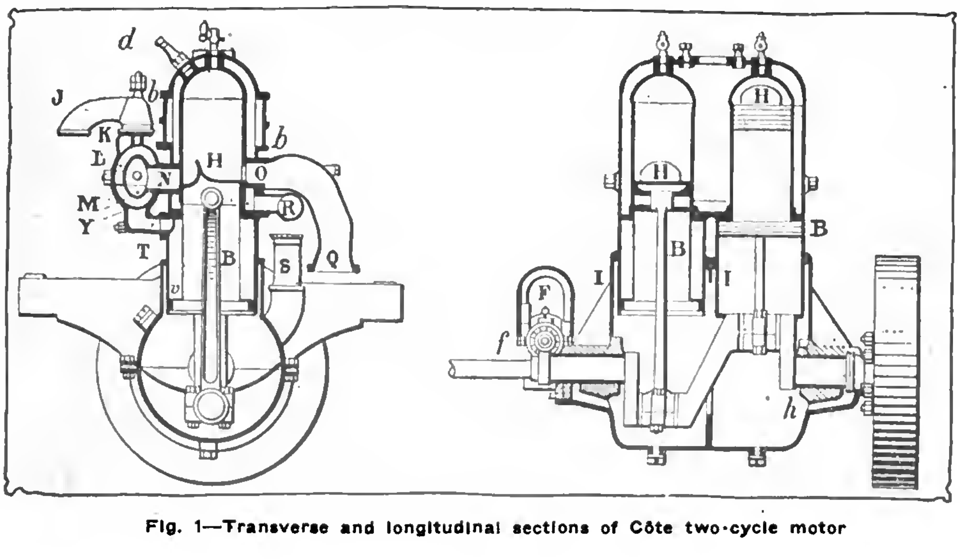


Fig. 1—Transverse and longitudinal sections of Côte two-cycle motor

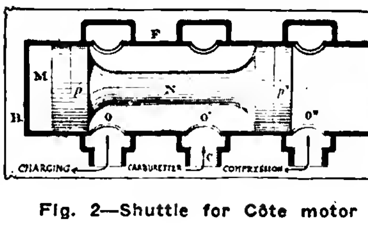


Fig. 2—Shuttle for Côte motor

As the shuttle is always held between two gas cushions there are no shocks or noise. [It is not stated, however, what means are employed for making sure of finding the shuttle in the right position when the motor is to be started.—Ed.]—From *La Vie Automobile*, January 2.

REPRESENTATIVE Carbureters—In a brief review of the progress recorded for the past year in the different construction features of automobiles, there are mentioned several carbureters as exemplifying the trend of progress. Among these the "Jarnac" and the Brewer have been recently described in the columns of The Automobile. One of the Longuemare models and the Langeron are also among them and are illustrated in Figs. 3 and 4. The features of the Longuemare are briefly as follows: The jet is a double concentric one, the outer annular channel G serving for normal motor speeds and

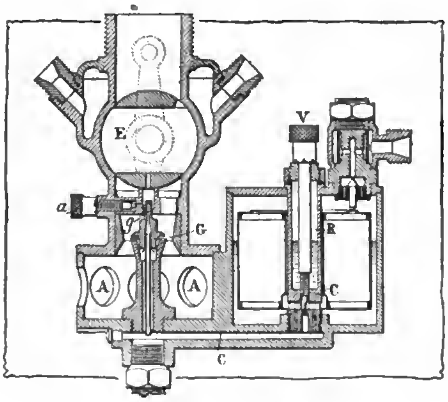


Fig. 3—Longuemare Carbureter

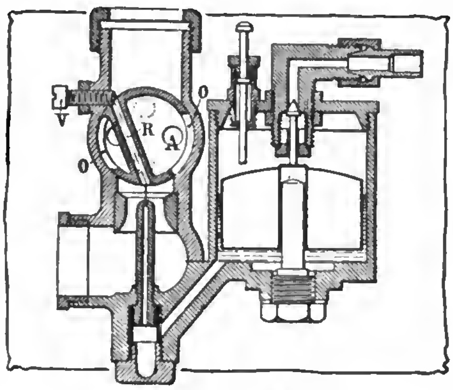


Fig. 4—Langeron Carbureter

the central channel g for keeping the motor running idle at minimum speed when the car is at a standstill. The air feed for the latter is subject to adjustment by the screw *a*. As shown in Fig. 3, it remains in action when the throttle is completely closed. The normal air intakes AA are not varied, but the gasoline feed can be regulated to suit the motor by the screw V. The fuel conduit C is in communication by special small perforations, shown in dotted lines, with a cavity R which is independent of direct regulation by the float action and forms a fuel reserve useful for accelerations and starting. It also has another function. At high motor speeds it is drained by the strong suction without having a chance to fill up from below, and then air is sucked in through the perforations referred to and is mingled with the fuel in the jet G, so as to assist in atomizing it and also holding its proportion to the air down to what it should be. The new Longuemare represents thus another conversion among the old-time makers to the new principle of mixing air with the fuel in the jet. An arrangement for heating the induction pipe from the cooling water or the exhaust gas is noticed above the throttle in the illustration.

The Langeron carbureter, Fig. 4, seems to represent simplicity and economy in design. It has only a single jet, but the throttle drum has a cross-channel R, whose section may be regulated by screw V, and the suction from the cylinders acts through this channel alone when the motor is completely throttled down, the illustration showing the carbureter at this adjustment. When the throttle is opened up and the suction takes effect through openings OO, the apertures AA in the flat side walls of the throttle drum register more and more completely with similar apertures in the carbureter wall.

In the Brewer carbureter, as in the new model Longuemare, the air and gas passages are of constant section and the automatic regulation takes effect on the liquid fuel only.—From *Le Génie Civil*, January 11.

ABOUT Wheels at the Shows.—The metallic wheel dominates but the wood wheel defends itself. The public likes the strength of the former and the form of the latter. This explains the success of the Sankey wheel which combines both features and is seen almost everywhere. The demountable wheels are becoming numerous and are getting better every day. The great specialists in this line, Rudge-Whitworth, Hall, Dunlop, RAF and Riley have accomplished marvels in mechanical construction and their means for locking the wheels in place vie with each other in shrewdness and subtility. On the other hand, certain car builders have equipped their chassis with demountable wheels of their own devising and of enchanting simplicity. In the *Zèbre* car, for example, the wheel is locked simply by means of the hub cap which is screwed upon the end of the axle. To prevent the cap from budging, it is provided with a number of cogs, and the hub is provided with similar cogs but one more of them. If there are five cogs on the cap and six on the hub, for example, a one-thirtieth part of a turn will bring two cogs in line, and the hub carries an elastic split-collar with a pin, and when two cogs are in line this pin is passed through them. It is held by the elasticity of the collar.

The demountable rim battles constantly against the demountable wheel, having in its favor lightness and cheapness. But it is sometimes difficult to operate.

An interesting wheel is shown by Riley, in which wire spokes are inclosed in rigid tubular steel spokes, as shown to the left in Fig. 5. The wires work under tension and the tubes under compression. The rigidity of the wheel as a whole is absolute and its lightness is remarkable. Perhaps it is the wheel of the future. In another Riley wheel a wire spoke is passed through a central bore in each wood spoke, as shown to the right in Fig. 5 and the appearance is that of an ordinary artillery wheel, excepting that the rim is metallic and light.—From *Omnia*, January 4.

Traps in Steel Testing—Careful experiments have shown that the customary tensile tests of steel specimens in themselves affect the steel which is being tested and that the Brinell test does the same. Even tests by scleroscope cannot properly be repeated in the same spot without showing a greater hardness than the untested steel possesses. The error seems to average larger for the elastic limit than for the ultimate strength.

Austria has now imitated Germany in imposing a tax on motor tourists. For an automobile or a motorcycle the owner is to pay 40 cents per day. The automobile can stay for three months before it becomes subject to the ordinary annual taxation but the motorcycle only one month.

Motor Hearses Now Silent—Success in the mechanical campaign for silent automobiles has resulted, among other things, in a boom for the motor hearse in European countries.

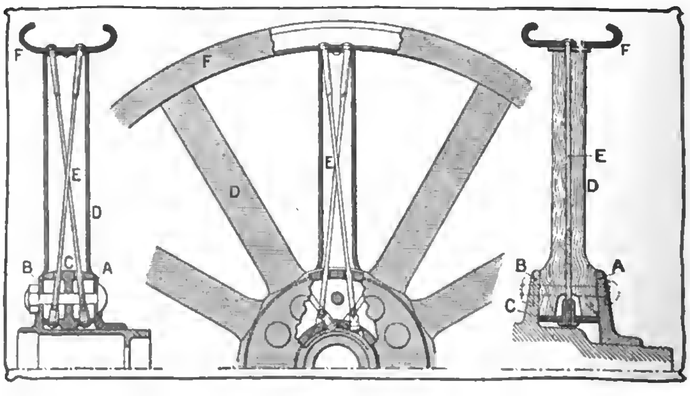


Fig. 5—Riley combined wire and tubular or wood wheel

Communications from The Manufacturer

Metallurgy of Shafts and Rods and Comparative Analyses—Cost of Running an Electric

SPRINGFIELD, O.—Service tests of chrome-vanadium and nickel steel shafts of identical design, and on the same car, conducted by the Kelly-Springfield Motor Truck Company, demonstrated conclusively the greater strength of the chrome-vanadium steel.

As a result of the tests, chrome-vanadium steel was adopted for jackshafts for their different truck chassis, from their 1-ton truck up to the heaviest model.

In making these tests, they equipped a 1-ton truck with a chrome-vanadium steel jackshaft on one side and a nickel steel jackshaft on the other.

The two shafts were identical in design. They were 1.37 inches in diameter and 24, 25, 32 inches long. The chrome-vanadium shaft was manufactured by the Carnegie Steel Company, and was of the steel company's "A Regular" type and heat-treated in accordance with their standard practice.

The method of conducting the tests for the details and results of which we are indebted to the Kelly-Springfield Motor Truck Company was as follows:

A 1-ton truck was rigged up with a 2-ton load, as shown in the accompanying photograph. It was then run continuously night and day for a period of three weeks, during which it was subjected to all possible strains. From the illustration which shows the truck after the completion of the test, it is evident that some "hard going" was experienced.

At the end of the three weeks constant driving, the nickel steel shaft showed a very perceptible twist, while the chrome-vanadium shaft showed no effect whatever from the strains.

All conditions being absolutely identical, the results were directly comparable and furnish indisputable proof of the greater strength of the chrome-vanadium steel.

This shaft was made to the following specifications for chemical composition and physical properties:

CHEMICAL ANALYSIS

Carbon	0.24 to 0.30 per cent.
Manganese	0.35 to 0.65 per cent.
Phosphorus	under 0.04 per eent.
Sulphur	under 0.04 per eent.
Silicon	under 0.20 per eent.
Chromium	0.75 to 1.25 per eent.
Vanadium	0.16 to 0.20 per cent.

PHYSICAL PROPERTIES

Elastic limit, lbs. per sq. in.	120,000
Tensile strength, lbs. per sq. in.	130,000
Elongation in 2 in., per cent	23.8
Reduction of area, per cent	49.4

Because of the superior merits of vanadium steel as shown by these tests, this type of alloy steel has been adopted for a number of the other parts of the truck, which are subjected to the greatest strains. Among these are the propeller shafts and the connecting rods.

In the latter case, vanadium steel was used in order to keep the weight of the reciprocating parts down to a minimum.

By the use of vanadium steel, a rod of lighter section is safely employed than would be deemed advisable if made of carbon steel.

For their 40-horsepower motors, a tapered channeled rod, 14 inches center to center is used. The flanges are .156 inches thick and the web .187 inches thick. At the crank pin end, the section is 1.625 inches deep with 1.125 inches width of flange. From this, it tapers to 1.125 inches depth and .875 inches width of flange at the other end.

In their 30-horsepower motors, the rod is similar in design, but of lighter section and 11 inches long. In this rod the flanges are .635 inch wide and .125 inch thick and the web .187 inch thick. At the crank pin end, the section is 1 13-32 inches deep, tapering to 1 1-32 inch at the opposite end.

The connecting rods are made to the following specifications for physical properties:

Elastic limit, pounds per square inch	100,000 to 110,000
Tensile strength, pounds per square inch	120,000 to 130,000
Elongation in 2 inches, per eent	20 to 22
Reduction of area, per cent	50 to 55

—KELLY-SPRINGFIELD MOTOR TRUCK COMPANY.

Running Expense of Electrics

The Woods Company have seldom published figures covering maintenance cost because none can be given which would be any criterion for the intending purchaser. Many people who use their electric machines a great deal find it costs them less than some of their friends who use their machines very much less. Some owners charge their batteries too often. By this I mean they put their cars on charge when there is sufficient current still in the batteries to give ample mileage for another day's use. This too frequent charging not only adds unnecessarily to the expense of operating, but also shortens the life of the battery needlessly. For these reasons the table of actual expenses which I am giving, while it is fairly typical, is not in any respect a standard upon which to base an estimate of probable cost in any other case. Some owners could show figures very much lower than these, while others, through lack of attention to the simple details of proper charging, etc., have made their expenses much higher than there is any need of.

The following statement sent in by Mr. More, of Sioux City, Iowa, represents the total expense for electric current during the past 2 years:

TWO YEARS' RUNNING EXPENSE

1911		1912	
January	$5.48	January	$2.51
February	1.00	February	3.45
March	1.48	March	2.00
April	3.76	April	3.00
May	7.85	May	2.00
June	8.78	June	3.30
July	7.75	July	4.85
August	6.50	August	3.40
September	3.19	September	3.20
October	8.66	October	4.85
November	4.34	November	2.00
December	3.55	Total for 2 years	96.90

In submitting this statement Mr. More states, in a letter dated December 3, 1912, that Mrs. More uses her Woods Electric on every possible occasion it seems to him, and says further that there was no other expenses for operating the car other than included in the above table.—LOUIS E. BURR, Woods Electric Company.

Care of Spark Plugs

NEW YORK CITY—The following hints and spark-plug don'ts are given to autoists:

Don't fail to wash the plugs with gasoline, using a stiff brush and scour the electrodes lightly with fine emery cloth.

Don't forget to remove all particles of emery before replacing plugs.

Don't forget to carry extra plugs and whenever one is used be sure and replace those used.

Don't throw your old plugs or your extra ones, in the tool box or locker with a lot of old junk, keep them in a wooden box first having greased the threads to prevent rust and then securely wrap each one in cloth. Porcelains are easily cracked and electrodes easily bent by rough handling.

Don't let a bunch of loose heavy wires drag and pull on your plugs, support them or encase in fiber tubing.

Don't treat them like a nut, treat them like a watch.

Don't fail to examine daily for dirt and breaks.

Don't forget to use kerosene on the threads if the plug sticks.

Don't buy cheap unreliable plugs.—EMIL GROSSMAN.

The Engineers' Forum

Exhaust Gas Analysis

Engineers Discuss Value of Analyzing Exhaust Gases To Determine Engine and Carbureter Efficiency

Opinions of Breitenbach, Marshall and Chase—All Experts in This Work

Part II

NOTE—These discussions by leading engineers are from stenographic notes taken during the recent session of the Society of Automobile Engineers in New York City, when this pertinent subject proved one of the most interesting of the meeting.

NEW YORK CITY—I agree with Mr. Hewitt that power loss is due to the globules forming and due to condensation in the manifold. Another reason for power loss is the explosion chambers of our engines are too large. In order to get a proper explosion heat it has to be highly compressed. Now to compress it it requires a smaller chamber. I am sure if you would try the smaller chambers you would see you would have a better gas.

Another cause for poor combustion is due to the valves. Often a valve will not close early enough; and supposing the gas has just exploded in cylinder No. 1, this exploded gas comes out through an inlet manifold and mixes with the gas which is to explode in cylinder No. 3. Now cylinder No. 3 is not getting the same explosive medium as cylinder No. 1, due to having this partly exploded gas mixed in with the unexploded gas. I think that better results could be gotten if the explosive chambers were smaller and we have large exhaust valves.—J. M. Breitenbach.

Best Results Contained No Oxygen

New Haven, Conn.—I have made a good many tests on the exhaust gas analysis, and on different motors of different kinds, running under different road conditions and at different speeds and different speeds of transmission and different speeds on the road, running at different times, and my analyses have followed very closely those of Mr. Hewitt. The best results I got from any car were about 13½ per cent. of CO_2. and practically no oxygen and no CO.

In connection with my experiments I measured the gasoline at the same time to see whether this car was using gasoline in proportion to the amout of CO that appeared in the exhaust. And the worst offender in this case backed up my conclusion that you can make an exhaust gas analysis and find that you have got about 5 or 6 per cent. of exhaust, and you have got a car that is running about 4 or 5 miles to the gallon. If you get an exhaust gas analysis that is in the neighborhood of 12 to 13 per cent. CO_2 and varying amounts of CO, O, that is, all small, and little free oxygen, you have got a car that is running 3 or 4 times as much. That is, the distance it will cover per gallon. I won't say it is in direct proportion, because that is not so, but it bears a close relation to the amount of CO in the exhaust.

The method of making exhaust gas analyses is not so complicated that any one need feel any apprehension about undertaking a gas exhaust analysis. He has got to be able to read the Dorsat and he has got to be able to get his gas into his apparatus without getting any air mixed with it, as I have found that out to my sorrow in one or two cases; and he has got to be sure that his apparatus is in good condition and his cylinders are in good condition.

The method of making exhaust analysis for the purpose of determining whether your mixture is right or not seems to me to be the only way of finding out whether you have a carbureter which gives you good mixture or not. The car that used the most gasoline had the worst percentage of CO, and a very large percentage.

Another point is to take an exhaust gas analysis when the car is standing idle. You will find cars running at garages and chauffeurs will tell you that it does not use any gasoline. You take an analysis of that exhaust and you will find anywhere from 5 to 6 or 7 per cent. of CO. If that is the case that car is probably using just as much gasoline when it is running idle as it would use in the same length of time when it is running on the road. If that is the case the gasoline consumption of that car when it is standing idle will be very much, and due to the fact that it is running without any load on the motor.—Prof. W. C. Marshall, Yale University.

Many Samples Improperly Taken

New York City—I think a great many of the difficulties which have arisen by people using the gas analysis to determine the efficiency of the motor was that the sample was improperly collected. I made a good many mistakes myself that way when I started, and I have been able to overcome that largely by properly collecting the sample. If, as I say, you collect the sample by simply allowing the gas to blow through it you are not at all sure of getting a fair average sample. Dr. Lloyd told me in a talk the other day that he had similar experiences himself when he started to take samples of exhaust gas from the motor. This is very important that you collect the samples properly, in such manner as not to get oxygen from the outside and also so as to get a good, fair average sample. Your results will surely be very confusing if you do not attend to that point.

Another difficulty is that if you attempt to take a sample by letting it flow quickly through the collection tube you are likely to get a sample which is not a regular sample of the whole run. There may be an instance in which the combustion in one cylinder has not been complete, does not show up by missing; there is no evidence of it, and yet probably there has been a little different combustion than you get as a rule with four, and hence as a result you might get less gas in that cylinder here and get a sample which would not be true for a sample. I have adopted the practice of displacing this water in this collection tube, taking enough time to be sure to get an average sample. Of course you can do that as slowly or as rapidly as you wish, according to the length of run.

I make it the practice to take the sample at the top of the exhaust pipe, as close to the motor as possible, in order that there may not be any after-burning in the exhaust pipe. Of course the only effect of combustion is what takes place in the cylinder, and that is what we want to learn something about. I use a waterjacket around this pipe simply for convenience, to keep those connections from getting so hot that it would burn the ordinary rubber hose connection here.

I found very little, practically no hydrogen in any of the samples which I have analyzed from four-cycle motors. In two-cycle motors, where part of the charge flows by without ever being ignited, you of course will get hydrogen, and in that case you should make a test for hydrogen. I have used both Dr. Elliott's apparatus, which is very good, and the Orsat apparatus, which is not so accurate, but which is rather faster to use, and for that reason it serves my purpose better when I am not looking for accuracy greater than 0.1 per cent.

I have found this method of procedure, that is, measuring the air and the gasoline, and then taking the samples of the exhaust gases, a good way of comparing mixing devices, of which there are a good many on the market. If, as is claimed, you really get more power with one of those mixing devices, it should show up in giving you more complete combustion. It is therefore of considerable use in that connection.—Herbert Chase, A. C. A. Laboratory.

New French Power Rating

New York City—Editor The Automobile:—I notice that the horsepower formula which it is proposed to adopt in France for taxation purposes rates a four-cylinder motor 25 per cent. lower than a single-cylinder motor; that is, when the bore, stroke and most efficient motor speed should give the same power for the four-cylinder as for the single-cylinder motor, the rating is changed by varying a numerical coefficient 25 per cent.

In a six-cylinder motor the deduction would on the same principle be about 33 per cent.

I believe this manner of rating corresponds with the variation in fuel efficiency ascribed to motors, according to their number of cylinders.

Now, assuming this to be correct, I would like to have you tell me what share in this loss of efficiency, due to an increased number of cylinders, comes under the head of greater thermic losses—due mostly perhaps to the smaller sizes of the cylinders—and what other share must be ascribed to proportionately greater mechanical friction?

At this juncture, when the question of fuel economy is so prominently before the public, it would seem to be interesting to know through what necessity it is that we so freely consent to waste fuel at the bunghole—the multicylinder construction—while striving assiduously to save it at the spigot—the carbureter.

For example, is it just to avoid the heavy flywheel and the old familiar chug-chug that we put four-cylinder motors in our heavy trucks, or is it possible to demonstrate a reduction of the wear and tear through the use of the four-cylinder type: a reduction compensating for greater first and maintenance cost?—Maurice C. Crosby.

Temperature Excites Unusual Interest

Worcester, Mass.—Editor The Automobile:—Professor Jones in your issue of December 26, 1912, asked "What the temperature of a cylinder is" and for his benefit I will state the following: The temperature of an automobile engine cylinder is a variable quantity, depending upon the particular point in question and the condition of operation. No definite value can be given. It may be illustrated, however, by the accompanying sketch, Fig. 1—D. L. Gallup.

Flame Propagation Considered

New York City—Editor The Automobile:—In The Automobile for December 26, Professor Jones seems to think that it is possible to determine the temperature of the gases in the cylinder at any particular time or period of the stroke. If the specific heat of a gas did not vary when its temperature was raised to the extent as is the case in exploding, it would be of course a simple matter to determine that temperature. Again if the temperature were maintained for any length of time, it would be possible to determine it by simple calorific measurement. As it is such a thing is impossible. Besides the difficulties thrown in the way by the impossibility of determining the specific heat the ever changing wall temperature and the stratification that might possibly exist within the cylinder are also impediments. From our knowledge of flame propogation it must be that different temperatures exist in different parts of the combustion space at the same time. When the charge is first ignited at the spark plug, one particle of gas is fired. This particle ignites its neighbors and we can readily imagine the flame spreading away in the shape of a hollow sphere except where bound by the cylinder walls. The progression of the flame must necessarily mean that as each particle is met it is raised to the igniting temperature and therefore it is impossible to state that any one given temperature exists in the cylinder at any given time. Countless experiments have been made to determine the temperature within the cylinder at different points and the results of these experiments have been anything but uniform. The artificial circumstance of cooling water circulating about the walls and of this water being of different temperature at different points alone would throw out any results that were obtained from a purely theoretical calculation. How much the charge is preheated on entering the cylinder by coming in contact with the heated walls also interferes with the chances of making a successful determination of the temperature value.

All that we can approach with any hope of success is an average value of explosion temperatures for even the mixture varies with every stroke.

I would like to see the views of others in The Automobile as I believe this is a subject of interest to all designers.

Oakland, Cal. J. E. Shepard.

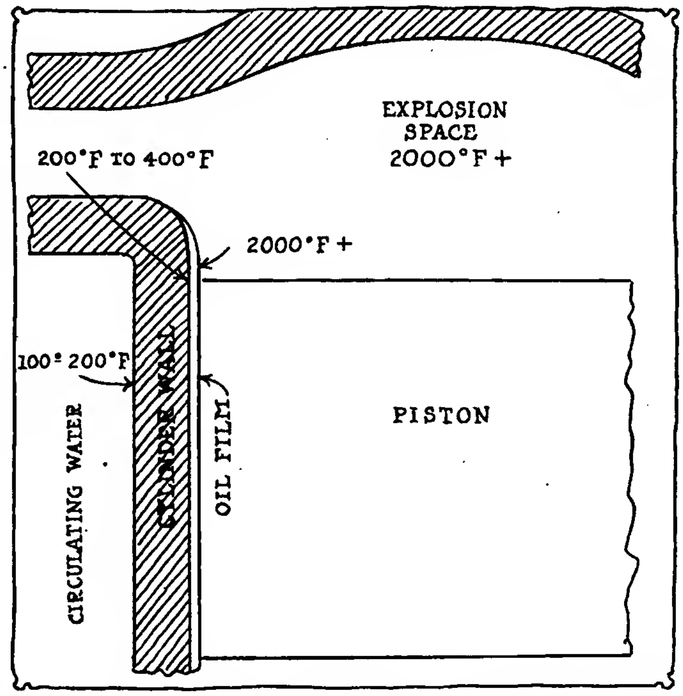
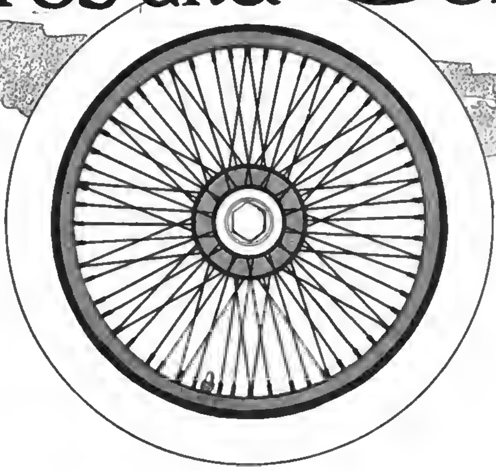


Fig. 1—Diagrammatic illustration of cylinder temperature

Pros and Cons of Wire Wheels



Engineer Outlines History of Wheel Development—Compares Wood and Wire Constructions

Cites Arguments Why Wire Wheels Ought to Be Introduced

PHILADELPHIA, PA.—Editor THE AUTOMOBILE—The idea seems to exist in the minds of the public and some engineers, too, that the wire wheel of 1913 is just the same, so far as use on automobiles is concerned, as the wire wheel of 1901.

As regards tire-saving qualities and resilience, this is so. That is, in principle, the wheels are the same in the fact that the axle is supported by wires from the top half of the wheel instead of being supported on wooden struts in the lower half of the wheel.

Here the likeness ceases. The wire wheel of today has been evolved by the Rudge-Whitworth company and their licensees in Europe until it is capable of carrying the load imposed by modern automobiles at any speed. The load and speed factors of today are very different from those of 12 years ago.

This firm has been for many years bicycle manufacturers, and now also makes motor cycles and wire wheels. With all its wire wheel experience in connection with bicycles, it did not succeed the first time it tried in making a perfect automobile wire wheel. The troubles were soon cured because of experience, however, and after 6 years' use in Europe the wheel is looked upon as being without a peer.

There are two elements in the modern wheel; one the structural wheel form, that is the rim, spokes and outer hub; the other the means or device to permit demountability and secure locking onto the hub. Both have been through a series of evolutionary steps, and always toward simplicity. The modern wheel is decidedly more simple than any of its predecessors.

As to the spoke construction, two forms are available. What is known as a double-spoke, Fig. 1, and triple-spoke, Fig. 2. With the double form of spoking it is not possible to put the plane of the tread of the wheel as near the center line of the car as with the triple system of spokes. The double-spoke wheel is still in use on such cars as have so modified their design as to permit the tread of the wheel to come where it should. The triple-spoke form permits the plane of the tread to be carried toward the center line of the car almost at will. Incidentally, the triple-spoke wheel is a stronger construction, weight for weight, and is the acknowledged superior.

The means of demountability has caused the greater amount of trouble in the development of the wheel. To arrive at certainty and simplicity did not prove to be easy, although the problem looked simple at the outset. The weight was carried, in the beginning, on the cylindrical member that did the driving. Wear followed, regardless of the character of the driving engagement. The old principle of differential creep was the difficulty. The driving and the load-carrying surfaces were then divorced and in the modern Rudge-Whitworth wheel the load is carried on conical surfaces at the two ends of the hub. These surfaces are at an angle which permits tightness without any tendency to seize.

Many different forms of locking devices are used in Europe where the wire wheel is so much in use. Most of them consist of some form of ratchet and pawl, or series of holes and spring-operated pin, or serrated teeth on a spring-operated nut. They operate well enough but are sometimes injured by slight accidents and give more or less trouble from clogging with dirt.

Discussion has arisen as to why a wire wheel is easier on tires than a wooden wheel. This feature was not anticipated to any such extent as has proven to be a fact in experience. Companies renting cars in England have actually found out that the tire mileage on cars equipped with wire wheels is greater by 50 per cent. or more than similar cars equipped with wooden wheels. These renting companies have looked into this matter carefully because of the saving in car upkeep. Every dollar saved in connection with a car rented is a dollar earned. Racing men have found out by experience that their tires stand up better at high speeds on wire wheels than on wooden wheels, and they have also learned, incidentally, that the tire change is made much quicker by demounting a wheel than by demounting a rim.

It seems to be a well-acknowledged fact in Europe that the wire wheel is more resilient and a tire saver. This being accepted as a fact it becomes interesting to study the causes. They are several: First, weight; second, elasticity; third. heat radiating properties.

On the subject of lightness, it is certain that a car equipped with six wire wheels, two being spare wheels, is 100 pounds or so lighter than a car equipped with six wooden wheels with demountable rims.

More important than this, probably, is the fact that the weight in the wire wheels, immediately in contact with the tire, where it can do most harm, is very much lighter than the weight immediately in contact with a tire mounted upon a demountable rim. It is an acknowledged fact that the demountable rim punishes tires because of the unusual weight continually pounding directly on the tire. It is for this reason that the demountable rim on a wire wheel is seldom seen in Europe.

The demountable rim would subtract from the benefits to be derived from it in several ways: By increasing the weight immediately in contact with the tire, by decreasing the elasticity of the rim, and by decreasing the flow of heat from the tire and also by increasing complication of changing tires.

The light weight at the rim in a wire wheel facilitates starting and stopping, because the flywheel effect is minimized. This the racing man appreciates and some users of wire-wheel equipped automobiles believe that they can tell the difference in the way cars "get away."

The second point is that of elasticity. **In the wire wheel the weight of the car is supported by the spokes in the upper half of the wheel. The axle is suspended in the wheel. When heavily loaded, therefore, the spokes in the lower half of the wheel are relaxed. The result is freedom from stone bruises or bruising injury of any kind in connection with the tires.** The explanation must be that a wire wheel coming in contact with a sharp stone, brick or edge of a pit hole in the road the rim and lower spokes yield more or less and cushion the blow. It is not probable that the lower spokes actually buckle or bend because that would loosen the spokes and crack the enamel. This does not happen in properly constructed wheels; yet there must be sufficient yield in rim and spokes to ease materially the bruising action of the wheel. This point is brought out in Fig. 4, in which the solid lines show the spokes that are in tension, supporting the car load, while the dotted lines represent the spokes that are comparatively relaxed.

Take the wood wheel in contrast, Fig. 3, which may help to make the matter clear. Therein the load is supported upon the spokes in the lower half of the wheel; the upper spokes are idle. And as a wooden post makes an ideal strut to support a load, it follows that the wooden spokes in the lower half of the wheel transmit the blow from the road surface to the hub of the wheel and to the springs and body much more readily and severely than the wire spokes which are manifestly very bad struts and incapable of sustaining compression loads. Inasmuch as the wire wheel is easy on the tire, it is similarly easy on the whole car.

Following this thought, it is common knowledge that solid rubber tires are much harder upon a car than pneumatic tires. The solid tire and its rim will not absorb the road shock at the place where most good is done, that is to say, at the road surface before the shock reaches springs or any other portion of the car. Similarly, the wire wheel is more resilient and elastic than the wood wheel, and consequently the wire wheel is actually easier on the automobile. This superior resilience, therefore, saves tires, the automobile structure and the passengers.

As to strength, the wheel is not only more resilient than wood but it is capable of carrying heavier loads and of resisting side-thrust, as in a skid, to a much greater extent than a wooden wheel. This is true in well-proportioned wheels only. A wood wheel resists only a very slight blow, comparatively, in the direction of the axis of the wheel. This applies particularly to wooden wheels of large diameter.

The third element is that of heat. The relative importance of this element is hard to prove. That it amounts to something is pretty well acknowledged by those who have used the wheels for the last 5 or 6 years. Racing men are particularly certain on this point, and it would seem that they ought to know inasmuch as the heat element in the endurance of their tires is an important consideration. The explanation is not so easy except that it is well known that wood is a bad conductor of heat. **The metal rim of a wooden wheel is largely covered by the wooden felloe and, therefore, pretty well insulated against radiation. The wooden parts do not carry away any of the heat. On the other hand, the whole of a wire wheel is metal and takes away the heat from the rim which is immediately in contact with the tire.**

There is a certain prejudice against carrying spare wheels as compared with carrying demountable rims, but experience in Europe indicates that it is a prejudice without foundation and that it is quite as easy and convenient to carry one or two spare wheels as demountable rims. Suitable devices have been evolved so that there is no complaint at all on that subject among those who have used the wire wheel. As to convenience of demountability in case of tire trouble, there is no question whatever. The one simple nut of the Rudge-Whitworth wheel, for instance, may be removed much easier than any one of the six or eight nuts involved in the popular demountable rim. Moreover, there are no small treads to strip or become crossed or worn out. Many who have tried both methods are greatly in favor of the demountable wheel as compared with demountable rim.

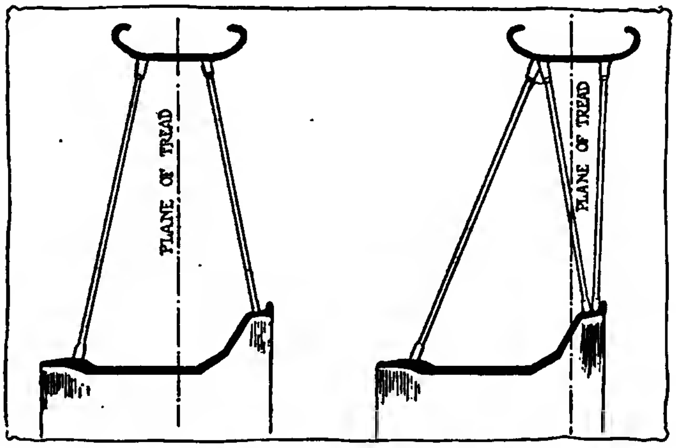
One device which is popular for carrying the spare wheels is an aluminum dummy hub bolted onto the car. Such hubs are made to carry either one or two wheels. The spare wheel is slipped onto the dummy hub and the locknut put into position. This holds it securely, keeps it clean and always ready for service.

In Europe, where the clincher tire with its security bolts (lugs) is still popular, the favored equipment for wire wheels is the soft-beaded clincher tire. In the United States it would seem logical that the popular equipment would be any form of inextensible bead Q-D tire, which means a Q-D rim on the wire wheel. The lightest possible Q-D rim must be used in order to get full advantage in tire saving.

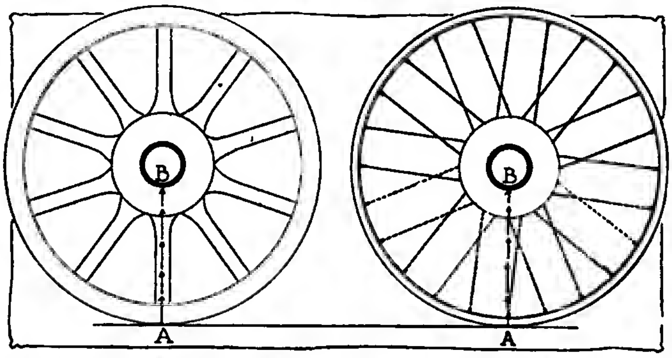
The speed qualities of wire wheels are well brought out in the records made on the racing track at Brooklands, England, up to the end of 1912. All the records between 85 and 98 miles per hour were run on Rudge-Whitworth wheels. The long duration records from 12 to 24 hours were also made on the same type of wheel at sustained speeds in the neighborhood of 66 miles per hour. These performances were shown graphically in the form of a chart published in the January 23 number of THE AUTOMOBILE.

HENRY SOUTHER.

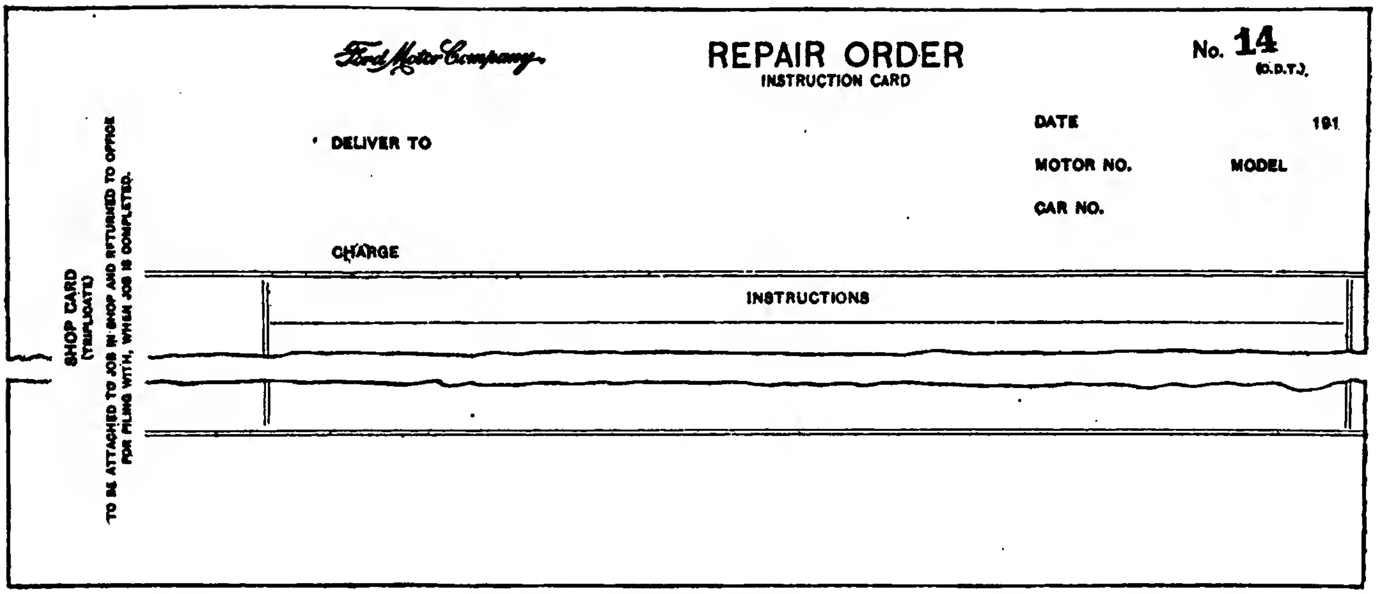
The Automobile invites comment on pertinent wire wheel topics.



Figs. 1 and 2—Double and triple-spoke wire wheels, showing position of tread in each case



Figs. 3 and 4—Showing effect of blow delivered at rim of wood and wire wheels



Ford Motor Company

REPAIR ORDER
INSTRUCTION CARD

No. 14
(O.D.T.)

DELIVER TO

DATE 191

MOTOR NO. MODEL

CAR NO.

CHARGE

SHOP CARD
(TRIPLICATE)

TO BE ATTACHED TO JOB IN SHOP AND RETURNED TO OFFICE
FOR FILING WITH, WHEN JOB IS COMPLETED.

INSTRUCTIONS

Fig. 1—Copy of repair order blank on cardboard, used by Long Island branch of the Ford Motor Company and kept on file in the office of the plant manager

Ford Service System

Building and Service Scheme Used for Supplying Metropolitan District with Cars and Repairs

Eight Principal Blanks Used — Factory Is Always Kept Posted on Branch's Business—Details of Stock Room

THE service which the Ford Motor Company, Detroit, Mich., gives to the users of its products in the Metropolitan territory stands upon a relatively simple but effective system, designed to be carried out in the 84,000 square feet service building at Long Island City, N. Y. This building consists today of a basement, ground floor and two stories, each with a floor space of 21,000 square feet. The service building is not only a repair and storehouse for Ford cars, but also contains the offices of the New York branch, there being on Manhattan Island only the showrooms of the company. The Astoria building is divided as follows:

In the basement, chassis frames, motors and dashboards, etc., are kept, all the cars which are sold in the district around New York—between Philadelphia and Cambridge, where the nearest service stations are located—being built here, from parts shipped by the Detroit factory. The basement also holds wheels, rims and tires; furthermore, small parts, bolts, nuts, screws, etc., which are required in the work of assembling.

The ground floor contains the large showroom, the sales offices and a large space serving as a garage for the cars employed by the company and the automobiles brought in to be repaired or ready to go out. Furthermore, the checker's office recording every car which leaves the building, with the time of leaving, is on this floor.

On the second floor, stockroom and main office are located. The stockroom contains and delivers all material needed for repair work or replacement of parts. The stockroom also serves as the order department for outgoing repair parts.

Cars ready for shipment are arranged on the top floor, side by side, with 1 inch clearance between the mudguards. From the elevator on—which is stationed at one end of the building—the floor is divided lengthwise in two parts. On one side of the floor is the repair shop and on the other the complete care are held until freight cars may be procured to send them to the dealers. Close to the end of the line of cars a small space for testing motors is reserved. The end of the floor is taken up by the body storage room at present.

Furthermore, the Ford company occupies a floor in the Galvin building, Long Island City, for finishing chassis equipped with motors, touching up scratched paint on bodies, and mounting the latter on the chassis, etc., until the car is ready to be returned to the main building, whence it is shipped to the dealers.

After describing the locality in short, the system used by the Ford company in its repair and stock departments will now be described. Besides the selling department, these two portions of the branch constitute the principal parts of the establishment.

The main stockroom, the basement stock for assembling work and the car and body stock on the top floor are under the supervision of foremen, and no part or car is permitted to leave its department except on an order signed by the foreman or his representative. Likewise, whatever work is done, is carried out in response to an order made out and sent to the specific department by the office on the ground floor. Only in this way is it possible to account for every minute of every workman's time and for every part which enters the building.

Accounting systems which cover work and material records are best described, in the case of automobile service establishments, by illustrating the way in which repairs are handled; as in this case, both material and labor expenditures and the forms for recording them, are involved. The forms used by the Ford plant include eight principal blanks, namely:

1—The repair order which is made out in triplicate;
2—Shop employee's daily time ticket;
3—Universal stockroom requisition;
4 and 5—Labor-and-material record form on the repair order;
6—Stock cards for parts, bins and stockroom file;
7—Quarterly inventory blank.
8—Unfinished repair work form.

In addition to these forms, which are described and illustrated below, the Ford service plant also uses purchase and credit orders, which, however, are very much like the repair order in design. The same applies to the parts-sale order form.

1—Triplicate Repair Work Order—This form is a blank, 9.63 by 8.13 inches and comes in form of a pad of consecutively numbered leaves. Two copies, orange and green, respectively, are printed on thin paper and the third copy is on light cardboard, Fig. 1, being printed on both sides. The light paper copies are printed on both sides, Figs. 4 and 5; the front, Fig. 4, differs from Fig. 1 but by the printing below the double line, provided to facilitate bookkeeping, while the reverse side, Fig. 5, forms the blank mentioned above under (4 and 5). The cardboard copy, Fig. 1, after the blank has been filled out downstairs, remains in that office for future reference. The orange-colored duplicate, filled out by a carbon with the name of the car owner, the number of the motor and that of the car and repair work instructions—along with the signature of the owner authorizing the repairs—is sent to the office upstairs and held for the bookkeeper until all the work is finished. The green triplicate, filled out, also by a carbon, like the other two copies, goes to the shop, where it is given to the foreman at the same time with the car to be repaired.

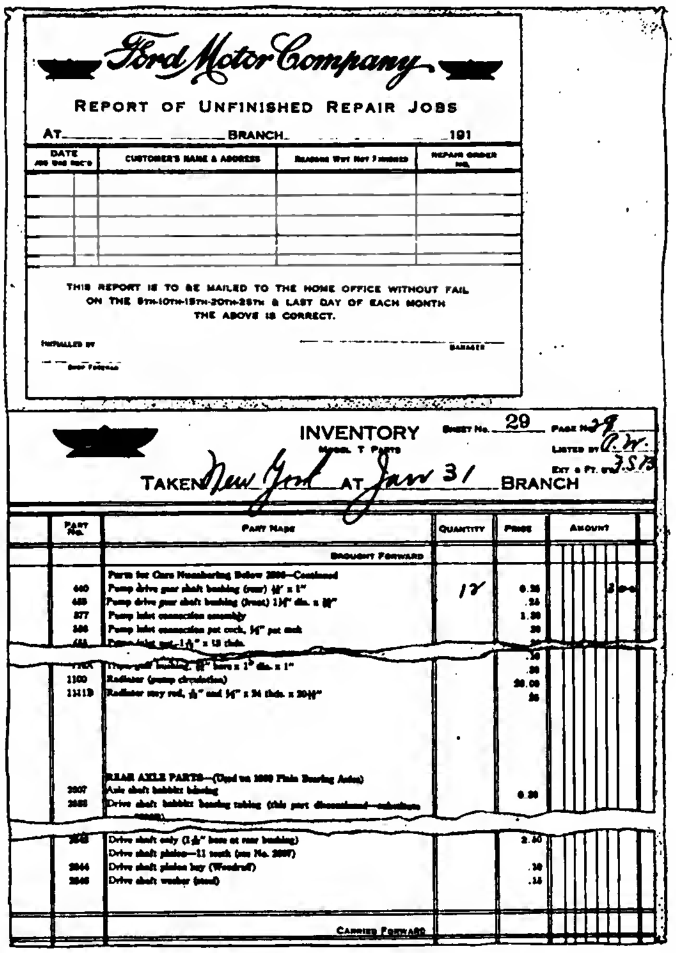
2—Shop Employee's Daily Time Slip—A duplicate blank, printed on thin paper, comprises the working time ticket used by all shop men. Besides this, every employee of the company rings in and out, on a time clock, to record the time spent in the building. The shop time ticket, Fig. 6, is 7.75 by 5 inches, both copies being printed on yellow paper. Every shop employee uses one ticket per day, marking on it his name and number, as well as the date of the day. Under job number the number appearing on the repair order is entered, while in the next columns is described the repair operation done by the man who fills out the ticket. This description indicates whether the whole operation outlined on the order has been done by him, or only part of it, without recording any more details than are necessary. The time used on the job is also recorded, together with the man's rate of payment. Copies of this form are O.K.'d by the foreman who keeps one and sends the other to the office.

3—Requisition for Getting Materials—Whenever a shop worker requires any sort and quantity of materials to do his work, he fills out the requisition, Fig. 7, which is the same size as Fig. 6 and comes in duplicate, both copies being blue paper. Under No. the number of the shop worker requiring the material is filled in, followed by: Please deliver to, where his name is filled in. In the following line, the repair job number and the name of the car owner, on whose machine the material is to be used, are entered. The part number and the quantity needed, as well as the name of the material are now filled in, the model for which they are required being mentioned also. When this requisition is brought to the stockroom, after the shop foreman has signed it, the material is taken from stock by one clerk who adjusts the record on the bin card; another rectifies the file record and signs under Entered stock cards; one of the stockroom clerks O.K.'s the delivery of the parts and signs under Entered repair order; while, finally, the shop man after receiving the material, signs under Received.

4 and 5—Labor-and-Material Record on Repair Order—By the use of Forms, Fig. 6 and 7, records are obtained of the labor and material used on every repair job. The foreman of the shop, after the job has been finished, takes all the records referring to it and appearing on the time tickets and requisitions and transfers the information contained in them to the reverse of his copy of the repair order, Fig. 5, which is then sent to the office, up stairs. The requisitions and time tickets are also sent into this office every evening, and a girl goes over these records and arranges them numerically, by the numbers of repair jobs and employees respectively. When the complete repair order is sent in by the foreman, the girl checks the time and material records against the back of the repair order, after which the bill is made out to the cusotmer. Of course, the work done under the guarantee is taken into consideration when charging for work.

6—Stockroom Bin and File Cards—The stockroom of Ford service plant is especially worthy of comment. It contains a complete stock of all parts of all Ford models ever built, worth at present about $225,000; about $50,000 worth of stock is disposed of through the stockroom in 1 month. The system of handling these large quantities of material is unusually simple, but designed to work with an efficiency of 100 per cent. At the same time, it is so simple that this efficiency seems to be easy to obtain. Only two forms are used in the stockroom. One is the bin record, attached to every bin in the stockroom and giving its exact contents. This card is shown in Fig. 8. It is 4 by 5 inches, printed the same way on both sides and ruled with red lines. On it are entered the number of the part in the bin—the part numbers on the model T start with 2,500—, bin No. 1 corresponding to the lowest part number of the current model. The minimum quantity to be kept in the bin, which, on an average is sufficient to last for 3 months, is also mentioned on this card. The maximum amount of stock is from 40 to 50 per cent. in excess of the minimum. Bin number and part name are also entered on the card. The column balance contains the number of parts in the bin, beginning with the number contained in it when the card is started, which is changed whenever material is drawn from or added to the stock. Under, Entered from, the number of the repair or selling order on which the material is sent out, or the credit or purchasing order with which it is brought in, appears. Fig. 9 is, in a way, a duplicate of Fig. 8, being a card kept in a file which is conducted separately from the bin record system. The file cards are adjusted from the repair and other orders which show what material enters and leaves the stockroom. Two clerks are continually checking bin against file card, and the date of the last check is noted on both cards. This insures correct records, as in case of a discrepancy, the contents of the bin are counted to arrive at a correct knowledge of the state of things. The file card, Fig. 9, is 7.75 by 5 inches, that is, twice the size of the bin card and each side is divided, a file card lasting twice as long as a bin card.

7—Quarterly Inventory Blank—Every 3 months the entire stock contained in the stockroom of the Ford plant is counted, piece for piece. The stock bin and file cards have been rectified, the information is transferred to the inventory sheets,



Ford Motor Company

REPORT OF UNFINISHED REPAIR JOBS

AT ____ BRANCH ____ 191

DATE	CUSTOMER'S NAME & ADDRESS	REASONS WHY NOT FINISHED	REPAIR ORDER NO.

THIS REPORT IS TO BE MAILED TO THE HOME OFFICE WITHOUT FAIL ON THE 5TH-10TH-15TH-20TH-25TH & LAST DAY OF EACH MONTH
THE ABOVE IS CORRECT.

INSTALLED BY ____ SHOP FOREMAN ____ MANAGER

INVENTORY MODEL T PARTS SHEET No. 29 PAGE No. 29 LISTED BY A.W.

TAKEN New York AT Jan 31 BRANCH

PART NO.	PART NAME	QUANTITY	PRICE	AMOUNT
	BROUGHT FORWARD			
1100	Radiator (pump circulation)		20.00	
	REAR AXLE PARTS			
3044	Drive shaft pinion key (Woodruff)		.10	
3046	Drive shaft washer (steel)		.15	
	CARRIED FORWARD			

Fig. 2—Report on unfinished repair jobs sent every 5 days from branch to factory, Fig. 3—Sample blank of quarterly-inventory-book

which form books made up of loose leaves, Fig. 2. Each leaf is 9.25 by 11 inches, light green and punched to fit into a binder. Each set of leaves deals of the parts of one model, so that a small number of books give a complete statement of the stock of all parts. The inventory is made out with a carbon copy, the original going to the file of the branch office, and the duplicate to Detroit. The sheets of every book are, of course, numbered consecutively, and the list price is checked by the foreman of the stockroom, while the total value of all parts of a certain kind is calculated by a stockroom clerk; both signing their names at the top of the sheet. The total value of every sheet is footed, so that it is easy to calculate the total value of the entire stock.

8—Unfinished Repair Work Record—To keep the factory fully posted on the progress of repairs at Long Island, that service plant fills out, on every fifth day, a statement giving the repair jobs which are on hand, explaining how they are progressing and why they are not finished. The shop foreman and the manager of the plant O. K. this statement. By a glance, it is thus possible for the Detroit officers to see which jobs have been under way for too long a time, and must consequently be dispatched.

The system of sending a statement of the unfinished jobs, inventory and general statement of how things stand—a bookkeeper's statement is sent to Detroit regularly—must necessarily prove of great value. The factory is kept posted by this system with regard to the state of the repair, reserve part and new-car departments and if it appears that any changes in the operating system are necessary, it is easy for the factory experts to detect this need.

A few words, regarding the promptness with which repair work is carried out and repair parts are shipped, may not be out of place. All orders are received, as above indicated, at the office on the ground floor. If mail orders for repair parts come in before 3 p. m., the materials are shipped the same day; otherwise on the following morning. In case a telegraphic order is received, it is filled immediately. Any order coming in is recorded in the office and at once forwarded to the stockroom. If a customer arrives with a car to be repaired, the car is at once put into the hands of a tester who determines what work should be done on it. After he has finished his work, the car is sent into the repair shop and the work started without delay.

One of the most interesting departments of the Astoria plant is the stockroom. It has been stated above that it contains complete sets of repair parts for all Ford models ever constructed and this is fully correct. When one considers, however, that this enormous mass of material—which, as stated before, is worth $225,000 at present—is kept in shelves averaging 8 feet in height and covering, including the passages between them, about 10,000 square feet, it becomes obvious that the strictest economy in space must be applied for this end. As a matter of fact, the Ford stockroom is a model in this respect. Wherever it is possible, the parts in each bin have been so arranged as to make the most of the available space. Excepting the cases of irregularly shaped objects, such as carbureters, etc., the parts have been built up in masses which fill 72.4 per cent. of the space on hand. Roughly speaking, it would take from twice to three times the space needed for an orderly array of the parts, if they be thrown or piled into the bins without any rule. The average space efficiency of 72.4 per cent. is utilized in the case of about 80 per cent. of the various kinds of material stored.

Name Part	Number of Parts	Cubic Feet Filled	Pieces per Cubic Foot	Space Efficiency Per cent.
Piston	700	28	25	78.5
Connecting rod	500	10	50	82
Axle housing halves	106	60	17.7	73
Rear axle halves	139	22	15.8	68
Transmission casing	32	25	1.28	80
Propeller shaft	110	15	7.35	66
Front springs	540	55	9.82	87
Rear mudguard	50	34	1.47	90
Front mudguard	20	34	.59	45
Wheel, 30 x 3.5	13	15	.87	48
Rubber mat, 2.5 ft. sq.	72	7	10.3	96
Radiators	18	42	.428	70
Radiator hose, 2 x 2.5 ins.	1,950	12.75	153	98
Transmission clutchband	940	18	52.2	73
Large ball race	2,000	4.5	445	79
Cylinder head gasket	1,324	9	147.2	80
Hub cap	1,250	4.5	278	97
Balls, 5/16	6,430	.4035	15,900	47.64
Balls, 3/8	6,500	.5044	12,900	47.64

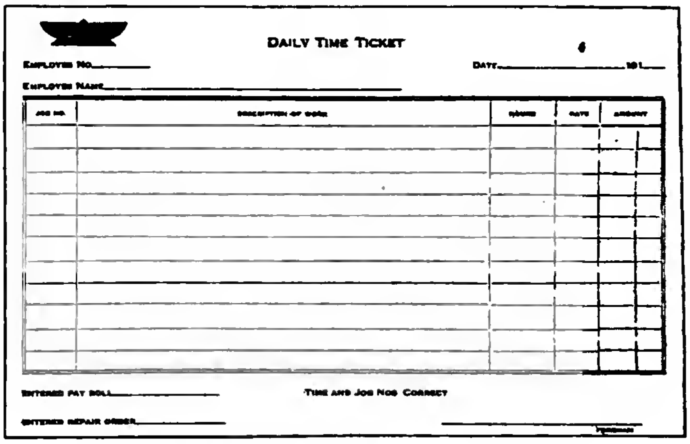


Fig. 6—Time-recording form used at the Astoria branch

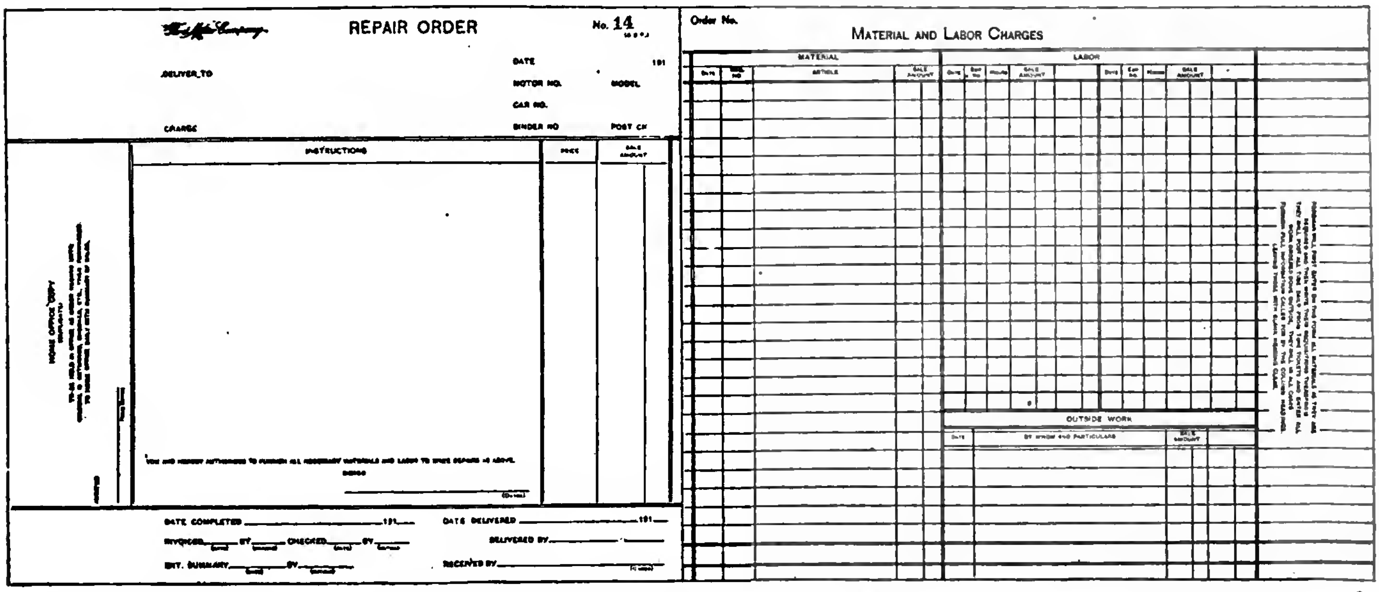


Fig. 4—Repair order blank printed on thin paper. Fig. 5—Reverse side of the thin-paper repair form, designed to take labor, material and outside-work records

On page 472 is a tabulation showing how much space is taken by materials of various nature, the number of pieces which may be stored in a cubic foot on a basis of average calculation, and the efficiency factor; that is, the percentage of the space used which is actually filled by material. All the examples here chosen represent the highest possible efficiency of practice under the circumstances obtaining in a stockroom of this nature. The parts referred to are, with very few exceptions, of the Ford model T.

The economy in space which may be attained by arranging the parts in the most orderly manner possible is easily illustrated by the following example: The 500 connecting-rods, fifty to each cubic foot, are laid in stacks. In each stack all upper and lower ends are arranged in the same direction and between alternate stacks, arranged in the same manner, there is one arranged in the opposite way, with the upper end fitting between the lower ends of the other two rows. This permits of bringing the rows very closely together, so that almost all the space of the bin is utilized. A number of connecting-rods in an adjacent bin were seen by the representative of THE AUTOMOBILE to be not arranged as yet, having been received shortly from the factory. In this case, the same space, that is, a full bin, was required to hold about 250 connecting-rods which were pyramided from the lower front up to the higher back edge of the shelf. It was only in this way that the tangled mass could remain in the shelf and it would have been impossible to fill up the bin completely without arranging the rods. But even if it would have been all filled up, it could not have held more than 400 pieces, necessitating a loss of space of 20 per cent. as compared with the orderly arrangement. Similar instances obtained in the cases of a few other parts just received, which were most effective in proving *ad absurdum* the efficiency of painstaking order.

It should not be forgotten that the advantage of efficient use of space lies in space economy only. As a matter of fact, the saving in time in getting the parts from the bins and preventing material from being destroyed or scratched are also effective in increasing the advantage derived from an orderly arrangement.

It is generally in this department of an automobile service establishment that the efficiency manager has most opportunity to introduce improvements and reforms. The cost of introducing these is almost negligible when compared to the saving effected. Provided that the foreman of the stockroom has brains—without which he should not be made foreman—he can introduce the change either gradually or at one stroke. For instance, when stock is being taken. All that is necessary is to experiment in an empty bin with the various parts before dictating the most suitable arrangement to a boy or clerk. There cannot be laid down any rule for arriving at the most suitable arrangement, but common sense and a sufficient knowledge of stockroom problems must dictate the choice of the finally selected process. The first best method which seems an improvement over the old practice must not be chosen, but experiments should be continued as long as one can think of a new way. After noting the various ways, the best should be selected.

Thus, in the case of connecting-rods, it may be a question of laying the stacks in the bin, pointing from side to side or from front to back. Pistons are probably best arranged in vertical columns as high as the bin. Springs should be laid with the leaf edges in contact with the horizontal supporting surface, so that only two small spaces, one at each end of the bin, remain empty. Hub caps are advantageously kept wrapped in thin paper to them from being scratched and may well be placed within one another, forming horizontal rows which might be stacked upon each other to entirely fill the bin. Depending on the nature of the part, 50, 75 or 95 per cent. of the space may be utilized. In the case of such objects as balls, which automatically—so to speak—arrange themselves in the most economical manner, all that is necessary is to pour them into the bin or keep them in a box. Other small parts, however, such as fittings, are better arranged orderly. It is surprising, for instance, in how small a space one may crowd hundreds or even thousands of washers, nuts, etc., as long as they are kept orderly. The work of developing these improvements invariably pays, and, while it may sometimes take quite a while until a satisfactory arrangement is found, it is work which an able man will enjoy every minute.

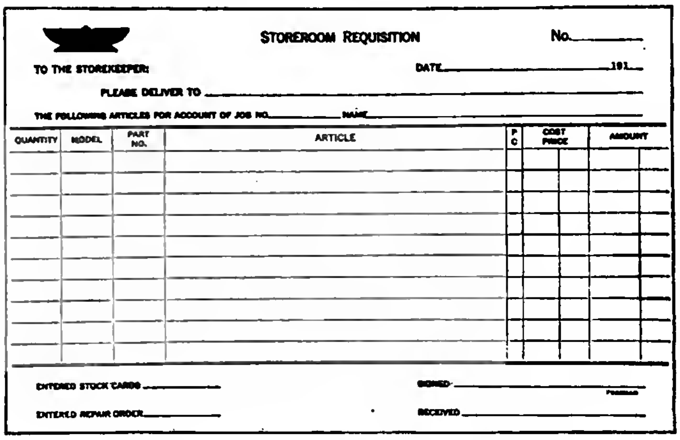


Fig. 7—Requisition form used for drawing materials

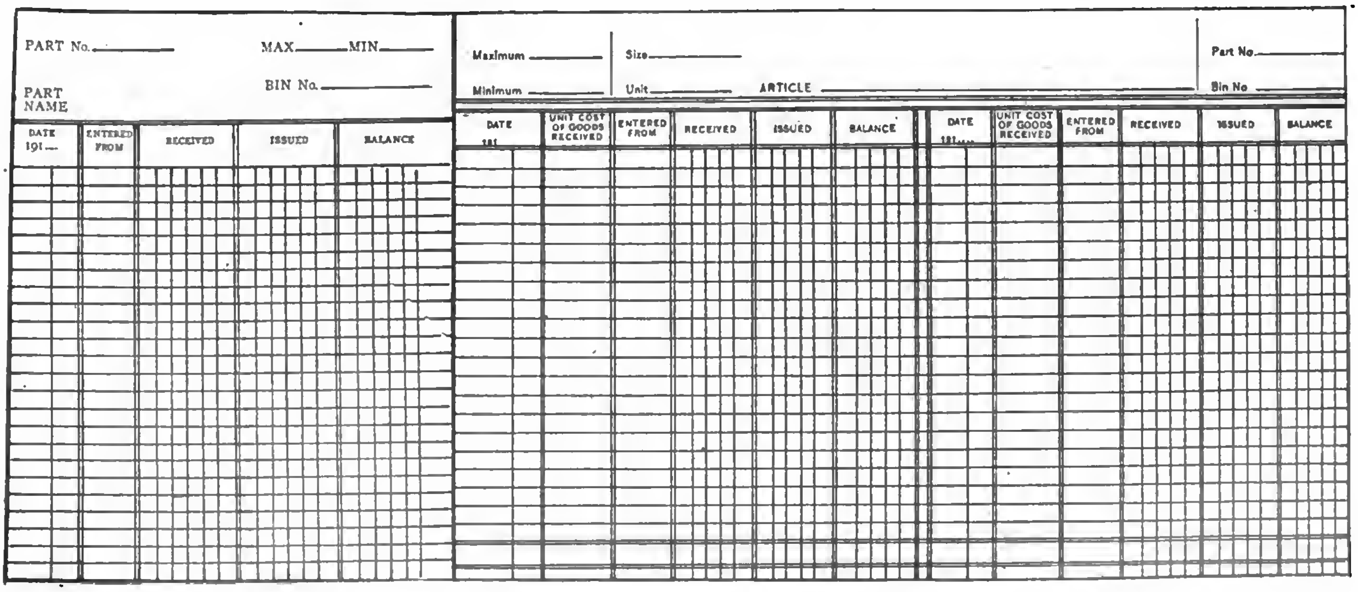


Fig. 8—Sample of bin card used by Ford Company to record contents of a bin. Fig. 9—Blank used for the file records of the stockroom, duplicating on the bin records

Beautiful Tennessee Cave—High and Low Tension—Wants Factory Practice—Brush Carbureter on Oakland—Price of Ether—Balancing Fan Drive—Motor Knocks on Hill—Electric Resistance—Sign Inquiries

A Tip for Tennessee Tourists

EDITOR THE AUTOMOBILE:—I find it very interesting to read about and see pictures of places of interest to tourists. Mammoth Cave, Natural Bridge and others too numerous to mention have all been noted in THE AUTOMOBILE, but I have failed to see any one who has been to or heard of the tourist visiting one of the finest pieces of natural curiosity and beauty and grandeur in this whole country. We have 2.5 miles east of Clarksville, Tenn., on a splendid pike, a cave, not surpassed by the Mammoth Cave of Kentucky. It has a main entrance that you can drive four-horse wagons into, that extends for miles into the earth with the finest scenery one ever saw.

It has a large river, also pools with blind fist, ball room, senate chamber that glistens with diamonds and the grand entrance that has extending rocks which reach over a dancing platform that accommodates easily 250 couples. It has an everlasting cool breeze of about 60 degrees. Just over the bank there is an immense spring of cool water, pure and refreshing. The grove is as fine as you could find in any country. Then just .5 mile south is the famous Idaho Springs with three kinds of sulphurous water, iron water and others. These have been noted for years. There is a fine hotel with every accommodation. It is on the line from Nashville to Hopkinsville, Ky. This is the famous Bunbar cave, none finer in the whole South, none half so cool. Come and see it!

Clarksville, Tenn. ED. C. BATES.

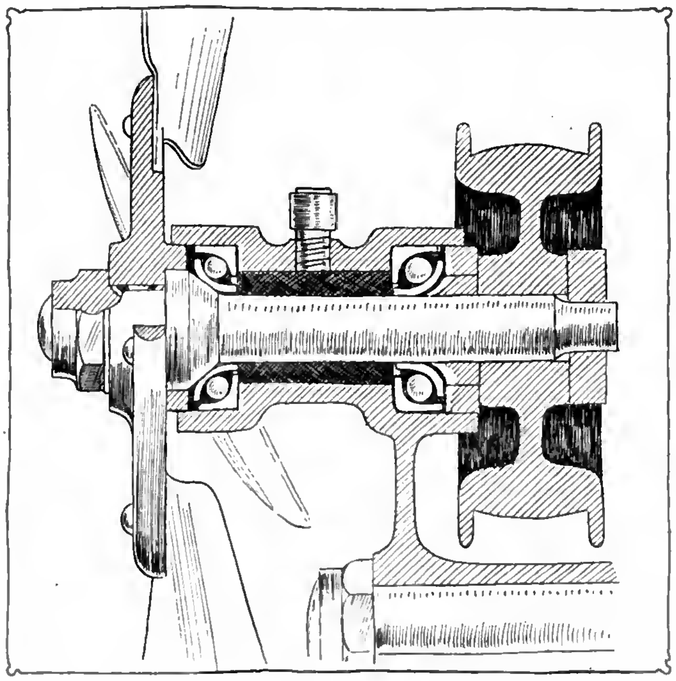


Fig. 1—Balanced fan drive; pulley and fan on opposite sides of bearing

High and Low Tension Magnetos

Editor THE AUTOMOBILE:—Please describe to me the different action of a high-tension and a low-tension magneto.

2—Would a high-tension magneto be advisable on a 30 E.M.F. touring car?

3—Would equal parts of coal oil and gasoline put together be advisable to use on a motor car? If not, what would be the result?

Lodi, O. W. A. BRIGGS.

—1—The high-tension magneto is a low-tension instrument with a high-tension coil added. In other words, it combines two instruments in one. With a low-tension magneto, it is necessary to run the current through a high-tension coil, in order to bring it up to the proper voltage to deliver a spark at the plugs. With the high-tension instrument, there is both a primary and a secondary winding on the armature. In the low-tension instrument there is merely a low-tension or primary winding and the induction or transformation of the current from a low to a high potential is secured through an auxiliary coil unless a make-and-break or other form of low-tension ignition is used. In this case there is no transforming of the current to a sufficient pitch to make it jump a gap.

2—A high-tension magneto would operate to great satisfaction on an E.M.F. car. It would be wise to consult the manufacturers.

3—If you had a carbureter that would handle the mixture it would operate. The difficulty would be in getting started and after starting to vaporize the fuel with sufficient rapidity to meet the requirements of the motor. It is not impossible to use this fuel in motor cars and it would be almost safe to predict that in a short time we will be running on a lower grade fuel than this.

Wants Gas Engine Handbook

Editor THE AUTOMOBILE:—Kindly tell me if I can find a book of reference on automobiles that will give standard practices of the factories: 1—The amount of allowance made per inch of cylinder diameter in turning piston rings; length of pistons, connecting rod proportions, etc.?

2—I wish to know also if model 31 Pope-Hartford selling for $2,250 is equipped with a Bosch dual or other make of magneto?

Houston, Texas. J. V. VAN VORST.

1—Standard practice in the automobile manufacturing business has not entirely reached the point where it can be laid out definitely in a book. The Society of Automobile Engineers which is standardizing work in this country wherever it is possible to do so have published a handbook in loose leaf form which is kept up to date by the society. This no doubt contains the latest information at the disposal of the average person. There are doubtless collections of private data which are unpurchasable. If you will study the car descriptions which appear from time to time in THE AUTOMOBILE, you will notice that although a motor may have the same bore and stroke as another, the piston length, the number and size of the rings and even the dimensions of the bearings will vary to a great extent. For that reason it would be impossible to secure anything which would represent a definite and fixed standard for automobile work. There are many books on the market which give very good empirical formulas. These are no doubt correct as far as they go and may even represent average American practice along certain lines. With the unstable conditions that we now have, however, it would be impossible to state that any given book gave American factory practice unless it was in such shape that it could be appended or amended from time to time.

2—Although not fitted to the first lot of cars that came through the factory, the Bosch dual is now regular equipment on model 31 Pope-Hartford.

Oakland Change of Carbureters

Editor THE AUTOMOBILE:—Kindly answer the following questions regarding a 1910 model 25 Oakland:

1—What make of carbureter is used? Is there any needle-valve adjustment? It seems impossible to throttle down when the motor is idling although the engine works perfectly with the load on. I notice a pipe leading from the exhaust pipe to the carbureter. What is this pipe or does the carbureter take its main air from the exhaust? Do not see any main air inlet elsewhere.

2—What oiling system is used?

3—Could you trace the ignition system for me?

4—There is a sucking sound when the inlet valve of the second cylinder closes. The sound seems to come from the crankcase. What would cause this?

Quincy, Mass. OSCAR WILBUS.

—1—The Brush carbureter made especially for this car was used in 1910. Since that time the Oakland company has taken the Brush carbureter off and are now fitting the Schebler carbureter. According to the Oakland service department in New York City, you would save the price of the carbureter in a short time on account of greater economy, if you would turn your present carbureter over to the Schebler people and add sufficient cash to purchase a new carbureter. The pipe you see leading from the exhaust is an exhaust-pipe heated air inlet.

2—The Oakland car is lubricated by a circulating splash system operated by a piston pump.

3—The ignition of the Oakland 1910 cars is by the Remy type S, a wiring diagram of which is shown in Fig. 4.

4—This is due to a leaky bushing around the valve stem. You can secure one of these from the factory and simply drive it in place yourself.

Has Opinion on Proper Balance

Editor THE AUTOMOBILE:—In reading the engineers' opinions on four and six-cylinder motors in THE AUTOMOBILE of January 23, they claim the four-cylinder type makes more noise and has a great deal of vibration. As many fours are not designed as well as they should be, I think a four-cylinder Knight motor 4.5-inch bore and 7-inch stroke with cylinders offset could be designed and perfected to run smooth and noiseless as any six at 3 miles an hour on high gear and develop 60 to 70 horsepower on the road, if put on a chassis with 136-inch wheelbase with light weight body, would make an ideal touring car using one-third less oil, gasoline and tires, the body could be placed more in front of the rear axle which would give greater comfort in riding without having a long wheelbase that is so hard to turn around in many places.

Alton, N. H. H. O. TIBBETTS.

Ether 35 Cents per Pound

Editor THE AUTOMOBILE:—In THE AUTOMOBILE for November 21, 1912, page 1063, P. C. Avery, Milwaukee, Wis., advises the use of ether in gasoline and suggests it can be obtained at a cost of 18 to 20 cents per pound. I would like to inquire where it can be obtained for about this figure, as the cheapest I have obtained was 35 cents. Can you get a quotation of about 20 cents in New York City, and if so where, and in what quantity?

Westerly, R. I. L. G. WAITE.

—Commercial ether sells for 35 cents a pound in New York City, and it is the opinion of THE AUTOMOBILE that Mr. Avery is low in his cost estimate.

Scraping in Main Bearings

Editor THE AUTOMOBILE:—In scraping in main bearings what precautions are taken in repair shops to maintain the shaft parallel with the bottoms of the cylinders?

2—In starting on the magneto, if the spark should be advanced to the limit, is a back-kick possible?

Boston, Mass. A SUBSCRIBER.

—1—A straight edge, a tightly strung piano wire or any other such means may be used. If the bearings are in a true line it is safe to assume they are correctly lined up with the cylinders and pistons. The wire is struck straight down the line of the top or bottom of the crankshaft and checked at various points along its length. A coating of oil may be given the bearings and a little tire talc sprinkled lightly on this. The shaft is then put in place carefully and lifted out vertically. The line of contact of the shaft may be noted in this manner.

2—It will be almost certain unless the motor is cranked at extremely high speed.

Balancing Belt Fan Drive

Editor THE AUTOMOBILE:—The belt on my fan is always pulling the fan out of line and I would like to know if there is any type of drive by belt that will not permit this to happen. I am using a plain bearing on the fan and I have ruined several bushings.

New York City. H. A. DEWITT.

—Most cars have a balanced drive which takes care of this. In Fig. 1, is shown a balanced drive. It is only necessary to have the bearing surface long or a good space between the bearings. In the drive shown in Fig. 1 the fan is on one side of the bearing and the belt on the other. This is generally the case and it makes for good balance.

Asks Some Splash Questions

Editor THE AUTOMOBILE:—Would you kindly tell me the following:

1—In descriptions of a splash system I have heard of the

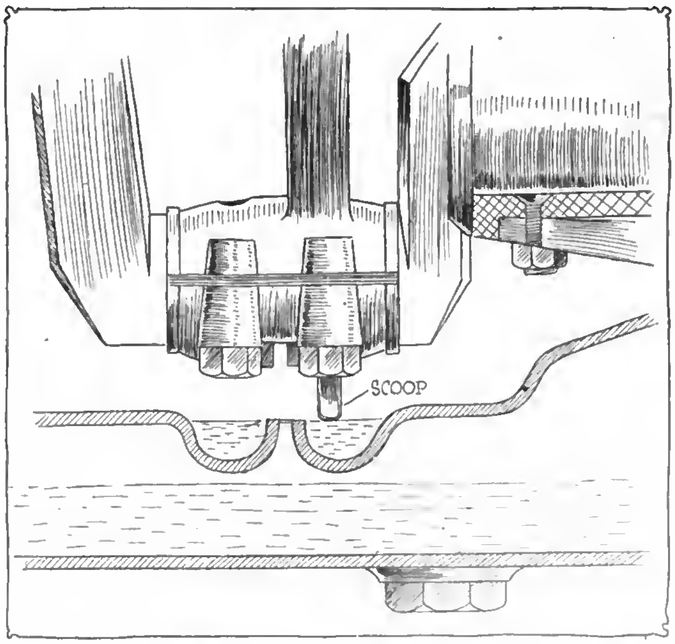


Fig. 2—Oil trough and oil reservoir, the upper small sump where the scoop dips is the trough, the lower part is the reservoir

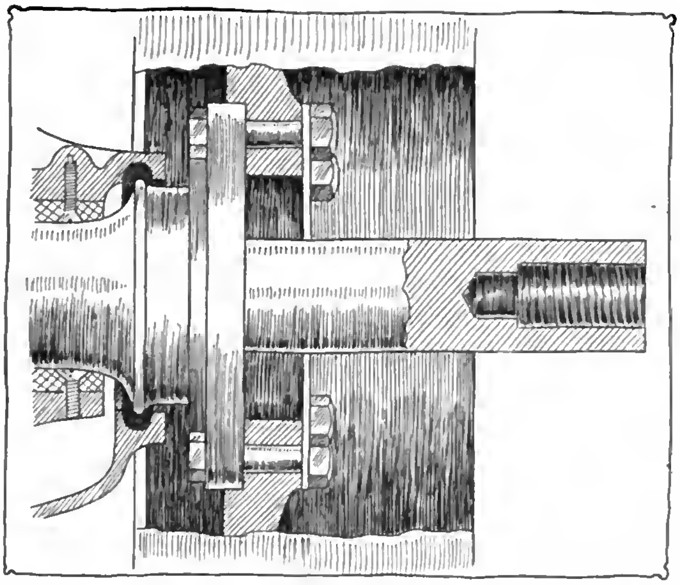


Fig. 3—Connection of flywheel to the end of the crankshaft

oil trough and the oil reservoir. What is the distinction?

2—How are the main bearings oiled in splash systems?

3—How is the flywheel generally fastened to the crankshaft?

Philadelphia, Pa. CHAS. DRUMMOND.

—1—The difference is seen in Fig. 2. The upper is the trough and the lower the reservoir.

2—By a small pocket generally as is shown at A, Fig. 5. The oil collects here and flows by gravity to the bearing.

3—The flywheel connection is generally by six bolts through the flange on the end of the crankshaft. The practice of keying on flywheels is still used to some extent although the bolted-on type is most common. A bolted connection is shown in Fig. 3.

Engine Knocks on Up Grades

Editor THE AUTOMOBILE:—I have a four-cylinder touring car with a 4 by 4-inch motor. It is equipped with a Splitdorf magneto and Maxwell 1912 carbureter. The engine picks up very well on level ground, but when climbing a hill on high gear it does not take hold but dies right down with a knocking sound in the motor which sounds exactly the same as when traveling with a spark that is too far retarded. What is the cause for this and what is the remedy?

Spokane, Wash. TROUBLED.

—There may be several causes for the trouble which you mention. When the motor is on a hill if there is any tendency to knock at all it is there that it will surely develop. The troubles which are commonly the cause of a knock that develops on a hill and which is not perceptible on level ground are as follows: Lean mixture, magneto set too early, valves seat poorly, carbon in cylinders, poor valve adjustment, loose wristpin bushing, loose magneto shaft coupling, sticking valves and piston slap. The cures for these may be taken up in order. They are as follows:

Lean mixture can be cured by opening the needle valve slightly or by closing the air valve. The former is preferable as it is easier to make a correct fuel adjustment than an exact air adjustment. This adjustment should be made on the road. Take the car out on a hill and run it up in the condition that it is at present. Return to the bottom of the hill and make a change in the mixture by turning the fuel adjustment. When this is done run the car up the hill again and note if there is any decrease in the knock. If there is none or the change is only slight it is time to pass to the next cause.

The setting of the Splitdorf magneto is explained in detail in the issue of September 19, and it is only necessary to follow the directions contained therein to secure perfect timing.

Bad seating of the valves may be due to two causes. Carbon or other foreign matter may lodge on the seats and prevent the valves from seating properly, or they may be adjusted too closely so that they are not able to get down to the seats when the motor is hot enough to have caused the valve stems to expand. The latter would be apt to cause a knock on level ground as well as on a hill, however, and thus can be discarded from the list of probable causes. Carbon flakes on the valve seats are common, however, and may be the cause for the whole trouble. They can be removed by dosing the cylinders with kerosene or some other carbon remover and then turning the motor over to work the deposits out from around the valve seats. In case the valves are worn or pitted they will have to be reground.

Carbon in the cylinders is removed as just described. If patent carbon removers are used be sure to follow directions accompanying same.

Loose magneto shaft couplings are readily cured by tightening up the connections. Should an Oldham coupling be used in your car and it is found that considerable play occurs between the driving and driven faces, coat these with solder.

Sticking valves are caused by insufficient lubrication of the stems. A little oil will cure this trouble, which is not probable in your case as it would have been evidenced on level ground as well as on hills. Slapping pistons are due to excessive wear and are of such a nature that the repairs can only be made at the factory.

Electric Resistance of Wire

Editor THE AUTOMOBILE:—The claim has been made to the writer that there is a greater percentage of loss of current from 14-gauge wire than when 10-gauge wire is used for lighting purposes.

Kindly advise me of the percentage of loss in using 16-gauge, 14-gauge, 12-gauge and 10-gauge wire, 12 feet long, connecting a 6-volt storage battery with a 6-volt, 10-candlepower lamp.

New York City, N. Y. L. M. SCHWARTZ.

—There will be a greater potential drop through smaller wire than there will be through large wire. This may be readily made clear to you if you will assume for the moment that your electric current is a quantity of water contained in a cylinder. Imagine two such cylinders, Fig. 6, with an equal amount of water and everything the same in every respect, except that one cylinder has a small orifice and the other a larger one. Suppose it is necessary to empty both the cylinders at the same rate of speed. It would be necessary to put a larger head or weight W_1 on the smaller orifice than W_2 on the larger orifice. It is the same with electricity. If it is desired to empty a battery at a certain rate where a certain pressure of voltage is maintained it is necessary to have at least a certain size wire. Below a certain limit it would be impossible to allow sufficient current to flow over the wire. It happened in the case of some

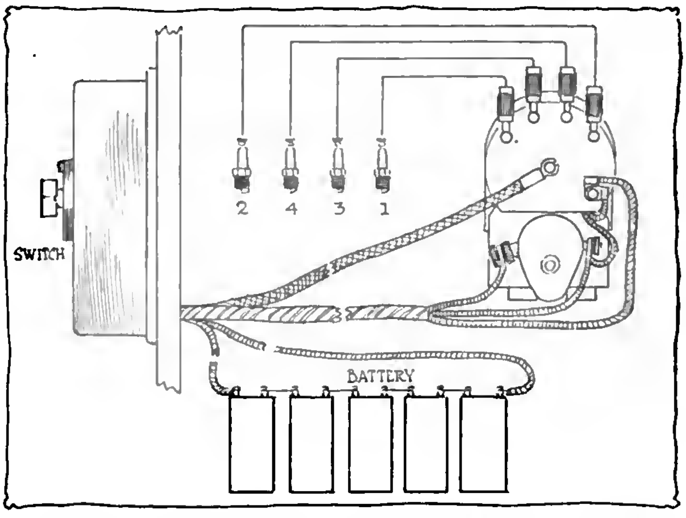


Fig. 4—Wiring diagram of the Remy type S, ignition system

6-volt lighting systems that the designer was not able to get a bright glow at his lamps. After a great amount of trouble it was found that the wire was so small that only 5 volts arrived at the lamp instead of the 5.75 volts required. The following table gives the allowable voltage drop per foot and also the voltage drop per ampere-foot of different gauge wire. In this table is also given the ohms resistance per foot. Knowing the amperes required, which may be secured from an ammeter or from the lamp manufacturer, and taking the ohms resistance from the table herewith, under the head of ohms resistance per foot, the voltage drop per foot can be calculated and compared with the permissible drop The method of calculation is by the following formula:

$$C = \frac{E}{R}$$

In this formula C is the current in amperes drawn by the lamp, R is the resistance in ohms per foot secured from the table and E is the voltage drop per foot. In other words, the voltage drop per foot would be the ohms resistance per foot times the amperes. A glance at the volts drop per foot column will tell if this is in excess of the allowable number as per the Underwriters' requirements.

RESISTANCE OF WIRE

B. & S. gauge	Allowable volts drop per ampere foot	Allowable volts drop per foot	Ohms per.ft. at 20° C=68° F.
14	.00256	.0300	0.002521
12	.0016	.0265	0.001586
10	.00105	.0235	0.0009972
8	.000685	.0206	0.0006271
6	.000400	.0176	0.0003944
5	.000316	.0166	0.0003128
4	.000252	.0158	0.0002480
3	.000200	.0148	0.0001967
2	.000158	.0137	0.0001560
1	.000126	.0130	0.0001237
0	.000100	.0127	0.00009811
00	.000079	.0114	0.00007780
000	.000063	.0108	0.00006170
0000	.000049	.0101	0.00004893

Proper Place to Carry Loads

Editor THE AUTOMOBILE:—Given a motor truck carrying 5 tons of coal. The scales show 63 per cent. of useful load is on rear axle. How far back must body be placed so that rear axle will carry 70 per cent. useful load?

Length of truck overall	220 inches
Wheelbase	138 inches
Rear overhang	39 inches
Loading space back of driver's seat	160 inches
Length of body	160 inches

New York City. F. J. M.

—Assuming that by useful load you mean the weight carried by the truck and not including the truck itself. the center of gravity of the load would be 80 inches forward from the rear of the truck or 41 inches forward of the rear wheels, by subtracting the overhang from 80, 80 being one-half length of loading space. According to your wheelbase, this would mean that the center of the loaded portion is 97 inches back of the front axle and that the weight on the rear axle as compared to the whole load—if the center of the loaded portion is the center of gravity—is as 97 to 138, or 70 per cent. Since you get but 63 per cent., the center of gravity of the load is evidently at present but 87 inches back of the rear axle and the weight will have to be shifted back 10 inches. It would be well to determine if you are correct first, and if so, why the center of gravity falls forward 10 inches when it would seem to be at the center of the load.

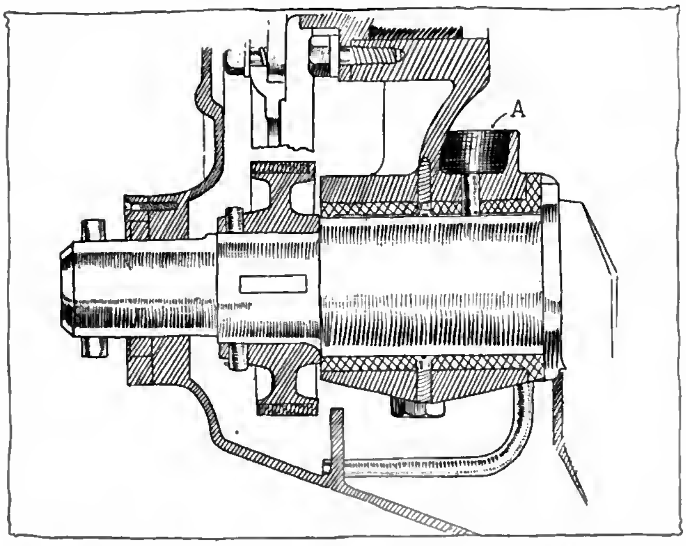


Fig. 5—Oil duct on top of main bearing used with splash system

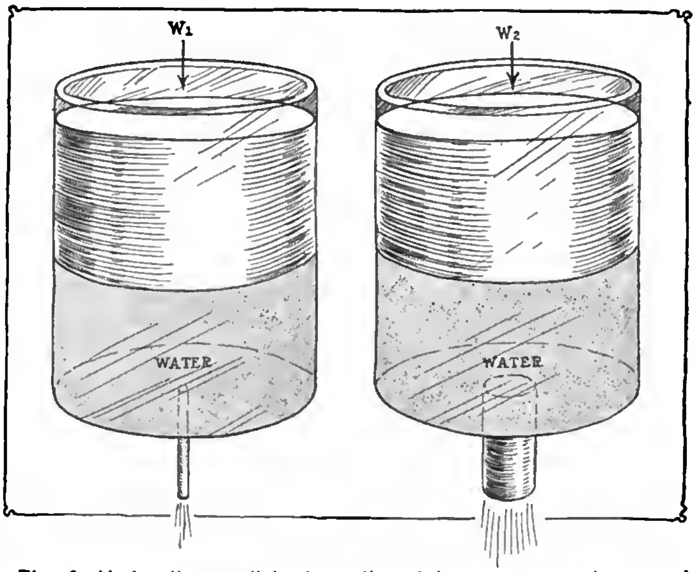


Fig. 6—Hydraulic parallel of small and heavy wire—a large and small orifice

Small Manifold on Intake

Editor THE AUTOMOBILE:—I have a six-cylinder Napier car. The cylinders are 3.5 inches bore by 4.5 inches stroke. Will you be kind enough to advise me in your best judgment what size of intake manifold would work the best on this car. Also, what type of carbureter. There is a foreign carbureter on the car now, and it has a very small intake pipe.

Batavia, N. Y. A SUBSCRIBER.

—You will have to keep the intake on your car that is now used upon it. The valve ports are of a definite area and the intake manifold has been designed to suit that area. The motor has a small bore and stroke and the small intake manifold is only to be expected. The number of cylinders on a motor does not affect the size of the carbureter at all. The reason for this is that the suction strokes of any two cylinders do not overlap. The carbureter that you now have on your car must be of the correct size as the Napier engineering department has a high reputation for its judgment in the design of the motor and its accessories.

Unless the carbureter is deranged to any extent, the best satisfaction will no doubt be secured from its use.

Please Sign Your Inquiries

[THE EDITOR OF THIS DEPARTMENT is in receipt of several letters signed Reader, Subscriber and by initials. No attention will be paid to anonymous or unsigned letters; readers who wish to make use of these columns must sign their letters as an evidence of good faith. No names will be published if the writer of the inquiry or communication does not wish the name to appear. It is only necessary to state this in your letter. Other letters which have not been deemed of sufficient general interest to publish in these columns have arrived without the sender's address so that it is impossible to answer them by mail. We are delighted to have our subscribers use these columns and most cordially invite correspondence, insisting only on the rules just mentioned.—EDITOR.]

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Exhaust Gas Analysis

UP to the present little attention has been given to the subject of exhaust gas analysis as a means of determining carbureter efficiency and also motor efficiency, a condition largely due to the fact that fuel economy until the present has been little sought after by the car building companies, the major object being power or speed. It is not long since the custom was to make large cylinders, add to the bore and stroke, to get more power. Little, if any, thought was given to changing valve openings, altering valve timing, redesigning intake manifolds or reducing the internal frictions in order to get more power, because all of these were made unnecessary by the additional cylinder sizes. With the new longer-stroke motors, the increase in price of fuel, and the demand for lighter weight it has become imperative to secure higher motor efficiencies. Increased efficiency has been obtained by improved designs and constructions, but also by improved carburetion. With these demands for improvement has come the necessity for an accurate method of gauging conditions, and, while the various types of testing dynamometers and manographs have come into more general use of late, it is also true that the analyzing of exhaust gas analysis is also becoming more common.

Analysis of exhaust gases is a scientific method of determining if the combustion of the fuel in the explosion chamber is complete. It is a scientific method of determining if gasoline and air are being mixed in the required proportions to give the best combustion. It is also a scientific method of determining questions of cylinder design insofar as the shape of the combustion chamber influences the thorough mixing of the air and gasoline.

Although exhaust gas analysis is receiving considerable attention at the hands of carbureter engineers today it is to be hoped that it will be kept in its proper perspective with relation to the various other methods of testing which are now in vogue. The dynamometer is needed; the manograph is imperative; it is necessary to have other test apparatus to measure the heat losses through the waterjackets; it is necessary to devise methods of measuring the loss due to friction of the internal moving parts of the motor; it is necessary to have methods of checking the condensation in the intake manifolds; and it is necessary to check the mufflers for back pressure; but while any one of these may force itself on the engineer at a particular time, that engineer will obtain the best results, who uses all, each in its proper place, and so has at all times a dependable balance wheel in his testing laboratory.

In order to bring exhaust gas analysis onto a practical basis THE AUTOMOBILE last autumn made a series of road tests with fifteen different makes of automobiles and trucks. These tests were conducted by a leading American university professor who was thoroughly conversant with the work. In all nine samples of exhaust gases were taken from each vehicle tested. The vehicles under test were put over the same road circuit so that it would be possible to make comparisons between different types of motors, cars, etc. The results of these tests will be published in these columns in a few weeks, and they should provide the actual information that the engineer and car owner wants.

This series of tests demonstrated satisfactorily the possibility of making such tests on a fully equipped car on the road. Collector tubes for the exhaust gases were the same as those used in laboratory tests and there was not the slightest difficulty in collecting the samples and analyzing them after the test was over. One leading American carbureter engineer has been conducting road tests of this nature for several years and he claims to obtain as good results as can be had in any laboratory. He even carries his analyzing apparatus with him and makes tests at different times during the same day over the same piece of road. One test is made with a certain carbureter adjustment; a second test is made with a slight variation; and third, fourth and fifth tests can be made after any desired alterations in carbureter setting have been made. Nothing could be more practical.

Greater fuel mileage is being talked of to-day from the Atlantic to the Pacific and the only means by which the engineer actually knows that he is obtaining complete combustion is by exhaust gas analysis. Careful tests will aid him in settling whether the loss in power is due to faulty carburetion or poor features in design. This, as one valuable motor test, should appeal to every engineer because of the accuracy of it and also because of the ease of performing it. There is not any guesswork and the test is made in actual road work, so that all differences between tests made in laboratories and those on the road are eliminated from the considerations. Carbureter makers will benefit greatly from such tests, because of the real facts such tests furnish. They furnish real facts because they are made under running conditions and not in a laboratory.

Executive Efficiency

Aptitude for the Task a Big Feature in the Ultimate Success Of the Boss or Workman

Inability to Calculate Wage Value the Source of Vast Money Losses

MORE than three-quarters of the industrial workers, including executives, do not have natural aptitude for the positions they fill. They are like dogs walking on their hind legs.

It is a simple matter to predetermine both the inherent ordinary and extraordinary capacities of any individual and to place both in positions for which their aptitudes will fit them.

The yearly money loss in direct cost on the average machinist of only 30 per cent. efficiency (not by any means an unusual standing) is nearly $5,000; not counting the loss of profit on output.

This loss from inefficiency increases as the position becomes one of greater importance.

The industrial loss from the ill adjustment of workers to their duties is only a small part of the total loss. Ill-assorted marriages are a phase of bad adjustment, improperly educated children another.

The value of the individual who is competent increases far more rapidly than his market price. Even in rough labor, the kind of man an 8-hour day and 35 cents an hour pay can secure is more economical than the 20 cents an hour man, working 10 hours.

If positions were filled by men fit for them, if the wages were paid necessary to secure men who were fit, difficulties between employer and employee would be inconceivable.

In a long experience we have always found the so-called employer, the executive, at fault. He has filled the positions in his plant with ill-qualified men, because he did not know how to secure competent men, was not able to compute their wage value and was unwilling to pay any advance on the current rate to badly placed men.

The vocational counselor is, like the musician, born with an aptitude which can be cultivated and trained in a scientific manner, resulting in great skill. If either natural gift or scientific training is lacking, the result is mediocre.

A paleontologist can reconstruct, from a single tooth fragment, the animal to which it belongs, including its general disposition. How much easier is it from all the external indications of a living animal to determine its characteristics.

Since man reveals himself in many ways the animal cannot—by his clothes, by his handwriting, by the fatal gift of speech—it is remarkably easy for those who have supplemented natural ability by comparative study to read accurately all the natural aptitudes of any man or woman. For instance, since the brain, spinal cord and whole nervous system are formed from an unfolding of the surface skin, it of necessity follows that the texture of the skin indicates the texture of the brain and nervous system. Therefore in speaking of the character do we use the expressions "thick skinned" and "thin skinned."

As nearly all men lack standards, as many men mistake the effort of incompetence for the achievement of genius, we cannot be guided by any man's estimate of himself. The young are particularly given to taking up with what is distasteful because they enjoy the struggle, the effort.

It is therefore the position that should be given the right man, not the man who should receive the position he wants or likes.

The qualities required for the best administration of every position should be specified.

It is for this reason that some men succeed better in partnership than each did singly. The partners complement each other.

Aptitude is more important than experience. Men with aptitude can be given experience and they learn with extraordinary rapidity. A man with aptitude can learn a trade in a few months. A man without aptitude never becomes a skilled worker.

In giving a man of aptitude experience—that is, educating him—his own peculiar qualities determine the form of education which is therefore adapted to the man, the man not warped to suit the method of education. Some men learn through the eye, others through the ear, others through the muscles. Some learn best under one kind of a man and others under another kind of man. The fitting of man to man is as important as fitting man to position.

As a rule, those who are not identical but also not very far apart in temperament work better than those who are identical or very far apart. A trotting horse does better, not in double harness but with a running mate who is just a little faster. He would not succeed if harnessed either with a donkey or with a fast runner.

Our general plan for industrial employment should be:

1—To establish a thoroughly competent and complete employment department.

2—To employ, assign, transfer, promote and discharge solely through this department.

3—To specify the required qualities for every position.

4—To establish wage classes. The man belongs to the class in which his hourly rate locates him.

5—The rates for certain positions should be determined by the price that has to be paid to secure men of full qualification for the positions. We should vary the rate of pay to secure standard ability. We should not vary the requirements as to ability in order to adhere to standard rates of pay.

6—Full efficiency, full punctuality, full reliability for a specified period entitle a man to advance into the next highest class and corresponding change of work. The only limits to a worker's advance are the limitation of his own ability and the shortage of positions for which he is competent.

7—Failure to attain high efficiency is prima-facie evidence, not of incompetence but of bad placing. Bad placing is very rare if the employment department is competent.

8—The personnel of a man's surroundings are as important as the work. Personal aptitudes count for as much as work aptitudes.

9—The teacher and the teaching should be adapted to the learner.—HARRINGTON EMERSON in *Bulletin of the Efficiency Society.*

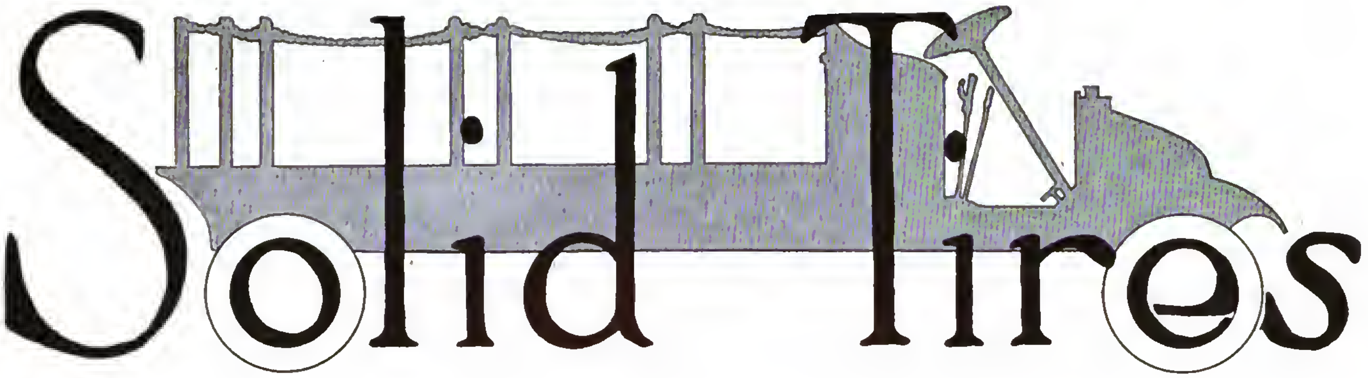
Eighty-Five Gotham Fire Trucks

Fire Commissioner Johnson, of New York City department, has just published his report for the past year. This report brings out the fact that the total number of fire cases increases during 1912, as compared with 1911, while the average damage done by each fire was 32 per cent. less in 1912 than in 1911. In 1911 there were 14,547 fires, with a total loss of $12,470,806, or an average loss of $855. while in 1912 there occurred 15,633 fires, averaging losses of $580, and aggregating a total loss of $9,069,580. The reduction in fire loss during the year 1912 was therefore $3,401,226.

That a great deal of this saving is due to the efficient and speedy service given by motor trucks is illustrated by the fact that Commissioner Johnson has contracted for eighty-five motor-driven pieces of fire-fighting equipment, as follows:

2 hose wagons	$8,326
26 combination chemical and hose wagons	105,170
3 high-pressure hose wagons	13,875
28 second-size steam fire engines	248,920
1 ladder wagon with 85-foot ladder	8,210
8 ladder wagons with 75-foot ladders	63,152
17 ladder wagons with 65-foot ladders	125,716
Total	$573,369

Besides these contracts, the trucks of which will be delivered during the current year, others will be purchased.



Treads Designed for Commercials

A Review of the Heavy Tires Now on the Market for All Weights of Vehicles

WITH the advance that has been made in automobile transportation in the last few years, considerable changes have been heralded from time to time in connection with solid tires. The recent show held in New York clearly demonstrated that tire makers are awake to the keen competition existing at the present time. While several prominent makers still adhere to the pressed-on type of tire as a regular standard, others have added a demountable tire or a block tire to their lines, thereby making the truck owner independent of the power press. With the new types of tires it is possible for the driver to change a tire in a short space of time, without even removing the wheel. There is still a large number of makers who manufacture the side wire or clincher type with cross wires, yet the metal and hard rubber base tire is favored by the majority.

The block tire has gained many adherents in the last year as is instanced by the number of concerns making this type at present. The adoption of the S. A. E. standard rim has been universal and if wheels are fitted with this type, it allows the truck owner to choose the tire he wants, without having to pay for having the wheels altered to suit a particular size of rim.

In order to present to the public the present offering of the solid tire market, a canvass was made at the show and the following is a brief résumé of the types made by the different makers who showed. This article does not deal with any of the mechanical types of tires, but only tires that can be termed solid.

Firestone solid tires, manufactured by the Firestone Tire and Rubber Company, Akron, O., are made in several styles. These include a hard-rubber base channel type; notched tread, con-

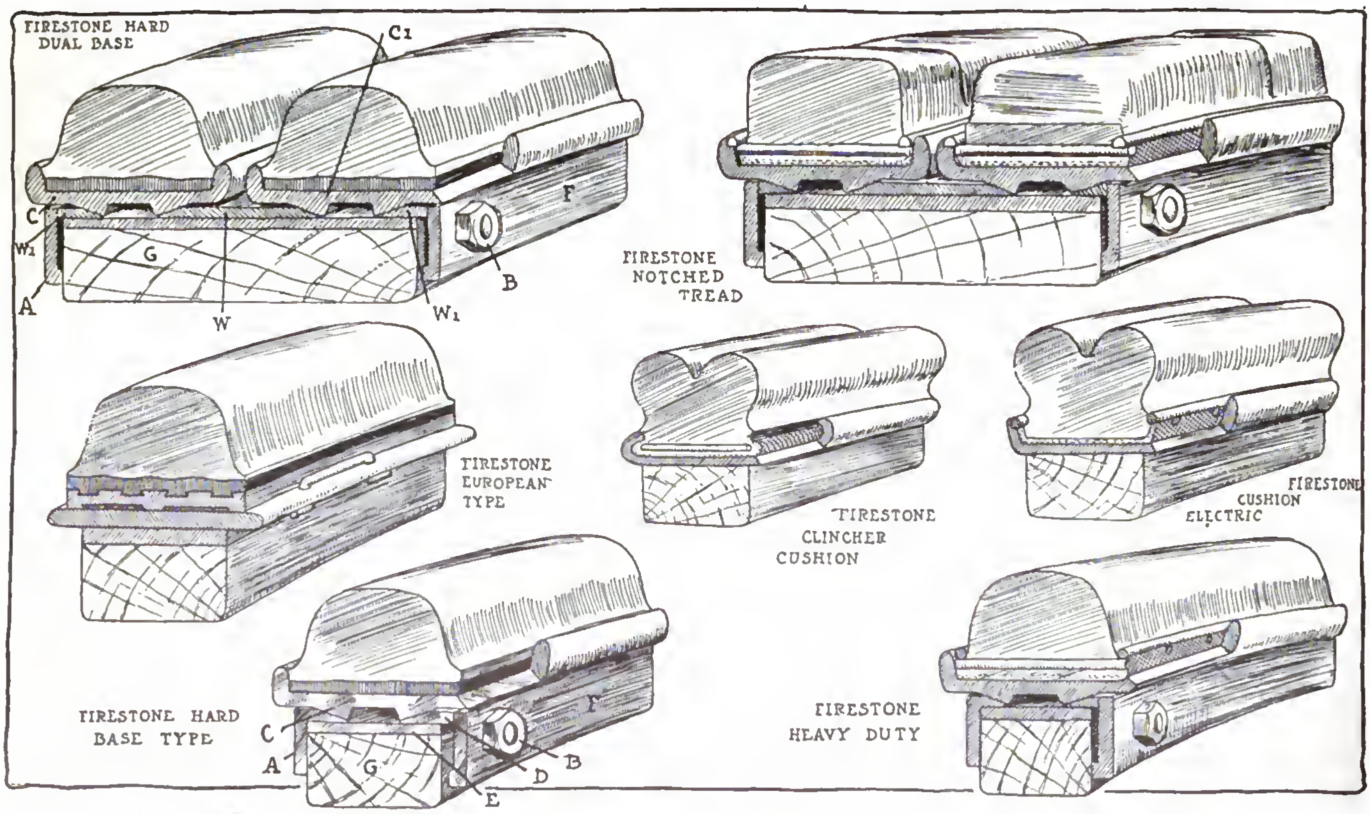


Fig. 1—Firestone solid commercial tires made in all sizes and styles to accommodate every weight of vehicle

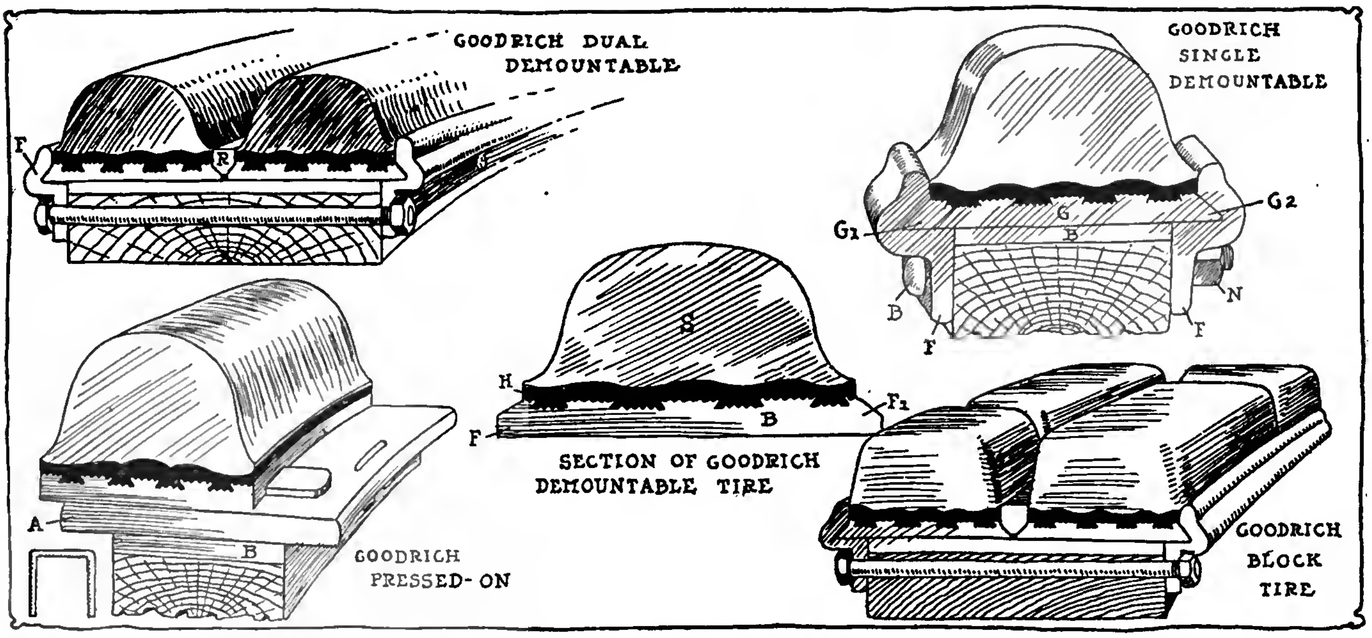


Fig. 2—Showing five styles of Goodrich solid tire for various capacity commercial vehicles

tinuous base, with side and cross wires; European type tire with steel and hard-rubber base, and a heavy-duty, side-wire tire, with plain tread. In addition to the above, the following tires are manufactured, especially for electric vehicles: a clincher cushion tire, a side-wire cushion tire and a special electric side-wire tire.

Dealing first with the hard rubber base channel type tire, Fig. 1, it will be seen that shape of the channel is intended to be used in connection with the Firestone quick removable rim. The inside of the base of the channel is serrated and a layer of hard rubber is interposed between the tire proper and the metal base. The sides of the tire are protected by the lips of the channel, thus preventing abrasion of the rubber through coming into contact with sharp protrusions such as curb stones or ruts. The illustration depicts a single tire as might be used on the front wheels and the quick removable feature of the rim for single tires can be seen. A steel ring E, is shrunk over the wooden felloe G and the flange A is then secured to the felloe by means of through bolts. The rim with tire attached is slid over the steel band E, butting at C against the wedge section of the inner ring A, finding a seat thereon. The steel ring D, having a wedge face, is then placed in position supporting the rim from the opposite side and the wedge is forced home by the flange F and the nuts B.

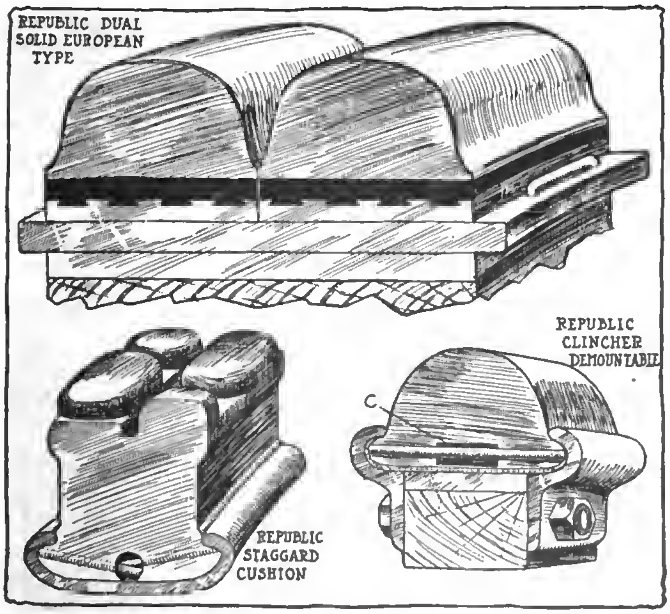


Fig. 3—Three styles of Republic solid tire

A similar principle is employed in the dual removable tires, there being some differences, however, in the execution. In this case, Fig. 1, there are three wedges W, W1 and W2, the wedge W being independent of the flange A. The center wedge W1 is a sliding fit over the steel rim, and when the nuts of the flange bolts are tightened, the outer wedges W and W2 force the rim on to the two sides, wedge W1.

The heavy-duty, side-wire tire of Firestone make is shown at Fig. 1. The tire is moulded on the rim, instead of being made endless and then shrunk over the lips of the channel. Cross wires are employed to assist the rigidity of the mounting. These tires are also fitted to removable rims as shown.

The construction of the Firestone continuous-base, notched-tread tires is shown at Fig. 1. In this instance it is fitted to a dual wheel and the construction is very similar to the heavy-duty tire just described. It is of the side-wire, soft-rubber base type, the base being endless as contrasted with the individual block type.

A cushion type of tire intended especially for electrics is also manufactured with either clincher or side-wire mounting, a section of these types being shown in Fig. 1. The European type of tire with steel and hard rubber base is made; the tire being pressed on to the rim under considerable pressure, held in position by a sunken key, and provided with wire staples to prevent side motion.

Goodrich wireless tire for trucks are manufactured by the B. F. Goodrich Company, Akron, O., in three styles, exclusive of varieties particularly intended for electrics. These are the Goodrich demountable type, block type and the pressed-on type. They are all of the metal and hard-rubber base type.

A sectional view of the demountable type, Fig. 2, shows the construction of the tire. The steel base B has a series of serrations and wedge-shaped protrusions on to which the hard rubber base H is attached. The base B has an undulating surface, the apex of the waves corresponding to the protruding wedges. The shape of the sides of the steel base F and F1 are worthy of notice here, as the method of attaching the tire is combined with this feature. Reference to Fig. 2 will make the reason of the taper clear. Before dealing with the method of attaching the tire, it must be stated tbat the steel base is not endless in the general accepted meaning of the word. It is slotted at three points, located at 90 degrees to each other; while at what would correspond to the fourth position, there is a key which fits into a

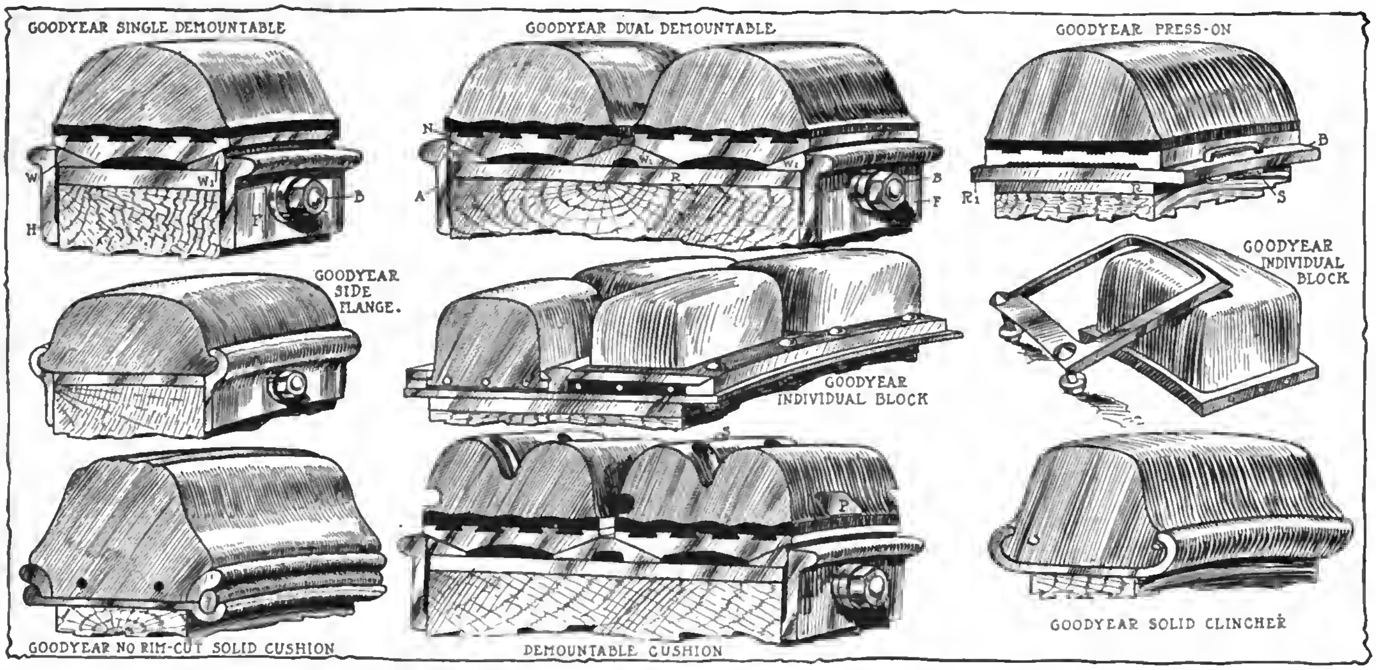


Fig. 4—The Goodyear solid tire output includes the complete line for all types of commercial vehicles

recess in the steel band and prevents the tire from creeping. By slotting the base as above described, it is possible to contract the tire over the band by tightening on the steel base with the rings F and F1. The steel base of the tire fits into the grooves G and G2 and when the nuts N of the through bolts B are tightened the tire is held rigid. It is claimed that the increase and decrease in circumference is so slight as in no way to affect the tire sub-base or tread. Fig. 2 shows the method employed for dual tires. The center ring R is endless. It is unnecessary to remove the wheel or the inner ring F to replace a tire, as everything can be removed after the outer flange has been taken off. A comparison of the block tire, Fig. 2, manufactured by the Goodrich company with their endless tire, Fig. 2, shows the principal differences. Each block has the same integral construction as the endless tire, but the blocks are individual and may be replaced and removed at will. The profile of the tire has been changed, this being necessitated by the construction. The blocks are placed end to end forming a complete tire, and applied direct to the permanent S. A. E. band. One block, known as the Key block, has a key seat which engages with the key on the felloe band. The initial application of the blocks is effected by holding them in position on the rim with a strap or rope while the outside flanges are applied. These tires are interchangeable on the same rims as the endless demountable type.

The method of applying the Goodrich pressed-on type tire is shown in the cross-sectional view Fig. 2. The intermediary rim A may be applied to the permanent S. A. E. band B or may be shrunk on the wood felloe without the use of the permanent band.

In order to provide a tire that will give low current consumption and at the same time give long mileage for electrics, a resilient compound tire has been placed on the market by the Goodrich company. The claim made for this tire is that it is not so soft that it will drag, nor hard enough to affect the batteries through causing excessive vibration.

Seven distinct types of tires are manufactured by the Goodyear Tire & Rubber Company, Akron, O., offering the purchaser a wide variety of choice. The various types are as follows: solid demountable; demountable cushion; solid metal base, pressed-on type; solid side flange; individual block; solid no rim-cut, and clincher truck tire. The solid demountable type, Fig. 4, belongs to the metal and hard-rubber base class. The metal base is undercut at an angle corresponding to the wedges W and W1 which latter rest upon the standard S. A. E. rim R. By applying the flanges A and F and contracting them together by the bolt B the wedges are forced against the rim. To take the tire off the rim, it is only necessary to remove the nuts and the outer rim and afterwards the wedge W1.

The construction of the Dual solid demountable Goodyear tire rim differs only in the center wedge W1, which is chamfered on both sides to accommodate the two tires. The tires intended for single and dual rims are identical, and are interchangeable.

The demountable cushion tire, as the name implies, can be removed from the permanent rim without the aid of a press. The sectional view, Fig. 4, shows that it is similar in base construction to the solid demountable just described, likewise the method of mounting. The tire has a dual tread, there being on the inner sides of the treads, undercuts as shown at S. These allow a displacement of the rubber and the double notches, besides having non-skid properties, offer increased traction. The undercut pockets in the sides provide for the displacement of the rubber, thereby adding resiliency. Fig. 4 shows a tire of the Goodyear cushion make in which the tread slots and base pockets can be seen.

The solid metal base Goodyear press-on tire is shown at Fig. 4. These tires consist of three strata, similar to the demountable types; namely, steel, hard rubber and soft rubber tread, but the shape of the base is different. In addition to the dovetails, the base is serrated to afford better gripping properties to the hard rubber. With the addition of a rim band R1, this tire fits the standard S. A. E. rim R. Side motion of the tire once it has been pressed on is prevented by the staples. It will be noticed that the rim band R1 is slightly bevelled at the sides at B forming a guide for the tire in the pressing-on process.

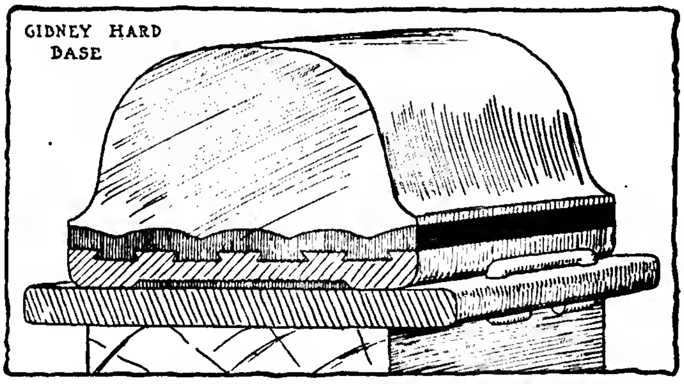


Fig. 5—The Gibney solid hard base truck tire

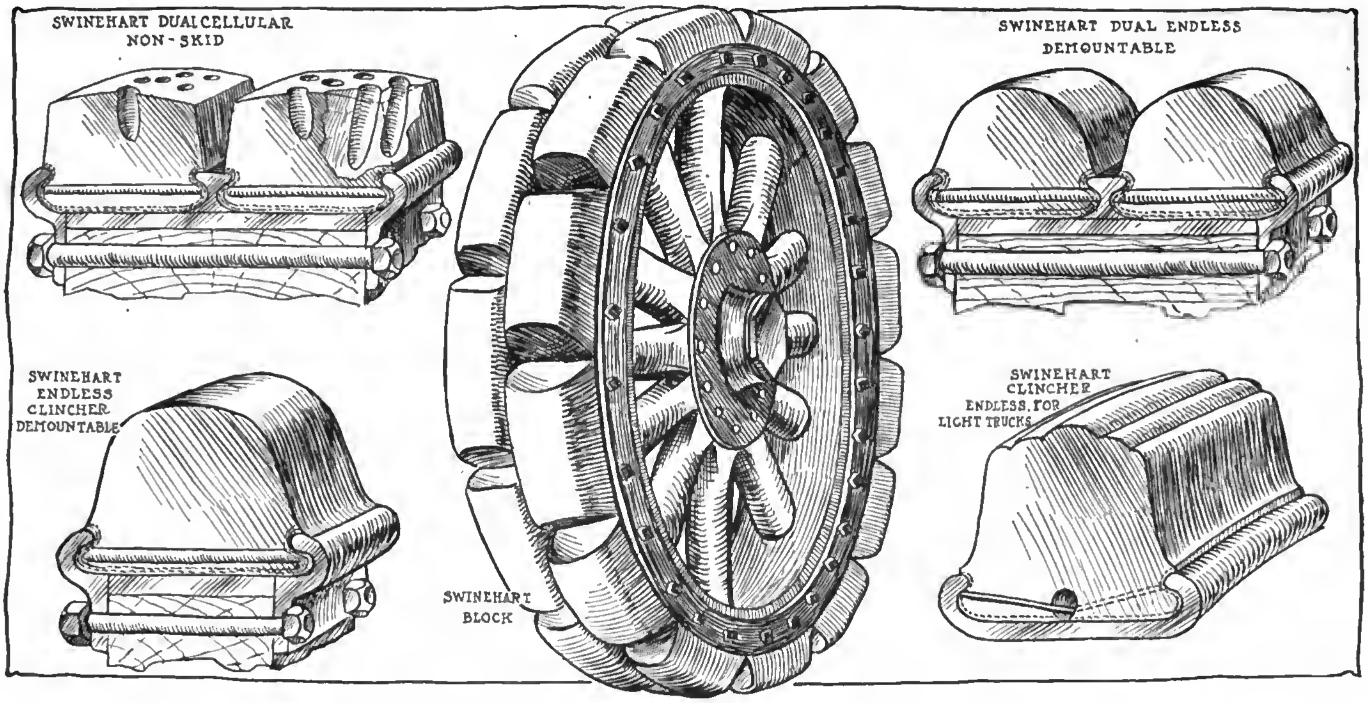


Fig. 6—Four styles of Swinehart solids and the block tread mounted on a wood commercial vehicle wheel

The Goodyear side-flange truck tire is made to the S. A. E. standard rim and side-flange specifications. A section of the tire fitted to a single rim is shown at Fig. 4. The cross wires or pins which are not shown run diagonally in the base of the tire, for which several advantages are claimed; one of which being that it is possible to tighten the side flanges and thereby increase the compression within certain limits, which would be impossible if the wire were placed straight across the tire. This tire, as can be seen from the illustration, has a soft-rubber base.

These tires can be used on dual rims, in which case a floating ring having a double clincher profile is used and placed between the tires. By tightening up the flanges the clincher sides of the tires are compressed into the four clincher grooves.

The Goodyear individual block tire is clearly shown in Fig. 4. Each block has a canvas base foundation, and the portion which is held by the metal clamps has three wires running through it parallel to the rim of the wheel.

Each block is an individual unit and is held in position on the rim by an individual retainer, the shape of block and retainer being seen in Fig. 4. It also shows a section through the tire. The sides of the retainers are bevelled at opposite angles, the inner one dovetailing under a ring placed in the center of the rim. The outside bevel rests upon a steel ring and both retainer and ring are held in position by two bolts for each retainer. In using this type of tire a separate rim is fitted over the standard S. A. E. ring.

The Goodyear no-rim-cut truck tire can be fitted to the standard Goodyear pneumatic rim. The sectional view, Fig. 4, shows that it is a soft-rubber base tire, as opposed to the hard-rubber base type, and there are two endless high-carbon steel wires running through the center of the base. The tire has concave sides. The method of applying the tire is similar to a pneumatic, except that it is necessary to use clamps to force on the inside ring B1 so that the locking ring L can be put in place.

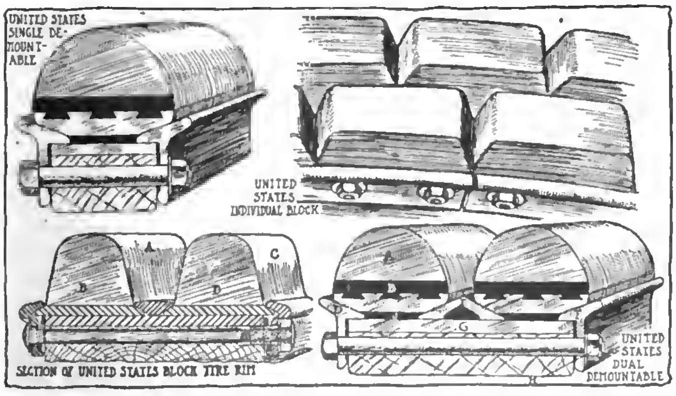


Fig. 7—United States line of some novel treads of great durability

The solid clincher truck tire can also be fitted to standard pneumatic tire rims either of the single-piece or demountable types. The section shows two wires, but these are not side wires. They run diagonally through the base of the tire and, being longer than the width of the rim, firmly wedge the base of the tire. The base is solid rubber and no machinery is needed in applying the tire. This is effected with a small hand tool supplied with the tires.

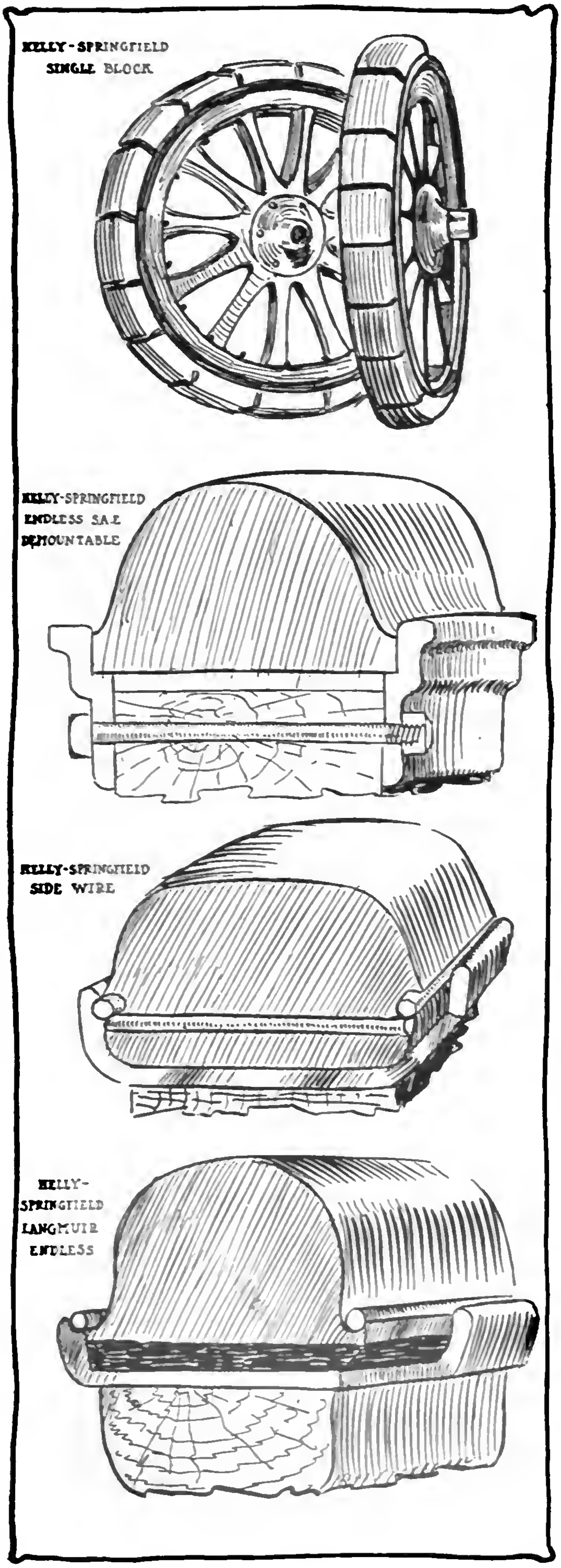
Kelly Springfield solid truck tires are manufactured by the Kelly-Springfield Tire Company, Akron, O., in five types, namely, the dual block or sectional tire; the endless S. A. E., new-type, single-block type; the side-wire type and the Langmuir endless type.

Considerable pioneer work has been done by the Kelly-Springfield company in connection with the block type of tire, having had this type on the market for some time. The rubber blocks are in single sections and have a reinforced base with three strands of wire running through it, Fig. 8. The blocks are held in position by retaining frames. The circumference of the rim is divided into three parts and these are placed over the blocks and held secure to the rim and wooden felloe by means of bolts with round heads.

The single-block tire is a new product of this company, and the method of mounting consists of two outside rings with a series of cross-bars placed between each block. The outside rings are fitted first and the cross-bars have bolts passing through them as well as through the main rim and the wooden felloe. This type of tire is especially adapted for low wheels.

Kelly-Springfield endless tires, a section of one being shown in Fig. 8, are of the soft-rubber base type with three endless wires passing circumferentially through the base. Side flanges hold the tire in position and prevent lateral movement; the wires are canvas covered.

The side-wire type, Fig. 8, differs from the endless type in the method of attachment. The base is formed with several layers of canvas imbedded into the rubber, above which are



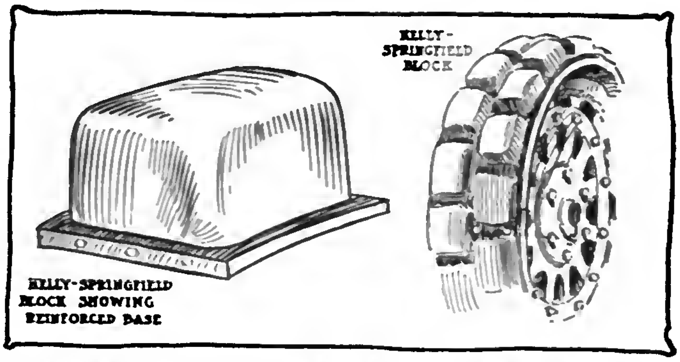


Fig. 8—Showing the Kelly-Springfield assortment of solid tires

cross wires at intervals. The tire fits into a channel rim and the bead is prevented from moving by side wires as can be seen by reference to the illustration. The Langmuir endless tire has a hard rubber and canvas base and is held onto the channel rim by side wires.

Gibney motor truck tires are only manufactured in the pressed-on type and are made by James L. Gibney and Brother, of Philadelphia at their factory at Conshohocken, Pa. These tires are of the metal and hard rubber base type, and a profile view of the tire is shown in Fig. 5. The tire is pressed on the standard S. A. E. rim and all slippage of the tire on the rim is prevented by a sunken key. It will be noticed that the sides of the tire are concave.

Up to the present, Motz cushion tires are made in various sizes, the largest of which is capable of being fitted to a truck having 2 tons capacity. They are made by the Motz Tire & Rubber Company, of Akron, O., which concern also makes a solid tire without the cushion features. The cushion or plain solid Motz tires are intended to be fitted to standard clincher or quick detachable rims as shown in Fig. 9. In the event that they are fitted to the Q. D. rim, a special tool is supplied to impress the rubber to permit the locking ring being removed, in the event that the tire is to be changed.

Excluding special tires manufactured by the Swinehart Tire & Rubber Company, Akron, O., for electric trucks, four distinct types are manufactured for gasoline trucks. These include the single and dual endless, smooth-tread tire, dual cellular non-skid tire, clincher endless tire for light trucks and the latest addition to the line, the continuous base block tire. The formation of the base of the solid endless and the cellular are identical as can be seen by referring to Fig. 6. These tires have cross wires running through the soft rubber base, which is covered below, and at the point of attachment to the side bead with rubber-coated fabric. The tires are intended for use on standard S. A. E. rims without any interliner. The clincher beads are gripped between the removable flanges, which latter are attached to the wooden felloe by a series of through bolts.

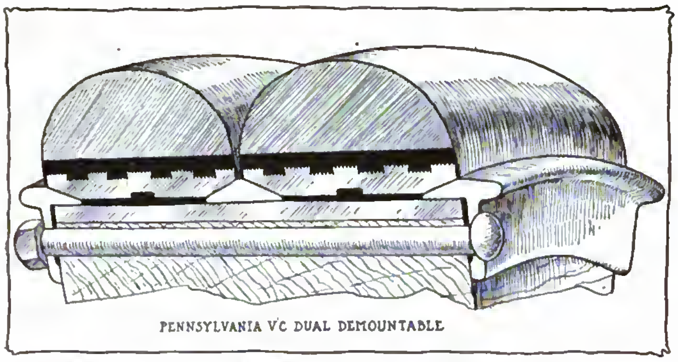
In the case of the dual tire, shown in Fig. 6 a center ring is employed having two clincher grooves. The cross wires pass well under the clincher rims thereby preventing the tire from pulling out.

The cellular tire shown in the dual form in Fig. 6 has a series of holes in the tread which form a suction grip on the road surface, besides allowing space for the displacement of the rubber thereby rendering the tire more resilient.

The new Swinehart block tire is of the continuous base type. It is demountable and is attached by means of side flanges, and fits standard S. A. E. rims without any special drilling of holes.

The Swinehart endless tire for light trucks is shown in Fig. 6. It is fitted to a clincher rim and has a series of cross wires placed at an angle from the lip of the bead to a point near the center of the base. The sectional view of this tire shows the construction clearly.

The Polack Tire Company, who recently has erected a factory at Bridgeport, Conn., is marketing two types of solid tires. These are known as the Polack European section tire and the Polack



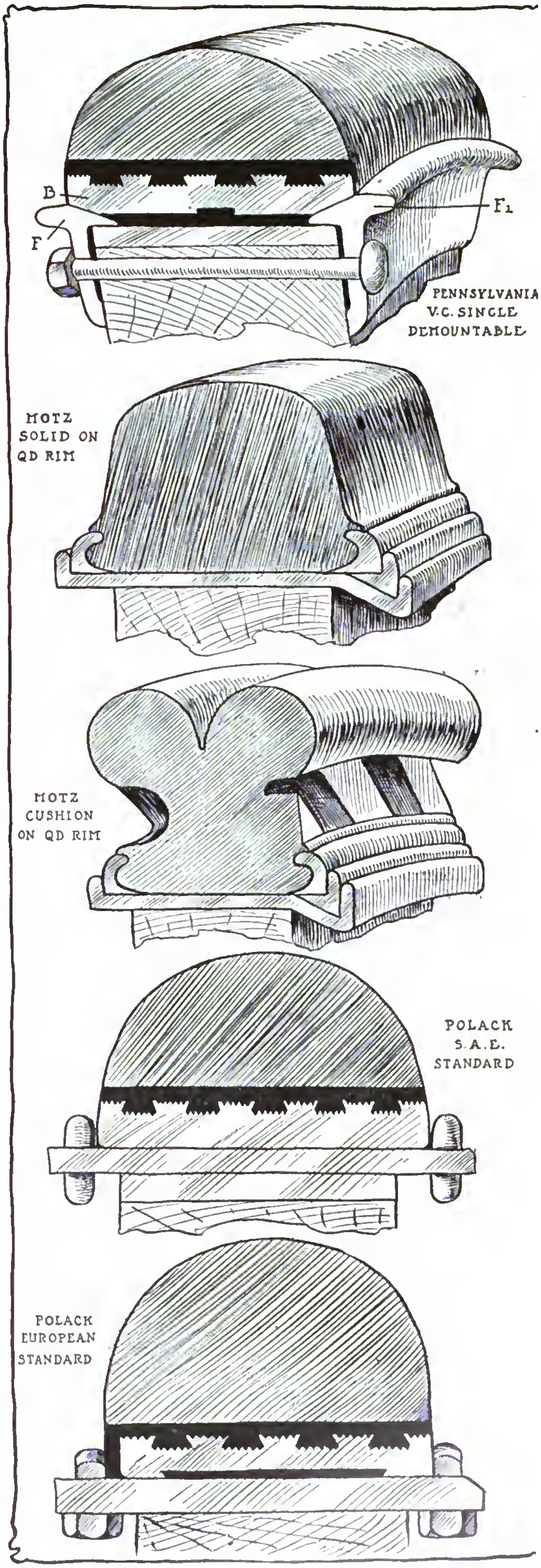


Fig. 9—The Pennsylvania demountable, Motz solids and Polack standard styles

S. A. E. standard tire. The sectional views of these tires in Fig. 9 show the principal difference between the two. The base is of steel and hard rubber in both cases. The European type tire is deeper in section than the S. A. E. standard which has a uniform sectional height of 2.75 inches. In the case of the European section, the hard rubber extends beyond the steel base on one side and all lateral movement of the tire on the rim is prevented by the T bolts shown. In this tire there is also a section of hard rubber beneath the steel, acting as a cushion. The S. A. E. section tire, of Polack make, is fitted to standard S. A. E. rims by interposing a liner between the rim and the steel base. Stout wire staples are used instead of T bolts to prevent lateral movement.

Pennsylvania V. C. motor truck tires are manufactured by the Pennsylvania Rubber Company, Jeannette, Pa., in the demountable form. They are of the hard-rubber and metal-base type. The section of the single tire, Fig. 11, shows the formation of the steel base B. It has a series of corrugations with serrated edges, on to which the hard rubber is moulded. There are also a layer of hard rubber on the under side of the rim that contacts with the permanent felloe rim. The tire is pressed over the rim and the steel B rides on the flange F, and when the second or outer flange is applied and tightened up, the double-wedge action on both sides holds the tire rigid. The flanges F and F1 are wide and project in plain view beyond the edges of the tires thereby protecting them from abrasion. The section of the dual tire, Fig. 10, shows that the same wedge action is employed. In this case, the inner sides of the steels ride on the center floating wedge ring, enabling both tires to be removed without taking off the wheel. The outside width of the tire is exactly the same as the width of the felloe, thus obviating the tendency to spring the flanges outward. The width of the flanges in the dual tire are almost double that used in the single tire.

The line of solid tire manufactured by the Republic Rubber Company, Youngstown, Pa., includes the following types: a single or dual pressed-on type; a block type; single or dual demountable, and an electric cushion tire with a staggard tread. The pressed-on tire is of the conventional form with steel and hard-rubber base. The steel has a series of wedge-shaped corrugations with serrated edges, to which a thick section of hard rubber is moulded. The profile of the soft rubber tread is slightly concave, although not so pronounced as some other tire of this type on the market. The section of the dual pressed-on Republic tire is shown in Fig. 3, in which it will be seen that an intermediary band is used between the S. A. E. rim and the steel base of the tire. Wire staples are fitted to the sides and a sunken key is employed to prevent creeping. The demountable solid tire is of the clincher bead category, with cross wires that fit under the lips of the flanges. The cross section shows the method of manufacture of this tire and the attachment to the wheel. Running through the center of the base of the tire there is a hard-rubber core through which the cross wires pass. The base of the tire is covered with a series of layers of rubber-

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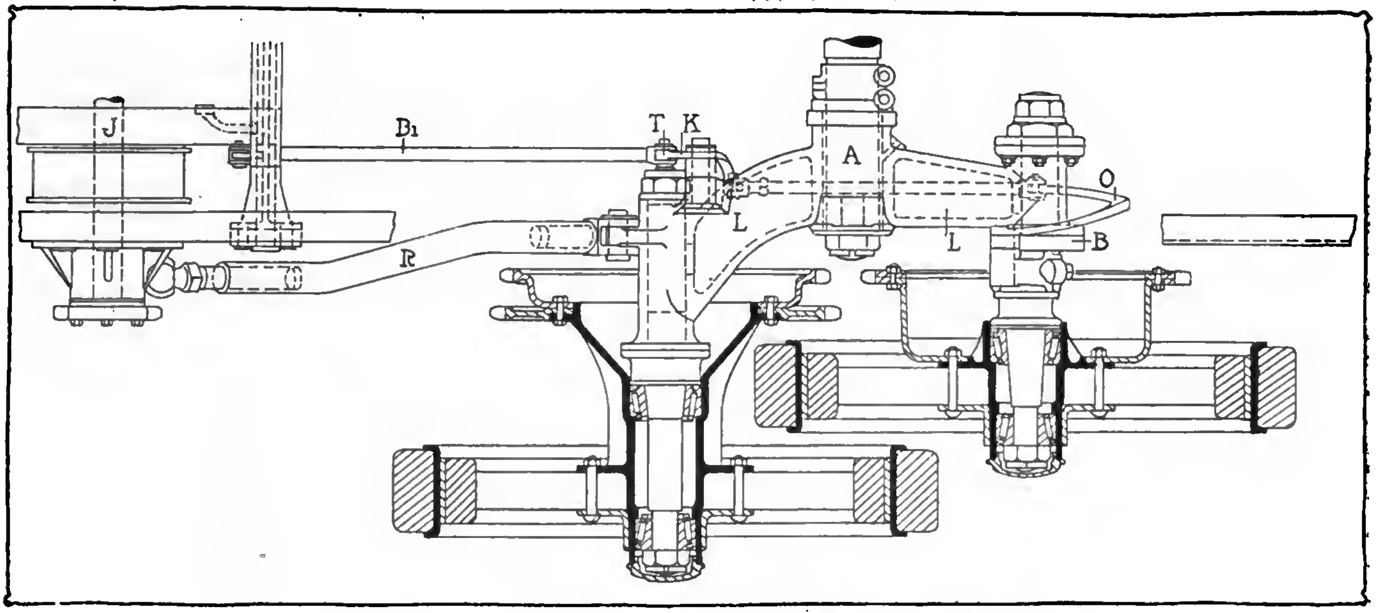


Fig. 1—Plan view of Dow dual wheel mounted on the rear end of a 5-ton Mack truck

Dow Dual Truck Wheels

Bogey Suspension Permits Use of Four Chain-Driven Rear Wheels with Many Advantages

Greater Traction, Lessened Depreciation and No Skidding Among Properties

INCORPORATING the principle of the Bogey truck with its various advantages, adapted to the requirements of freight automobile construction, the Dow dual wheel set made by the Dual Wheel Company, 1733 Broadway, New York City, is now being introduced in the truck market. The use of this wheel set includes a pair of levers having a wheel on each end and free to oscillate on the ends of the axle.

The Dow wheel is the invention of H. B. Molesworth and Charles Edgar Masterman, of London, England. The English patents having been granted, American patents were applied for and the fundamental letters patent protecting this invention is No. 907,847, granted on December 29, 1908. This patent with the other American rights was assigned to Alexander Dow.

The construction of the wheel is shown in Figs. 1 and 4, being plan and side elevation of the Dual design. As Fig. 1 shows the wheels are mounted on the ends of a lever L which is pivoted at its center on the end of the axle A. Referring to Fig. 4, it is seen that the two wheels are not the same distance from the longitudinal center line of the chassis, but that the front wheel is further from this line than the back wheel, the distance between adjacent plans of the wheels being the same as in the case of dual wheels mounted, in the ordinary way, on one axle. The drive is taken from the jackshaft J, which carries the differential to both wheels by separate chains and sprockets, both running at exactly the same speed, they being of the same diameter. The brake construction is as follows:

The brake drum B is fitted only on the rear wheels of the

Solid Tires for Commercial Vehicles

(*Continued from page 485.*)

coated fabric, and the beads of the tire are clamped in position on the steel S. A. E. felloe band by outside flanges and a series of through bolts. The block tire, which has just been placed on the market, is of the individual block type. The method of attachment differs from any other tire of this description on the market. The blocks are laid on the permanent rim and retainers in the shape of an offset figure 8 are placed over the blocks and bolts pass through the center of the retainer and the wooden felloe to secure the blocks. In addition the sides of the retainers are clamped by outside flanges. The blocks are staggard or in other words are placed alternately with the block on one side, filling the corresponding gap between two blocks on the other side.

The United States Tire Company, New York, are offering two new types of tires for motor trucks, namely the demountable and the standard block tire. The demountable tire was placed on the market last year, but the block tire is new. The demountable type tire has a steel and hard-rubber base. The inside of the metal base is beveled on both sides to fit wedge-shaped flange rings used in connection with the rim. A section of the tire is shown in Fig. 7, from which it can be seen that the standard S. A. E. rim is employed without interliners. The wooden felloe is drilled to receive the bolts that hold the side flanges in place. The flanges D and F differ in shape to most others of this class in that the wedge surface on the top continues the entire width. The spacer E is split, the same applying to the outside flanges. This permits of an increase in tension from time to time, if such is needed, and obviates the possibility of the rings freezing to the rim. To accommodate the split flange rings, the holes in them are slotted to give the rings the necessary expansion.

The United States block tire is an individual block tire in every sense of the word. Each and every block can be removed and replaced separately and the tire will fit a standard S. A. E. rim without alteration or drilling of additional holes. The sectional view in Fig. 7 shows the method by which the blocks are held in position. Each block has a steel base with chamfered sides. The sides fit under the center ring A and are held on the outside by the undercut flanges B and C. The side view of the tire, Fig. 7, shows how each block has its individual flange piece, held in position by two nuts and lock washers. Upon removal of the rim section the block can be taken out without disturbing the remainder of the tire.

system and is the emergency brake of the truck, but through the chain brakes all four wheels. The drum is intended to be operated by lever through connections, being such that when the chain between the two wheels of the system is being adjusted, it is not necessary to change the brake adjustment; the latter is not interfered with by either the front or rear wheel of the system riding over elevations or dropping into depressions. This is accomplished as follows: The brake connection rod B1 parallels the radius rod R and couples with a bellcrank K at a point T which is in alignment with the center of the hub of the front wheel of the system. The bellcrank K works on T as a center and has a connecting arm K which is hooked at its rear end. The chains between the front and rear wheels of the system are adjusted by the rear stub axle having the portion carrying the wheel eccentric to the portion in the housing. This dual system can be fitted on any standard chain-driven truck, such equipment calling for the elimination of the old axle but permitting the use of the original springs.

The springs rest on the axle A which acts purely as a weight-carrying member. Through this axle and the horizontal levers the weight is so distributed as to be carried equally by all four wheels, and the axle is so mounted that exactly twice as much weight rests on it than does on the front axle of the truck. The dual equipment itself adds about 400 pounds to a 5-ton truck. The centers of the front wheelhubs of the dual wheel equipment occupy the same position as the rear axle, before the dual construction is installed. By this arrangement the dead axle A is placed farther back, the wheelbase being consequently lengthened by 12.5 inches. The tread, on the other hand, is not increased; but, in the case of a 5-ton Mack truck, has been reduced to 70 inches, the standard tread for commercial vehicles of this type being 71 inches.

As each of the four rear wheels carries the same weight, the weight of each individual wheel is reduced 50 per cent., the tire surface being the same as in the case of single wheels. This results, of course, in a saving of tires. As the tires contact at four points with the roadbed, side-skidding is made practically imposssible; while the use of four tractive wheels in itself insures good traction under almost all conditions. Incidentally, the brake efficiency is increased—according to the claims of the maker—due to the use of four road wheels. Another advantage claimed is the saving in fuel in climbing out of a hole or over a road obstacle, as it is easier to get traction with two out of four wheels than with two wheels only; spinning of the wheels is therefore made practically impossible, since the connection of the wheels through the medium of the jackshaft keeps any individual wheel from speeding up. The vibration of the entire truck mechanism and the effect of road shocks is indeed remarkably small, as was witnessed by a representative of The Automobile during a test. The above-mentioned 5-ton Mack truck was run against a curbstone, mounting it with an almost unnoticeable shock, while holes and bumps in the road were taken with the greatest ease and producing very little vibration. This latter point is perhaps one of the most important advantages of the Dow Dual scheme, as it necessarily tends to reduce depreciation and thus results in a direct saving of money.

Fig. 2—Dow dual wheels and chain drive

Fig. 3—Dow wheels have minimum clearance

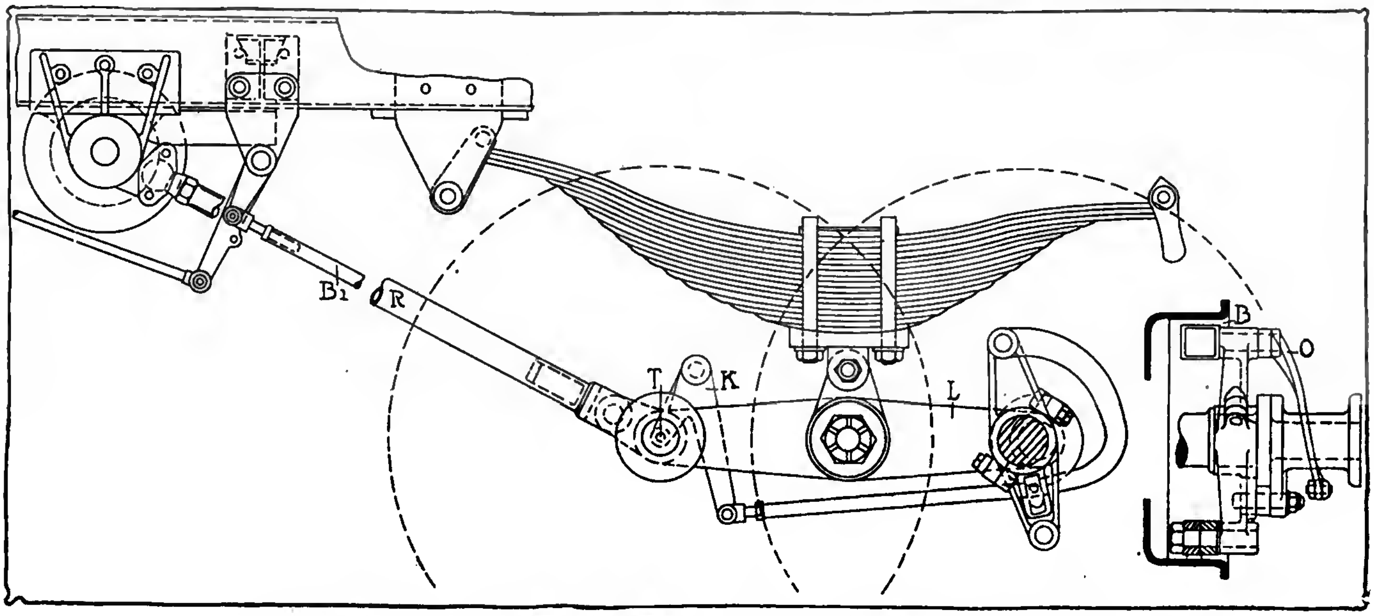
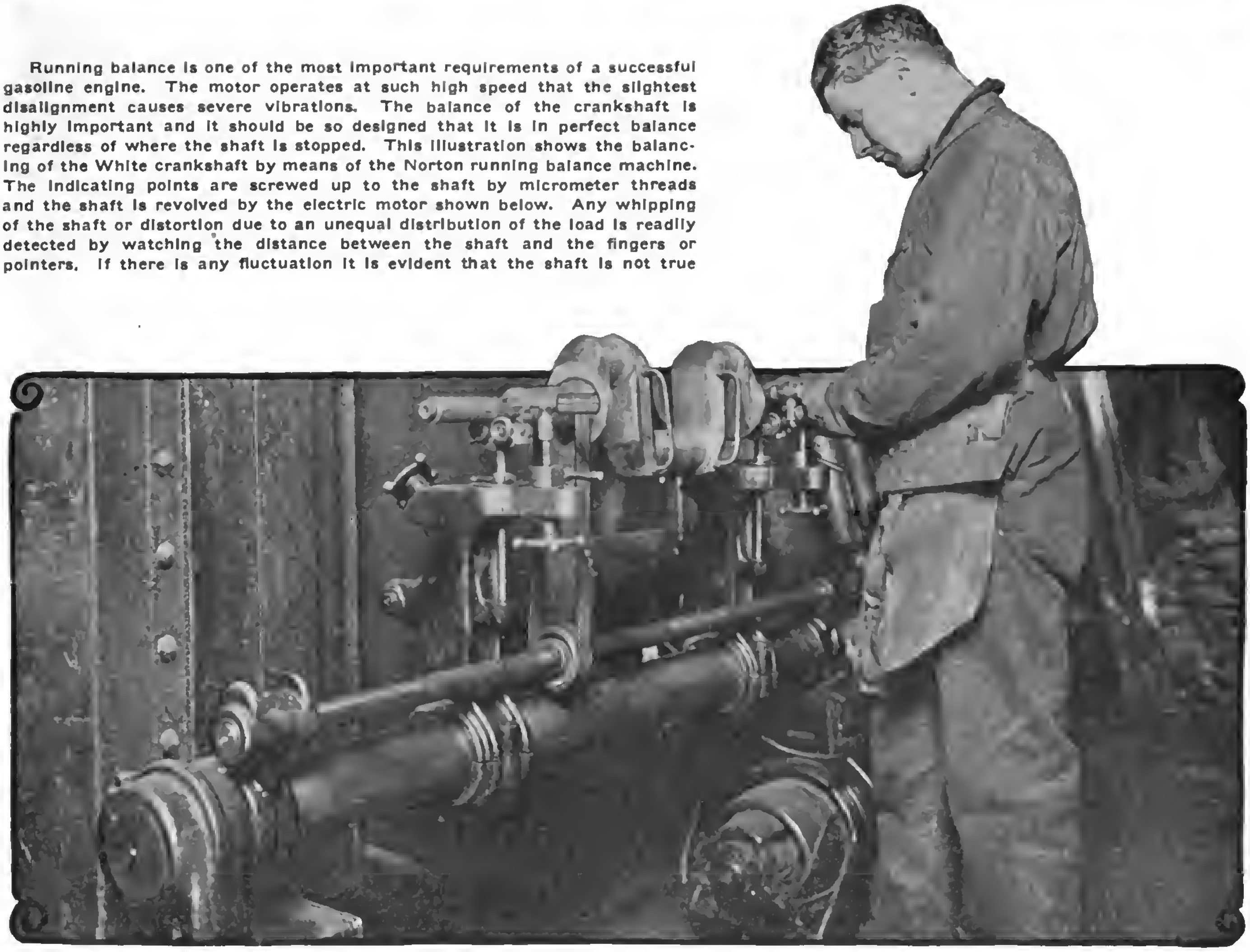


Fig. 4—Elevation of Dow dual wheel rear unit, showing brake adjustment mechanism

Factory Miscellany

Running balance is one of the most important requirements of a successful gasoline engine. The motor operates at such high speed that the slightest disalignment causes severe vibrations. The balance of the crankshaft is highly important and it should be so designed that it is in perfect balance regardless of where the shaft is stopped. This illustration shows the balancing of the White crankshaft by means of the Norton running balance machine. The indicating points are screwed up to the shaft by micrometer threads and the shaft is revolved by the electric motor shown below. Any whipping of the shaft or distortion due to an unequal distribution of the load is readily detected by watching the distance between the shaft and the fingers or pointers. If there is any fluctuation it is evident that the shaft is not true



Balancing the White crankshafts in the testing department of the company's factory at Cleveland

SANFORD Truck to Build—The Sanford Motor Truck Company has purchased from the Syracuse, N. Y., Savings Bank a brick building and will occupy it for factory purposes. Alterations and improvements are being made in the plant which has a floor space of upward of 60,000 square feet. New machinery, including a large freight elevator, is being installed. The plans call for a plant with a manufacturing capacity of 1,000 motor trucks a year.

Lee & Porter Add—The Lee & Porter Manufacturing Company, Buchanan, Mich., will erect a frame addition to its plant for making automobile axles. The new structure will be 32 feet by 90 feet with concrete foundation.

Factory for Centralia.—W. A. Perkins, Seattle, Wash., is interested in the organization of a company with a capital of $2,000,000, which will construct an automobile factory in Centralia, Wash. The proposed structure will cost about $250,000.

Work on New Pilot Factory—Construction work has started on the new addition to the plant of the Pilot Motor Car Company, Richmond, Ind. The new building, which will be two stories high and 120 feet long, will be finished in 40 days.

Bidding on Ford Plant.—Bids are being received for the structure of a five-story factory, 150 feet by 150 feet in size, for St. Louis, Mo., for the Ford Motor Car Company, Detroit, Mich. It will be of reinforced concrete and will cost approximately $150,000.

Enlarge Chalmers Plant.—The Chalmers Motor Car Company, Detroit, Mich., is reported to have made plans for the erection of a new building, with 24,000 square feet floor space, to be used for general manufacturing purposes. This will give the Chalmers a combined floor space of over 1,000,000 square feet.

More Freight Cars Needed—The traffic manager of the Ford Motor Company, Detroit, Mich., estimates that more than 30,000 cars will be needed to care for the factory's shipping during the coming year. To take care of this large amount of business five additional side tracks are being built at the factory.

New Departure's New Plant—Increased business will necessitate the immediate operation by the New Departure Manufacturing Company, Bristol, Conn., of the plant of the Whitlock Coil Pipe Company at Elmwood, Conn., recently acquired. The home plant of the company at Bristol is working to capacity. The Whitlock plant was taken on to meet the need for additional factory space.

Shows, Conventions, Etc.

Jan. 27-Feb. 13....Troy, N. Y., Annual Show, State Armory, Troy Automobile Club.
Feb. 8-15..........Hartford, Conn., Annual Show, State Armory, Hartford Automobile Dealers' Association.
Feb. 8-15..........Minneapolis, Minn., Annual Automobile Show.
Feb. 10-15.........Chicago, Ill., Truck Show.
Feb. 10-15.........Winnipeg, Man., Show, A. C. Emmett.
Feb. 10-15.........Ottawa, Ont., Ottawa Motor Show, Howick Hall, Louis Blumenstein.
Feb. 11-15.........Binghamton, N. Y., Annual Show, State Armory. Dealers' Association, R. W. Whipple.
Feb. 15-22.........Albany, N. Y., Annual Show, State Armory, Dealers' Association.
Feb. 15-22.........Newark, N. J., Annual Automobile Show, First Regiment Armory, New Jersey Automobile Exhibition Company.
Feb. 16-23.........Richmond, Va., Annual Show.
Feb. 17-22.........Kansas City, Kan., Annual Automobile Show.
Feb. 18-19.........Madison, Wis., Annual Show, City Market Building, Dealers' Association.
Feb. 18-21.........Grand Forks, N. D., Annual Show, Auditorium, Dealers' Association.
Feb. 18-22.........Baltimore, Md., Annual Show, B. A. D. A.
Feb. 19-22.........Bloomington, Ill., Annual Show, Coliseum, McLean County Automobile Club.
Feb. 19-22.........Geneva, N. Y., Automobile Show, Armory, Louis Blumenstein.
Feb. 19-22.........Kalamazoo, Mich., Annual Show.
Feb. 19-23.........New Orleans, La., Annual Show.
Feb. 19-27.........Topeka, Kan., Annual Show.
Feb. 20-22.........Canandaigua, N. Y.. Automobile Show, Louis Blumenstein.
Feb. 22-Mar. 1....Brooklyn, N. Y., Annual Show, 23rd Regiment Armory.
Feb. 24-27.........Kansas City, Mo., Truck Show.
Feb. 24-Mar. 1....St. Louis, Mo., Annual Show.
Feb. 24-Mar. 1....Memphis, Tenn., Annual Show.
Feb. 24-Mar. 1....Omaha, Neb., Annual Automobile Show.
Feb. 24-Mar. 1....Paterson, N. J., Annual Show, Paterson Automobile Trade Association.
Feb. 24-Mar. 5....Cincinnati, O., Annual Show, Music Hall, Cincinnati Automobile Dealers' Association.
Feb. 25-28.........Eau Claire, Wis., Annual Show, Armory, Dealers' Association.
Feb. 25-Mar. 1....Syracuse, N. Y., Annual Show, Syracuse A. D. A.
Feb. 26-Mar. 1....Fort Dodge, Ia., Annual Show.
Feb. 26-Mar. 1....Glens Falls, N. Y., Automobile Show, Louis Blumenstein, Manager.
Feb. 27-Mar. 1....Toronto, Ont., Annual Show, Toronto Automobile Trade Association.
March 3-8.........Bridgeport, Conn., Show, Park City Rink, B. B. Steiber.
March 3-8.........Denver, Col., Annual Show, Municipal Auditorium.
March 3-8.........Springfield, Mass., Automobile Show, New Auditorium Building, United Amusement Company.
March 3-18........Des Moines, Ia., Annual Show, Pleasure Car Section, Coliseum, Dealers' Association.
March 5-8.........Tiffin, O., Annual Show, Tiffin *Daily Advertiser*.
March 5-8.........Louisville, Ky., Annual Show, Dealers' Association.
Mar. 5-8..........London, Ont., Annual Show, Drill Hall, Louis Blumenstein.
March 8-15........Boston, Mass., Annual Automobile Show.
Mar. 8-15.........Columbus, O., Annual Show, Billy Sunday Tabernacle, Automobile Club and Trades' Association.
March 12-15.......Ogdensburg, N. Y., Automobile Show, Louis Blumenstein, Manager.
March 19-26.......Boston, Mass., Annual Truck Show.
March 20-24.......New Orleans, La., Annual Show, N. O. A. D. A.
March 24-29.......Indianapolis, Ind., Annual Automobile Show.
March.............Nashville, Tenn., Annual Show, Nashville Automobile Dealers' Association.
March.............Pittsburgh, Pa., Annual Automobile Show.

Race Meets, Runs, Hill Climbs, Etc.

May 30............Indianapolis, Ind., 500-Mile Race, Speedway.
July 27-28..........Tacoma, Wash., Tacoma Road Races.
Nov. 24............Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 26............Savannah, Ga., Grand Prize Rice, Automobile Club of America.

Foreign

March.............France, Sealed Bonnet, 3000-Mile Run.
March 31..........Montevideo, Uruguay, International Competition of Agricultural Motor Vehicles.
April..............Barcelona, Spain, International Exhibition.
May...............St. Petersburg, Russia, International Automobile Exposition, building of Michael Maneze, Imperial Automobile Club of Russia.

Wright Leaves Springfield Body.—J. A. Wright, body designer and general foreman of the Springfield Metal Body Company, Springfield, Mass., has gone to New Haven, Conn. He is now with the New Haven Carriage Company.

Morrow's One-Story Addition—The Morrow Manufacturing Company, Elmira, N. Y., manufacturer of automobile parts and accessories, has plans in progress for a one-story addition to its plant, which will add about 50,000 square feet of floor space.

Michigan Builds New Office.—The Michigan Motor Car Company, Kalamazoo, Mich., is preparing to erect a new office building on a vacant tract adjoining its factory. The new structure will be equipped in the most up-to-date manner and will represent an outlay of $250,000.

Appraisers Examine Knox Factory—The entire assets, real and personal, of the Knox Automobile Company, Springfield, Mass., are now being appraised by the American Appraisal Company. No definite action on the proposition to reorganize the company will be taken until a full inventory of the plant is taken.

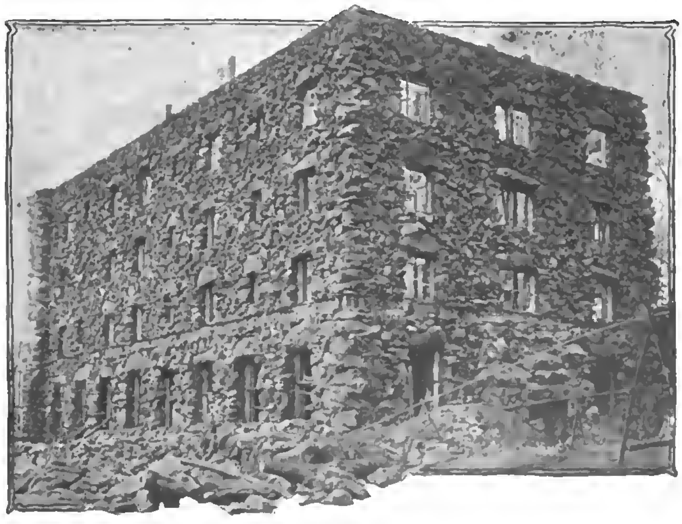
Ford Assembling in Hutchinson—Arrangements have been made with a Hutchinson, Kan., automobile concern by the Ford Motor Car Company, Detroit, Mich., to utilize part of the establishment for the assembling of Ford cars for the central and western parts of Kansas. The work is expected to give employment to about thirty men.

Steel Wheel Company Builds—The Steel Wheel Company, Bethlehem, Pa., which will manufacture a spring steel wheel for use on automobiles and motor trucks, will shortly locate a factory on Broad street in that city. It will be of three stories with ample floor space for the assembling of machines and the manufacture of wheels.

Gould to Superintend Alco Manufacture—J. W. Du B. Gould, of 30 Church street, New York City, has made arrangements to connect with the American Locomotive Company, Providence, R. I., in the capacity of an efficiency engineer. He will superintend the manufacture of automobiles with a view to obtain greater factory efficiency.

Davis-Bach's New Plant—The Davis-Bach Manufacturing Company has established itself in a model plant at Alliance, O. Incorporated under the laws of Ohio, the new industry will specialize in the manufacture of autmobile parts and steel stampings, and also its own line of radiators, airless tires, horns, etc. C. H. Davis is president, and J. J. Schmidt, vice-president.

Budd Buys Grabowsky Plant—Negotiations have been completed by which the Edward G. Budd Manufacturing Company, Philadelphia, Pa., purchases the plant formerly occupied by the Grabowsky Power Wagon Company, Detroit, Mich. Extensions will be begun immediately to cost about $200,000. The property purchased contains a modern reinforced concrete factory building, four stories in height, containing 72,000 square feet of floor area and a modern power building. It is planned to begin at once the erection of a factory building that will contain about 135,000 square feet. Between 300 and 500 men will be employed, and it is expected the plant will have an output of at least 30 completed bodies a day by next May. The company manufactures pressed steel bodies for commercial and pleasure cars, the parts being welded to form one piece, practically without joints or seams.



East wing Grove Park Inn made from crude mountain road rock

News of the Week Condensed

Packard truck of 3 tons capacity drawing a wagon train of fifteen wagons up a North Carolina mountain

MIDSUMMER Show for Detroit—Harry Fosdick, director of sales for the Hupp Motor Car Company, Detroit, Mich., states that there is only one drawback in regard to automobile shows, and that is the time of holding the events. He thinks that the most opportune time is in midsummer, just after the different manufacturers announce their new models, and he with a number of manufacturers made a proposal during the recent New York show to the effect that it would be for the advantage of all concerned to stage the next national show at Detroit at that time of the year.

Havers Makes Hard Trip—J. R. Elliott, of Portland, Ore., recently drove a Havers car from that city to Medford, a distance of 300 miles, over the roughest roads of that state.

Wheeler with Johns-Manville—The H. W. Johns-Mansville Company, New York City, has appointed C. L. Wheeler as traveling representative in its Atlanta, Ga., territory.

Handles J. M. Shock Absorber—The Powell-Elliot Auto Repair Company, Brooklyn, N. Y., has acquired the general agency for that city and Long Island for the J. M. shock-absorber.

Manitoba Spends $1,000,000—A report issued by the Highways Commissioner for the Province of Manitoba shows that a sum over $1,000,000 was spent during 1913 on the highways of the province.

Taffinder Retires—S. N. Taffinder, of Monterey, N. L., Mexico, has retired from the management of the Fronterizo Garage, for which he previously held power of attorney from Antonio Elosua and his wife.

Automobile Conference—The Automobile Underwriters' Conference met recently and elected officers for the ensuing year as follows: C. F. Jungman, president; W. F. Whittlesy, vice-president, and D. F. Cox, secretary.

Fisk Factory Branch in Winnipeg—The Fisk Rubber Company of New York City has opened a direct factory branch in Winnipeg, Man. The branch is one of the first in Canada to be operated directly by the factory which manufactures the tires.

Service Department Established—Joseph Maw & Company, Ltd., Winnipeg, Man., has established a service department in its agency with Frederick Sager manager. One of the principal functions of the department is the instruction and education to the owners in the proper care of their cars.

Mitchells for Moving Pictures—Both the Kinemacolor and the Universal Film companies, with three others—the Majestic, Carlton and Vitagraph—are using Mitchells in their moving pictures and also for the transportation of the actors and paraphernalia to and from the scene of the plays.

Car Ordered by Wireless—What is probably the first order ever taken via wireless by an automobile salesman was recorded recently by G. N. Jordan, Los Angeles, Cal., branch manager for the R-C-H car. The order came from C. E. Hansen, who was aboard the steamer Mauretania returning from Europe.

Korea's Seventh Car Hudson—Korea recently bought its seventh car, a Hudson. All of the cars are American makes and their importation has extended over a period of 4 years. The fewness of automobiles in that country is probably due to the fact that it is a very mountainous region and has very few good roads.

Corbin Speedometer on Keeton—Colonel Wilbur C. Brown, general sales manager of the Corbin-Brown speedometer division of the American Hardware Corporation, New Britain, Conn., has arranged to outfit the Keeton car entered in the Indianapolis, Ind., 500-mile race with a 200-mile speedometer, something never before made.

Inter-Provincial Highway Movement—The movement for the construction of an inter-provincial highway between Montreal and Toronto and Montreal and Ottawa is meeting with success. This highway entails the construction of bridges connecting Montreal with the mainland from a point at St. Anne de Bellevue to Ile Perrot and another bridge from Ile Perrot to a point in Vaudreuil County.

Amend Automobile Bill—The Dunn automobile license bill, up for hearing recently before the House Tax Committee in St. Paul, Minn., probably will be amended to eliminate a license based upon the horsepower of automobiles and to fix a flat registration fee for each machine of about $10. It is probable that the money collected from automobile registration will be distributed among the counties for road purposes, instead of being handled directly by the State highway commission, as the bill provides.

Texas Motor Speedway Formed—J. D. Christenson, of St. Louis, Mo., is named as the principal stockholder in the Texas Motorway Company, which has just been organized for the purpose of constructing an automobile highway between Dallas and Del Rio, Tex., a distance of approximately 500 miles. The company has a nominal capital stock of $10,000, divided into 100 shares of $100 each. Mr. Christenson owns sixty-four of the shares, G. W. Baker, of Dallas, thirty-five, and G. L. Cade, of Dallas, one.

New Agencies Established During the Week

PLEASURE CARS

Place	Car	Agent
Allantic City, N. J.	Moon	Harry T. Erpenback
Baltimore, Md.	Pathfinder	L. M. Vordemherge Motor Co.
Baltimore, Md.	Stoddard-Dayton	A. Trust Poehlmann
Brooklyn, N. Y.	Moon	Dunham Auto Co.
Charlotte, N. C.	Franklin	Woodside Motor Co.
Deer Lodge, Mont.	R-C-H	G. Van Arsdale
Des Moines, Iowa	Moon	Central Iowa Motors Co.
Durange, Colo.	R-C-H	D. R. McKinney
Evant, Tex.	R-C-H	C. W. Workman
LaFayette, Ind.	R-C-H	Geo. B. Doyle
Lake City, Minn.	R-C-H	Zwick Bros.
Littleton, N. H.	R-C-H	Gadhois & Greenwood.
Milford, Ind.	R-C-H	R. W. Method
Minneapolis, Minn.	King	Barclay Automobile Co.
Montclair, N. J.	Moon	Montclair Garage & Machine Co.
Montreal, Que.	Hupp-Yeats	C. W. Doheny
Montreal, Que.	Locomobile	Provincial Motors, Ltd.
Montreal, Que.	Ohio	C. W. Doheny
Passaic, N. J.	Moon	Sheely Motor Car Co.
Presho, S. Dak.	Moon	Reetz & Brown
Red Bank, N. J.	Moon	Fred H. Van Dorn
Redlands, Cal.	R-C-H	Jas. H. Maize, Jr.
Redwood City, Cal.	R-C-H	Miller Paulsen
Rochester, N. Y.	Franklin	MacCollum and Stevens
Saginaw, Mich.	R-C-H	Oliver B. Whipple
San Diego, Cal.	R-C-H	C. deBlinn
San Diego, Cal.	R-C-H	E. C. Bigelow
Sioux Falls, S. Dak.	Moon	Hessinius Auto Co.
Tabor, S. Dak.	Moon	Tabor Mercantile Co.
Union Hill, N. J.	Moon	Clifton Auto Co.
Victor, Colo.	R-C-H	Bert Snyder
Waltham, Mass.	R-C-H	Ernest R. King
Washington, D. C.	Moon	Moon Motor Car Co.

COMMERCIAL VEHICLES

Place	Car	Agent
Baltimore, Md.	Commerce	Square Deal Auto Co.
Boston, Mass.	Westcott	Westcott Motor Company
Buffalo, N. Y.	Westcott	Mutual Motor Car Co.
Pittsburg, Pa.	Westcott	Westcott Motor Sales Co.
Washington, D. C.	Commerce	Loffler Co.

ELECTRIC VEHICLES

Place	Car	Agent
Montreal, Que.	Buffalo	Universal Electric Company.

Seymour with White—Joseph Seymour has joined the selling force of the White company in New York City.

Bill with Disco Starter—H. L. Bill, of Detroit, Mich., has become manufacturing expert for the Disco Starter Company, of that city.

Bates with Firestone—G. J. Bates has recently connected with the Firestone Tire & Rubber Company, Akron, O., having charge of the sales in the pneumatic tire department.

Automobile Trade in Mexico—Three passenger automobiles and two motor trucks, all of American make, have been imported into northeast Sonora, Mexico, within the past 2 months.

New Georgia Road—It has been decided to begin immediately the construction of a temporary highway through the great Altamaha swamp, which will, as rapidly as possible, be made a part of the Savannah, Ga.,-Jessup highway.

Lexington Club Elects—The New Lexington Automobile Club, New Lexington, O., has elected the following officers for the year: C. C. Chappelear, president; H. A. Lowe, vice-president; C. L. Chuet, secretary, and J. O. Cullen, treasurer.

Philadelphia Tire Firms Combine—The M-S-H Sales & Rubber Company and Meeley Tire House, Philadelphia, Pa., have been consolidated and will hereafter be known as the Meeley Rubber Company, Inc., with headquarters at 660 North Broad street.

Inspector to Enforce Laws—The Ohio State Automobile Department, located in Columbus, O., will soon start out a traveling inspector to make the rounds of Ohio cities with a view of inforcing the State automobile law with reference to securing 1913 number plates.

Supply House in Bankruptcy—Millie Wachman, operating under the name of the U. S. Auto Supply & Manufacturing Company, Detroit, Mich., has filed a petition in bankruptcy in the United States Court. The assets are given at $9,100 and the liabilities at $10,731.45.

Jiffy Directors Re-Elected—At the annual meeting of stockholders of the Jiffy Auto Curtain Company, held in Chicago, Ill., recently, the entire board of directors holding office this past year were re-elected and the reports of business for the past year were presented.

Auburn's Fire Apparatus—Auburn, N. Y., will have after February 15, when work will be completed, a completed equipped automobile fire apparatus. The station cost $15,000 and is used by Automobile Fire Company No. 3, which has been especially drilled for the new service.

Automobile Trade Association—Owners of garages and automobile repair establishments of Beaumont, Tex., recently formed the Beaumont Automobile Trades Association with all the seven proprietors in the city as members. J. G. Minter is president; C. A. Ross, vice-president and H. P. Jirou, secretary.

Milwaukee's Fire Equipment—Milwaukee, Wis., recently installed a motor-propelled fire-fighting equipment, a combination hose, chemical and flying squadron car built by the Stegeman Motor Car Company, of that city, at a price of $5,500 with full equipment. The accompanying illustration shows the truck.

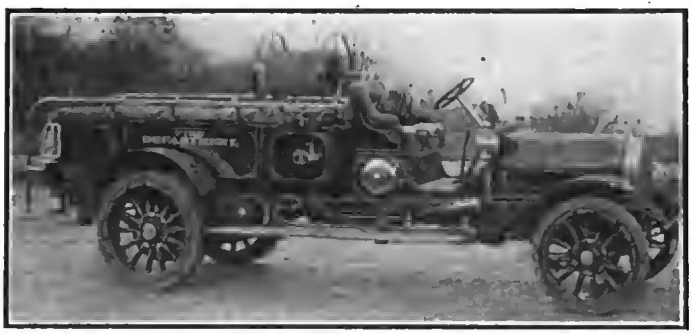
Savannah Dealers Form Organization—Savannah, Ga., automobile dealers have formed a temporary organization and set a time and place for a more formal meeting at which a permanent organization will be perfected. J. E. Finney, agent for the Buick people, was made temporary chairman. The purpose of the organization is to encourage better business methods by co-operation.

Manchurian Passenger Service—An automobile passenger service has been inaugurated between Tsitsihar and Blagovestchensk by the Eikhenbaum Company, Pristan, Harbin, Manchuria, China. Two closed and one open automobiles are to be used and the fare for a single trip in either direction is in the former 100 rubles, $51.50, and the latter 75 rubles, $38.63; 36 pounds of baggage will be allowed.

Ohio Treasury Enriched—The Ohio State treasury was enriched $153,034.17 when a certified check for that amount was turned over to Treasurer Brenneman by J. A. Shearer, Ohio register of automobiles. The amount represented the receipts of the department for the month of January less the expenses of the department. The total receipts were $169,319.65 and the expenses $16,327.52. The gain over the same month last year was $59,068.40.

Drivers' Club Formed—The Auto Drivers' Protective Association of Minneapolis, Minn., has been formed and has quarters at 735 Temple Court. The officers are: President, B. C. Montgomery; vice-president, W. H. Feitzler, and secretary-treasurer, B. M. Emerson. Mr. Geitzler will be manager. The purpose is to put driving on a good basis, to get legislation to control speed and to protect the right of its members, provide attorneys in case of arrest and hospital care in case of accident.

"Little Chunk of Cole" at the Chicago Cole Exhibit—He just smiles



New Stegeman flying squadron car of Milwaukee Fire Department

Jones Manager of Cole—H. S. Jones has been appointed manager of the Cole Motor Company, Philadelphia, Pa.

Will Attend Washington Convention—A delegation of merchants and farmers from Louisiana will attend the good roads convention in Washington, D. C., in March.

Bradford Now Manager—B. C. Bradford of Detroit, Mich., has taken the position of manager of the United Motor, Columbus, O., Company, succeeding F. E. McClure.

Organize Wabash Automobile Club—Wabash, Ind., automobilists held a meeting recently and organized an automobile club. C. H. LaSalle was named chairman and William Dixon, secretary.

Cortland Automobile Club's Banquet—The annual banquet of the Cortland Automobile Club was held at the Messinger Hotel, Cortland, N. Y., recently, and 230 members, with many friends, were present.

Wage Earners Number 75,721—The number of wage earners in the automobile industry in the United States is 75,721, and the automobile wage standard is said to be estimated somewhat higher than that of other industries.

Fort Atkinson Club Elects—The annual election of the Fort Atkinson, Wis., Automobile Association resulted as follows: President, Gavin Coppins; vice-president, R. F. Colby; secretary, C. A. Downing, and treasurer, G. E. Ward.

Peerless Sales Company Formed—The Peerless Sales Company, Ltd., Winnipeg, Man., was recently formed to sell the Peerless filler. This new concern is backed by prominent Winnipeg men and has for its managing director G. E. Webb.

Fire in Chicago Salesrooms—Fire destroyed $30,000 worth of goods in the building at the Gardner Engine Company's Chicago, Ill., building. The Hester Manufacturing Company and the Motor Car Supply Company also occupy this building.

Peerless Moves in Columbus—The Columbus, O., branch of the Peerless car, of which F. J. Girard is manager, has moved its salesroom and service department to 168 North Fourth street. The new salesroom and repair shop is 168 feet by 35 feet.

Meyers Studebaker Manager—Henry Meyers has taken charge of the wholesale distribution of Studebaker cars and trucks for New England in the place of Philip Hawley, who resigned a few weeks ago, making Boston, Mass., his headquarters.

Amends By-Laws—The St. Louis, Mo., Automobile Manufacturers' and Dealers' Association has amended its by-laws to prevent exhibitors at the spring show held in the Coliseum each year, exhibiting at the show given by the association in the fall of each year.

New Tire Filler—A patent has been granted on a tire filler to A. J. Causey, sheriff of Amite County, Miss. A company has been formed to exploit the invention. The concern has applied for a charter under the name of Causey No-Leak Manufacturing Company.

Wants Automobiles—The purchase of automobiles for the use of the automobile bureau of the secretary of state in Albany, N. Y., and Buffalo will be recommended to the Legislature by Secretary May. The cars are needed to try out applicants for chauffeurs' licenses.

Goodyear Sales Large—At a banquet held recently by the Goodyear Tire & Rubber Company, Akron, O., in Chicago, Ill., F. A. Seiberling, president of the company, announced that the Goodyear sales for the year 1912 approximtaed $25,000,000, nearly doubling the sales of 1911.

Miller Sells His Interests—A. R. Miller of Barthel, Daly & Miller, New York City, importers of Schafer ball bearings, has sold his interest to the remaining partners. Mr. Miller will still continue as western representative for the firm, which will be known in the future as Barthel & Daly.

Baltimore Club Meets—The regular monthly meeting of the Automobile Club of Maryland, Baltimore, Md., was held at its clubrooms recently and the evening was spent in the discussion of the advisability of ordinances regarding the emission of smoke and the elimination of powerful lights from automobiles in the city.

Farmers' Day Show Feature—One of the features of the annual automobile show to be given at the Billy Sunday Tabernacle, Columbus, O., on March 8, will be farmers' day, which has been fixed for March 14. It is the intention to make this day one for the rural population of the state and a special program will be arranged.

Big Los Angeles Sale—The sale of half interest in the Pacific Coast Simplex and Mercer Agency by George Bentel of Los Angeles, Cal., to George Mackey of the same city, has just been announced. The deal is one of the largest and most important of the season as the territory controlled extends into Canada and south to Mexico.

Chance for American Agency—An American consular officer has forwarded a copy of a letter from a foreign government which desires to substitute automobiles generally for horses and carts for carrying rural mails. His company also desires to deal in automobiles, availing itself of the mail service as an advertising medium. As gasoline is an expensive item in that country, the firm wants a make which would be economical in that respect. If it can obtain cars run on kerosene, which can be depended upon, this will be a controlling factor in making selections. Those interested will get all information at the Bureau of Manufactures, Washington, D. C., file No. 10,359.

Automobile Incorporations

AUTOMOBILES AND PARTS

ALEXANDRIA, VA.—Express Spark Plug Company of America Incorporated; capital, $10,000 to $200,000. Incorporators: C. H. Duffey, John Keane, Leo Loughran.

ANDERSON, O.—Clark-Moody Automobile Company; capital, $10,000; to deal in automobiles. Incorporators: John D. Clark, Louis W. Moody, Maud B. C. Clark, Anna M. Moody.

CINCINNATI, O.—Powel Crosley, Jr.; capital, $30,000; to manufacture a six-cylinder car.

CLEVELAND, O.—Chandler Motor Car Company; capital, $1,000. Incorporators: Isadore Grossman, Claude W. Sbimmon, Harry C. Gahn, E. L. Fraser, S. D. Howells.

CLEVELAND, O.—Motor Van Delivery Company; capital, $10,000; to carry on a general trucking business. Incorporators: Elizabeth Grabam, S. T. Stewart, John R. Gaunter, Alice B. Gaunter, O. D. Eshelman.

COATESVILLE, PA.—Watts Wagon & Automobile Company; capital, $5,000. Incorporators: F. N. Watts, Robert C. Birmingham, H. J. Faust, F. N. Pratt.

CONNERSVILLE, IND.—Howard Motor Car Company; capital, $10,000; to manufacture sutomobiles and accessories. Incorporators: Guilford C. Babcock, Harry Tuttle, Clarence L. Millard.

DETROIT, MICH.—Detroit Trailer Company; capital, $5,000; to manufacture automobile trailers and accessories. Incorporators: Stanley R. DuBrie, William H. Turner, A. C. Turner.

EL PASO, TEX.—Longwell Automobile Truck and Sales Company; capital, $10,000; to deal in motor trucks. Incorporators: J. J. Longwell, H. M. Andreas, J. A. Tays.

FT. WAYNE, IND.—Fox-Shryock Auto Company; capital, $10,000; to do an automobile sales business. Incorporators: William W. Sbryock, Bartlett W. Shryock, George T. Fox.

GREENVILLE, O.—York Supply Company; capital, $25,000; to deal in automobiles, supplies and accessories. Incorporators: C. F. York, C. H. York, A. Z. Heller, J. H. Byord, Lillie N. York.

KINGSTON, PA.—D. and H. Auto Company; capital, $25,000; to buy, sell and deal in and witb electric, steam and gasoline vehicles. Incorporators: John M. Deatrich, J. G. Harris, Lester Harris.

KNOXVILLE, PA.—Hollis Automobile Traction Company; capital, $250,000; to manufacture, deal and sell in and with motor vehicles and all accessories thereto. Incorporators: O. A. Hollis, J. H. Mering, R. W. Egan.

MERCEDES, TEXAS.—Sterling Automobile Company; capital, $10,000. Incorporators: A. H. Crawford, W. D. Chadwick, G. E. Simpson.

MOBILE, ALA.—Mobile Overland Company; capital, $8,000; to deal in automobiles. Incorporators: Morgan L. Duke, Henry Tonsmeire, Norwood A. Richards.

NEW YORK, N. Y.—Accessories Sales Company; capital, $50,000; to manufacture, sell and deal in and with automobiles and all accessories thereto. Incorporators: Charles Hymann, James R. Howe, Jr., Forrester A. Gin.

NEW YORK, N. Y.—Atlantic Transportation Company; capital, $10,000; to engage in the trucking business. Incorporators: William T. Gridley, Alhert B. Colton, Paul Englander.

NEW YORK, N. Y.—Chrome Manufacturing Company Incorporated; capital, $25,000; to deal in motor and other vehicles. Incorporators: James E. Marshall, Wm. H. Buckley, William P. Green.

NEW YORK, N. Y.—Dann-Gorman Company Incorporated; capital, $10,000; to deal in automobiles. Incorporators: Thos. F. Dann, John L. Gorman, John B. Gouger.

NEW YORK, N. Y.—Veersc Motor Truck Company Incorporated; capital, $10,000. Incorporators: Harry B. McGinley, Edward L. Whittemore, Geo. H. Hinnau.

NORFOLK, VA.—Tidewater Automobile Association Incorporated; capital, $500 to $15,000. Incorporators: D. P. Paul, M. Levy, C. L. Young, J. K. Water.

Nadall with Stewart-Warner—Berne Nadall has joined the staff of the Stewart-Warner Speedometer Corporation, Chicago, Ill.

Bergougnan Tires in New York—The French Etablissement Bergougnan, which is preparing to invade the American market with its tires, has leased the premises at 49 West Sixty-fourth street, New York City.

Bryant Resigns from Franklin—G. H. Bryant has resigned as advertising manager of the Franklin Automobile Company, Syracuse, N. Y. He is succeeded by W. M. Williams, who has been assistant advertising manager.

Club After Noisy Automobilists—Noisy automobilists and motorcycles and irresponsible chauffeurs are being raked over the coals by the Savannah, Ga., Automobile Club. Automobiles with open mufflers are the greatest nuisances.

Hagerstown's Automobile Show—At a meeting of the 25 automobile agencies at Hagerstown, Md., arrangements were made to hold an automobile show. At least 100 cars will be on exhibit. The show probably will be held the first week in March.

Automobiles for Agricultural Work—The automobile is to be generally used in agricultural extension and development work in Minnesota. Seven automobiles are to be added this year to the extension equipment of the agricultural department of the University of Minnesota.

Ontario and Quebec Licenses—Mayor Ellis recently returned to Toronto, Ont., giving notice that he would at the next session of the Legislature move to amend the law relating to automobile traffic. This means that the Legislature will be asked to authorize the reciprocity of licenses between Ontario and Quebec.

Best in Savannah—Among the guests at the De Soto Hotel, Savannah, Ga., is Vice-President W. F. Best of the Nyberg Automobile Company, Anderson, Ind., who is in the city on business connected with the automobile industry and also for the purpose of looking over the field with the idea of establishing a branch office there.

Western Electric Adds Officers—The Western Electric Company, which through its alliance with the Pittsfield Spark Coil Company, has chosen two new vice-presidents. Gerard Swope, general sales manager, and A. L. Salt, general purchasing agent, have been appointed to these newly created positions at a meeting of the board of directors.

Minneapolis Club Improves—Improvement work which the Automobile Club of Minneapolis, Minn., has decided on for 1913 is as follows: To improve the water front of the club property on the Minnesota River; raise the membership to 1,200 or more, and put up at least 100 additional road signs.

New Motor Bus Line—A corporation has been formed in Worcester, Mass., called the Worcester & Paxton Motor Company, to operate a motor express and passenger service between the two places. George H. Johnson, of Paxton, is president and treasurer; J. N. Peck, vice-president, and George C. Douglass, clerk.

North Dakota Registration Statistics—A report of the secretary of state of North Dakota, just issued, of automobile and motorcycle licenses for 1912 goes to show that Cass county leads in number and Oliver county has the minimum. Grand Forks county is second. In all there are 8,897 automobiles in the state and 469 motorcycles, with tax receipts of $28,398.

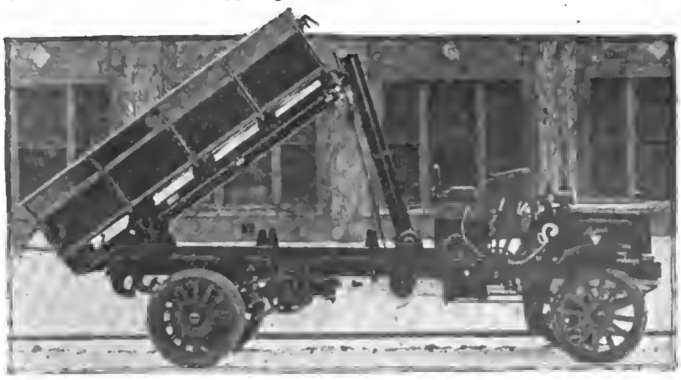
Syracuse License Distributing Point—The Automobile Club of Syracuse, N. Y., through its president, H. W. Smith, asked Governor Sulzer's board of inquiry at Albany recently that when the new legislation is prepared Syracuse be made a distributing point for automobile licenses, it being argued that Rochester is too far away to require Syracuse automobilists to go there for them.

Wants Fire Department Motorized—Fire Chief C. W. Ringer of Minneapolis, Minn., is expecting favorable action on a $150,000 bond issue so he can continue to motorize the department. Eleven pieces will be added if the bond issue is authorized for the purpose. He believes that with $350,000 he could do away with the horse entirely, which would be a saving of $50,000 a year, he estimates.

Two Los Angeles Agencies—Because of the greatly increased demands upon its services the branch of the Chalmers Motor Company at Los Angeles, Cal., will in the future be conducted in two separate establishments, one of which will handle the wholesale and the other the retail sales. The former will be under the Western Motor Company, while the latter will do business as the Chalmers-Los Angeles Company.

Work on Coast-to-Coast Road—The painted automobile trail from New York to the coast is being marked along the Southern Minnesota division of the Chicago, Milwaukee & St. Paul road. A crew is now marking the course with posts in the vicinity of Albert Lea, Minn. Posts are painted with broad stripes so the motorist can travel day or night. Where there are no standing telephone poles the crew is setting posts for markers.

Ontario's Registration Large—Ontario's revenue last year from the sale of licenses for automobiles totaled $50,831.25, twice the amount received during the year 1910, which was $24,394. The revenue for 1906, the first year fees were imposed, was only $15,235.15. The licenses issued last year totaled 11,339, and for 1910, 4,390, while in 1906 1,176 were issued. Fees collected for issuing charters to automobile corporations totaled $235,663.10.



New Packard dumping body, showing same in tilted position

Automobile Incorporations

PITTSBURGH, PA.—Pullman Taxi Service; capital, $5,000; to conduct a taxicab business. Incorporators: W. M. Laird, W. S. Laird, W. M. Laird, Jr., E. F. Kramo, A. W. Tennant.

ROCHESTER, N. Y.—Alling & Miles Incorporated; capital, $20,000; to do a general automobile business. Incorporators: Edmund M. Alling, Alice R. Alling, Milton B. Miles.

STAUNTON, VA.—Flynn-Allen Tire Corporation; capital, $10,000; to manufacture tires. Incorporators: J. J. Flynn, G. Allen.

STRATHROY, ONT.—Loyal Motor Car Company, Ltd.; capital, $500,000; to manufacture and deal in automobiles and accessories, machinery and vehicles of other kinds. Incorporators: D. W. Henry, J. M. McEvoy, H. E. Anderson, C. S. Parker, C. C. Wright.

TOLEDO, O.—General Motor Truck Company; capital, $50,000; to manufacture motor trucks. Incorporators: C. B. Grandy, C. O. Norton, E. M. Dotson, W. C. Prickett.

WHEELING, W. VA.—Lavender Automobile Supply Company; capital, $25,000; to operate and let for hire automobiles, operate garage and storage houses. Incorporators: A. E. Kennard, Jr., C. E. Lavender, R. M. Lavender, A. E. Kennard, Sr., Annie Kennard.

GARAGES AND ACCESSORIES

BROOKVILLE, O.—Brookville Automobile Company; capital, $10,000; to operate a sales agency and operate a garage and repair automobiles and other motor vehicles. Incorporators: J. Ward Somers, Edward S. Somers, V. T. Somers, John K. Somers, Anna Somers.

CLEVELAND, O.—Motor Car Service Station Company; capital, $100,000; to repair automobiles of all kinds and operate a storage business. Incorporators: Paul S. Knight, M. Marquard, Don C. Mills, M. W. Spear, W. P. Godfrey.

COLUMBUS, O.—Park Motors Company; capital, $30,000; to conduct a garage and repair shop and devote considerable attention to the development of a starter which is being experimented upon. Incorporators: Scott Van Etten, Charles Parkison.

HAMILTON, O.—Hamilton Taxicab Company; capital, $5,000; to engage in the transportation of passengers and baggage for hire. Incorporators: J. A. Weigel, Cora A. Weigel, George J. Kalbheir, Louise E. Weigel, Caroline Weigel.

HARROLD, S. D.—Allen-Schultz Company; capital, $50,000; to manufacture an automobile tire filler.

HOPKINSVILLE, O.—Christian County Automobile Club; to carry on an automobile club. Incorporators: J. F. Bible, Frank Bassett, H. A. Keach.

NEW YORK, N. Y.—Aeroplanes Motors & Equipment Company Incorporated; capital, $20,000; to manufacture and sell aeroplanes and equipment. Incorporators: Bernard Cowen, Max Miller, Maurice Lazone.

NEW YORK, N. Y.—Commercial Lubricating Company Incorporated; capital, $2,500; to deal in oils, greases, etc. Incorporators: Agnes R. Mayfield, Louis Preau, John J. Crawford.

NEW YORK, N. Y.—Munnich's Garage Incorporated; capital, $500. Incorporators: Christopher Munnich, Elizabeth Munnich, John Munnich.

NEW YORK, N. Y.—United Garage Company; capital, $14,000. Incorporators: Knud Mynter, Edwin B. Smith, Samuel Ecker.

SPRINGFIELD, O.—Maitland Rubber Company; capital, $10,000; to manufacture rubber and deal in rubber articles of all kinds, including tires and other automobile accessories. Incorporators: Frank R. Talbott, Cora P. Coitwell, Frank P. Patrick, Garnet W. Brand, Henry H. Durr.

WHEELING, W. VA.—Adolph Schick; capital, $10,000; to manufacture a wheel for automobiles invented by Adolph Schick.

WILMINGTON, DEL.—Colonial Tire & Rubber Company; capital, $25,000; to manufacture tires for automobiles. Incorporators: F. D. Buck, George W. Dillman, B. M. Grawl.

CHANGES OF CAPITAL AND NAME

SPRINGFIELD, O.—Robbins & Myers Company; increase of capital from $50,000 to $1,000,000.

SPRING Wheel Construction—Resiliency is furnished by bow and spiral springs in place in a space formed between two concentric rims.

The subject matter of this patent is a wheel, Fig. 1, which consists of an inner rim I and an outer rim O spaced from one another. The opposed faces of rims I and O have pins projecting into the space formed between them and bow springs B, the ends of which are provided with openings engaging the pins are mounted intermediate the rims. Spirals springs S are in position on the pins. The inner portions of the springs B are so shaped as to fit the curvature of the inner rim I; these inner portions P are relatively longer than the outer portions Q of the springs B, and, as Fig. 1 shows, the intermediate portions of the bow springs lie diagonally between the rims I and O.

No. 1,051,745—to Ola C. Messick and Frank Jefferson, Seaford, Del. Granted January 28, 1913; filed April 25, 1912.

Headlights Cut-Off Shade—Consisting of hoods which may be moved in front of the headlight flame or bulb by a mechanism controlled from the driver's seat.

Fig. 2 illustrates the cut-off shades for automobile headlights described in this patent. This device consists of a number of lamp hoods H, one of which is carried by each lamp casing. The hoods of the two headlights are fitted with stub shafts, which ahe connected with hood-operating rods R; the latter are engaged by a coupler member C. A bell crank B carried by the front of the car is connected to the coupler member and to an operating link O adapted to pass along the side of the automobile so that by operating a suitable control mechanism from the driver's seat the shades may be positioned in front of the headlights or lifted from this position.

No. 1,051,388—to Maurice F. Castleman, Berryville, Va. Granted January 28, 1913; filed March 7, 1912.

Resilient Automobile Wheel—Consisting of three rings so arranged as to form the base for a solid annular tire.

This patent describes a wheel, Fig. 3, consisting of a felloe, a pair of endless rings R secured to its lateral faces and transversely aligned appertures in which cross bars C are mounted. Treads forming members M have their lateral walls concentric with the flaring portions of the rings R and their ends overlapping with the lateral walls, in engagement with the inner faces of the outwardly flaring portions of the rings. The contacting portions of M and R form frictional joints J resisting inward pressure on M. The outer faces of M are formed with a continuous circumferential groove G, which constittes a seat for an elastic tire T. Snrings S hold the members M and the cross bars C together.

No. 1,051,457—to Bert Halaster Seevers, Akron, O. Granted January 28, 1913; filed August 2, 1912.

High-Tension Ignition—Including means for producing a high-frequency, oscillatory discharge at the spark plugs for igniting the cylinder charge.

The ignition system, Fig. 4, includes a current source S, a self-induction coil, a condenser C, a discharge circuit D for the same and a resonator R attached to the spark plugs for producing oscillatory high-frequency discharges at the same. When the circuit controlling the whole system is closed, the current flows from the battery S through the coil, which attracts an armature, charging the condenser. As the armature returns to its normal condition, closing the discharge circuit, a current is shot from the condenser through D and the resonator fitted to the spark plugs, thereby producing the above mentioned discharge.

No. 1,051,642—James E. Seeley, Los Angeles, Cal. Granted January 28, 1913; filed April 29, 1907.

Pneumatic Tire—Consisting of a single tube designed to be inflated.

The tire, Fig. 5, is of resilient material and formed with a thick portion P opposed to the rim of the wheel and being formed with an inner side I, which is straight in the direction of the width of the tire. I has a port formed in the longitudinal center of the portion P and a main air conduit A, which communicates with the port. A non-return valve of suitable construction serves for the inflation of this tire.

No. 1,051,738—Garrett Kavanagh, St. Johns, New Foundland. Granted January 28, 1913; filed January 29, 1912.

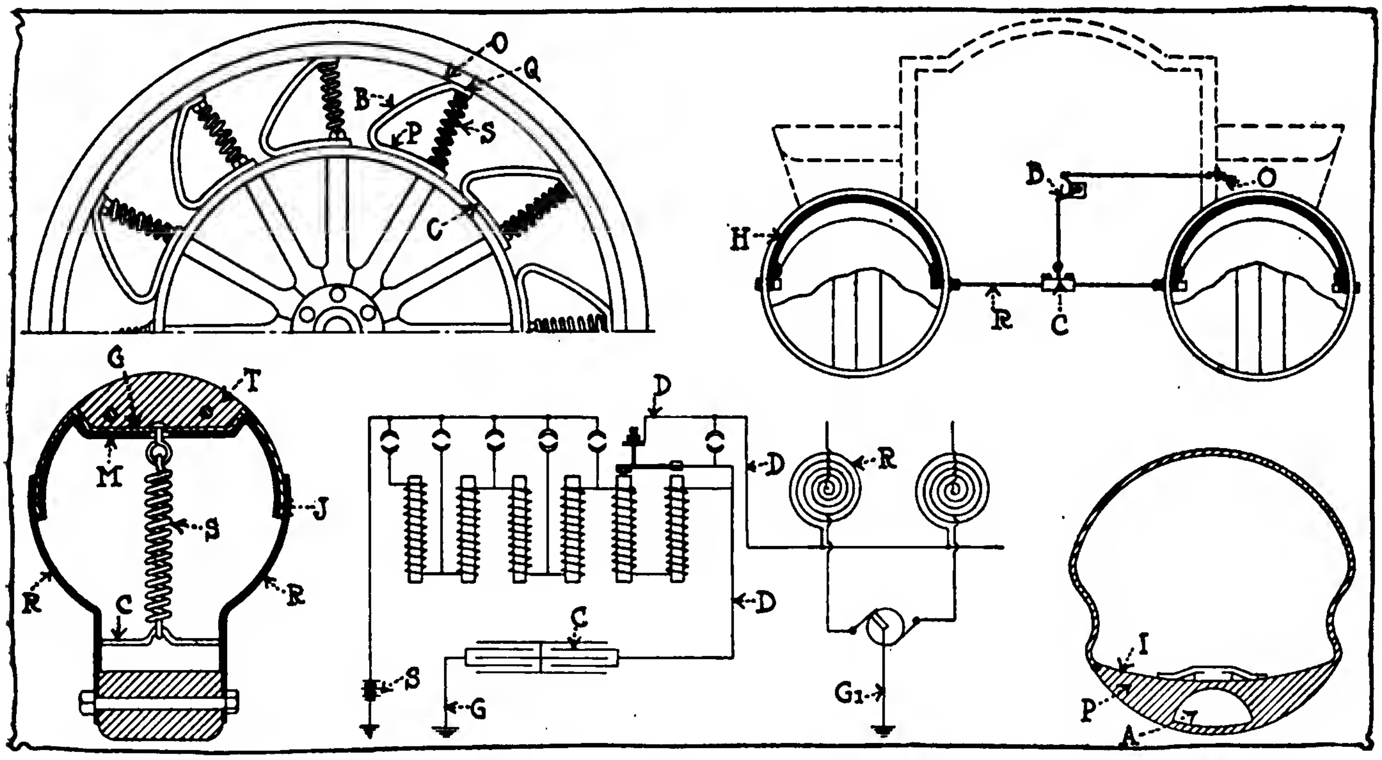


Fig. 1—Messick wheel. Fig. 2—Castleman shade. Fig. 3—Seevers wheel. Fig. 4—Seeley ignition. Fig. 5—Kavanagh tire

The Automobile

Automobiles Now Form 59 Per Cent. of Massachusetts' Vehicles

Actual Counts Made on Public Highways Reveal Relative Proportions of Horse-Propelled and Automobile Traffic—Second Census, Made in 1912, Indicates Big Increase in Automobiles Over Number Recorded in 1909

By James T. Sullivan

BOSTON, MASS., Feb. 14—Traffic census is the necessary foundation for true and just traffic taxation. It is impossible to know just how much of the road maintenance cost should be borne by the automobile public unless the relative destructive effects of horse-drawn and horseless vehicles are determined by actual count and experimentation. Therefore, any activity tending to shed light upon this question deserves the full support of automobilists.

It is significant and not a matter of chance that New England leads in this work of determining the relative effect of horse and motor traffic upon public highways. The Northeast, prominent both as a user of pleasure and commercial cars, and evidencing its progressive constitution by the use of these vehicles, is necessarily the leader in this work. Among the New England states, Massachusetts leads in progressive spirit, and Massachusetts it was that first introduced practically the idea of counting horse and motor vehicles. This state, in which at present one person in every fifty-nine owns an automobile, naturally recognized the importance of the problem before any others did so. Consequently, in 1909, the authorities planned and executed a scheme for arriving at a fairly exact knowledge of the relative proportions of the two kinds of road vehicles. In 1912 the second census was taken.

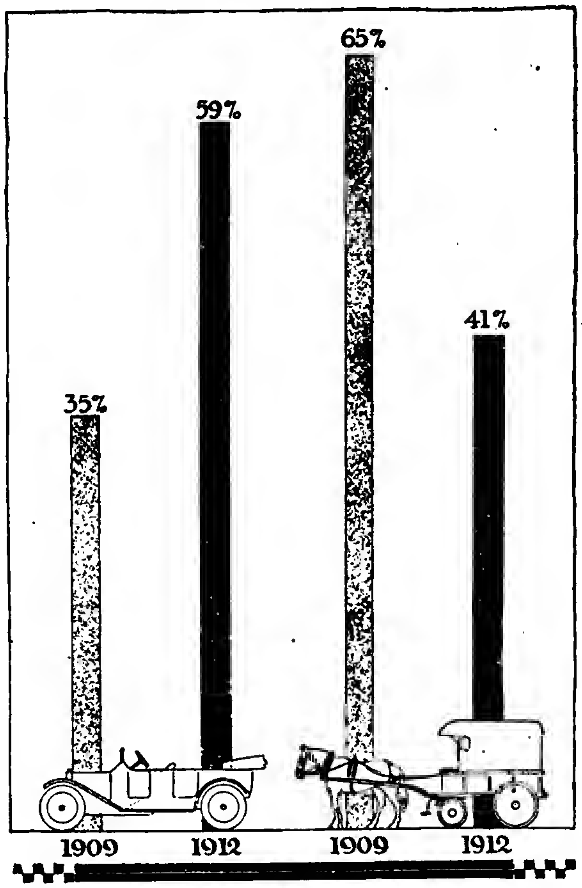
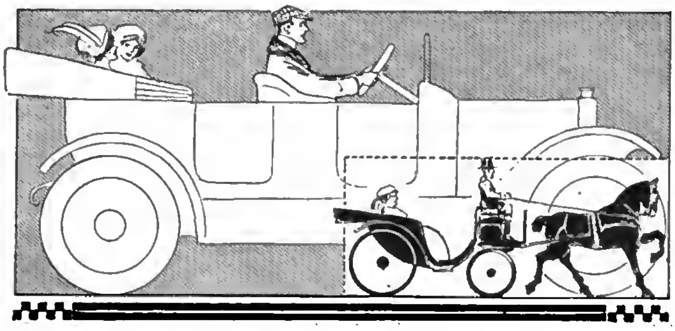


Diagram illustrating the comparative percentage of horse-drawn and self-propelled vehicles which traversed the roads of Massachusetts during the months of October, 1909, and October, 1912, according to count by observers of the state highway commission

The method of procedure used to obtain this information being described below, it remains but to bring out a few principal results of the investigation. The first census showed that of the vehicles counted on the highways of the state 35 per cent. were automobiles and 65 per cent. horse-drawn. In 1912 59 per cent. of the traffic was self-propelled and only 41 per cent. utilized the tractive effort derived from real horsepower. This alone shows the tremendous increase of the automobile in Massachusetts. The actual numbers are not of such importance, as they vary in proportion to the number of counting stations, of which there were more in 1909 than in 1912.

The advocates of horse traffic, that is, the owners of horse-drawn vehicles, would, of course, argue that there being more automobiles than horse-drawn vehicles, automobiles as a whole and each car in particular, should pay higher taxes than horse vehicles, or the whole expense of road maintenance. They forget, however, the different effects of horses' hoofs and automobile wheels upon the road. A horse, in moving over a road,



In August, 1912, the road traffic in Boston parks showed a ratio of one horse-drawn vehicle to four automobiles

destroys the roadbed as effectively as only a horseshoe can do it. Steel formed with rectangular edges, driven by vertical fall into the surface, still more depressed to give the fulcrum about which the weight of the horse body is thrown forward. On the other hand, the automobile wheel, shod with elastic rubber, forming an almost perfect ring which gradually engages at every instant the road, without leaving it, and always applying the driving force in a direction almost parallel to the horizontal direction of travel. It would be worth while to make tests of this situation for once; running a horse-drawn wagon over a sample stretch of road, and then an automobile over a similar stretch; no doubt the result would be interesting to both automobile and horse-vehicle users, but more gratifying to the former than the latter.

As a matter of fact, while it cannot be denied that automobiles traveling at high speed do destroy the roadbed to some extent by the adhesion of the tires which lasts a very short space longer than the actual driving engagement of the tire surface with the road, a very different situation obtains when the car is traveling at moderate speed. In this case the above mentioned tearing effect of the tires on the road is practically nil, and to a certain extent they act even as rollers which assist in the setting of the road material on the foundation. Now, as an overwhelming majority of automobiles on American roads travel at a normal speed no greater than 30 miles an hour, the beneficial effect of this road traffic by far exceeds the destructive efforts of high speed vehicles.

A study of the following report on the recent Massachusetts vehicle census will bring out the facts that in the methods employed there is room for more than one improvement, and it is up to automobilists' organizations to discover such and bring about their practical introduction in vehicle census work. All, however, will admit that the census idea is meritorious.

It may be said that there are two very good reasons why comparative figures relative to traffic over the roads of Massachusetts are of interest at the present time. One reason is the fact that there is agitation in a number of states to increase the fees for motor trucks, and already legislation to that end has been considered in Massachusetts and will be enacted at this session of the Legislature. The other reason is that states elsewhere may get some idea of what a traffic census will reveal, and as it is an intelligent way to get at the real damage done to highways because of the use of the roads by vehicles it will save states lots of money by delving into it as Massachusetts has done. Once the effects of various kinds of traffic are known, authorities will cease to consider the automobile public free game.

The first census was taken in 1909 and another was taken last year so that they were just 3 years apart. The Massachusetts Highway Commission worked out and carried on the census. It was decided that as August was a month when about everyone was on the roads it would be the best on which to get the abnormal traffic, while October would be the better for getting the ordinary traffic figures. So six days were picked out in the middle of each month, and in 1909 the commission planted men at 237 stations on the various highways of the state in August and at 240 stations in October, divided into five sections.

TABLE SHOWING RESULTS OF MASSACHUSETTS TRAFFIC CENSUS IN BOSTON AND VICINITY

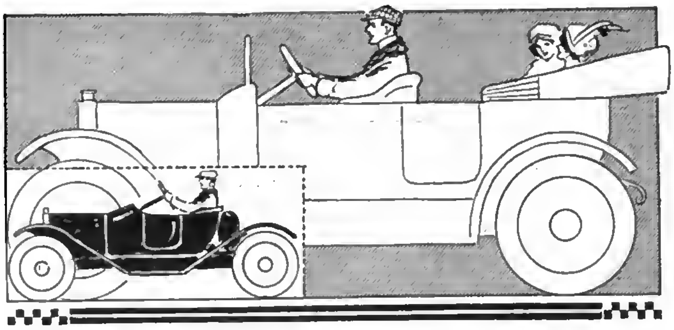
	HORSEDRAWN				AUTOMOBILES			TOTALS					PERCENTAGES				AVERAGE NUMBER OF VEHICLES					
	Single Horse		Two or More					Horsedrawn					Horse-drawn				Horse-drawn					
	Light	Heavy	Light	Heavy	Runabouts	Touring Cars	Trucks, Omnibus	Light	Heavy	All	Automobiles	All Kinds	Light	Heavy	All	Automobiles	Light	Heavy	All	Automobiles	All Kinds	Number of Stations
August, 1909																						
*Night Traffic.	154	180	7	86	109	426	Not	161	266	427	535	962	17	28	45	55	13	22	36	45	80	12
Metropol. Pk..	973	372	69	242	1,130	4,245	c'nt-	1,042	614	1,656	5,375	7,031	15	9	24	76	208	123	331	1,075	1,407	5
Boston Park..	616	109	136	78	444	2,641	ed in	752	187	939	3,085	4,024	18	5	23	77	250	62	313	1,028	1,341	3
Newton......	428	557	30	172	287	775	1909	458	729	1,187	1,062	2,249	20	32	52	48	114	182	297	265	562	4
August, 1912																						
*Night Traffic.	42	125	4	86	38	133	27	46	211	257	189	455	10	46	56	44	14	70	85	66	151	3
Metropol. Pks.	516	470	34	327	1,829	8,036	189	550	797	1,347	10,054	11,401	5	7	12	88	69	100	169	1,256	1,425	8
Boston Parks.	319	308	94	311	893	3,778	369	413	619	1,032	5,020	6,052	7	10	17	83	138	206	344	1,673	2,017	3
October, 1909																						
Metropol. Pk..	708	394	58	221	776	2,571	Not	766	615	1,381	3,347	4,728	16	13	29	71	153	123	276	669	946	5
Boston Park..	686	213	256	65	633	2,608	c'd in	942	278	1,220	3,241	4,461	21	6	27	73	314	93	407	1,080	1,120	3
Newton......	126	120	13	40	134	513	1909	139	160	299	667	946	15	17	32	68	35	40	75	162	236	4
October, 1912																						
*Night Traffic.	47	182	6	108	44	20.	33	53	290	343	280	623	8	47	55	45	11	58	69	56	125	5
Metropol. Pks.	603	480	30	300	1,554	6,45	358	633	780	1,413	8,363	9,776	6	8	14	86	79	98	177	1,045	1,222	8
Boston Parks.	716	450	217	205	1,279	2,347	721	933	655	1,588	4,347	5,935	16	11	27	73	311	218	529	1,449	1,978	3
Swampscott....	139	270	7	60	207	499	46	146	330	476	752	1,228	12	27	39	61	.....	.....	.....	.....	.....	1

*One night only.

These men were given cards to tabulate all vehicles that passed a given point between 7 a. m. and 9 p. m. In 1909 they tabulated the vehicles, dividing them into horse-drawn, light and heavy, using one, two or more horses. The motor cars were divided into runabouts and touring cars. As motor trucks were not much in evidence in 1909 they were omitted that year, but they were included in 1912. Not only were the highways under state supervision watched, but also the park system, the Metropolitan, which takes in a radius of about 10 miles around Boston; the Boston park department, and a few roads on the outskirts.

When the census was taken in 1912 the number of stations were reduced to 155 and held into four divisions. But practically as much mileage was covered in 1912 for the stations were a little further apart, the commission having had the experience of the previous census to guide them in placing the stations. The map given on page 498 shows the divisions according to 1912. The first of these began up at the northwest corner of the state near the New York and Vermont line and sweeping down through the Berkshires toward Connecticut, passed through the principal towns and the larger cities, then turned easterly toward the center of the state. This route takes in the more traveled through roads leading to New York and there were thirty-eight stations on it. Division 2 began at about the same place, but went easterly in a more direct line to the center of the state. It had fifteen stations. Both of these routes took in the mountainous part of the Bay State. And the Division 2 was also a through route branching off to allow motorists to go through New Hampshire in the southwestern portion and the southern part of Vermont.

Division 3 took in the most populous section of all. This route, or these routes, radiated from Boston to Worcester on the west in the middle of the state and also took in the whole northeastern part, which comprises the famous North Shore district where thousands go to spend the summer; and over the routes used going to and from the White Mountains and the resorts in Maine. The section is flat and the roads are good. On this section there were established fifty-three stations in August and fifty-six in October. Division 4, while not so populous as Division 3, is nevertheless very well peopled and it comprised the southeastern section of the state extending to Cape Cod from Boston. In this place, like in Division 3, there are a number of cities and many towns. In fact, the greater part of the population by far are centered in these divisions. The land in the last division is level or rolling, and more of a sandy nature. There



Showing the ratio of large cars to runabouts, about four and a half to one, in Massachusetts last year

SHOWING RESULTS OF MASSACHUSETTS TRAFFIC CENSUS IN THE FOUR STATE DIVISIONS

August—6 Days—7 A.M. to 9 P.M.—1909 Traffic Census Figures

	HORSEDRAWN				AUTOMOBILES			TOTALS					PERCENTAGES				AVERAGE NUMBER OF VEHICLES					
	Single Horse		Two or More					Horsedrawn					Horse-drawn				Horse-drawn					
	Light	Heavy	Light	Heavy	Runabouts	Touring Cars	Trucks, Omnibus	Light	Heavy	All	Automobiles	All Kinds	Light	Heavy	All	Automobiles	Light	Heavy	All	Automobiles	All Kinds	Number of Stations
Div. 1	1,464	688	201	618	362	1,475	Not	1,665	1,306	2,971	1,837	4,808	35	27	62	38	67	52	119	73	192	25
Div. 2	2,947	1,173	165	795	434	1,335	count	3,112	1,968	5,080	1,796	6,849	45	29	74	26	107	68	175	61	236	29
Div. 3	2,595	1,690	209	1,144	695	2,571	ed	2,804	2,834	5,638	3,266	8,904	31	32	63	37	59	60	119	70	189	47
Div. 4	6,251	4,603	323	2,304	2,756	9,083	in	6,574	6,907	13,481	11,839	25,320	26	27	53	47	85	90	175	154	329	77
Div. 5	5,263	3,804	204	1,150	1,675	6,923	1909	5,467	4,954	10,421	8,598	19,019	29	26	55	45	93	84	177	146	323	59
Totals	18,520	11,958	1,102	6,011	5,922	21,387		19,622	17,969	37,591	27,309	64,900	†30	28	58	42	83	76	159	115	274	237

August—6 Days—7 A.M. to 9 P.M.—1912

	Single Horse Light	Single Horse Heavy	Two or More Light	Two or More Heavy	Runabouts	Touring Cars	Trucks, Omnibus	Horsedrawn Light	Horsedrawn Heavy	Horsedrawn All	Automobiles	All Kinds	Horse-drawn Light	Horse-drawn Heavy	Horse-drawn All	Automobiles	Horse-drawn Light	Horse-drawn Heavy	Horse-drawn All	Automobiles	All Kinds	Number of Stations
Div. 1	1,923	1,378	247	878	1,056	5,844	369	2,170	2,265	4,435	7,269	11,704	18	20	38	62	57	60	117	191	308	38
Div. 2	884	334	32	247	267	1,282	44	916	581	1,497	1,593	3,090	29	19	48	52	61	39	100	106	206	15
Div. 3	2,568	2,707	166	1,250	2,875	13,839	835	2,734	3,957	6,691	17,549	24,240	11	16	27	73	52	74	126	331	457	53
Div. 4	3,431	2,850	69	836	2,357	11,107	516	3,500	3,686	7,186	13,980	21,166	17	17	34	66	72	75	147	285	432	49
Totals	8,806	7,278	514	3,211	6,555	32,072	1,764	9,320	10,489	19,809	40,391	60,200	†16	17	33	67	60	68	128	260	388	155

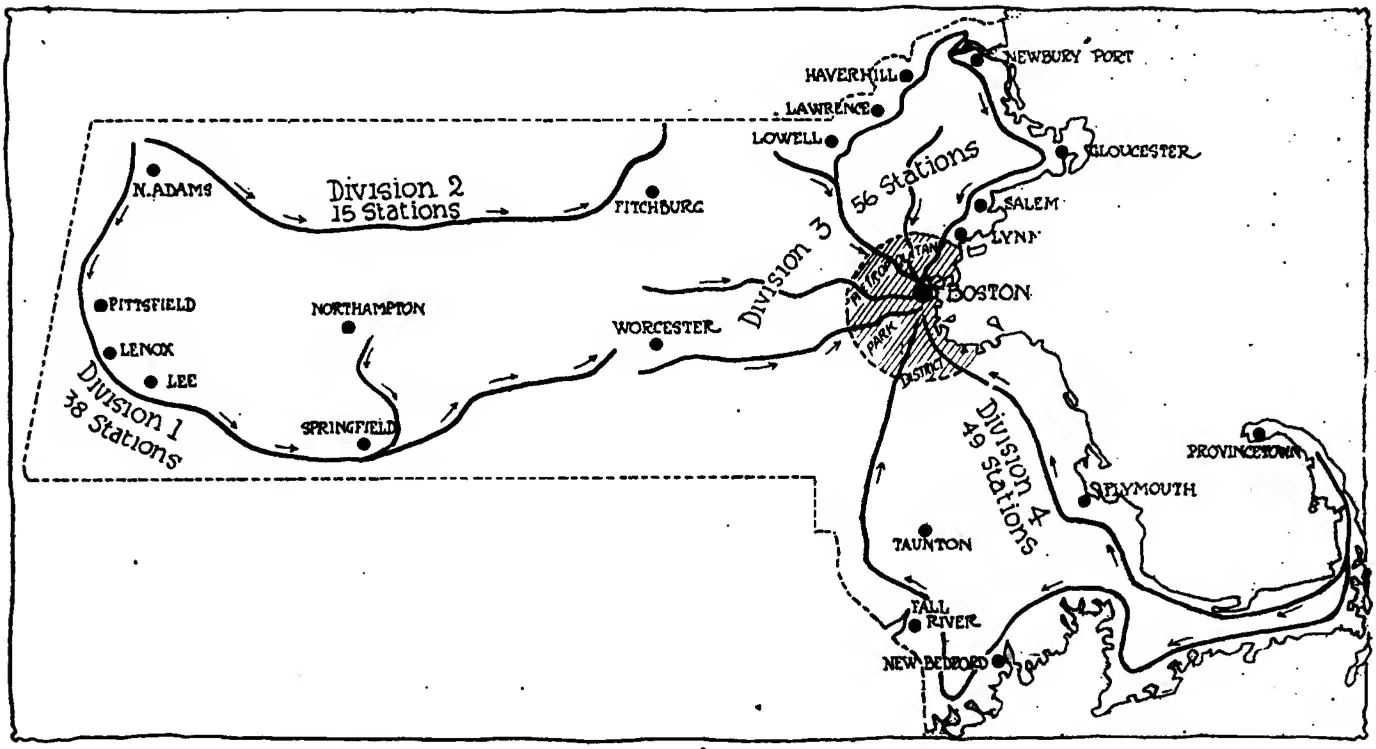
October—1909—6 Days—7 A.M. to 9 P.M.

	Single Horse Light	Single Horse Heavy	Two or More Light	Two or More Heavy	Runabouts	Touring Cars	Trucks, Omnibus	Horsedrawn Light	Horsedrawn Heavy	Horsedrawn All	Automobiles	All Kinds	Horse-drawn Light	Horse-drawn Heavy	Horse-drawn All	Automobiles	Horse-drawn Light	Horse-drawn Heavy	Horse-drawn All	Automobiles	All Kinds	Number of Stations
Div. 1	1,254	730	175	779	289	1,473	Not	1,429	1,509	2,938	1,762	4,700	30	32	62	38	55	58	113	68	181	26
Div. 2	2,644	1,204	131	957	332	1,124	c'unt	2,775	2,161	4,936	1,456	6,392	43	34	77	23	93	72	165	48	213	30
Div. 3	2,272	1,769	177	1,243	520	2,353	ed	2,449	3,012	5,461	2,873	8,334	29	36	65	35	54	67	121	64	185	45
Div. 4	5,194	4,234	285	2,117	1,875	6,190	in	5,479	6,351	11,830	8,065	19,895	28	32	60	40	71	83	154	104	258	77
Div. 5	4,182	3,630	142	1,304	979	3,374	1909	4,324	4,934	9,258	4,353	13,611	32	36	68	32	70	80	150	70	220	62
Totals	15,546	11,567	910	6,400	3,995	14,514		16,456	17,967	34,423	18,509	52,932	†31	34	65	35	69	75	144	77	221	240

October—1912—6 Days—7 A.M. to 9 P.M.

	Single Horse Light	Single Horse Heavy	Two or More Light	Two or More Heavy	Runabouts	Touring Cars	Trucks, Omnibus	Horsedrawn Light	Horsedrawn Heavy	Horsedrawn All	Automobiles	All Kinds	Horse-drawn Light	Horse-drawn Heavy	Horse-drawn All	Automobiles	Horse-drawn Light	Horse-drawn Heavy	Horse-drawn All	Automobiles	All Kinds	Number of Stations
Div. 1	1,633	1,413	270	1,126	997	4,813	307	1,903	2,541	4,444	6,117	10,561	18	24	42	58	50	67	117	161	278	38
Div. 2	878	404	95	788	322	1,201	58	973	1,190	2,163	1,581	3,744	26	32	58	42	65	79	144	106	250	15
Div. 3	2,641	2,854	140	1,529	2,350	10,298	954	2,781	4,383	7,164	13,602	20,766	13	31	34	66	50	78	128	243	371	56
Div. 4	2,802	2,967	93	1,087	1,414	5,973	517	2,895	4,054	6,949	7,904	14,853	20	27	47	53	59	83	142	161	303	49
Totals	7,954	7,638	598	4,530	5,083	22,285	1,836	8,552	12,168	20,720	29,204	49,924	†17	24	41	59	54	77	131	185	361	158

†Average percentages.



Map of the state of Massachusetts, showing the divisions of main roads over which the traffic census was taken

were forty-nine stations on this division. One night in each month was gven over also to a census, but only three stations were established in August and five in October. The Metropolitan Park had eight stations and the Boston Park system three.

With all these arrangements it was possible to get some figures that throw some light on matters that are at variance with the statements made to legislative committees relative to what motor traffic does to the road. For example, Mayor Fitzgerald, of Boston, recently said that horse-drawn vehicles were driven off the Boston parks by the motor cars, and yet this census shows that one in every six in August and one in every four in October using the parks were horse-drawn vehicles. Other statements will be taken up later, particularly as to trucks. Going back to August, 1909, there were 64,900 vehicles of all kinds registered by the watchers on the roads, and of this number 27,309 were motor cars. Compared to the 37,591 horse-drawn vehicles the percentage was in favor of the latter, the figures standing 58 to 42. This was a very close division.

When it is considered that in August, 1912, with 155 stations registering instead of 237, 60,200 vehicles of all kinds were tabulated, of which 40,391 were motor cars and but 19,809 were horse-drawn, it gives food for study. That changed the percentage to automobiles 67, horse-drawn 33. Of course, there was a large increase in the number of motor cars registered, and also in the number of tourists. But the figures seem to indicate the fact that motor cars make long trips, and so during the day the same car would be recorded several times while on the route. Moreover, as the number of stations were diminished, and the distance increased, many horse-drawn vehicles on the road turned off before coming to a station. Therefore the percentage would not be so high for motor cars had the number of stations been as large as in 1909, although it would have still changed in favor of the motor vehicles.

26,284 Horses on the Road in August, 1909

Giving consideration now to the traffic from a truck standpoint for a digression, in considering August of both years, one finds that in 1909 there were 17,969 heavy teams drawn over the highways in August. Of this number 7,113 were drawn by two or more horses, while 11,958 were drawn by one horse each. That represented at least 26,284 horses who were pounding their way along the state highways drawing steel-tired vehicles and doing their share to damage the roads. Motor trucks were not tabulated that year, so a comparison may not be made for 1909 on that basis. However, in August, 1912, trucks were registered and it was found that 1,764 were on the roads. There were 19,809 horse-drawn vehicles registered that month, of which 10,489, or more than 50 per cent., were heavy vehicles. Of this number 3,725 had two or more horses and 7,278 one horse each. So that the horses on the road numbered at least 14,728 exclusive of those drawing pleasure vehicles. This is a reduction by about 40 per cent. from the 1909 figures, but consideration must be given to the great reduction in the number of stations. So the motor trucks were but 10 per cent. of the number of heavy vehicles on the road.

Motor Trucks 3 Per Cent. in August, 1912

Just for the purpose of comparison let us assume that the horse-drawn vehicles, the heavy ones alone, for we are now dealing with the trucks, traveled but 10 miles a day while the motor-driven vehicles went 50, it means that the horse-drawn vehicles averaged 104,890 miles, while the motor vehicles averaged 87,200 miles. Therefore it is reasonable to assume that the horse-drawn vehicles traveling over roads on hot days when the sun was burning up the roads did something to add to the damage that so many are always trying to blame on the motor cars. And it should be particularly noted that the motor trucks were but about 3 per cent. of the total traffic in August, 1912, while the heavy horse-drawn traffic was 28 per cent.

Turning now to the month supposed to represent the ordinary traffic conditions it is found that in October, 1909, there were 52,932 vehicles tabulated. That was nearly 12,000, or 7 per cent., less than August of that same year. Of this number there were 34,423 horse-drawn and 18,509 motor vehicles. The decrease showed more in motor cars, where there were 8,800 less than in August, while there were 3,168 less horse-drawn vehicles, which brought the motor cars down to 35 per cent. from 42, and ran the horse-drawn up to 65 per cent. from 58. Then comes October, 1912, furnishing another basis for comparison. With eighty-two less stations than in 1909 there were 49,924 vehicles registered, a difference of 3,008 less between the two Octobers. Of this number 29,204 were motor vehicles and 20,720 horse-drawn, the percentages being 59 and 41 respectively, or 18 per cent. more automobiles. As this is a supposedly normal month it makes an interesting table for it shows that people were turning to motor cars, perhaps, as there was a gain in the figures for power vehicles of 10,695, while the horse-drawn vehicles decreased 13,703, when compared to October, 1909.

The truck and heavy horse-drawn vehicles form another further interesting comparison. In October, 1909, no trucks were tabulated. Last year there were 1,836 trucks noted on the highways. This was but an increase of 72 over August, an indication that the motor truck business was growing a little. In October, 1909, there were 34,423 horse-drawn vehicles tabulated, of which 17,967, or more than 50 per cent., were heavy vehicles, 7,310 having two horses each, 11,567 one horse. In the same month last year, while the totals were smaller, the percentage of heavy traffic by horse-drawn vehicles had increased, for of the 20,720 noted 12,168, or about 60 per cent., were the heavy sort. And this number was about 24 per cent. of the entire traffic. Again of the heavy vehicles 5,128, or about 40 per cent., had two or more horses and 7,638 one horse each. This made at least 17,894 horses on the roads in October, 1912, hauling heavy loads. It does not include the horses drawing lighter vehicles, of which there were nearly 8,000 more.

Trucks Gain 72 Over August Figures

Now, as August is claimed to be an extraordinary month and October an ordinary one in traffic here again is an interesting basis of calculation. In August, 1912, there were 60,200 vehicles of all kinds recorded, while in October that same year but 49,924 were tabulated, a drop of 10,276. Motor cars dropped from 40,391 to 29,204, a loss of 11,187. But the horse-drawn vehicles in October, the ordinary month, increased to 20,720 over the 19,809 in August, the extraordinary month, a gain of 611, and of these figures the gain in heavier horse-drawn vehicles was the larger, for while in August last year 10,489 were registered, yet in October the figures went up to 12,168, or 1,679 more. In other words, of the gain in horse-drawn vehicles more than 1,000, or about 60 per cent., were the heavy vehicles. And it must be remembered that the trucks gained seventy-two in October over August. Figuring again on the basis of mileage that the trucks might average 50 miles and the horse-drawn vehicle but 10, it would mean that the motor-propelled vehicles covered 91,800 miles to the 121,680 miles of the heavy laden horse-drawn vehicles.

Moreover, it is well worthy of note that the number of motor trucks increased by seventy-two between August and October, 1912, especially as August is reckoned an extraordinary traffic month while October is an ordinary month from this viewpoint.

The figures for the parks are confined more to pleasure vehicles so that heavy traffic cannot be estimated so well, but they show a large gain on the part of the trucks and omnibuses in October over August last year. The motor cars dropped in the fall month due no doubt to the fact that there were less visitors in Boston going through the park systems.

Touring Cars Are Most Numerous

Another interesting feature to note is the division between the motor cars. In 1909 in August 5,922 were runabouts, while 21,387 were touring cars, or about three and one-half times as many of the larger cars as the smaller ones. In August last year the figures were, runabout 6,555, touring cars 32,072, showing that the percentage was growing, so that there were nearly five times as many big cars as little ones—basing touring cars as big ones for comparison—than in the same month three years before. And this with a smaller number of stations. In October, 1909, there were 3,995 runabouts and 14,514 touring cars, so that the percentage was just a little bit more than in August of that same year. In October, 1912, the figures showed 5,083 runabouts and 22,285 touring cars, so that there were more than four times as many of the larger cars, so called, that month. In other words, the runabouts kept up a pretty good percentage last year, gaining a bit over 1909.

Summing the whole matter up, therefore, from all angles legislators in all states in this country should give consideration to figures such as these before assuming to tax further the motor vehicles. In the Bay State the pleasure motor vehicles have been responsible for the state receiving approximately $1,000,000 in fees covering both the years this traffic census was taken, while there never was $1 collected from horse-drawn vehicles. And Col. Sohier, chairman of the Massachusetts Highway Commission, has stated in a speech made last fall, that there were instances where a change from horse-drawn vehicles to motor trucks has saved the wear and tear of the road. Moreover, the weather has much to do with the destruction of highways, for there is on record in one of the old reports of the Highway Commission a report of a macadam road going to pieces due to winter weather and over which a motor car had never been run. That motor cars and trucks damage roads is admitted, but whenever the opportunity arises to get extra money in any way it is the users of these vehicles that are always the target, while the owners of the horse-drawn vehicles are never even considered. So it would be well for all those interested in the future of the motor industry to make a study of the figures in this article.

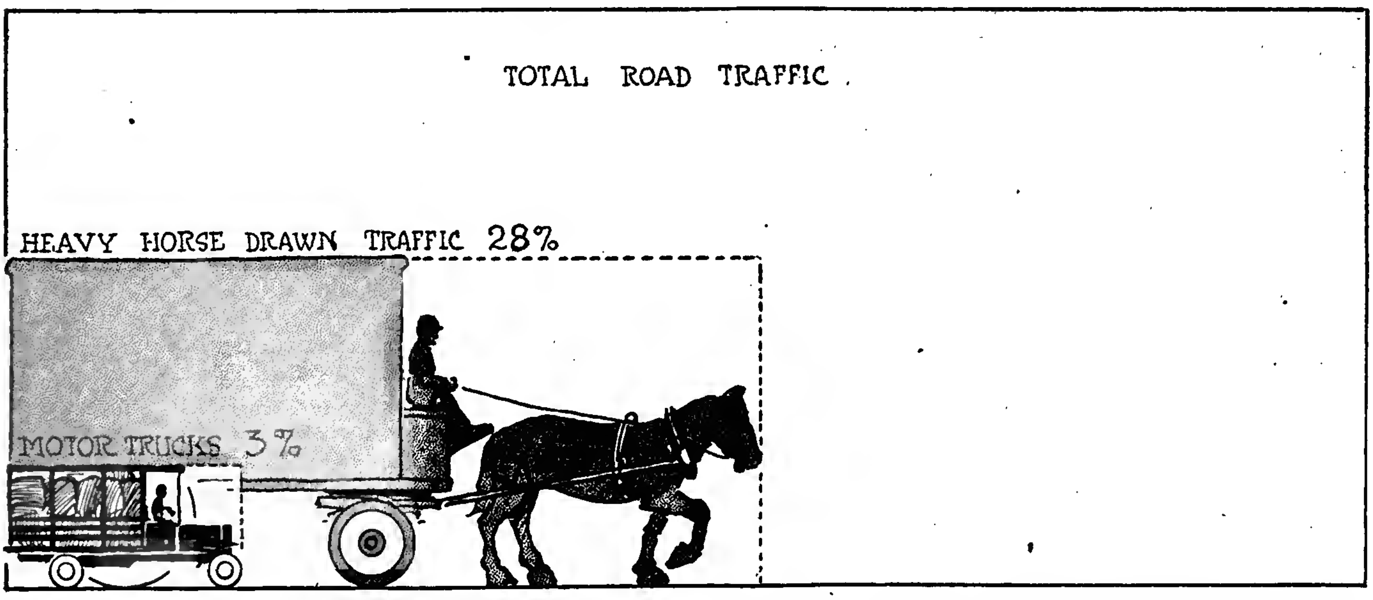


Diagram showing the relative percentages of heavy horse-drawn traffic and motor trucks on the roads of Massachusetts, from figures taken in August, 1912

New Standard Oil Fuel

Motor Spirit Announced To Sell at 3 Cents Cheaper Than Gasoline To Solve Fuel Problem

New Fuel Runs From 52 to 55 Degrees Baumé—Gives More Miles Per Gallon

CHICAGO, Feb. 18—(*Special Telegram*)—With a new fuel selling at 3 cents a gallon less and with 25 per cent. more power and 25 per cent. more mileage per gallon than gasoline the Standard Oil Company comes to the rescue of the automobilist in his fight with the higher cost of motoring. Motor spirit is the name of this new fuel announced today by the company. It resembles gasoline very closely except that it is yellow in color and has a very pungent odor. It has a slightly greater range of boiling points than has gasoline, its minimum point being somewhat lower than that of the older fuel and its maximum slighter. This allows a motor to be started as easily or more easily with this fuel than with gasoline. In gravity it is somewhat heavier than gasoline, ranging from 52 to 55 degrees Baumé while gasoline ordinarily runs from 58 to 60 degrees. It is not so much the lower cost of the fuel nor its greater power that means so much to the motorist. It is the fact that by its production the output of fuel for gasoline engines from a given amount of crude petroleum practically is doubled. This will tend to prevent further rises in the price of gasoline.

New Process for Making Spirit

Motor spirit is an additional by-product of petroleum to any which has been obtained heretofore, that is, in addition to the quantity of gasoline which formerly had been obtained from a given amount crude, almost the same quantity of motor spirit is obtained. This has been made possible by an invention of W. M. Burton and patents for the process have been granted only since the first of the year.

It is stated that the yellow color and the offensive odor could be done away with by a process of deodorizing and decoloring similar to that employed with gasoline, but such refinement would make the product just as expensive as the older fuel. The use of motor spirit requires a slight adjustment of the carbureter as it requires more air for combustion than does gasoline. Although the new fuel has the very desirable advantages of lower cost and increasing economy in miles per gallon, it has in its present state several disadvantages which may militate against its widespread adoption, particularly for use in pleasure cars. In fact the Standard Oil Company is not offering motor spirit as a pleasure car fuel but only as a fuel for motor trucks and for stationary engines.

One of the chief disadvantages, particularly where cars are to be driven on the boulevard, is that the exhaust is in the form of a white smoke, quite similar to that due to an excess of oil.

It is stated, however, that by reducing the quantity of oil smoking is to a great account overcome in fact, it is found that quite a little less cylinder oil may be used safely with motor spirit than it would be safe to use with gasoline. There is a slight carbonizing of the cylinders similar to that found when an excess of oil is used but this deposit is soft and a weekly application of kerosene has been found to keep the cylinders clean. The fuel although giving initial explosions on starting and letting the motor run for several minutes will seem to choke up occasionally until the manifold gets warm. This is due to the condensation in the manifold which seems to be much more pronounced than when gasoline is used. With the short intakes, however, this difficulty could be avoided. The odor of motor spirit, though unnoticeable in open air or in small quantities, be-

Automobile Securities Quotation

This week's automobile stock market witnessed an almost general decline, the reason being the strike now pending in Akron and by which several of the largest tire manufacturers are seriously affected. Following are the losses of some of the principal issues, comparing Wednesday's quotations with those of 1 week ago: Goodyear common, 160; Firestone common, 130; Miller, 35; Swinehart, 24; Goodrich common, 15; Goodrich preferred, 11; Consolidated common, 3, and preferred, 26. The fact, however, that Firestone preferred remained unchanged and Goodyear preferred fell but 5 points, seems to indicate that the situation is hopeful of an early settlement. Among other changes are the declines of Garford, 6; Chalmers, 5; General Motors common, 4; Studebaker common, 4 1-2; White and Overland, 2 points each. International Motor preferred rose 40 points.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	165	180
Ajax-Grieb Rubber Co., pfd	..	..	95	100
Aluminum Castings, pfd	..	..	99	100
American Locomotive Co., com	32	32½	36	37
American Locomotive Co., pfd	104	104½	104½	105½
Chalmers Motor Company	..	..	130	145
Consolidated Rubber Tire Co., com	10	15	20	23
Consolidated Rubber Tire Co., pfd	25	35	80	87
Firestone Tire & Rubber Co., com	200	205	225	240
Firestone Tire & Rubber Co., pfd	108	110	105	107
Garford Company, preferred	..	..	100	102
General Motors Company, com	32½	33½	30	32½
General Motors Company, pfd	75	76	77	78
B. F. Goodrich Company, com	..	..	40	41½
B. F. Goodrich Company, pfd	..	..	92	94
Goodyear Tire & Rubber Company, com	330	335	300	325
Goodyear Tire & Rubber Company, pfd	104	106½	99	102
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	5	15
International Motor Co., pfd	..	..	40	60
Lozier Motor Company	..	..	..	32
Miller Rubber Company	..	..	160	175
Packard Motor Company	104	107	103	105
Peerless Motor Company	..	..	120	125
Pope Manufacturing Co., com	38	40	29	32
Pope Manufacturing Co., pfd	68	70	74	78
Reo Motor Truck Company	8	10	11½	12½
Reo Motor Car Company	23½	25	20½	21¼
Rubber Goods Mfg. Co., pfd	100	105	105	108
Studebaker Company, com	..	..	31½	34½
Studebaker Company, pfd	..	..	91	93
Swinehart Tire Company	..	..	80	90
U. S. Motor Company, com	..	..	..	8
U. S. Motor Company, 1st pfd	..	..	..	32
U. S. Motor Company, 2nd pfd	..	..	..	65
U. S. Rubber Co., com	45	46	62½	63½
U. S. Rubber Co., 1st pfd	..	..	105½	106½
White Company, preferred	..	..	103	107
Willys-Overland Company, com	..	..	68	69½
Willys-Overland Company, pfd	..	..	97	98¾

comes somewhat pronounced when a tank full of the fuel is kept in a closed room. For motor truck work where there is little objection to smoking and where the odor is not a fault, motor spirit will have its greatest field. The great consumption of gasoline by commercial vehicles has been threatening the available supply for some times and has been advanced as a chief reason for the increase in price of gasoline. The new fuel, however, should do very much to relieve this situation. Motor spirit has been under test by the Standard Oil Company in its own pleasure cars and trucks for several weeks and has proven its superiority of efficiency.

Chandler Plans Working Out

DETROIT, MICH., Feb. 17—It is learned that as long ago as last August F. C. Chandler, general manager of the Lozier Motor Company, and Samuel Regar, treasurer of the same organization, tendered their resignations and employed J. N. Whitbeck, who severed his connection with the engineering department of the Lozier company at the same time, to design the new Chandler six. C. A. Emise, sales manager, M. S. Mead, Eastern sales manager, and J. R. Hall, former manager of service, also tendered their resignations, but continued their connections with the Lozier organization until released.

It is understood that the car will not be manufactured in Detroit, although it will be built in one of the cities recognized as an automobile manufacturing center.

Akron Plants Crippled

Strike Calls Out 14,000 Tire Workers, As Firestone Wage Cut Gives Rise to Discontent

Principal Plants Shut—Strikers Organize Their Campaign —Violence Expected—Stocks Collapse

AKRON, O., Feb. 19—A paralyzing blow which has sent stocks tumbling down the scale to the extent of more than 100 points in the case of two of the largest tire makers of Akron, and which threatens to spread to other centers, has occurred in the form of a strike on the part of the rubber workers.

The strike started in the plant of the Firestone Tire and Rubber Company when the wages of some of the workmen were cut from $3.50 to $3.00 a day in order to fulfill a reduced rate contract with the Ford Automobile Company. The men left the factory and waited at the gates and acted as pickets. In a short time they had recruited a formidable number and the plant was compelled to shut down. The trouble at the Firestone plant has pricked the bubble of contentment among the workers in the other local plants and as a result there is a general walkout on the hands of the other concerns. It has been necessary to close the plants of the Buckeye, Swinehart and Miller companies and the others in this city are badly crippled. The workers in the plants have already taken steps to form a union and representatives of the Industrial Workers of the World have come to Akron to take the situation in hand. It is possible that the trouble will spread to other plants throughout the United States. Local prosperity has been dealt a severe blow. The Mayor has deemed it wise to order all saloons closed and in anticipation of violence has requested troops. A wage scale committee has been appointed by the strikers as a preliminary to arbitration.

Barley Buys Halladay Plant

STREATOR, ILL., Feb. 17—A. C. Barley has bought the property and business of the Streator Motor Car Company from the Merchants' Realization Company. While he expects to carry on the manufacturing operations on conservative lines, the business will be so operated that the old Halladay agents can be supplied with the cars they require.

Model 30 will be made and sold with electric starting and lighting equipment, listing at $1,450; a limited number of model 40 cars will also be made and sold with equally up-to-date equipment, for $1,935. Plans are also on the way for the manufacture of a few sixes, but nothing definite has been announced in this respect as yet.

30 Per Cent. Settlement for Thomas

BUFFALO, N. Y., Feb. 18—Edwin L. Thomas, 246 Bryant street, this city, has announced that he is willing to redeem the creditors' extension notes issued under the date of February 15, 1911, payable August 15, 1912, at 30 cents on the dollar, if these notes are sent to the office of the Commonwealth Trust Company, Buffalo. This settlement, according to Mr. Thomas, shows a possible margin of from 2 to 5 per cent. in his favor, but as the receivership will probably continue in effect for no less than another year, such a settlement will assist the present holders in obtaining their money earlier than would otherwise be possible.

Admiral Company Officers Chosen

DETROIT, MICH., Feb. 17—At a meeting of the stockholders of the Admiral Motor Car Company, of St. Louis, Mich., the following directors were elected: Dr. A. R. Wheeler, David Harrison, J. H. Whitney, William L. Yost, Don C. Evans, G. Earl Porter and Howard Dewey, all of St. Louis. At a meeting of the directors the following officers were chosen: President, Dr. A. R. Wheeler; vice-president, J. H. Whitney; secretary and general manager, Don C. Evans; treasurer, William L. Yost. Mr. Evans, who becomes general manager for the company, for 2 years was sales manager for the Alma Manufacturing Company, at Alma. The company will build a truck.

Market Changes of the Week

A weaker tone was developed in tin on Monday in Europe, prices here were sympathetically lower. Fluctuating throughout the week, it finally closed at a loss of $.25 per hundred pounds. Lead remained quiet but steady at $4.30 per hundred pounds. Electrolytic copper was offered at concessions here and in Europe, the closing prices on electrolytic and Lake coppers here being $.14 1-2 and $.14 7-8 respectively, sustaining losses of $.00 3-4 and $.00 5-8. There was an absence of new developments in the market for refined petroleum yesterday. Both prices on Kansas and Pennsylvania wells remaining constant at $.88 and $2.50 a barrel throughout the week. There was an absence of fresh developments of importance in the market for scrap rubber.

An easy tone pervaded the leading crude rubber markets of the world yesterday, and the reactionary tendency which developed on Monday made further progress. This applied to the markets on both sides of the water. The depression was attributed largely to the trouble which developed on Monday, causing the affairs of a leading crude rubber company to be placed in the hands of a receiver.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, per lb..	.08¼	.08¼	.08¼	.08¼	.08¼	.08¼	....
Beams & Channels, per 100 lbs......	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	28.50	28.50	28.50	28.50	28.50	28.50	....
Copper Elec., lb...	.15¼	.15⅛	.15¼	.15	.14¾	.14½	—.00¾
Copper, Lake, lb...	.15½	.15½	.15⅛	.15⅛	.15	.14⅞	—.00⅝
Cottonseed Oil, Feb., per bbl...........	6.35	6.31	6.32	6.33	633	6.35	....
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil, Menhaden Brown	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 gal.........	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime....	.90	.90	.90	.90	.90	.90	....
Lead, 100 lb.......	4.30	4.30	4.30	4.30	4.30	4.30	....
Linseed Oil.......	.50	.50	.50	.50	.50	.50	....
Open-Hearth Steel, ton.......	29.00	29.00	29.00	29.00	29.00	29.00	....
Petroleum, bbl., Kansas crude....	.88	.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa. crude.......	2.50	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	....
Silk, raw Italy.....	....	4.30	....	....	4.30	4.30	....
Silk, raw Japan....	....	3.75	....	....	3.75	3.75	....
Sulphuric Acid, 60 Beaumé......	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb.......	49.25	48.90	48.75	48.88	49.00	49.00	—.25
Tire Scrap........	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	....

U. S. Obligation To Be Paid

Announcement has been made, on February 14, by the reorganization committee that obligations of the sub companies of the former U. S. Motor Company will be paid after that date, at the office of the Central Trust Company, of New York, 54 Wall street, to holders of certificates of deposit which represent notes made or endorsed by Alden-Sampson Manufacturing Company, Brush Runabout Company, Columbia Motor Car Company, Dayton Motor Car Company and Maxwell-Briscoe Motor Company. The same applies to claims against the above-mentioned companies which have been admitted as valid obligations by the committee. These are to be paid in full, properly endorsed in blank, the holders being entitled to receive part cash and part voting trust certificates properly endorsed in blank, for the notation thereon of the amounts payable in both respects.

Fisk Rubber Company Issues $3,000,000 Stock

Par Value of Shares Is $100 Each on 7 Per Cent. Cumulative First Preferred Stock

For the Year Ending October 31, 1912, the Company's Net Earnings Were $758,421

THE Fisk Rubber Company, of Chicopee Falls, Mass., has arranged with William Salomon & Company, New York City bankers, for the issue of $3,000,000 7 per cent. cumulative first preferred stock in shares of a par value of $100 each. The quarterly dividends are payable on February 1, May 1, August 1 and November 1, and the entire issue or part of it is redeemable by the company at 120 and accrued dividends on 60 days' notice.

The full capitalization of the company is $15,000,000, consisting of:

	Authorized	To Be Issued
Cumul. first pref., 7 per cent.	$5,000,000	$3,000,000
Cumul. sec'd pref., 7 per cent*	2,000,000	2,000,000
Common	8,000,000	8,000,000
	$15,000,000	$13,000,000

*Convertible into common stock.

For the year ending October 31, 1912, the net earnings were $758,421. For the fiscal year ending that day of 1913, net earnings are expected to exceed $900,000, insuring net profits of fully $250,000. There is no funded debt and such cannot be incurred without the consent of three-fourths of the holders of first preferred stock, the same applying to mortgages, bonds, notes and other indebtedness maturing later than 1 year from date.

An annual sinking fund will be created for the purchase of first preferred stock; during 1914 and 1915 an amount equal to 7.5 per cent. of the entire authorized first preferred stock; after that, an amount equal to 15 per cent. of the net profits of the company will be set aside. During the past year the Chicopee Falls plant has been working at the rate of 24 hours a day, without producing more than 25 per cent. of the immediate requirements.

The Chicopee Falls company is now at the point of acquiring the property and business of the Fisk Rubber Company, of Delaware. Its own business during the past 5 years was as follows:

Year ending October 31	Automobile Casings	Automobile Tubes	Bicycle Tires
1908	57,695	40,960	84,387
1909	78,259	59,077	103,085
1910	96,692	88,061	168,990
1911	125,279	121,584	207,561
1912	221,826	198,925	240,623

On the basis of an appraisal made by the American Appraisal Company, Milwaukee, Wis., the total net tangible assets, exclusive of good will, trademark and patents, aggregate $5,000,000, the net quick assets alone being in excess of the issue of preferred stock now being arranged for.

Price, Waterhouse & Company, chartered accountants, have inspected the books of the Fisk company and report that, for the past 4 years, the net earnings available for payment of dividends were $1,337,485, averaging $334,371 per year, which exceeds the dividend requirements on the first preferred stock issue of $3,000,000 by 50 per cent. For the fiscal year ending October 31, 1912, the available net earnings aggregatd $508,421, which is 250 per cent. of the amount necessary for paying the dividend on the present issue of stoek.

In case the company shall have failed in respect of four quarterly periods to declare and pay the regular first preferred dividend, the holders of the second preferred and common stock shall have no voting power and the holders of the first preferred stock exclusively shall possess voting powers for all purposes, except as stated below, as long as there shall be any arrears in dividends upon the first preferred stock:

The company shall not without the vote or consent of at least three-fourths of the outstanding first preferred stock, and three-fourths of the outstanding second preferred stock and common stock;

(1) Sell or dispose in any way of the property and business of the company in their entirety.

(2) Dispose of any plant, the disposition of which would materially reduce the earning capacity of the company, unless the proceeds of such disposition shall be set aside and applied to the increase of the physical assets of the company or to the retirement of its first preferred stock.

(3) Create any mortgage or other lien to secure an issue of bonds or otherwise.

(4) Create or issue or guarantee any bonds, notes or other evidences of indebtedness maturing later than 1 year from the date of issue.

(5) Create any shares of stock having priority over or on a parity with the authorized first preferred stock or increase the authorized first preferred stock.

(6) Issue any of the authorized first preferred stock in excess of $3,000,000, except for cash at not less than par, nor unless the net earnings and income of the company before the payment of dividends on the first preferred or other stocks for the then last preceding fiscal year or the average of such net earnings and income for the preceding 3 fiscal years, whichever shall be greater, shall have been at least equal to three times the annual dividends on the first preferred stock outstanding and so to be issued. Except as above provided, the first preferred stock shall have no voting power.

Weed Obtains Permanent Injunctions

The Parsons Non-Skid Company and Weed Chain Tire Grip Company, New York City, were granted permanent injunctions in United States District Court in the cases of the Auto Company, Mutual Taxi Company, Renault Taxi Company and F. M. Elmond. All the defendants, who were using chains infringing on the Parsons-Weed patents, consented to the action of the court, which is thus final in these specific cases.

Injunction Against E-Z Chain

CHICAGO, Feb. 17—The United States court for the Northern district of Illinois, Eastern division, today made permanent the injunction against Edward D. Lewis, Thomas V. Garvin and Mathew J. Frambach, doing business under the name of the E-Z-On Chain Tire Protector Company and the Hartley Manufacturing Company, secured recently by the Parsons Non-Skid Company, and the Weed Chain Tire Grip Company. This is one of a half a dozen cases started by the Weed people for alleged infringement of their patents, as exemplified in the E-Z-On chain. The others made no answer.

Ford Move for Injunction Denied

The Ford Motor Company's motion for an injunction preventing Bowring & Company, New York City, from shipping cars to New Zealand was denied in the United States Supreme Court, Special Term, Part I, New York, on February 11 by Justice Davis. The Ford Motor Company alleged that Bowring & Company, together with individuals named Vanderpool & Chavez, had formed a conspiracy for unauthorized export of Ford cars to the territory mentioned. The reason for the court's action was that the Bowring company bought the automobiles in regular course of business from the individuals.

Wisconsin Association Meets

MILWAUKEE, WIS.—James T. Drought, of Milwaukee, the best known Wisconsin motorist in American motoring circles, was elected president of the Wisconsin State Automobile Association at the annual meeting of the directorate in Milwaukee on February 14. Other officers were elected as follows: First vice-president, Max G. Kusel, Watertown; second vice-president, Dr.

C. A. Conro, Rhinelander; secretary, H. A. Appel, Milwaukee; treasurer, George A. West, Milwaukee. Executive committee, Russell H. Jones, Kenosha; H. L. Halverson, Whitewater; George A. West, William H. Raymond and Isaac G. Hickman, Milwaukee. Mr. Raymond was also recommended to the A. A. A. as Wisconsin representative on the contest board for the present year. The fourth annual reliability tour was given in charge of the executive committee with full power to act. There is some talk of going back to grade 1 rules which governed the 1910 and 1911 tours, but were supplanted by grade 3 rules in 1912. Last year the Milwaukee dealers remained out of the tour, but the entrance of President Hickman, of the M. A. D. A. into the councils of the state association is believed to presage a return of the dealers to the contest activities of the state. Reports of officers showed that the state association now has a membership of 1,500 and a campaign will be made during this, legislative year, to double or triple the number by the employment of a state organizer.

Columbus Buggy Creditors Confer

COLUMBUS, O., Feb. 15—At a meeting of the creditors of the Columbus Buggy Company, of Columbus, O., which went into the hands of Daniel McLarin as receiver some time ago, a committee consisting of George W. Bright, E. R. Sharp, D. N. Postlewaite, B. G. Watson, Thaddeus Dunlap and George W. Lattimer was named to draft a plan of reorganization to be submitted by mail to the creditors. A number of different plans of reorganization were discussed, but none was indorsed.

Grossman Not Violating Injunction

Justice Holt, in the U. S. District Court, Southern District of New York, ruled on February 11 that the motion of the Rajah Auto Supply Company, claiming that the Emil Grossman Company had violated an old court injunction, be denied.

Emil Grossman Company, New York City, furnished a set of porcelains ordered by a user of Rajah spark-plugs in Connecticut. The denial of the motion was founded upon the ground that the defendant has not advertised the porcelains to be Rajah products, so that the entire matter would seem to be a blunder on the part of the clerk who sold the parts.

Cleveland-Galion Company Fails

FINDLAY, O., Feb. 17—The Cleveland-Galion Motor Truck Company, a $1,000,000 corporation, has been placed in the hands of a receiver, Attorney A. B. Thompson, of Cleveland, being named as such court officer. The appointment was made on request of Elliott Bright, creditor to the amount of $350, and was concurred in by the company. Mr. Bright says the company is solvent, but that threats of litigation and possible filing of suits by other creditors might affect the stability of the company.

New Underwriters' Association

CHICAGO, Feb. 15—Following along the lines laid down by Eastern insurance men, the Western Automobile Underwriters' Association was formed here last Wednesday. P. D. McGregor, of the Queen company was elected president and F. J. Sauter, secretary-treasurer. Negotiations are on for co-operation with the Eastern conference which will provide for an interlocking board of directors.

Broadwell Resigns from Hudson

DETROIT, MICH., Feb. 14—The Hudson Motor Car Company announces the resignation of E. H. Broadwell, who has held the position of vice-president and director of sales. Mr. Broadwell's disposing of his Hudson interests is the result of a disagreement as to company policy. The directon of the sales work has been assumed by C. C. Winningham.

New York's Fees Increase $129,481

List of Recommended Amendments to the State Automobile Law Included in Secretary's Report

Details of Incorporation and Automobile Bureau Work During 1912 and Comparison of Both Offices

THE report of the New York Secretary of State covering the year 1912 has just been published, containing the details of the incorporation and automobile bureau work. The following is a comparison of the work and revenue of both offices:

	1911	1911	1912	1912	Increase
Corporation	$133,989	8,357 Inc's	$136,663	8,757 Inc's	$2,674
Automobile	918,197		1,047,678		129,481
	$1,052,186		$1,184,342		$132,155

Compared with the receipts, the disbursements are as follows:

1911	$221,597
1912	185,680
Decrease	$35,917

A number of amendments to the state automobile law which are being recommended in former Secretary Lazansky's report to the Legislature follow:

Requiring all persons who operate motor vehicles to be examined as to their qualifications and he licensed.

Making it a misdemeanor punishable hy fine of not less than $250, or imprisonment for not more than six months, or both, for operating a motor vehicle without a license granted as ahove stated, and making it a misdemeanor similarly punishable for an owner to permit an unlicensed person to operate his motor vehicle.

Making it a misdemeanor, similarly punishahle, for operating a motor vehicle not registered or on which there are not displayed the number plates required hy the act.

Providing that in cities of the first class, no license shall be granted hy the secretary of state without the approval of the commissioner of police, first ohtained.

Giving the secretary of state the power to refuse any application for registration or license for cause, subject to review hy the courts in a proper proceeding.

Giving the secretary of state the right to suspend a registration or license for cause and, after a hearing, the right to revoke a registration or license subject to review by the courts in a proper proceeding.

Providing that no person under the age of eighteen years shall operate a motor vehicle.

Providing that the operation of a motor vehicle hy a person who is intoxicated ahall be a felony punishable hy imprisonment only.

Providing a uniform aet of rules throughout the state regulating the speed with which a motor vehicle may be operated within limits of towns, villages and cities, etc.

Prohibiting local ordinsnces with reference to speed.

Empowering the secretary of state to appoint inspectors to co-operate with police authorities in the enforcement of the motor vehicl elaw.

Giving the secretary of state authority to require applicants for licenses to permit prints of their fingers to he taken.

Making effective the power of the courts to punish violators of the motor vehicle law, hy specifically providing for imprisonment as well as fine.

Requiring numher plates issued to manufacturers and dealers to have in addition to the regular number a serial number.

Requiring each manufacturer and dealer to notify the secretary of state within 24 hours, of the name and address of the person to whom he has sold a motor vehicle, and to whom he has, under the law, granted the temporary use of the manufacturer's number plates, giving the serial number of such plates. The failure to notify the secrctary as above shall be a misdemeanor punishable by fine or imprisonment or hoth.

Prohihiting manufacturers and dealers from using their plates issued under the law, except for purposes of demonstration or in removing the car from place to place for purpose of sale.

Providing for a uniform flat rate fee for registration and renewals of registration of automobiles at 50 cents per each horsepower or part thereof, with a minimum fee of $5. This will be more equitable than the present fees which are $5 for automohiles of 25 horsepower or less, $10 for cars of 25 horsepower and less tban 35 horsepower, $15 for 35 horsepower and less than 50, and $25 for 50 horsepower or more. It will also result in greater revenue.

Requiring the secretary of state to furnish without charge lists of owners and chauffeurs to the police in cities of the first class.

Giving to non-residents the right to operate their cars in this state provided they have been licensed to operate tbeir cars in their own states.

Providing that the owner of every garage shall keep a record of every motor vehicle which enters or leaves the same.

In the table on page 329 of THE AUTOMOBILE for January 30 the population per car for the State of California was given as 254 whereas it should have been 25.4.

French 2,680-Mile Run

On March 1 Thirty-Four Cars Will Start on 14-Day Sealed-Bonnet Touring Competition

Talbot Makes 103 Miles in 1 Hour on Brooklands—Three Peugeot Cars Will Race at Indianapolis

PARIS, Feb. 17—Agricultural motor activities promise to be an important feature in France during the present year. During the month of April the agricultural commission of the A. C. F. will hold a series of motor plowing matches and demonstrations of the use of the internal combustion motor to agriculture at Algiers, in Algeria. The rapid growth of this colony and the importance it is assuming for the supply of fruits and vegetables to the French markets make it a particularly attractive field for the motor agriculturalist.

Paris will hold its annual and national agricultural exhibition during the present month, when, in order to encourage farm workers to study the use of machinery, there will be a series of practical competitions for farm mechanics. There will be two distinct classes, one for men who are qualified to look after stationary machinery and the other for mechanics who can handle motor plows in the field. In the first class the various features on which the men will be examined will be the following: Starting an internal-combustion motor, adjusting carbureter and ignition and finding the causes of a breakdown; starting a locomobile and a thresher driven by a locomobile; fitting up a mechanical creamer; indicating the attention to be given an internal-combustion and a steam engine during and after work; showing how repairs should be carried out on various types of machinery. For men capable of handling machinery in the fields the examination will cover the following points: Fitting up a double Brabant plow; fitting up and regulating a mechanical seed sprinkler; adjusting a reaper and a reaper and binder; starting and looking after a gas motor; indicating attention to be given to a gas motor, plows and various agricultural machinery; indicting attention to be given to horses and oxen on the field and in the stable.

From March 25 to April 15 there will be another agricultural exhibition, when the Agricultural Commission of the A. C. F. wil hold a motor-plowing competition in which the sum of $2,000 wll be offered in prizes.

Talbot Makes 103 Miles an Hour

LONDON, ENG., Feb. 18—(*Special Cable*)—On Saturday, February 15, a 25.6-horsepower Talbot car, driven by Lambert, broke the Brooklands 1-hour record by making 103 miles, 1,470 yards during that space. Lambert's car thereby beats the former world's record for 1 hour, established by Hemery, of 97 miles, 1,037 yards on a 59.6 horsepower Lorraine-Dietrich. The Talbot car used Palmer cord tires.

Must Test on Speedway

INDIANAPOLIS, IND., Feb. 17—Local motor car manufacturers are much opposed to a bill that has passed the state Senate, forbidding motor cars to be tested on any street or highway in this county, permitting such cars to use the streets and highways only for the purpose of reaching any track used for testing purposes. The effect of the bill would be to force all manufacturers to test their cars at the Indianapolis Motor Speedway, the manufacturers say.

As the bill passed the lower house, it prohibited test cars using any street or highway in the state. The Senate amended it to include this county only. The bill will be returned to the House for action on the Senate amendments.

Having rejected a plan for a state highway commission, the House committee on roads has prepared a good roads bill. This provides for the appointment of a county road superintendent by the county commissioners in each county. The road superintendent is to direct all road repairs and construction and is to be allowed not to exceed four assistants for each 100 miles of highways under his control.

One of the features of the bill is that it requires an annual state motor car license which would range from $5 to $25, according to the size and capacity of the car. The money thus raised is to be divided among the counties, one-third equally, one-third on the basis of the number of miles of free gravel roads and the remaining third on the basis of the number of motor cars licensed from each county.

Peugeot Cars for Indianapolis Race

INDIANAPOLIS, IND., Feb. 17—The management of the Indianapolis Motor Speedway has been notified by wire that three Peugeot cars will be entered in the 500-mile race to be held at the local speedway May 30. The word comes from A. G. Kaufmann, of New York City, American agent for the Peugeot line, who says the factory has agreed to enter the cars. Formal entries are expected in a few days. According to the dispatch, the drivers will be Georges Boillot, Goux and Zuccarelli, all of whom are foreign drivers of note. Boillot won the last European Grand Prix. Details of the Peugeot cars to be entered have not been received, although it is understood that they will be either the same cars that participated in the French Grand Prix or machines of similar design.

Shorter Course for Big Races

SAVANNAH, GA., Feb. 14—If the recent recommendation of the course committee of the Savannah Automobile Club is adopted by the committee of the whole the Grand Prize and Vanderbilt Cup races will be run over a 12-mile course next November. As the sub-committee is composed of three of the most influential members of the general course committee it is pretty certain their judgment will prevail.

The new plan provides for a track that is 5 miles shorter than the one over which the last two big races were run here, and has the additional advantage of making it unnecessary for the county to build any additional roads.

The cars will start in front of the grandstand on Waters avenue as heretofore. and will run out to the Montgomery Cross Road; then out on the Montgomery Cross Road to Sandfly; from Sandfly to Norwood avenue; then to LaRoche avenue; then to the Skidaway road; over the Skidaway road to Dale avenue; then down the home stretch back to the starting point on Waters avenue.

Columbus May Not Have Show

COLUMBUS, O., Feb. 14—After having made arrangements in every way for holding the Columbus Automobile Show in the Billy Sunday tabernacle, March 8 to 15, a split occurred between the Columbus Automobile Show and the Columbus Auto Trades Association which resulted in the former organization withdrawing from the show committee. This leaves the matter up to the Columbus Auto Trades Association and it is extremely doubtful if the show will be given at all this year though hope is still expressed by some. Some of the dealers favor the show while others are indifferent.

The cost of gettng the tabernacle ready for the show was in excess of $10,000 and the question of guaranteeing this expense was the cause of the split. It was believed that the Columbus Automobile Club should not guarantee the expense without the chance of some profit, which was denied it. It may be that a show will be given later.

175,000 at Chicago Show

One-Sixth More Visitors Than in 1912 and 800 More Dealers Illustrate Success of the Show

Shows in Minneapolis, Hartford, New Orleans, Washington and Newark Gratifying

CHICAGO, Feb. 17—With the closing of the doors of the Coliseum last Saturday night ended what was probably the most successful automobile show which the Windy City ever had the opportunity to witness. The 175,000 people that passed through the doors during the 2 weeks of the show were different from the visitors in other years in that a greater percentage of them came on business and fewer came to view the displays and decorations as a spectacle. As a result of this there was more real business done at the exhibition just closed than at preceding ones.

Samuel A. Miles, manager of the show, estimates that the attendance as based on the paid admissions showed an increase of more than 15 per cent. over last year's figures. One of the gratifying features was the increase in the number of dealers in attendance. The registration shows that there were 3,800 dealers in attendance, 800 more than last year. That the delegations of dealers were cosmopolitan in character is evidenced by the fact that they came from as widely separated points as Berlin, Germany, and Sydney, New South Wales.

Commercial vehicles held the floor during the second week of the exhibition, and the reports from the exhibitors indicate that the business done was far greater than that of previous exhibitions.

Minneapolis Has Business Show

MINNEAPOLIS, MINN., Feb. 14—From an educational and sales viewpoint the sixth annual automobile show of the Minneapolis Automobile Trade Association, Feb. 8-15, in the Armory annex, and the first national show, is declared a success. A great many dealers sold a good many cars at retail and on contract, and several sold no cars, but every dealer expressed the opinion that the show was a success, considering the educational results as the most desirable feature. At the show there were 118 exhibits, 175 pleasure cars, twenty-five commercial vehicles, fifty chassis, twenty-five commercial vehicles and thirty-five accessory exhibits. Sales are estimated at $1,250,000. The attendance was nearly 200,000.

HARTFORD, CONN., Feb. 15—The sixth annual show of the Hartford Automobile Dealers' Association, held at the First Regiment Armory under the auspices of the city battalion of the state militia, which concluded this evening, was a success.

Several Shows in Wisconsin

MILWAUKEE, WIS., Feb. 14—Two important local motor shows are being held in Wisconsin this week, and a third is scheduled for next week. At Madison, the state capital, eighteen dealers are exhibiting cars at the third annual show in the city market building, the dates being February 18 and 19. It is essentially a retail show and while many sub-agencies are placed at this tme, the principal business of the show is to make sales to the consumer direct.

Oshkosh's third annual show is being held in the National Guard Armory and will run 4 days, instead of 3. The Oshkosh show draws from the entire Fox river valley and is a retail sellers' affair, much like the Madison show. It has an attendance of approximately 6,500 during its run.

Eau Claire, the center of the northwestern part of the state, will give its show in Fournier's Academy from February 2 5to 28. Forty cars will be exhibited and an attendance of 6,000 is expected.

NEW ORLEANS, LA., Feb. 19—There are 108 cars on the floor of the Washington Artillery Hall. One of the features of the show is the increase in number and prominence of the commercial vehicles. As there has been considerable trouble with springs on trucks forced to use the cobble-stone streets of the harbor districts especial attention is being given extra heavy springs, several designs of which are on exhibition. Shock-absorbers of various makes are being urged by the commercial car men as well as those selling pleasure vehicles. Floor space in the main show was so limited that a number of overflow exhibits have been arranged. Several trucks are being demonstrated in the streets adjacent to the show, while an engine and numerous accessories are being displayed in hotels and business houses.

Denver Show Opens March 4

DENVER, COL., Feb. 17—The dates for the twelfth annual automobile show at this city have been fixed as March 4 to 8. The show will be held in the Auditorium, which will be elaborately decorated. Red and white have been decided upon as the official colors for the exhibition. The regular lighting equipment of the Auditorium will be supplemented by a large number of powerful electric globe-lights, one to be hung at the top of each of the white columns to be installed.

Many Sales at Washington

WASHINGTON, D. C., Feb. 15—Washington motor car dealers are elated over the success that marked the first motor car carnival or opening week, which came to an end tonight. Sixteen dealers, representing many of the most popular makes of cars on the market, participated in the affair, and the sales made during the week more than justified the expense entailed by the dealers. The carnival week was inaugurated with a motor car parade in which nearly 500 machines took part, a record-breaking crowd being out to witness the parade, which was over the principal streets of the city.

Newark Show Success

The sixth annual automobile show held in Newark, N. J., opened on the night of February 15. More than 300 pleasure cars and commercial vehicles were on exhibition, representing forty-eight pleasure car firms and twenty-one commercial firms. In point of attendance the show has proved a decided success. As a special feature the show committee has obtained the National racing car which made such an enviable record last year and also the trophies won by the Marmon company.

St. Louis Show Two Weeks

ST. LOUIS, MO., Feb. 15—The eighth annual St. Louis Spring Automobile Show will be much larger than was at first anticipated. It has been decided to make it a two week's show. The first week will be for pleasure cars and accessories, while the second week will be devoted to a display of commercial. The show will open on February 24 and continue until March 8.

SAN FRANCISCO, CAL., Feb. 15—San Francisco will see its first annual truck show this year, which will open in the Coliseum Hall April 1 and will keep open until April 16.

Digest of the Leading Foreign Journals

Constructive Improvement to Simplify Automobile Fire Engines Takes Another Forward Step in Germany—Body Builder Gives Strict Rules for Caretaking Showing Ultimate Unfitness of Paint and Varnish for Motor Cars

NEW Type of Centrifugal Fire Pump.—While America still stands doubtful towards the mobile and relatively inexpensive fire engine which is essentially an automobile with a high-speed pump actuated from the automobile motor, and permits the fire departments to place large orders for equipments of the old and accustomed types, Germany and, more recently, France are going ahead developing and improving the simpler machines in which it is always the same engine power which serves transportation and fire service purposes, and the designers in these countries have succeeded in removing most of the shortcomings which in the United States are still mentionel as decisive against the new type. While both Germany and France are divided with regard to the relative merits of centrifugal pumps, pumps with rotary pistons and pumps with high-speed reciprocating pistons, they have managed to develop each of these varieties to such a point that those fire departments which are friendly to the new movement no longer insist that the new apparatus shall be dimensioned and powered with a view to fitting into the older conditions, or to working in unison with steam pumps or chemical engines, but accept the idea that the fire-fighting tactics should be modified to agree with the capacity and range of the best new engines in which respect there are always some compromises to be made, however, since the construction is in a state of constant development.

It is at the same time emphasized by one of the leading authorities on automobile construction in Germany (Privy-Counselor Riedler) that the advancing development of the centrifugal pump for fire engines holds out the best promise so far mechanically realized for the eventual perfecting of a simplified hydraulic transmission for automobiles and commercial motor vehicles.

The weakest point in the fire engine with centrifugal pump has so far been found in the special provisions which had to be made in order to make it act as a suction pump, so as to draw water from a lower level where no hydrant pressure is available, at the start of operations. If the supply hose leaked or joints were not screwed up tight, dependence had to be placed in these provisions not only at the start but also after every intermission in the play of a stream. The continued operation of the pump was not in itself sufficient to prevent the column of water in the supply hose from breaking, under these conditions, if the flow of water from the hose nozzle was not kept up. The provisions adopted to offset this limitation of the centrifugal pump consisted usually in switching into the water circuit a small positive pump. capable of acting on air as well as on water, or in equipping the vehicle with an auxiliary water tank holding 75 to 100 gallons of water from which the supply pipe could be filled at the start and after interruptions. Altogether the troubles experienced at this point have accounted for the preference shown for rotary piston pumps in Berlin and some other German towns and for reciprocating piston pumps in France. despite the greater complication of mechanism and gears which is necessary with these types (see THE AUTOMOBILE of Jan. 30, page 351) but, on the other hand, the great simplicity of the centrifugal pump and the wide range of fire conditions which it can meet by mere throttle control, so far as the reach and volume of the stream thrown by it are concerned, have acted as a powerful stimulus among designers of this class of pumps for improving it from all points of view and especially ridding it of the one important drawback referred to. The latest improvement of this nature is described by Engineer Schwerdtfeger with reference to the illustrations reproduced in Figs. 2 and 3. The general contours of the fire engine, made at the Adler works at Frankfurt am Main, to which it is applied, are shown in Fig. 1. Instead of having side seats and a hose reel it can also be equipped as a touring car, giving additional comfort for long runs, and is in that case scarcely distinguishable from a large automobile, excepting that the pipe joints, the larger one for coupling the suction or supply hose and the smaller one for the pressure hose, are visible at either side at the middle of the vehicle, and that the vehicle in service carries the suction hose on the running-boards while the pressure hose is stowed in the rear of the carriage body.

The construction of the chassis is interesting at many points, but the one feature which craves attention outside of Germany is the improved centrifugal pump, because it is capable of operating on air and therefore can draw water from a lower level. thus representing an advance step in the very principle of centrifugal pumps. To be sure, a water tank is employed for this purpose but it contains only 9 gallons. It is located back of the dashboard, in front of the driver who can connect and disconnect it, with relation to the pump, by means of a small handwheel. No check valve at the lower end of the suction hose is required in order to make the suction effective. The construction therefore has the full advantage of the centrifugal system in being able to handle water in which there is sand or mud. It is also shorter than the ordinary high-pressure centrifugal pump with four speed translations.

PRESSURE RAISED FOUR TIMES BY TWO WHEELS

In Fig. 2 the Roman figures II to X indicate the course of the water in the conduits of the pump, here shown in longitudinal section. It flows in through one of the two suction pipes—the one not used being plugged—and reaches the introductory channel L. This channel does not take it to the entire area of the central entrance to the first centrifugating disk A but only to the upper half of this area. Here its speed is increased and it enters the channel II and is bypassed through III back to the lower half of the centrifugating disk A where the speed and pressure are again raised. Passing from IV to V and from V through VI to the lower entrance to the second centrifugating disk B and thence through VII to VIII to the upper half of the same wheel and out through channel IX into the pressure channel X, the water again reaches higher speed and pressure twice; so that, in all, four advancements of the pressure are accomplished by means of two centrifugating disks.

As the water enters the centrifugating chambers from opposite sides, end-thrust of the pump shaft is avoided by this construction, which means a considerable simplification in the mechanism of the bearings.

The suction and pressure pipes are located so high with relation to the pump body that the water does not run out of the latter when the supply hose or pressure hose is uncoupled. The pump body thus remains almost full of water after an interruption of service and is also connected with the small water tank previously mentioned by two pipes, one opening into the suction chamber of the pump and the other into the pressure chamber X. When the engine is in normal operation both these conduits are closed. At the start—provided no hydrant pressure is available—they are both opened, and when the tank is to be refilled only the conduit leading to the pressure channel is open. The operation under this most trying condition is as follows:

AIR EVACUATED BY CENTRIFUGAL PUMP WITH WATER JOINTS

In order to start, the suction hose is attached and connected with the water supply, while the slide valves of the suction pipe as well as the slide valves or the different pressure hose couplings remain closed. The pump is completely filled with water from the tank, and the pump is then clutched to the motor shaft. (In the Adler construction the shaft from the vehicle clutch to the gear box runs through the hollow pump shaft.) A circulation of water between the tank and the pump is now effected, and the water from the tank runs into the suction chamber of the pump through the pipe shown in Fig. 3 above the letter Z which represents a specially shaped trough causing the water to fall in two cascades into the introductory channel (L in Fig. 2), and the latter is divided into three compartments by means of two ribs FF. The water falls mainly into the two outer chambers, while the central one contains mainly air. Now the slide valve to the suction hose is opened a little and air is drawn out of it, the water making the pump act efficiently as an air evacuater, and the mixture of air and water is passed through the pump to the water tank where the air separates from the water and passes into the atmosphere through an overflow pipe. Meanwhile the water from the low-level supply has replaced the air taken from the suction hose, the slide valve for the latter has been opened completely and the condition for normal operation has been established. The conduit from the water tank to the suction chamber is now first closed, whereby the tank is refilled until it begins to overflow, and then both the conduits from the tank are closed.

Trials with this construction have shown that water can be raised 9 meters in less than one minute and without failure, and that in the subsequent normal operation the pump continues to raise the water this height while at the same time developing a pressure of 8 atmospheres, corresponding to the work of raising the water, inside of the hose, to a height of 80 meters.

With four hose simultaneously at work, each with an interior hose diameter of 52 millimeters (a little more than 2 inches) and a nozzle diameter of 10 millimeters, streams were thrown to a height of 30 meters and the delivery amounted to 800 liters (211 gallons) per minute. The motor in the machine develops 40 horsepower at 1,500 revolutions per minute.—From a more complete description by Schwerdtfeger in *Der Motorwagen*, January 20.

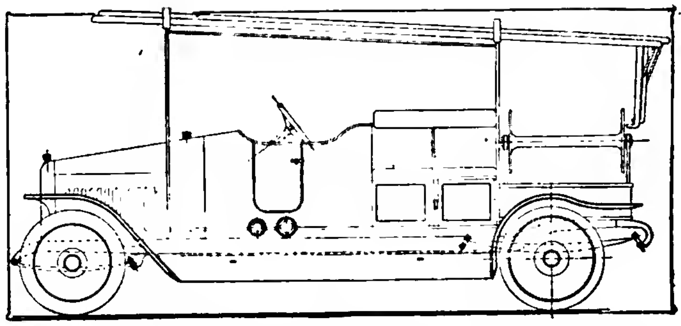


Fig. 1—General view of Adler fire engine with Gentil pump

DIRECTIONS for Grooming an Automobile—A double interest attaches to the directions given by Georges Kellner, of the well-known carriage-building firm of Kellner & Sons in Paris, with regard to the care to be given the bodies of automobiles. In the first place they proceed from the best knowledge on the subject and may be applied directly by any owner of automobiles in his relation to his chauffeur, caretaker or stableman, and, secondly, their very exacting nature suggests the urgent need of devising materials and a finish for automobile bodies which may be kept in presentable order with much less of care and labor than is now involved in the task. The directions are given in full in the following:

The care of the carriage work is a very important question to the owner of a vehicle. Every owner who is economical and careful of the elegance of his conveyance should always before entering his automobile throw a rapid glance over it to see that everything is proper and correct.

He should also occasionally assist at the washing of it. A conscientious mechanic can only be flattered to see that his principal is interested in his work.

The durability of a carriage body depends upon the quality of its manufacture, the maintenance of it and upon its paint. A vehicle should therefore always be well covered with its paint and its varnish. At this point the proverb that a stitch in time saves nine may be seriously applied. To wait till the paint becomes rough or the wood exposed before having the work done over is from no point of view advisable. It is necessary to groom this coat of paint and varnish with extraordinary care and not to forget that this care must be so much more assiduous the more the vehicle is exposed to wear and tear.

Water is the enemy of carriage work and the greatest cause of its deterioration. It rots it when it is in the wood; it rusts and disintegrates the sheet metal. A carriage body into which water enters by slow degrees is doomed to early decay.

Consequently, washing with a hose should be completely prohibited. Water used in too great abundance and at too high pressure deteriorates the paint at the joints, works in between the moldings and the panels, penetrates to the door drops and to

Fig. 2—Longitudinal section of Gentil centrifugal fire engine pump. The course of the water is indicated in the succession of Roman figures from II to X

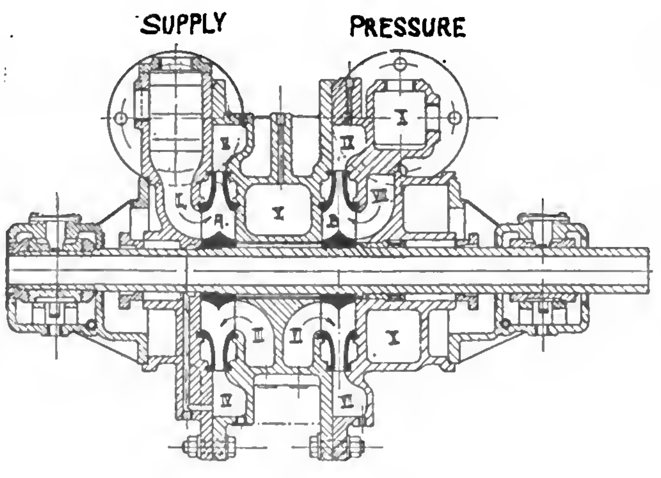
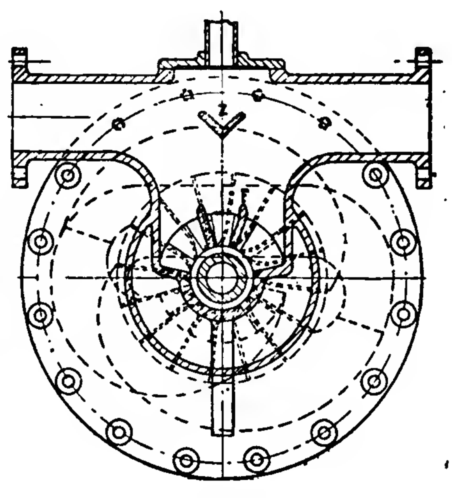


Fig. 3 — Transverse section through supply pipes and introductory chamber of Gentil pump



the linings, remains in corners where it cannot readily be wiped off, and can in the long run loosen the glued joints, make the wood swell and the paint fall off.

If the hose is tolerated, as it unfortunately is, it should at all events absolutely be provided with a rose so as to break up the power of its stream.

At the Kellner establishments the hose is tabooed. At the largest garage in Paris it has been abolished.

In one word, water should be used freely in washing the carriage but not in excess. To this end, washing with a pail of water and a sponge is a hundred times preferable to washing with a hose.

On the other hand, it is of the highest importance that a vehicle is well wiped after the washing, so that no water will stay long at any one point or streak the varnish.

The varnish should be particularly well treated, so as to remain brilliant for a long time and thereby fulfil its mission as a protector.

All dirt should therefore be removed at once upon the return of the vehicle to the stable before it has had time to dry. Unless this is done, the dirt leaves spots (especially on freshly painted vehicles) which detract notably from the lustre of the varnish and are difficult to remove.

The dirt must not be removed by rubbing. The mop is a poor instrument, even for the wheels. By using it, one spreads the dirt which acts like sandpaper and destroys the whole brilliant and protecting surface of the varnish. The mob is a stable tool intended for assisting in cleaning the feet and legs of horses but not for brilliant surfaces. The continued use of it ends by laying the wood bare.

Other things to be prohibited are: The addition of kerosene or gasoline to the water used for cleaning and the use of soap. Both these expedients roughen the varnish in the long run. Finally, hot water is banned because it makes the varnish crack or peel off; it may also affect the glue in the woodwork.

NECESSARY UTENSILS

Two good and large sponges; one for the carriage body and one for the chassis and wheels; two shammy skins.

The sponge and the skin intended for the running gear must not be used for the body, to avoid carrying oil and grease from one part to the other.

Two or three pails.

A large trough, to assist in filling the pails rapidly, if other means for this purpose are not at disposal.

A very soft feather duster, which must only be used for removing the dust which settles in the stable. Further, the dusting must be done very lightly with the ends of the feathers. The dust of the road must always be rinsed off with water.

A brush for the upholstering; a whisk broom for the mats or rugs.

A beater, a skin ball or soft rags.

A jack, a footstool.

Washing should be done in the shade, so that the water shall not dry too rapidly. The sunlight drying it up quickly, is likely to leave streaks or spots on the varnish.

In the winter the washing should be done in a sheltered place where the water will not freeze on the vehicle, but under no circumstances should hot water be used.

All interior and exterior cushions should be removed; also all the carpets, and these should be brushed after the washing.

All the upholstering should be beaten and brushed.

The windows of close vehicles should be raised and the tops of open ones should be removed to avoid getting water into the interior.

Begin by removing the worst of the dust and dirt. To this end, throw from a distance of a step or two, one, two or three pails of clean water against each exposure of the vehicle (the two sides, the rear and the front part of the running gear). Thereafter, fill the pails with fresh water again and return to the part at which work was begun and start by dashing water obliquely from a well-soaked sponge against the panels to loosen the dirt and make it drop off. Finish by sopping the panels lightly with the sponge. Under all circumstances, do not rub so long as the dirt has not yet been removed.

In the case of a close vehicle or one with a top, begin with the roof, washing it with a sponge full of water and wipe it dry at once. The sponge should be frequently rinsed out in the pail and the water in the latter should be changed as soon as it becomes too dirty.

When the carriage body has been washed, remove first—while always proceeding in the same order—all surplus of water by using the sponge for this purpose after squeezing it off, wet the shammy skin and wring it off and, with it, dry conscientiously the panels, the window panes and all the corners where water might linger.

Wring off the shammy skin from time to time by twisting it around the pail handle, so as to remove the water which it has absorbed.

When the body has been finished, pass to the motor hood, to the chassis and to the wheels, wiping each of these parts dry as soon as it has been washed.

When the washing is done, attend to the nickel and other plating, beat the cushions, clean the carpets and put them back in place; then rinse the sponges and the skins and empty the pails.

Two hours are required for the cleaning which has been described and which is usually done in the morning.

Every neat chauffeur should be careful not to place rags, wrenches or maps under the cushions, as this practice spoils the shape of the cushions and gives the vehicle a messy appearance which is in bad tone.

SPECIAL REMARKS

It is difficult under certain circumstances to proceed at once to the washing of a vehicle after it has been out. An automobile may be called upon to go out several times in one day; sometimes even morning, afternoon and evening. It is impossible to wash thoroughly after each of such trips. The amount of work involved cannot be asked of one man, although a vehicle used so severely should have more care than ordinarily is required. In such cases it is necessary to have a stableman or to put the vehicle up at a garage where special men do the washing.

However, a careful chauffeur can find time to give his vehicle a superficial cleaning after each trip, even in the evening. He can throw water over it and rapidly wipe the carriage body and the top of the fenders. This will take about 45 minutes.

A vehicle which has been out in dry weather and is covered with only a very light coat of dust, can at a pinch remain in this condition if it is intended to go out once more the same day, but it must in all cases be washed after the second outing. A vehicle which has been out should never be left unwashed more than 24 hours.

MISCELLANEOUS ADVICE

From other advice given by Mr. Kellner, most of which is familiar, a few extracts are presented:

The private garage should not be near to a horse stable, as the ammonia in horse dung causes paint and varnish to crack. A carriage should never be placed near to a stove. In storage it should be washed once in a while to keep the varnish bright, and upholstery should be brushed to keep moths out.

If leather tops harden they should be rubbed with neat's foot oil and brushed till they shine. No top should be left long folded but should be raised at every chance to obviate wrinkles and cuts. Celluloid windows are cleaned with alcohol.

Obstinate mud spots are removed by rubbing them lightly with a wad of cotton soaked in linseed oil. It is useful to have at the private garage a pot of black japanning, wherewith to touch up from time to time the lamp brackets (if they are black), metal wheel rims and the under part of steps and fenders. It should be applied only in very light coats.—From *Omnia*, January 18.

Preventing Vibration

Periodicity of Rocking Moment Broken by Lanchester Device Using Four Rotating Weights

Device Is Absolutely Silent and Is Invisible—Used on Fours or Sixes

IT is a well known fact that the balance of an ordinary four-cylinder gasoline motor is not perfect. At high speeds of revolution the vibration of a four-cylinder engine becomes quite a serious factor, both as affecting the comfort of a vehicle and as prejudicial to the durability of both chassis and body work. It is in fact on this want of balance of the four-cylinder engine that the demand for the six-cylinder engine is mainly based. It is true tbat the six-cylinder engine for a given power has the advantage of more uniform torque, that is to say, for any given mean torque there are less extreme limits of maximum and minimum, but the advantage of the six-cylinder engine in this respect is a secondary matter as compared with its advantage in the matter of smooth running as dependent upon more perfect balance.

The main piston movements on a four-cylinder engine may be said to be balanced, since the pistons of Nos. 1 and 4 cyliders are at their highest point when Nos. 2 and 3 are at their lowest point and vice versa. If the connecting rods were of infinite length, or in practice of such a length that their extreme angularity were very small, all four pistons would reach mid-stroke position at the same instant and at all other points Nos. 1 and 4 pistons would by their motion accurately compensate for Nos. 2 and 3. In an actual engine with a rod length of about two and a quarter times the stroke, Fig. 1, there is a considerable error in the position of the pistons when they should be at mid-stroke, thus when the crank pin is at 90 degrees from the dead center all four pistons are somewhat below their mid-stroke position, in the case of an ordinary 20 or 25-horsepower engine the error of position amounts to about .25 inch. This downward displacement of all four pistons due to connecting rod angularity takes place twice per revolution, or (regarding the main piston motions as mutually balancing each other) there is left a displacement of the whole reciprocating equivalent mass through the distance of .25 inch vertically taking place twice per revolution.

Analysis shows that this displacement may be approximated to a very close degree as a harmonic motion of twice the crankshaft period and in the new anti-vibrator a simple means has been found to compensate for this source of disturbance.

The serious magnitude of this secondary vibration on existing four-cylinder engines is scarcely appreciated by many designers; it amounts on an ordinary 25-horsepower four-cylinder motor at full running speed to as much as .5 ton applied alternately upwards or downwards twice per crankshaft revolution. The importance of eliminating a want of balance of this magnitude can scarcely be overstated.

On an open car, the vibration due to the cause under discussion is always felt at certain critical speeds and has hitherto been looked upon as inseparable from the four-cylinder design. Of recent years the trouble has become aggravated owing to a powerful sympathetic vibration or resonance set up in landaulettes, limousines, and other closed forms of body such as have to-day come into general use. It has therefore become difficult in a four-cylinder car to meet the demand for perfect smoothness consequent on the public having become educated up to high ideals by the six-cylinder car.

The new anti-vibrator patented by F. W. Lanchester the well known designer acts by supplying the equivalent of a reciprocating movement equal and opposite in effect to the unbalanced component of the piston and connecting rod motion, of twice the frequency of the main piston reciprocation.

The means employed is shown in Fig. 2. It will be seen tbat there is no actual reciprocating part but in place thereof four rotating weights A are provided, arranged symmetrically in pairs at the extremities of spindles B1 and B2 driven by screw gears C1 and C2 at double the crankshaft speed. The two spindles rotate in opposite directions and so the lateral movements of the balance weights, that is the horizontal components of their motion neutralize one another but the vertical motions combine to give the effect of a single reciprocation. The diagram Fig. 3 explains this action. Here the corresponding position balance weights are numbered 1, 2, 3, etc., and their common center of gravity for each numbered position is given at 1', 2', 3', etc.

It is possible in this arrangement to correct for irregularities of turning moment due to piston inertia, these following the same law as to frequency as the linear secondary vibration. But in the ordinary gasoline motor the advantages in this direction have not hitherto been found sufficient to give any marked superiority to engines corrected in this sense.

The balance weights in any case are quite small. In the arrangement shown in Fig. 2 each weight weighs about .5 pound for an engine of 25-horsepower.

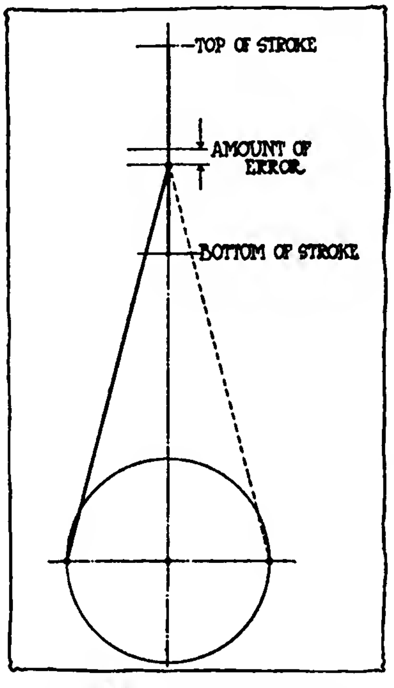


Fig. 3—Error due to angularity of connecting-rod

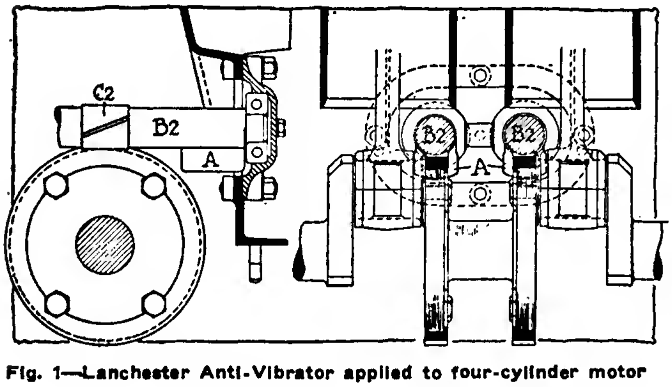


Fig. 1—Lanchester Anti-Vibrator applied to four-cylinder motor

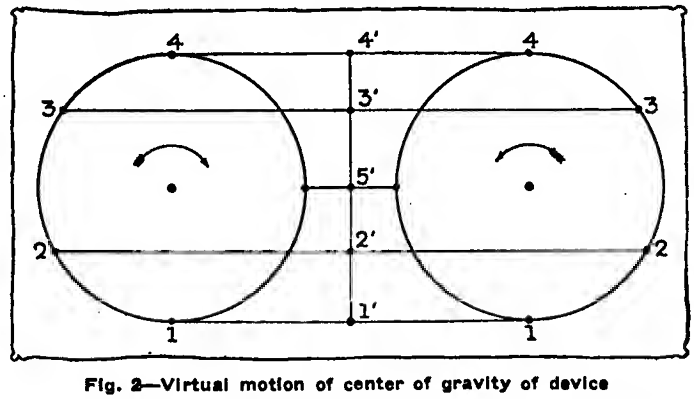


Fig. 2—Virtual motion of center of gravity of device

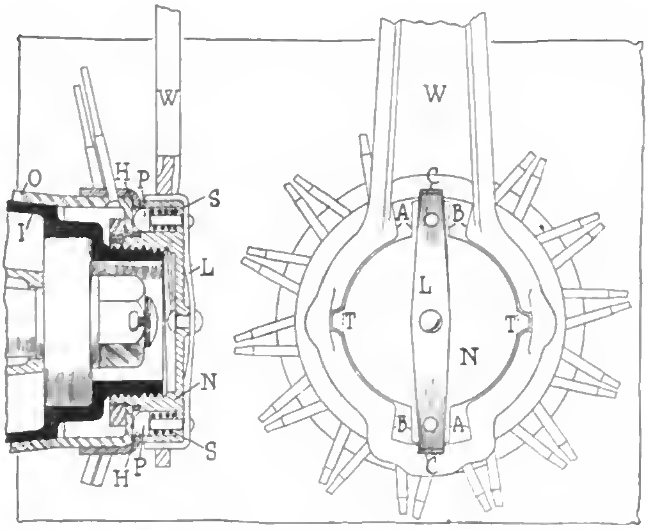


Fig. 1—Detail of locking device on McCue wire wheel

McCue Wheels Used As Regular Equipment

Two American Makers Fit This Make to 1913 Cars

THIS year marks the introduction, to any real extent, of the wire wheel into the automobile practice of America. This type of wheel has withstood a practical test for several years in Europe and is therefore far beyond the experimental stage.

One of the advantages possessed by the wire wheel over the wood artillery wheel is that absolute circularity of the rim, besides truth in the relation of rim to hub, is maintained irrespective of atmospheric changes. This is owing to the fact that only one material is used throughout its construction, and consequently even expansion or contraction of the components, on varying heat conditions, results.

One of the objections raised against the wire wheel two or three years ago in Europe was that moisture found its way through the junction of spokes to rim and caused damage to the rubber tire. If there was any foundation for this objection it certainly does not hold with the present-day methods of accurate spoke fitting and thorough enameling.

The McCue Company is a pioneer manufacturer of wire wheels in this country, and its product appears this year as a standard fitting on some of the important car builders.

The McCue wheel follows European practice in that it belongs to the triple spoke class. It is built on a pressed steel hub O, Fig. 2, of conical shape. The spokes, drawn from a special alloy steel, have enlarged ends to provide a strong fastening. Small semi-spherical depressions in the rim form a seating for the spoke nipples. The method by which each spoke is tightened to a uniform tension is interesting. A special wrench is used for this purpose, so designed that when the tension applied to the spoke reaches the right point, which is in the neighborhood of 1000 pounds, the wrench automatically stops tightening it any further. The wrench is set at the desired tension, and the operator simply tightens each spoke nut until the wrench refuses to make it any tighter.

After lacing up the wheel in this manner, it is trued by hand, and a final absolute truing of the hub to rim obtained by machining the interior of the hub while the wheel is held in a chuck by the rim.

Seventy spokes are used in the standard wheel, made up as follows: outer set, twenty-eight; cross, twenty-eight, and inner fourteen.

A point of considerable importance in the fitting of spokes is the angle at which each spoke enters the hub or flange to which it is fixed, i. e.: the angle between the center line of the spoke and the direction of the hole in the hub which receives it. In bicycle practice the flange is usually at right angles with the axis of the hub, and therefore it is necessary that the spoke end be bent through 90 degrees. Mechanically, this is a weak fastening. It requires that the spoke at that point be much heavier in order to equal the breaking strain of the spoke proper, than would be necessary if the spoke end passed through a hole in line with its axis.

Of equal importance is the outer end of the spoke. The screw thread which is necessary here to take the spoke nipple brings down the tensional strength of the spoke to that of a wire equal to the diameter of the base of the thread. It will be noticed that the ends of the spokes in the McCue wheel are considerably larger than the body of the spoke so as to eliminate any weakness that might follow if the points mentioned above were ignored. A further reason for this enlarging of the ends is that most of the driving strain is met at by these portions of the spokes.

Turning now to the method of mounting and locking the wheel, the inside of the wheel hub is machined to fit accurately the conical surface of inner hub I, Fig. 1 to which it is clamped by the locknut N. The drive is taken by a series of studs S positively connected to the inner hub and which project into corresponding holes in the flange of the wheel hub. The locknut is shown in detail in Fig. 1. It is of the floating type, that is, it is free to rotate on the wheel hub, but cannot be detached therefrom. This is an excellent feature of the wheel. Except for the special wrench there are thus no separate parts to lose or forget, while changing wheels. Two spring-actuated pins P are the means of locking the nut after screwing up. These engage with

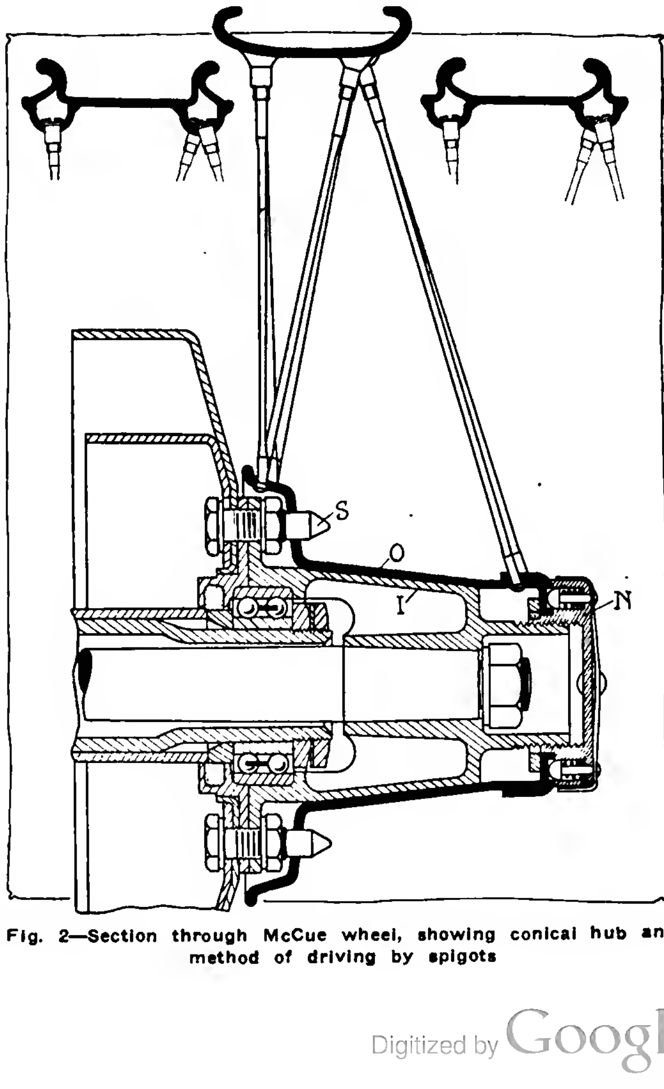


Fig. 2—Section through McCue wheel, showing conical hub and method of driving by spigots

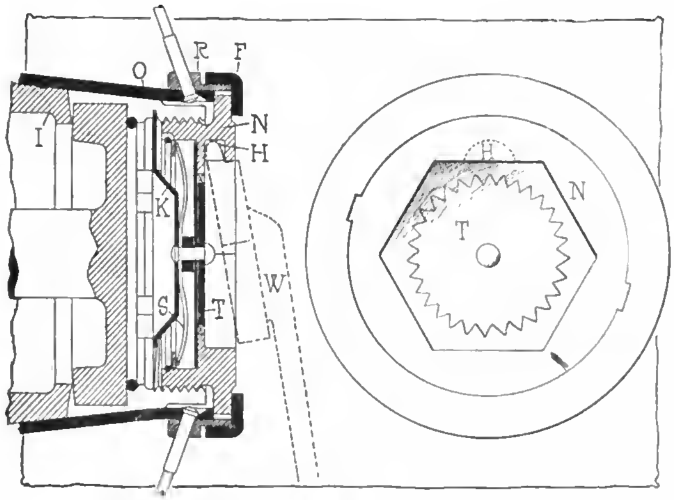


Fig. 3—Special locking device adapted to McCue wheels by Edwards Motor Company

a number of holes H drilled in a flanged ring shrunk on the end of the wheel hub. The springs S are sufficient in themselves to retain the locknut unless considerable turning force be applied, but an absolutely positive lock is insured by the use of a stiff flat spring L, which normally is in such a position as to prevent the pins P from sliding out of engagement.

The operation of removing the wheel is performed by a special wrench W which can only be placed over the nut in such a way that two small notches C engage with the ends of the cross-spring L. On applying force to the handle the spring C is first rotated through a few degrees until the faces B come into contact. This movement uncovers the ends of the pins P which are then free to move against the action of the light springs S and a further rotation of the wrench handle unscrews the nut, drawing the wheel with it by means of a flange on the inside. On replacing the wheel it is impossible to remove the wrench until it is in the position shown in the diagram, owing to the teeth T, which otherwise would be resting on the face of the wrench ring.

In Europe, where the extensible beaded tire is the rule, it has not been the custom to use detachable rims on wire wheels, but the introduction of these wheels to the American market made it necessary to incorporate the Q. D. rim owing to the prevalence of inextensible tires. The very slight addition thus made to the weight carried at the periphery is more than compensated by the greater facility with which tire changes can be made. In this connection it is rather to be wondered at that the European motorist has not demanded the Q. D. rim, even for use with extensibly beaded tires.

The insets in Fig. 4 show a type of detachable rim fitted to some of the McCue wheels. It will be noticed that the rings are reversible so as to be adaptable for either straight-sided or clincher tires.

Another type of Q. D. rim is shown in Fig. 4. This is a product of the Standard Welding Company and is incorporated in the McCue wheels used on the Edwards-Knight and Henderson cars. The method of fastening is shown in the same illustration. The split ring C is provided at its ends with notched teeth T, which project through holes in the rim proper, and are clamped thereto by the latch L. This latter carries an oval-shaped piece P, which permits the ring to be withdrawn when the latch is in the position shown in the lower illustration, but which engages the notches in the teeth when the lever is laid along the rim. No special tools are required in the operation of this locking device. The rims are made to accommodate either clincher or straight-sided tires. The latter type is shown at 4, in which it will be seen that the detachable portion is not altered in any way, being merely reversed.

A locking device which differs from the McCue standard is that shown in Fig. 3. This design has been brought out by the Edwards Motor Company and is incorporated on all the McCue wheels fitted to the Edwards-Knight cars for this year. It is characterized by a smooth and neat external appearance.

The flange on the existing wheel hub is turned off, and a ring R fitted outside through which the spokes pass at their inner fastening. A flanged ring F screwed on to the ring R provides a free seating for the locknut N, allowing it to be turned but not detached. This nut is screwed inside to engage directly with the inner hub I, a hexagonal depression on the front face being provided to take a wrench W for applying and removing the wheel. Actual locking takes place between the toothed disk T and the corresponding aperture in the locknut. A three armed spider K is the means employed to maintain the locking disk in permanent relation with the inner hub O. Rigidly attached to the toothed disk is a flat spring so arranged that the disk is normally forced outwards in engagement with the locknut, being prevented from passing right through the aperture by a guide disk fixed to the inner surface.

A hexagon headed wrench W, shown in dotted line, is the only tool necessary in the operation of applying and removing the wheel. On applying the wrench a tooth projecting from one of its faces engages with a milled hole H in the locknut, forming a fulcrum on which the wrench is swung into place. In so doing the inner surface of the wrench comes in contact with a rivet head in the center of the disk T, thereby forcing in the latter against the action of the spring S, and out of engagement with the locknut N. The locknut is then free to turn and on being rotated forces up the wheel on the inner hub I or withdraws it, by means of the flange F.

Overloading vs. Brake Capacity

Loading a truck above its rated capacity and driving a car at too high a speed are the same sort of misdemeanor, when one comes down to a final analysis of the problem. On the surface, it would seem that a man who owns a truck may put a load of 8 or 10 tons on it, even if the rating is only 5 or 6 tons. One might argue that the excessive depreciation which is the inevitable result of overloading, is as much as the business of the owner as insufficient lubrication or any other neglect. This, however, is not true.

A man who overloads his truck, driving it over public highways, jeopardizes public safety in exactly the same proportion as he exceeds the rated loading capacity of the truck. The reason for this is that the brakes on each vehicle are designed to absorb a certain momentum, that is to say, to nullify the dynamic energy of the moving body by changing it into friction and heat. A certain momentum, that is, the power used for driving the truck at a certain speed, may be absorbed, and no more. If the truck is driven above that certain speed, the brakes will not be able to hold and act as they should.

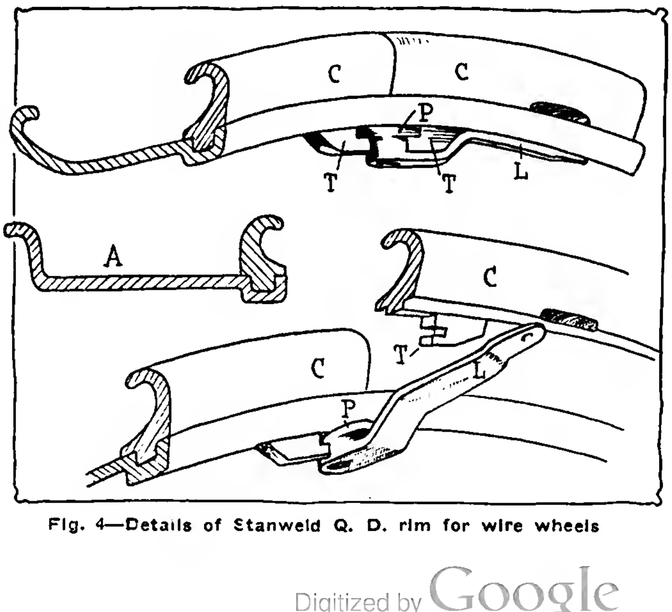


Fig. 4—Details of Stanweld Q. D. rim for wire wheels

The Engineers' Forum

Exhaust Gas Analysis

Engineers Discuss Value of Analyzing Exhaust Gases To Determine Engine and Carbureter Efficiency

Hutton and Coffin Give Results and Favor Changes

Part III

Hutton Outlines Importance of Manifold
Coffin Wants More Air in Cylinders

NOTE—These discussions by leading engineers are from stenographic notes taken during the recent session of the Society of Automobile Engineers in New York City when this pertinent subject proved one of the most interesting of the meeting.

NEW YORK CITY—The real carburetion as in the case of gasoline and air is that we propose by the velocity combined with heat that we have in the intake to get a current of air soaked with the true gas, so that the moving column of air, which is the air for combustion, shall be thoroughly saturated with the fuel that is to be burned.

Now thorough saturation, of course, is a combination of two conditions: the presence of the finely divided particles of gasoline just ready to vaporize and a mechanical mixture of those vaporized particles with the air. Now when we are thinking of passing from the carburetion of air by gasoline to the carburetion—and let me put an interrogation mark after carburetion in that sense—to the carburetion of that air with a less volatile fluid, such as kerosene, do we ever in the presence of, say, ordinary temperatures soak or saturate that current of air with the hydrocarbon gas? We may mix it together very intimately with the foggy kerosene particles in a very finely divided state; but is it possible with any non-volatile fued like kerosene to absolutely soak the current of air in the same sense in which we soak it with gasoline?

The manifold has a very important function, much so in gasoline, but even more conspicuously so in kerosene, in its operation of soaking through the air. When we once get that manifold acting slowly, then comes the function of the manifold acting as a vaporizer to help along this reluctant process with kerosene. If the manifold is too long, then comes exactly the same result as observed, that it never gets hot enough the fog settles in the form of a deposit of rain on the bottom of the pipe. If the manifold is short and we have got it going hot and the engine is running at high speed, there is never any chance for this precipitation of kerosene fog, and we carry a product finally to the engine in full condition to burn smokelessly.

Now the problem of varying the speed of passage through the manifold, the problem of varying the volatilization of the liquid fuel, makes me want to ask whether the profession will undertake to confine the use of the term carbureter to a device which makes, without extra heat, a gas that issues from the carbureter valves. If it does not make a gas, but makes simply a fog, a mist of finely divided hydrocarbon particles in the air, I would like to refrain from calling this process carburetion. I do not think this is a true carburetion. If so, a device which uses kerosene and does not make a complete gas of it ought not to be called a carbureter, but we should find some other name for it—an atomizer or vaporizer. Well, those are two good names anyhow. But the thought that is in my mind is would it be sufficient—put it a little high—would the commercial interest permit an arrangement for atomizing kerosene, consent to have it called by some other name than carbureter? It would be scientifically more defensibe, but could it be commercially done?—Prof. F. R. Hutton.

Injecting Air a Great Help

Detroit, Mich.—From the standpoint of the manufacturing interests, I should say that we are principally interested in the results, and I think stand ready to welcome any carbureting device which will do the work, without much regard to whether it is indirect or direct. At least, I think the Standard Oil Company is going to force it into existence. I did a little experimental work 2 or 3 years ago which proved pretty conclusively that if it were possible to construct a motor in such a way that at the end of the intake stroke or the suction stroke, after the cylinder had filled itself with all the charge that it might take through the carbureter, that if we were able to inject into that cylinder a surplus of fresh air immediately over the top of the piston that we had no trouble in burning up everything within the cylinder, that our carbureter troubles largely disappeared and that we consumed everything, even to the cylinder oil, without leaving any residue in the line of smoke through the exhaust. As a matter of fact, we could take a spark-plug which had been deliberately fouled and which refused to work in an ordinary motor and put it in the engine with such a device and take the spark plug out after 5 minutes' running just as clean as the day it was made. This gave, I suppose, merely a condition of air and an excess of oxygen which aided in the combustion of everything which had been taken into the cylinder. We discovered, however, at the same time, that, due to the excess power we developed in that way, that it would be necessary to revise our gas engine practice in so far as construction went. In other words, our bearings were not of sufficient area and many other parts of the motor were not of sufficient strength to take care of the additional power generated. And if a charge were put into the cylinder under pressure, which would seem desirable from his standpoint of getting the speed in the intake pipe up, that then there might be a question as to whether the gas engine as it is now constructed would take care of the higher temperatures and the additional power developed. There is absolutely no question but that in so far as the cylinder contents go, it is possible to put into any cylinder, as our gas engines are now constructed, a charge which shall be a mixture of gasoline and air which will give an explosion that will be too extreme for the parts of the engine to stand up any length of time. Putting it in there wet it is now possible to construct a motor or it is now possible with motors of our present construction, to get within the cylinder, by an addition of air at the end of the suction stroke, or by putting in the charge under pressure, a power which our current practice in gas engine construction will not take care of. We can wreck an engine as we now build it with such practice. I do not know that there would be any difference in taking in a charge under pressure, a pressure applied beyond the carbureter, reaching through the intake pipe into the cylinder, or as we did it, taking the charge, ordinary charge, through the carbureter fairly rich, perhaps, but anything that is so arranged that the piston at the extreme bottom of its intake stroke would open up every part, which would admit air at a pressure of 10 or 15 pounds per square inch, and thereby fill up the vacuum, any remaining vacuum—I use vacuum in the term that there is some portion of the cylinder which of course is not filled through the carbureter. As long ago I think as 9 or 10 years back, in a series of experiments which were conducted in the laboratory at the University of Michigan, we found that piston displacements were not by any means being filled under the method of carburetion which we were using then, and which we still use to-day. We found that our charges filled in something like 90 per cent. of the piston displacement at low speed, down to 55 or 60 per cent. of the possible piston displacement at fairly high speed, and of course we found a great many other things which we probably did not understand as well then, as to the inertia of the gas column, and so forth. But we did satisfy ourselves that we were not getting the gas into the cylinders, because the friction through the valves, the friction of the intake pipe, the restricted passages from one end to the other—and that same situation holds, I think, to-day, and it is probably just as well for gas engines as we now build them that it does hold. Otherwise I think that we should have to change our ideas of design quite materially.

The addition of fresh air at the end of the suction stroke, thereby completely filling the cylinder and adding oxygen and aiding in the combustion of air within the cylinder, will give such an increase of power that the engine will not take care of it.—Howard Coffin—Hudson Motor Car Co.

Where Much Heat Is Lost

New York City—One-third of the money we pay for gasoline is literally thrown into the winds of our radiator cooling fan. For every dollar we pay for fuel we get back less than 15 cents worth of ride. Any man would fire a laborer who worked at the rate of $1 worth of effort for $7 hard cash in wages, yet this is what we get from our mechanical servant, the gas engine, and we are not merely satisfied but delighted.

Owing to the unfortunate habit of water to boil whenever it reaches a temperature of 212 degrees Fahrenheit or less we are compelled to keep the cooling water to the safe and sane temperature of 180 degrees Fahrenheit in order to allow ourselves a slight margin of safety whenever the slope of the ground becomes excessive. This is one source of lost energy. It is the greatest source, too, constituting as it does 30 per cent. of the total heat value of the fuel. What can we do to chop off a few per cent. from this and add the percentage gained here to the percentage that forces the car over the ground? Evidently we can do nothing as long as water is used unless some kind soul discovers non-boilable water or some other miracle happens. Leaving this matter for the few remaining air-cool advocates to gloat over, the next big source of loss, the heat thrown into the muffler, may be mentioned.

It is, of course, thoroughly understood that the exhaust of a gas engine is going to be hot from now until gas engines are no longer in use. The muffler will never be used as a refrigerator for tired tourists' lemonade, etc. The problem is not to take from the exhaust what may be called the liberated heat, but to take from it the heat that still remains bottled up in the form of combustible products. If we had a log fire in a cold room and the fire persisted in going out before the fuel was consumed we would know that there was something wrong and that conditions in the grate were not such that were most conducive to a successful fire. When we throw carbon monoxide into the muffler it is like dragging a half-burned log out of the grate and throwing it away.

The entire secret of good combustion is enough air. What is considered by chemists as sufficient to cause perfect combustion for a given weight of charge will not do. The air must be plentiful enough to be in contact with the burning particle. There must be more than enough. Therefore to stop the loss of power into and through the muffler it is up to the driver to furnish plenty of air by proper carbureter adjustment. Why not inject excess air into the cylinder anyway? Cannot our engineers find a way to do this? A few who have experimented will vouch for the good results and the increase in thermal efficiency. —Carl Vechter, Unattached.

Harking Back a Decade

FROM The Automobile for February 14, 1903:

Some difference of opinion between the Automobile Club of America and the National Association of Automobile Manufacturers has at times been surmised, but has usually been well smoothed over in the interest of the moral effect of a united front by the two leading automobile organizations. Until the Madison Square Garden show, held under their joint auspices, was over, the external appearance of harmony was preserved, but no sooner had this affair been successfully pulled off, before an open declaration of disagreement in views was made by the manufacturers' association in the form of a resolution expressing disapproval of the most important event projected by the club.

But from the outside the resolution by the manufacturers looks as a deliberate challenge to the club to hold no automobile contests in the future without first obtaining the sanction of the manufacturers' organization; in other words, to keep its hands off the development and encouragement of the industry, in general, and limit its activities to matters of sport; failing in which the two organizations will have to measure strength.

With some local variations the display of new automobiles and automobile appurtenances which was placed before visitors at the New York show, is now spread under the eyes of another community, and is being judged by another public. A half dozen Western manufacturers of complete automobiles whose absence from the New York event was deprecated, are exhibiting their products in the Coliseum in Chicago, and a score of their Eastern colleagues, satisfied with the results obtained at the Madison Square Garden, are refraining from further effort. But outwardly the two exhibitions are of the same size and of the same character, though running a little more to parts and accessories in Chicago and little more to complete vehicles in New York City.

The annual meeting of the National Association of Automobile Manufacturers was held on February 4 in New York City and Milton L. Budlong was elected president; H. Ward Leonard, Windsor T. White and Charles Clifton, vice-presidents. Percy Owen was re-elected treasurer and the re-election of Harry Unwin as secretary was ratified.

The Automobile Club of Great Britain and Ireland is loath to give up all hope of holding the race for the Gordon Bennet cup on British soil, and through its latest efforts the club has discovered a stretch of road of over 150 kilometers in length in Ireland, which it has pronounced fully satisfactory as to condition. This road lies in the Province of Leinster, the start being at Naas, some 30 miles southwest of Dublin.

Copper Alloys for Motor Car Service

Copper, Tin, Zinc and Lead the Basic Ingredients of Bronze and Copper Alloys; Properties Important

Paper Presented Before the Detroit Section of the S. A. E. by W. H. Barr, Chairman of the Alloys Division

IN offering a paper on copper alloys one approaches a subject of such magnitude that it can only be treated briefly, in a manner that may prove of interest and service to automobile engineers.

The basic ingredients of bronze and copper alloys are, of course, copper, tin, zinc and lead, and we will consider these metals from a viewpoint somewhat unusual.

Men of mechanical training, especially those who have not made a study of metallurgy, are always interested in knowing something of these virgin metals, their origins and their effect upon each other when brought into alloys or combinations.

Copper was probably the first metal used by the human race. Weapons and ornaments have been found which seem to prove that the men of prehistoric ages made use of it on account of the ease with which it could be worked, and the fact that it was found in the ground in the metallic state. It is claimed by many that its use antedates that of iron.

The copper mines of Wady-Magrah, located in Upper Egypt, are thought to have been worked as early as the second dynasty, upward of 3000 B.C.

The Romans claimed that their best copper was obtained from Cyprus, an island in the Mediterranean, and for this reason the metal was known as "Cyprian Brass"; later, the contraction to "Cuprum," and then to "Cuper," from which our present term "Copper" was derived.

In the United States copper is usually classified in three grades: Lake copper, that brought from the Lake Superior region; electrolytic copper, that refined by the use of electric current; casting copper, that which is not entirely refined, but carries varying amounts of impurities, and as a result is rapidly disappearing from the commercial fields.

In bronze and brass alloys copper is the preponderant metal, being the element with which we can best alloy smaller quantities of other metals. The essential charactertistics of copper are to impart strength and toughness, and in ornamental work varying degrees of rich red color. It is the best conductor of both heat and electricity, slightly excelling silver in the latter respect.

Chemically pure silver was for years believed to have the highest electrical conductivity of all the metals, and accordingly was the basis for the 100 per cent. standard. Recently, however, copper has been produced in so excellent a state of purity as to indicate an electrical conductivity of 104 per cent. was silver as a base.

The United States produces more copper than any other country, or about 65 per cent. of the total production of the world, the total amount for 1911 having been 1,090,000,000 pounds. The first mine worked in the United States was the Simsbury Mine, of Grandby, Conn., in 1705, which proved to be of little value and only small amounts of copper were taken from it.

The specific gravity of copper is 8.82; melting point 1,981.5 degrees Fahrenheit, United States Bureau of Standards; the tensile strength varies with the physical condition, producing the following results: In cast copper the tensile strength is 26,000 pounds per square inch; in bolts 34,000 pounds, and in wire 55,000 pounds.

The tempering of copper has for years been considered a lost art, but among the latter-day scientists the unity of opinion is that this climax of the art never existed.

Tin was first known about the time of Moses, or about 2000 years B.C., and it has been produced in varying quantities ever since. Tin was imported by the Phenicians from the British Islands long before the Christian era. These islands were, on this account, known as the Cassiterides, from the Greek word Kassiteros, meaning tin.

Tin stone, which is an oxide of tin, is, at the present time, the only ore used for the production of metallic tin, and is found in the largest quantities in the Malay Peninsula (Chinese) and the Island of Banka (Dutch East Indies).

The total world's production of tin in 1911 was 233,504,000 pounds, of which the United States consumed about 40 per cent.

Tin is a white metal with a distinctly yellowish tinge, and can be rolled into very thin sheets, but its low tenacity prevents its being drawn into wire. Its specific gravity is 7.29, melting point 449.4 degrees Fahrenheit, United States Bureau of Standards. It has a distinctly crystalline structure and emits a peculiar crackling sound on being bent back and forth, due apparently to the rubbing of the crystals on each other.

The smelting is a comparatively simple operation, as the oxide is readily reduced by carbon at a red heat. The purest metal is obtained from reverberatory furnaces. This is further refined by liquidation, which consists in subjecting the metal to a low temperature on a sloping hearth, where the tin, having a low melting point, runs out, leaving the impurities behind.

Tin produces a decided tempering effect in combination with copper, varying in proportion as it is used. Above 25 per cent. tin, the alloy is too hard and brittle for use. The true bronzes are alloys having these two elements as their main constituents. Up to about ten or twelve per cent. tin, the material is not affected by quenching. Above that percentage quenching from the proper temperature renders the alloy softer than if slowly cooled, being directly opposite to the effect which such treatment has on steel.

Tin also has a high coloring effect on copper, a very small quantity being distinctly discernible.

Tin, in combination with the brasses or copper zinc alloys, when present in small amounts, renders the alloy more sound, more fusible, and capable of taking a better polish.

Zinc, commercially called spelter, is the next important metal. It is of a bluish white color and of a decided crystalline nature and at ordinary temperature is quite brittle. Between 250 degrees and 300 degrees Fahrenheit however, it is malleable enough to permit of rolling into thin sheets and drawing into wire. Zinc is not found in a free metallic state, but is obtained from its ores, which are chiefly sulphide of zinc and carbonate of zinc. The concentration of the ore is attended with considerable difficulty, as the associated impurities are generally of about the same weight as the ore.

The specific gravity of cast zinc is 6.87; melting point 786.9 degrees Fahrenheit. It is a poor conductor of both heat and electricity.

The United States is the largest zinc producer of the world, New Jersey, Missouri, Kansas and Colorado containing the greatest deposits. Our total output in 1911 was 623,122,000 lbs.

Of the different metals that we are considering, zinc is the only one that can properly be called a bearing metal. Used unalloyed for bearings where strength is not essential and its brittleness is not objectionable, there is probably nothing superior to it for wearing qualities.

The Effect of Zinc and Lead

Zinc in combination with copper produces the brasses. Very small additions of zinc render copper suitable for casting. Larger additions cause gradually increasing hardness, but not to as marked an extent as tin. Nearly fifty per cent. zinc can be added before an alloy too brittle for use is obtained. With increasing zinc contents the strength and elongation, as well as the fusibility of the alloy, increases.

In the high copper-tin bronzes zinc is used in small quantities of about one or two per cent., mainly for a cleansing effect. It improves the fluidity of the metal, thus making sharp, clean castings, free from blow holes.

With a higher percentage, the hardness and strength of the bronze decreases, and the brasslike qualities thereby imparted become apparent.

Lead has been known from remote antiquity. It is mentioned in the Bible at a period of about 3000 B.C., and articles made from the metal by the Ancient Romans, in the form of water pipes, tanks, rings, etc., are still preserved. Many European countries produced lead as early as the tenth century and still supply the market. **The United States leads the world at present, the annual production for 1911 having been 795,628,000 lbs., or about forty per cent. of the world's production.** The first lead in the United States was discovered near Jamestown, Va., in 1621, but the present main supply and the richest ores are obtained from the Western States. The principal ore is the sulphide called Galena, which almost invariably carries a small percentage of silver.

The specific gravity of lead is 11.35; melting point 621.1 degrees Fahrenheit, United States Bureau of Standards; tensile strength 2000 lbs. per square inch.

Lead, in combination with copper, is exceedingly difficult to introduce in its best form and remains undissolved as inter-crystalline material. It is, therefore, not an alloy, but rather a mechanical mixture.

The action of the lead in combination with a copper tin bronze is as a lubricant, the small free globules of lead in a bearing being very beneficial.

Although lead makes the alloy denser and more malleable, it has a decidedly weakening effect upon the alloy, as its globules break up the continuity of the crystals. A high lead bronze when broken will show a gray fracture as a result of breaking through the weaker lead globules and not through the crystals of the copper tin mixture.

Phosphorus a Cleaning Agent

In brass, lead also acts as a lubricant and prevents fouling of the tools in working.

Some elements, such as arsenic, antimony and sulphur, have a detrimental influence on bronze, but there is one which has a decidedly beneficial effect, and that is phosphorus.

The function of phosphorus on a bronze is that of a deoxident. It cleans the metals from oxides of copper and tin, and if the correct amount is used for this purpose none remains in the finished alloy. By the removal of these oxides the bronze is rendered more fusible and better castings are possible.

Larger additions of phosphorus harden the metal, but at the expense of toughness. The production of various qualities of phosphor bronze depends more upon the proper proportioning of the various ingredients than upon the quantity of phosphorus.

One of the problems which must be contended with by the sales department of a brass foundry is the lack of information about phosphorus, which results in ridiculous specifications, often asking for phosphorus as high as ten per cent. The specification of phosphorus can with safety be left only to the metallurgist, instead of the ordinary brass foundry foreman, who usually relies entirely upon guesswork. Phosphor bronzes should be secured only from companies of reputation, who make a specialty of their manufacture.

High copper alloys, as related to motor car construction, may be divided into four classes:

1—Soft Phosphor Bronze.
2—Hard Phosphor Bronze.
3—Red Brass.
4—Yellow Brass.

Soft bronzes in general are low in phosphorus and high in lead, the former being used solely as a purifying or deoxidizing agent. **This class of bronze can only be considered for bearings, the high percentage of lead reducing the tensile strength of the alloy, so as to make it unsuitable for severe strains.** Under this head may be mentioned one of the standard S.A.E. alloys, 80 copper, 10 tin, 10 lead. This combination is generally used throughout all motor car construction, and present practice among the best makers finds use for the alloy in a number of places.

It is difficult to recommend a particular alloy to render the best service in any part of a motor car without the specific knowledge of conditions covering its use. Before making an intelligent selection it is necessary to know the bearing pressure, character of lubrication and vibration, as well as the nature and quality of the steel which is used in the rotating piece.

Those phosphor bronzes commonly described as hard are generally high in both phosphorus and tin, and low in lead contents. In those cases where the phosphorus contents runs as high as one and one-half per cent. the tin content is necessarily under twelve per cent., or the alloy would be too brittle. The reverse is also the case, and where alloys contain a mixture of approximately 80 copper and 20 tin, the phosphor contents should not be over one-half of one per cent. An alloy of this character is used to withstand heavy pressures and has no place in motor car construction.

Among the high copper-tin bronzes may be classed the gear bronze most generally used in the United States and abroad, being an alloy of 88 or 90 copper, and from 12 to 10 tin. No standard gear bronze has yet been adopted by the Alloys Committee of the S. A. E., owing to a lack of unanimity of opinion as to what is best to recommend. A few prominent manufacturers of bronzes of their own special formula, which in many cases they believe to be superior to a formula of 88-12 or its approximate. **The composition of 90 copper and 10 aluminum has proven one of the most successful gear bronzes on the market, having an average tensile strength of 60,000 lbs. per square inch, and wonderful bearing qualities.** It has not been generally used owing to the difficulties encountered in its manufacture, only one or two makers having solved the problem of producing perfect castings. The alloy of 88 copper, 10 tin, 2 zinc, probably the most prominent of the United States Standard alloys, fills many requirements most satisfactorily, and for all around use is hard to improve on.

Red brass, commonly known as "Composition," contains a maximum of 85-86 per cent. copper. In this way it can be differentiated from the bronze class. Too often red brass is only an excuse for a visit to the scrap pile on the part of mediocre brass foundrymen, where the scrap is selected with varying degrees of care, depending largely on what the customer will stand for. Fortunately, this condition is being remedied, and that type of brass foundrymen eliminated, through the demand by automobile engineers for a brass of uniform color and texture.

One of the standard alloys which has given excellent satisfaction is 85 copper, 5 tin, 5 lead, 5 zinc. This alloy has an excellent color and may be used in motor car construction where severe bearing necessities of great strength is not a requirement.

Yellow brass may be sub-divided into two classes, one being the type of brass used generally for ornament. The other is manganese bronze, in which the percentage of copper and zinc runs close to yellow brass. Its tensile strength and other remarkable properties are brought about through the use of small quantities of iron, manganese, aluminum and tin in varying proportions. Manganese bronze being very generally used either for experimental or permanent construction, should not be passed without a comment.

If it is the intention to use the casting where rigidity is required, the manufacturer should be so advised. By slightly changing the composition of manganese bronze, it is possible to alter its rigidity and consequently its ductility to a marked extent. In specifying manganese bronze castings, it is wise to adhere to established brands, particularly where the work is being done by your own or a local foundryman who perhaps lacks the metallurgical knowledge necessary to produce or judge a good ingot metal. Unscrupulous refiners of scrap metals frequently offer for sale, under the name of manganese bronze, an ingot which would be decidedly out of place in a yellow brass classification.

Manganese bronze may be used for practically all brackets, foot levers, radiator braces, and all external parts requiring strength in the body. This covers the brakes, lugs, levers, hubs, spider, steering yokes, fan pulley, dust covers, plates, brake lugs, windshields, handles, supports, hinges, buttons, latch, foot adjustment, quadrant, and any parts (not bearing parts) which require the strength of high grade steel.

The correct practical solution of the severe bearing requirements on the modern high-speed gasoline engine is of the utmost importance. In designing engine bearings there are two important conditions that must be taken into consideration.

First, the selection of a proper alloy, having the requisite anti-frictional qualities, and secondly, the selection of a metal having the necessary physical properties as regards strength and resilience.

Requirements of Bearing Metal

A soft babbitt may have the antifrictional requirements necessary for gasoline engine service, though owing to its plastic nature its physical properties render it unsuited for the work. On the other hand, a bearing made entirely of steel would have the necessary strength and resilience, but would be anti-frictional. These anti-frictional qualities are so obviously imperative that in nearly every case these have been considered at the expense of the mechanical or physical properties of the bearing. Soft babbitts have been discarded, and for the reason stated, harder babbitts have been substituted; in many cases the die cast bearings have become generally used as crank bearings in some classes of motors.

In the light of the foregoing facts, **it is not a difficult task to design the ideal bearing, for it resolves itself into combining the best anti-frictional qualities with the highest physical strength and resilience.** These qualities have not been found in any one metal or alloy now known.

It therefore becomes necessary to unite these characteristics in a bearing and this is done by adopting the old-fashioned babbitt lined bronze shell of a modified design. For the bearing surface requirements we select a high tin, so-called genuine babbitt, containing about 90 per cent. tin and approximately 5 per cent. each of antimony and copper.

For the necessary physical property we shall select a copper tin bronze having high strength and resilience. The constituents of this bronze should be so proportioned that upon cooling from the molten to the solid state there is no eutectic formed; that is, no small portions of the alloy may have a lower melting point than the greater part of the mass.

Systems for Salesmen Becoming Popular

Methods of Checking Force Engage the Attention of Most Up-to-Date Concerns

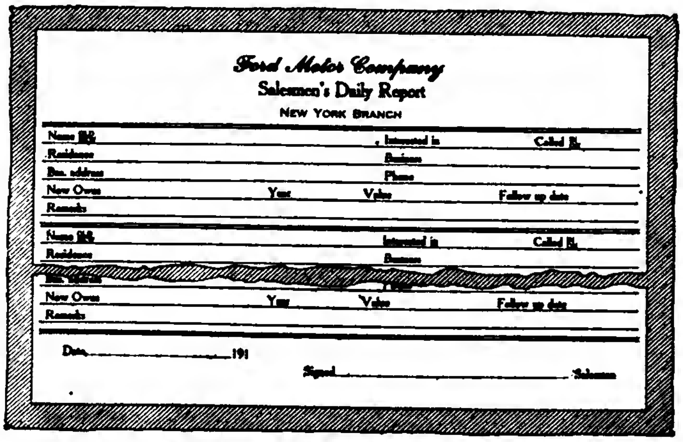
SALESMEN'S work systems for recording the doings of all men from day to day are now in far from common use, although they are constantly increasing. The reason is that many companies, especially those selling high-priced cars, do not wish to put the sales force to any unnecessary trouble, since the number of customers is naturally limited on account of the price of the ware. Where a medium or low-priced automobile is being sold, however, exact records must be kept of the work of all men; not so much for controlling the work done by the men, but for the purpose of knowing with whom the company deals. Likewise, the advantage of a work-recording system overcomes such weak sides of the one-man idea as the difficulties growing out of one man's resigning his position with the company. Finally, the increased orderliness in carrying on the business, has an advantageous effect on all employees connected with that end of the concern. Thus, a number of reasons make the use of such a system desirable.

It hardly remains to be said that not only the factory branch profits from systematically executed work, but that the salesman does as well. It is easier for him to oversee his work, to avoid missing an appointment, to follow up the good prospects and drop the others in due course, to economize on his time and temper, and to make more money in a more pleasant way in a shorter time than otherwise. All these advantages should tend to make salesmen favorably disposed toward systematic recording of their work.

The forms used for recording salesmen's doings are as different as the companies are many. In every case sales contracts, card files, daily or weekly sales reports are used. Besides these, reports of the calls made every day are frequent practice.

Special interest attaches to the system of the Ford branch in Long Island City, N. Y., as this company, representing the Ford Motor Company in the Metropolitan district, naturally does a tremendous amount of business. In many respects, this system resembles others already described—see THE AUTOMOBILE, November 21, 1912—but among the forms used are two which are quite original and should prove of interest to dealers of low-priced cars and business men using such cars. These forms are the salesmen's daily report and the dealers' weekly report.

The salesmen's daily report which is made out in duplicate is a blank, printed on thin white paper, 8.5 inches wide by 11 inches deep and printed in black. Besides the company's letter-head design printed on the top and a space for date and salesman's name, the sheet offers room for the recording of six visits, with all the necessary and desirable details. The name, residence, business address, business and telephone number of the prospective customer are recorded; furthermore, there is space for the make of the car—if any—which he owns at present, together with the model number and its value. Besides, the salesman notes on this form, in which model—touring car, runabout or what else—the party seen is interested. The hour at which the visit was made, the date and hour of the next appointment and eventual remarks also find space on this blank. Some of this information, like the hour at which the party was called on, might seem like superfluous records; but they are not. The time at which a man may be expected to be at his office or home is generally the same every day. Another point should be brought up in this connection. The value of the car used by the prospective owner when seen by the salesman is recorded; but the Ford


Ford Motor Company
Salesmen's Daily Report
New York Branch

Name Hr. Interested in Called Hr.
Residence Business
Bus. address Phone
Now Owns Year Value Follow up date
Remarks

Name Hr. Interested in Called Hr.
Residence Business

Now Owns Year Value Follow up date
Remarks

Date 191
Signed Salesman

Fig. 1—Salesmen's daily report used at Ford branch

company does not take any used cars in exchange for cars sold by it; nor does it allow a discount on the price of the new car. This information is put down simply for the purpose of notifying a used-car dealer who is to sell the car for the account of the purchaser of a new car. Outside of this act—which is purely one of assisting the purchaser in a business of his own—the Ford people take no steps to dispose of used cars and the purchase of a car is the same whether it is the first, second or tenth car bought by any given party.

Each salesman's report is made out in duplicate, one copy being held by the salesman and the other going to the office of the company, where the information is transferred to a card file, containing it on cards marked with the names of the prospective owner. There is also a system for the purpose of insuring all dates being kept and prospectives properly followed up.

Besides the salesmen's report, the above mentioned dealers' weekly report is of interest. This report is made out—in duplicate—by every dealer served by the Long Island branch and a copy is mailed to the branch at week end. The purpose is not only to keep the branch informed of the number of cars held in stock by each of its dealers every week, but also of the names of the people who buy Ford cars, furthermore, of the specific cars sold. As Fig. 2 shows, this sheet is designed for the recording of the motor and car number of each automobile sold, the date of sale, the name of the purchaser and his address. Besides, the dealer states whether the buyer is a sub-dealer or the ultimate user of the car. The latter point is for the purpose of obtaining, from the sub-dealer if such buy the car, the name of the ultimate purchaser. Furthermore, when repair parts are demanded by a dealer for a car in his territory, the company may look up its records and find out whether the user is the purchaser to whom the car was originally sold or not. Incidentally, the sheet affords an opportunity of checking a dealer on his territory, that is, of finding out whether he passes over its limits or not. The sheet affords space for entering twelve transactions, and at the right end, there is space for making a record of all cars unsold on hand, with the car and motor numbers, which, of course, must also be sold by the dealer who sends the record, in course of time.

This sheet is 11.5 inches wide and 8.5 inches high. The print is black and the ruling red and blue, the paper thin and greyish white. The company, after receiving this record, files it, having incorporated the names it contains on its owners' list. The records are filed by the names of the dealers, and all records sent in by one dealer in the order of the dates, so that it is easy at any time to find any dealer's record for any week.

These records, of course, facilitate the handling of a large business to a great extent. Of course, to sell a car as cheaply as possible, up-to-date manufacturing facilities are a prime necessity. But an efficient sales scheme is an important requisite. After all, not to create only; as the poet of industry, commerce and activity says; but to work out in detail, finish up and realize the plans which are prepared, in concrete shape, by the factories.

Communications from The Manufacturer

Manager of Abbott Motor Company Does Not Believe in New York and Chicago Shows

DETROIT, MICH.—Editor THE AUTOMOBILE:—That the annual automobile shows as now conducted, especially the New York and Chicago events, have lived their day and fulfilled their original purpose, is the absolute conviction of the majority of automobile manufacturers. Until the past few weeks few people with authority and influence have felt free to publicly express their views on what heretofore has been considered a delicate subject. The promoters of these shows have been very anxious to suppress anything that has been set afloat that would have a tendency to cause any indifference or unfavorable action on the subject. However, the day has fully arrived when manufacturers are declaring without reservation that the usefulness of these events has already ceased and that they are no longer willing to give their influence and support to this economic waste. It is a well established and accepted rule of political economy, based upon good common-sense, that when a thing has fulfilled the purpose of its existence and become useless, it should at once die a natural and honored death, and give way, if conditions so dictate, to something else. This applies to automobile shows.

The necessity of these events has ceased to be a fact. During the earlier days when the industry required all the encouragement and assistance that could be given it, they were unquestionably a good thing, but the public attitude has changed and the day of educational campaigns to teach people the utility and importance of the motor car has ceased. There is now little more logic in holding these periodical exhibitions than would justify a similar display of railway coaches and street cars.

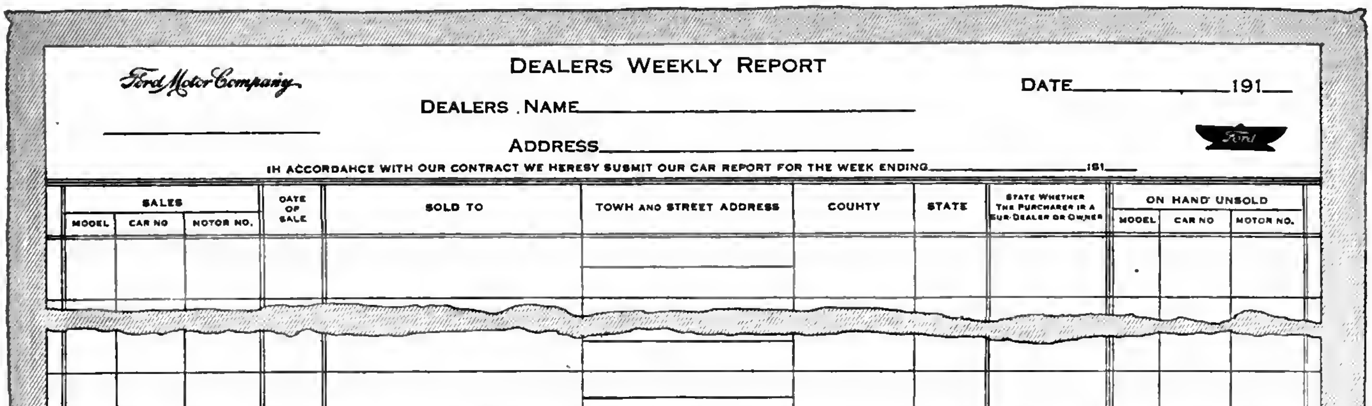
A few years ago we had "shows" in a very acceptable sense of the term, but not so any longer. Then the new models were not made known until they were displayed at the New York show, but now practically all manufacturers are announcing their respective lines not later than August, and many have ceased to make these announcements altogether. Anybody with any degree of interest now attending these shows, well knows just what he will see. The models shown are for the most part those which have been on the streets from 6 to 8 months.

After as careful analysis of trade conditions as possible, I have been unable to discover any real demand for the annual show. The situation seems to be that while the majority of manufacturers have had their own private convictions in the matter, each has disliked to be the first to take a definite step, not knowing for a certainty in just what light their position might be regarded. Few, if any, of these manufacturers feel that the returns are commensurate with the enormous expenditure intailed and the wisdom of continuing the practice is strongly questioned. Floor space is charged for at extortionate rates and the numerous other expenses incurred amount to a small fortune for each fair sized show. The millions of dollars poured into New York, Chicago and the many other places, is of necessity almost entirely borne by the automobile industry. It has been pointed out by Col. Albert J. Pope, president of the Pope Manufacturing Company, that 60 per cent. of the gate receipts at the Madison Square Garden in 1912 were paid by the industry and that the percentage was even greater at the last show. Besides, these tickets not only pay the rent and decorations but a large percentage of the patronage as well.

Col. Pope also calls attention to the disorganization of the factory and sales departments and business in general during the weeks of the shows, and declares that it is a serious subject that will have to be reckoned with in the near future by the automobile industry. Objection is again made to squelching by the newspapers for large spreads of advertising, which if used at more logical times would bring incomparably greater returns.

The automobile manufacturers are greatly indebted to Col. Pope in taking the lead in the more improved conditions as regards this matter of the shows. The industry cannot afford to incur such expense as are incident to the part participation in such shows as are held at New York and Chicago. The public realizes with a fair degree of accuracy what an enormous amount of money is intailed in this expenditure, and the industry is being criticised severely by sound business men on the outside as a result of this apparent economic waste; and further, that if the industry can afford a performance of this kind as a result of the net return to the business in general the funds so appropriated should be retained by the industry and the buying public given the benefit of same in reduced prices of the product.

It is my firm belief that the time has come when the industry can abolish the matter of automobile shows in New York and Chicago in the winter time without suffering anything in the way of reduction in the total amount of automobile business done in the country. If in the opinion of all manufacturers an automobile show should be held it should be held in the summer season at about the time the manufacturers introduce their new models and hold just one show, and that at some point outside of both New York and Chicago, preferably Detroit.—M. J. HAMMERS, Abbott Motor Company.


Ford Motor Company

DEALERS WEEKLY REPORT

DATE ______ 191__

DEALERS NAME ______

ADDRESS ______

IN ACCORDANCE WITH OUR CONTRACT WE HEREBY SUBMIT OUR CAR REPORT FOR THE WEEK ENDING ______ 191__

SALES			DATE OF SALE	SOLD TO	TOWN AND STREET ADDRESS	COUNTY	STATE	STATE WHETHER THE PURCHASER IS A SUB-DEALER OR OWNER	ON HAND UNSOLD		
MODEL	CAR NO	MOTOR NO.							MODEL	CAR NO	MOTOR NO.

IMPORTANT—ACCORDING TO YOUR CONTRACT YOU WILL PLEASE MAIL THIS REPORT TO THE FORD MOTOR COMPANY AT ______ IMMEDIATELY AFTER THE CLOSE OF EACH WEEKS BUSINESS

INCLUDE ALL SALES WHETHER DELIVERED FROM YOUR STOCK OR SHIPPED DIRECT TO YOUR CUSTOMER BY THE MANUFACTURERS.

Fig. 2—Dealers' weekly report used for statements of sales and cars on hand sent to Long Island plant by dealers

Leaky Exhaust Manifold—New Bushings Around Valve Stems—Believes in Right Drive—Putting Gasoline Tank Under Cowl—Changing to Demountable Rims—Reduction of Drive Through Friction Disks—Portable Racks for Wagons

Leak Around Exhaust Manifold

EDITOR THE AUTOMOBILE:—I have a motor that leaks around the point where the exhaust pipe joins the cylinder. I have tried to fix this but it remains in spite of anything I do. I attempted to caulk the leak with asbestos packing but was unsuccessful. What is the cause of a leak of this nature and how may it be stopped?

Allentown, Pa. WILSON PETERHOFF.

It will sometimes happen that the stirrup which holds the manifold to the cylinder will become warped and allow the gases to escape from around the juncture of the manifold and the cylinder. The point at which the warping takes place is that shown in exaggerated form in Fig. 1. This can be remedied by applying a new stirrup.

If the stirrup is not warped or the manifold is not applied in this manner a new gasket should readily stop further leaks. Secure a sheet of gasket paper of the correct size from any accessory dealer and lay it over the joint to which the gasket is to be fitted as in Fig. 2. Gently tap around the gasket with a hammer. The rim of the opening to be fitted will leave a mark on the gasket. By the aid of this the gasket can be cut with a sharp chisel or knife as in Fig. 3. The finished gasket should then be placed in position and the parts replaced. The finished job should have an even appearance all around. The gasket when properly fitted against a smooth surface will not permit any escape of gases at the joint.

It is impossible to caulk a leak of this kind. In fact it is dangerous as it would be very easy to spoil the motor by forcing some foreign matter into the cylinders which could get caught between the piston and the cylinder wall and score the latter. A warped stirrup is a rare occurrence and shows bad work.

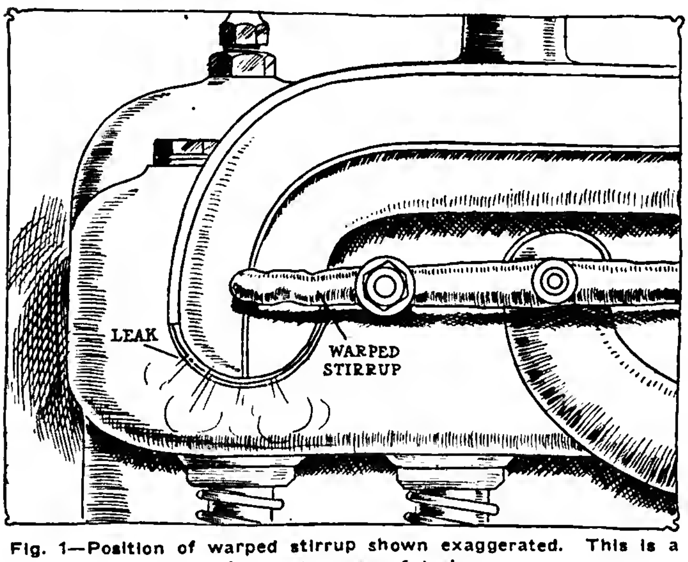


Fig. 1—Position of warped stirrup shown exaggerated. This is a frequent cause of leak

Rebushing Valve Guides

Editor THE AUTOMOBILE:—1—Would it be good or bad practice to bush the worn exhaust valve stem guides, of any standard motor, with brass or bronze bushings? Is there any material that would be better for this purpose?

2—What is the process of making malleable iron castings?

3—What is the distinction between gasoline and benzine?

Dixfield, Maine. T. P. H.

—1—Rebushing with bronze would be good practice and would be more satisfactory than anything else.

2—The process of making malleable iron may be summarized as follows: The proper cast irons are melted in either the crucible, the air furnace, the open-hearth furnace, or the cupola. The metal when cast into the sand molds must chill white or not more than just a little mottled. After removing the sand, they are packed in iron scale or other materials containing iron oxide and subjected to a red heat (1250 to 1350 degrees Fahrenheit) for over 60 hours. They are then cooled slowly, cleaned from scale, chipped or ground, and straightened.

When hard, or just from the sand, the composition of the iron should be about as follows: Si, from 0.35 to 1.00, depending upon the thickness and the purpose the casting is to be used for; P not over 0.225, Mn not over 0.20, S not over 0.05. The total carbon can be from 2.75 upward, 4.15 being about the highest that can be carried. The lower the carbon the stronger the casting consequently. Below 2.75 there is apt to be trouble in the anneal, the black-heart structure may not appear, and the castings remain weak. A casting 1 inch thick would necessitate silicon at 0.35, and the use of chills in the mold in addition, to get the iron white. For a casting .5 inch thick Si about 0.60 is the proper limit, except where there is danger of getting heavily-mottled if not gray iron from the sand molds, and this material, when annealed the long time required for the white castings, would be ruined. For every thin casting Si can run up to 1.00 and still leave the metal white in fracture.

3—There is no definite distinction between benzine and gasoline as far as the oil trade is concerned. If you asked a company to quote you on benzine, they would quote you on gasoline. Four or five years ago gasoline was anything above 70 gravity. Now it is anything above 60. What gasoline is, is fixed by the demand for it and the state of the trade. Very often benzine is taken to mean gasoline in the raw state. That is, before it has gone through the final refining process.

Protests Against Left Drive

Editor THE AUTOMOBILE:—I contend that the left-hand steer is not in accord with true mechanical skill. To illustrate, if a person running an automobile sees a large one coming towards him from the opposite direction and he wishes to avoid all chances of an accident he should be on the right-hand side so as to see how near he can run to the gutter and not enter it; that takes care of the automobile that is approaching him. Again, if you wish to pass an automobile going the same way you should be on the right side of your automobile so as to see how near you are going to the vehicle you are to pass, as the law says you must pass all vehicles on their left. That takes care of the vehicles going the same way you are.

I am well aware that in some cities there is a rule that all automobiles shall stop on the right side of the street; in that case it would, if you were in a runabout, oblige your companion to walk the immense distance of around the back of your automobile in order to reach the sidewalk. Those in favor of the left-hand drive continually harp on the trouble it puts your companion to in having to get out in the mud, as though it was always muddy, when the fact is there is not a muddy day more than one in four, and many people will not run their automobile when it is muddy, and if your car is a touring car that argument has no weight. I think the left-hand drive is a fad and the quicker it is abolished the better for the autoist.

Lynn, Mass. JOHN S. WRIGHT.

Changing Tank Location

Editor THE AUTOMOBILE:—Is it feasible to change the gasoline tank from under the front seat to one like the Henderson car has on the dash, new tank and cowl being made, of course. Will the difference in pressure (gravity) make any difference?

Hasbrouck Heights, N. J. A SUBSCRIBER.

—It is very feasible to do this as there will be no difference at all but in the arrangement of the piping except insofar as the shape of the cowl and the tank are concerned. Any sheet metal worker will do this work for you or it would be possible to do it yourself if you have had any experience in this line. The difference in pressure due to the greater head of the gasoline will make no change in the operation of the carbureter. The float feed device on the carbureter is so designed that it takes care of the supply of gasoline furnished to the spray nozzle regardless of what the pressure on the gasoline may be.

Changing to Demountables

Editor THE AUTOMOBILE:—I have a Mitchell car with Q. D. 34 by 3.5 wheels which I wish to change to demountable rims. Please advise where I can have change made and what type rim you would recommend.

Lewisburg, W. Va. W. D. SLAVEN.

—Any standard rim company will make this change for you at a cost of about $15 for the labor and whatever the price of the rim may be. It is necessary to cut off the spokes about an inch in the average case of making such a change and it is for this that the above amount is charged. The felloe necessary with the demountable type of rim is thicker than that used with the clincher or Q. D. and therefore the change will have to be made. Any good type of demountable rim will be satisfactory.

Ignition of Overland Car

Editor THE AUTOMOBILE:—Would you please explain by a diagram the ignition system used on my Overland model 69?

Brooklyn, N. Y. T. E. D.

—The dry cells for starting are connected in series as shown in the wiring diagram, Fig. 4. These operate through a non-vibrating coil and form one part of the dual system. The high-tension magneto forms the other part. The wiring is as shown in the illustration.

Mathematics of Friction Drive

Editor THE AUTOMOBILE:—I am very much interested in the friction drive for automobiles. As a speed-changing device I consider it ideal. However, there are a few points I don't understand and will thank you very much if you can clear them up for me and no doubt other subscribers will find it interesting also.

Let us take the Cartercar, for example: Suppose the driven wheel is at the outside of the driving disc and that the surface here is, say, 6000 feet per minute. Evidently the most power can be got from the friction at this point. But if we attempt to drive up a steep hill we have got to move the driving wheel in towards the center of the disc. Just when we need the most power is when we have the least as the surface speed is a great deal less as we move in. How is it possible to go up a 50 per cent. grade, as they say in the last issue of THE AUTOMOBILE. I would like to see this figured out mathematically.

Streator, Ill. JOHN DUNN.

—Theoretically the same amount of energy is available at any point on the face of the driving wheel of a friction drive. If all the energy available could be transmitted through the medium of the friction drive this would then be practically true also. As it is the efficiency of the drive varies for different reductions and the practical result only approaches the theoretical. With this in mind the explanation will be simple.

Power is the rate of applied energy. A small amount of energy applied rapidly may develop the same power in foot-pounds per minute as a large amount of energy delivered slowly. A horsepower is 33,000 foot-pounds per minute. The shaft turning over the friction wheel contains so many foot-pounds per minute of power. It delivers all of that to the friction wheel. At any point on the wheel therefore the foot-pounds per minute are the same. Since the linear feet per minute travel of the wheel is greater at the rim than near the center and the foot-pounds are the same, the pounds delivered must be less per minute. Because the foot-pounds are the product of the pounds and the distance moved through in feet. Therefore in moving the vehicle a less number of feet per minute, or in moving the friction wheel a less number of feet per minute, a greater number of pounds resistance can be overcome for the same number of foot-pounds. We secure a wheel which is moving more slowly at a given number of revolutions per minute when we lessen its diameter.

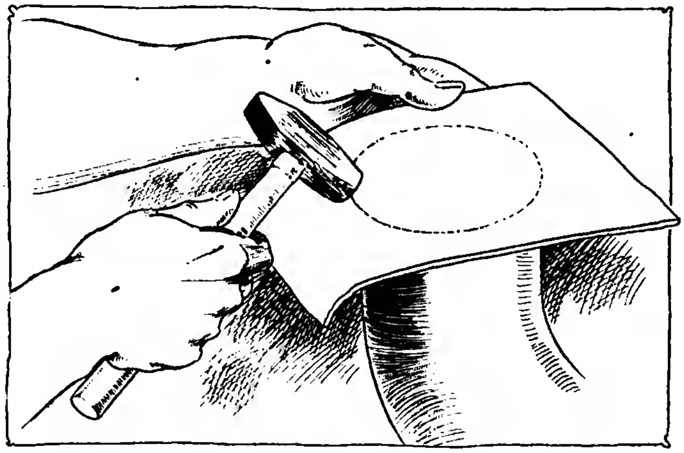


Fig. 2—Outlining the point at which to cut the gasket

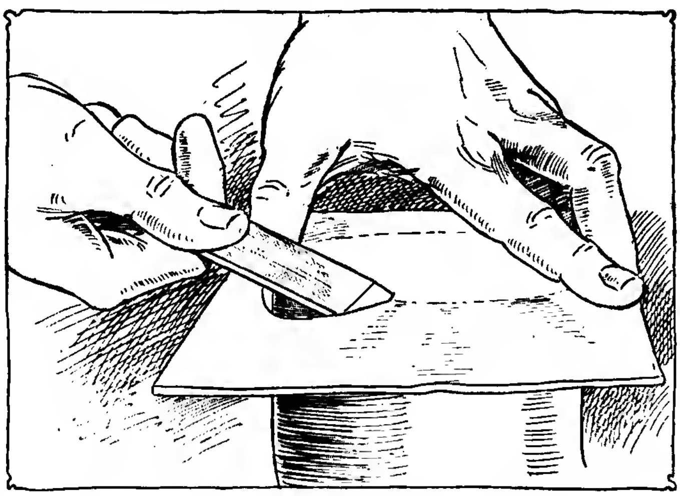


Fig. 3—Method of cutting thin gasket with sharp chisel

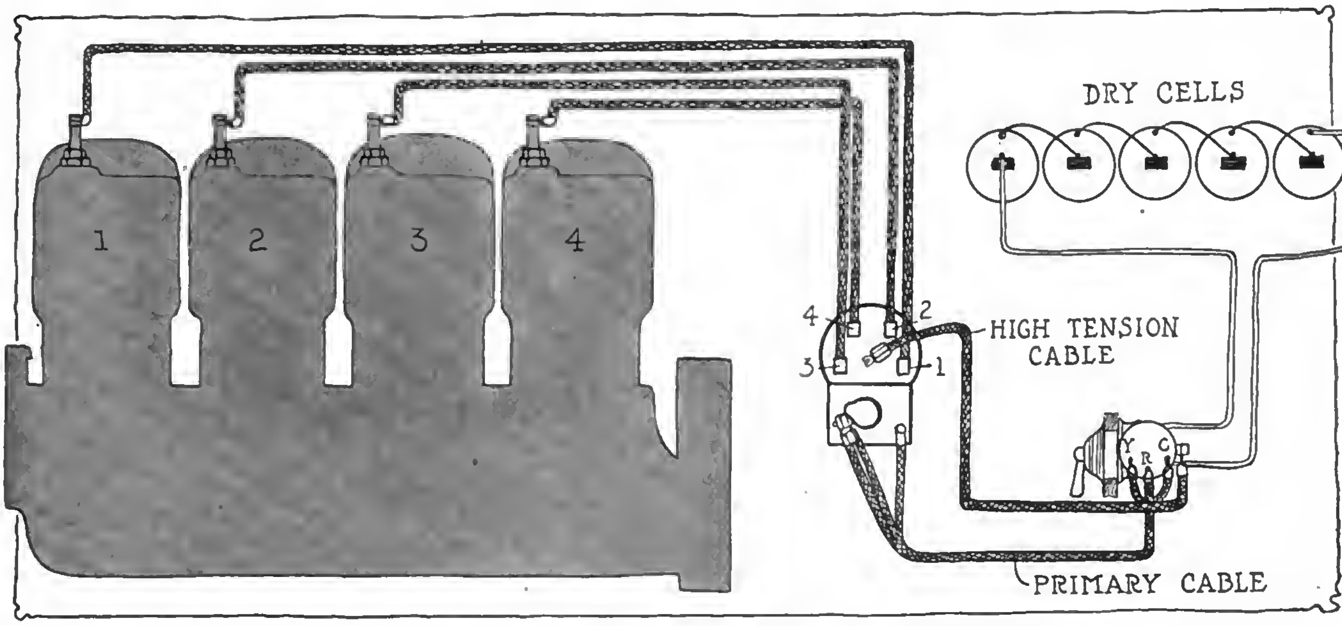


Fig. 4—Wiring diagram of four-cylinder motor using dual system, showing arrangement of batteries, switch, magneto and spark plug

The equation is as follows:

Foot-pounds per minute = pounds × feet per minute.

Therefore in a concrete example 100 foot-pounds per minute may be 10 pounds at 10 feet per minute or 1 pound at 100 feet per minute.

Racks Used on Grocery Trucks

Editor The Automobile:—I am interested in a grocery business which is using two 1-ton trucks for delivering and contemplates the installation of three more.

We have been trying to figure out a practical rack which can be rolled into the trucks after being loaded with groceries and rolled out again when empty. In this way the trucks would not have to remain long at the platform for loading and could be kept running the greater part of the day.

The trouble has been that we want a rack with several shelves for rush days and want to remove the shelves when the loads are light.

Cleveland, O. N. C. Groeh.

—The easiest way to solve your problem would be to equip a small truck, which fits into the body of your truck, with a series of superimposed shelves and to roll the whole business into the truck as soon as the latter draws up in front of the loading platform. The obvious detriment of this system is that two small trucks are needed for every big truck, one being used on the truck while the other is being loaded so as to be ready when the big truck arrives.

A more economic solution is proposed in the illustrations, Figs. 5, 6 and 7. The first illustration shows a closed body, seen from the rear, the side walls of which are fitted with horizontal runways which extend all along the sides of the body. In the illustration three runways are provided and the floor of the truck body providing another runway, there is a possibility of placing four shelves in the truck. Of course, if there is no need for this number, one, two or three shelves may be used. Since, when the load is carried on roller-supported shelves, the load is carried to quite some extent by the vertical uprights which form the edges of the truck-body walls, it stands to reason that these uprights as well as the runways must be of steel and the whole system braced properly so as to be strong enough at every point. Of course, the back of the loading space is provided with a door of optional construction, and it would seem that the two-section type of door, half of which is turned upward and the other dropped, would have many advantages for grocery work.

Fig. 6 shows the small truck which is needed for transferring the roller shelve from the room where they are loaded with the parcels to be delivered to the automobile. This truck, as Fig. 6 indicates, consists simply of a platform and two sidewalks constructed with similar runways as the big truck so that the shelves carrying the goods may be placed on these runways. The spac-

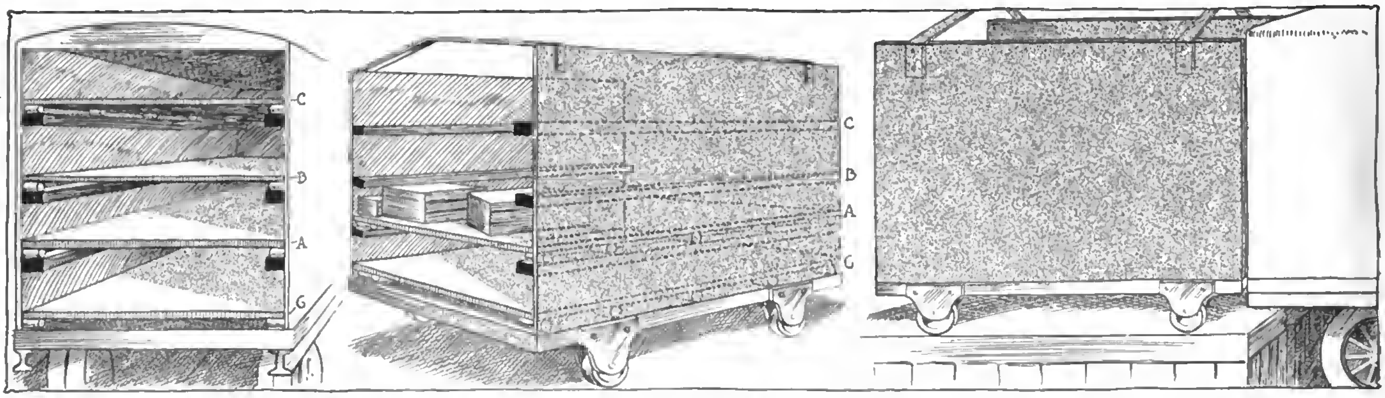


Fig. 5—Rear view of truck designed to take in shelves rolling on runways fitted to the side walls of the body. Fig. 6—Loading truck which supports the shelves carrying goods before they are rolled on to the freight automobile. Fig. 7—Schematic view of delivery wagon, loading truck and inclined platform for driving the latter up to the former. The letters on the runways shown on the automobile truck and those on the loading truck correspond with respect to the alignment seen in Fig. 7 which permits of simple transfer to the loaded platforms from the runways of the small truck to those of the automobile. If the level of the loading platform is not on just such a height as to provide perfect alignment of the runways, an incline plane and additional platform, not shown here, must be used for obtaining this alignment.

ing of the latter on the small truck is likewise the same as on the big one. Of course, the small truck must be of sturdy construction, with steel uprights, runways and overhead braces, if posssible. The best thing to do would be to order the steel body for the small truck to be made by one of the steel-shelf manufacturers, whose products were described in THE AUTOMOBILE of June 27, 1912. The running gear, that is, the wheels could be fitted in any suitable way, by means of casters held in hangers as shown by four small trucks which may be secured to the under side of the truck platform. If the big truck has a loading platform more than 7 feet long it may be necessary to put two shelves on each runway level.

To complete the equipment, the loading platform against which the automobiles abut for loading must be of such a height that the first, second, etc., runways of the small and big trucks correspond. If this is the case, loading may be done in the loading department of the store by a boy, according to standardized rules, all the roller shelves being kept on racks. Shortly before the return of a truck is expected the boy transfers the shelves from the rack to the small truck and the latter is brought near the door, ready to be unloaded to the big truck as soon as the latter arrives. Then the small truck is driven up against the big one and the loaded shelves transferred from one to the other. It is possible, by this process, to accomplish in 3 minutes what otherwise takes perhaps 30. Of course, the loading of the shelves in the loading department must be carried out according to well-proved rules so as to make speedy unloading easy.

Suggests New Spring Suspension

Editor THE AUTOMOBILE:—You will see in Fig. 6 inclosed blueprint of a spring suspension. The object of it is to overcome the boosting of car body by allowing the end springs to oscillate. What do you think of it?

Regarding side strains I do not think there would be any more side strain on the middle spring than on the hangers of the end springs. I do not see how this type of spring could be subject to any more strain than the platform or full elliptic spring; the rods could be set at an angle so as to take most of the side strain.

I believe this form of spring would have more shock-absorbing qualities than the platform or elliptic spring. The wheel upon striking a "bump" would cause the end spring to rock, the shock being taken up by the rocker and half of center spring and doing away with the jolt of the body.

There are cars using a straight spring pivoted in the center and fastened to the frame at the pivot and inner end, the outer end being fastened to the axle. Such a type is used on the King car and would be subject to as much side strain as the spring in question.

Flint, Mich. E. M. MORLEY.

—The opinion of our readers is invited on devices suggested in these columns. The idea is to provoke a discussion of general interest and at the same time to encourage ideas brought out by those who may not be regularly employed in the business.

Foreign Rating Formulae

Editor THE AUTOMOBILE:—I noticed the A. L. A. M. rating for horsepower in one of the last numbers. Can you tell me the European method of rating?

Marquette, Mich. A. A. YOUNG.

—There are several methods in use for rating the horsepower. This is due to the fact that the taxation on the manufacturer is based on the bore in some countries and on the horsepower in others. This condition leads to a preponderance of the long-stroke motor in the countries where the tax is by bore. In Germany the formula in common use is:

$$\text{Horsepower} = .3\,N\,D^2\,L.$$

In England the formula used for some time was the same as ours:

$$\text{Horsepower} = \frac{D^2N}{2.5}$$

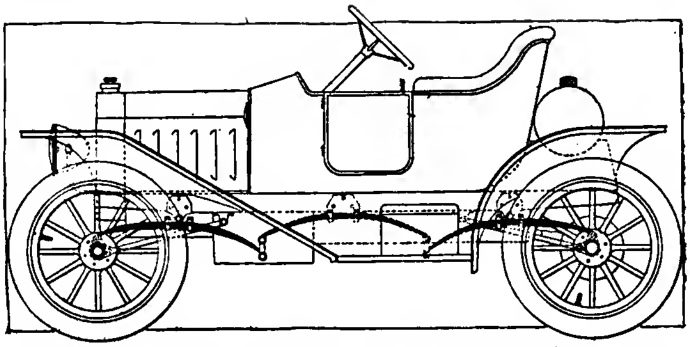


Fig. 8—Novel spring suspension suggested for comfort in driving

They have now evolved a formula which brings in the stroke factor more fully, that is:

$$\text{Horsepower} = .464\,N\,(D + L)\,(D - 1.18).$$

In France they are beginning to use a formula which brings in the most efficient speed of the motor. They are somewhat up in the air at present, however, owing to the fact that they are trying to find a good fiscal formula which will serve the purpose of taxation. The French believe in a different formula for different classes of vehicles. For touring cars of the ordinary type the following formula is used:

$$\text{Horsepower} = \frac{N\,D^2\,L\,S}{2 \times 10^6}$$

For high-speed touring cars the formula is:

$$\text{Horsepower} = \frac{N\,D^2\,L\,S}{1.9 \times 10^6}$$

For commercial vehicles the formula is still further modified to:

$$\text{Horsepower} = \frac{N\,D^2\,L\,S}{1.8 \times 10^6}$$

In all of the above formulæ, D = the diameter of bore of the cylinder, N = the number of cylinders, L the length of the stroke and S the speed of the piston at the highest efficiency.

Tincher Car No Longer Made

Editor THE AUTOMOBILE:—I am interested in the Tincher car and would like to know if they are still made.

Sheffield, Mass. GEORGE BRIGGS.

—THE AUTOMOBILE has no record of the Tincher car after 1910. Perhaps some of our readers can give you further information.

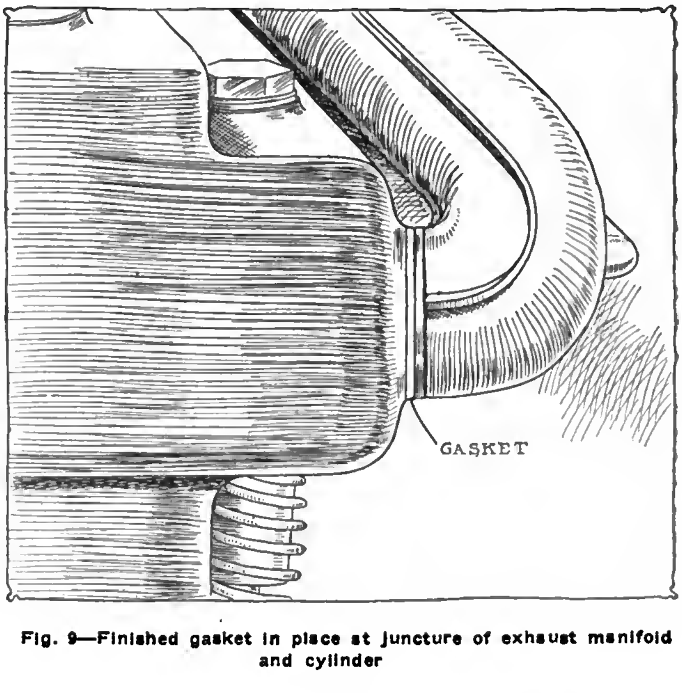


Fig. 9—Finished gasket in place at juncture of exhaust manifold and cylinder

The Automobile

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Saving the Seconds

THE proverbial "Save the pennies and the dollars will take care of themselves" should be rewritten for the owner of motor commercial vehicles as "Save the minutes and the hours will take care of themselves."

The minutes must be saved in motor truck operation and if the systems under which the vehicles are operating take recognition of the minutes it is a positive assurance that hours per week will be added to the length of time the truck is moving. The very fact that the transportation engineer has looked after the economy of minutes in loading and unloading the truck; the very fact that the minutes have been taken into consideration in the design of the body with a view to lessening delays; the very fact that minutes have been a prime consideration in the design of the loading or unloading platforms; the very fact that time has been a basic consideration in the drafting of the internal system of the factory, warehouse or mercantile establishment; and the fact that minutes have not been overlooked in manning the truck are all *prima facie* evidences that the transportation engineer has grasped the big problem in individual transportation and is an assurance that the truck will not be standing idle 30 or 45 per cent. of its time and, in the words of the horseman, "eating its head off in the stable, when rents are high and provender is dear." The truck destroys its usefulness when it is standing idle at the loading or unloading platform.

The show which closed last week at the Chicago Coliseum demonstrated that the buyer of today is as much interested in the type of body he is going to fit to his truck as in a great many chassis details. In a word, some of the newest truck body creations are features, carefully planned and worked out, combining not a few details indispensable to the particular industry in which the truck must operate. Thus, for example, although there may be fifty different coal operating concerns in New York City, yet these fifty cannot use the one design of dumping coal body but may require ten to twenty different designs, according to the conditions each operator has to meet. One concern loads from overhead hoppers and calls for a particular type of dump body which may be low and wide; another concern with cross-sidewalk deliveries must utilize an elevating dump body; then again, a Chicago house making deliveries into alleys finds it impossible to use the rear end dump and has to introduce the revolving dump body which permits of turning the body through an angle of 90 degrees and then dumping it to the side; still another operator in the Windy City discovers that he cannot load from overhead hoppers but must shovel the coal into the wagon and to make a truck efficient under such an exigency he has to have some form of demountable body, perhaps made in one or two detachable parts, so that the only loss of time experienced is that consumed while removing or replacing the demountable compartments; a third coal operator requires a compartment body which is not demountable, but one containing 3, 5 or 7 tons with a similar number of compartments and each compartment fitted with its individual unloading means to economize in time; and a score or more of similar examples could be cited to show the necessity for versatility in body design, a versatility made imperative by the varying conditions to be met by the many concerns. The fact that operator No. 1 uses a rear dump body is not the slightest reason why operator No. 2 should use a similar type simply because he does business in the same city and in a contiguous territory. If truck operators are going to economize time by loading and unloading means adapted to their respective businesses then they must design bodies to meet their special requirements. The transportation engineer is the man to determine the body requirements and his investigation must be thorough and not based on mere hearsay. The ultimate success of the motor truck installation is largely dependent on the features of body design and the reconciling of terminal facilities to these requirements.

The motor truck buyer must keep before him always the body situation and must be conscious of the fact that the selection of what he considers a satisfactory chassis is but a part of the problem he has to handle. He must not imagine that because he has used a certain design of body on his horse vehicles that these have simply to be duplicated for his motor vehicles. Such a course may be motor transportation suicide. The motor truck is a new order of things, demanding new methods, new constructions and scientific conduct of loading and unloading operations. The transportation engineer must realize that mere substitution of motor power for horse equipment is not enough and more than mere experience could be considered a satisfactory reference for an applicant for an important position.

Present Location of American Freight Cars

Report of the American Railway Association Shows There Are 2,308,700 Cars in the Country

There Is a Shortage of 825 Cars in the Group of Greatest Automobile Producing States

In view of the great annoyance to which the automobile industry was put during the last shipping season on account of the great shortage in the West of freight cars which could handle the business of delivering automobiles, the present situation is of interest.

The American Railway Association has just compiled its report showing the present location of the freight cars throughout the United States. This report is condensed in the table given below. From this tabulation it is possible to note the condition of shipping facilities throughout America.

An explanation of the table may be of value in order that the reader may readily follow the status of freight car affairs as applied to the automobile industry:

Number of Roads Reporting—This column refers to the number of railroad lines which have sent data to the association for the compilation of the table. It includes every line of importance in the country.

Total Cars Owned—The total number of freight cars owned by the lines reporting.

Home Cars on Home Roads—The number of cars out of the total cars owned given above, which are on the lines of the roads reporting in that particular district.

Foreign Cars on Home Roads—The total number of cars of other lines which are at present on the territories of the home cars.

Total Cars on Line—The summation of the home cars on the home roads and the foreign cars on the home roads.

Excess or Deficiency—The excess is given in light type and the deficiency in heavy type. The excess cars are those standing idle. These are the cars in excess of those required and for which there is no use. The deficiency is the number of cars required above the number available for business of any kind.

Surplus—The number of cars of special types above those required for the specific purposes for which the cars were designed.

Shortage—The number of cars of a special type below those required for the specific purposes for which the cars were designed.

Home Cars in Home Shops—The number of freight cars being repaired in shops of the line by which they are owned.

Foreign Cars in Home Shops—Cars repaired belonging to outside lines.

Total Cars in Shop—A summation of foreign and home cars in the shops.

Per Cent. to Total Cars Owned—Under this general head the foregoing quantities are reduced to a percentage basis.

Group 3, comprising Ohio, Indiana and Michigan and group 6, including Iowa, Illinois, Wisconsin and Minnesota, are of special interest to the automobile industry. It will be seen that group 3, which includes Michigan and Indiana, the greatest of the automobile shipping states, suffers from a shortage at the present time of 825 cars. This, while not promising in view of the fact that the trend of the cars is away from Michigan at present, is not so bad as last year. Group 6 has an excess of over 17,000.

Middle West Has Prosperous Year

St Louis, Mo., Feb. 12—According to a monthly statement issued by the Merchants-Laclede National Bank, of this city, Tuesday, February 11, thousands of the farmers in the territory tributary to this city have become the owners of automobiles as a result of the profits coming to them from their recently marketed crops. What is more to the point the report shows that the farmers who have purchased cars have been able to pay for them.

This situation is contrasted in the report with that prevailing a few years back, when farmers from the same community were compelled to borrow money to buy their cars. "The machines which they have purchased recently," the report says, "are not expensive makes, but they represent excellent investments."

FREIGHT CAR REPORT OF THE AMERICAN RAILWAY ASSOCIATION

GROUPS	Number of Roads Reporting	Total Cars Owned	Home Cars on Home Roads	Home Cars on Foreign Roads	Foreign Cars on Home Roads	Total Cars on Line	*Excess or Deficiency	Surplus	Shortage	SHOP CARS: Home Cars in Home Shops	SHOP CARS: Foreign Cars in Home Shops	SHOP CARS: Total Cars in Shop	PERCENT TO TOTAL CARS OWNED: Home Cars on Home Roads	PERCENT TO TOTAL CARS OWNED: Total Cars on Line	PERCENT TO TOTAL CARS OWNED: Home Cars in Home Shops	PERCENT TO TOTAL CARS OWNED: Foreign Cars in Home Shops	PERCENT TO TOTAL CARS OWNED: Total Cars in Shops
1 New England	8	86,124	39,251	46,873	61,354	100,605	14,481	992	714	5,178	1,699	6,877	45.57	114.32	6.01	1.46	7.47
2 N. Y., N. J., Del., Md., Eastern Pa.	58	675,791	340,368	335,423	315,420	655,788	**20,003**	5,648	2,088	30,571	8,905	39,476	50.37	97.04	4.52	1.32	5.84
3 Ohio, Ind., Mich., Western Pa.	46	284,380	83,510	200,870	200,045	283,555	**825**	3,112	1,479	11,937	8,824	20,761	29.37	99.63	4.55	3.37	7.92
4 Va., W. Va., No. and So. Carolina	28	196,980	96,307	100,673	86,625	182,932	**14,048**	6,818	1,801	8,575	1,930	10,505	48.89	92.87	4.35	.98	5.33
5 Ky., Tenn., Miss., Ala., Ga., Fla.	51	170,644	68,376	102,268	85,241	153,617	**17,027**	1,577	5,058	9,310	2,578	11,888	40.07	90.02	5.46	1.51	6,97
6 Iowa, Ill., Wis., Minn.	56	456,977	276,645	180,332	197,576	474,221	17,244	5,707	7,039	18,996	5,909	24,905	60.54	103.77	4.39	1.37	5.76
7 Mont., Wyo., Neb., Dakotas	10	16,506	3,442	13,064	11,857	15,299	**1,207**	780	559	439	740	1,179	20.85	92.69	2.66	4.48	7.14
8 Kans., Colo., Okla., Mo., Ark.	29	150,154	64,277	85,877	85,129	149,406	**748**	5,610	793	7,696	2,492	10,188	42.81	97.34	5.13	1.56	6.69
9 Tex., La., New Mex.	28	29,362	11,804	17,558	31,364	43,168	13,806	4,072	80	1,413	1,261	2,674	40.20	147.02	4.81	4.30	9.11
10 Ore., Idaho, Nev., Cal., Arizona	33	127,057	61.538	65,519	69,771	131,309	4,252	17,691	1,115	3,915	2,370	6,285	48.43	103.35	3.08	1.87	4.95
11 Canadian Lines	4	114,725	75,128	39,597	57,303	132,431	17,706	2,653	4,162	3,751	582	4,333	65.49	115.43	3.27	.51	3.78
Grand Total	351	2,308,700	1,120,646	1,188,054	1,201,685	2,322,331	13,631	54,660	24,888	101,781	37,290	139,071	48.54	100.59	4.50	1.65	6.15

*Deficiency in heavy faced type.

Stroke-Bore Ratio Affects Efficiency

Defining the Term Long-Stroke—High Rotative and Reciprocating Speeds Prohibitive for Practical Reasons—Foreign Engineers Discuss Problem

From Paper Read before the S. A. E. by John H. Wilkinson

IN the earlier days of the automobile industry the ratio of the stroke to bore of a gasoline engine was not a much argued question. Engines of equal stroke and bore were quite common, as well as engines with longer strokes; among the latter, as I remember it, the 4 1-4-inch by 5 1-4-inch engine was very common. Later the square motor became well-nigh universal both in this country and abroad.

It was at this time that the horsepower formula

$$\text{Horsepower} = \frac{D^2N}{2.5}$$

came into general use, being adopted first by the Royal Automobile Club of Great Britain and later by the Mechanical Branch of the Association of Licensed Automobile Manufacturers. **This formula was meant only as a working one relative to the almost universal practice of equal bore and stroke.** As such it served its purpose well, but today is out-of-date because the practice has changed somewhat. Three or 4 years ago the so-called long-stroke motor began to come into use abroad. Its use in England was first stimulated by a 4-inch race in 1908, in which the size of the engine was limited to a 4-inch bore, stroke not being limited. As the power of a motor can be increased by increasing its size in the direction of stroke as well as bore, this naturally led to the building of motors with strokes of more or less extreme length.

Bore Affects English Tax

Another strong incentive for small-bore long-stroke engines is the English annual inland revenue tax based on horsepower by the formula. This tax is pretty high as can be seen by the following table:

	£	s		£	s
6½ horsepower	2	2	33 horsepower	8	8
12 "	3	3	40 "	10	10
16 "	4	4	60 "	21	
			Exceeding 60 "	42	

Still another incentive is that the power classifications for speed and hill-climbing contests all favor the long-stroke motor.

In this country our speed contests are based as far as power is concerned on the volumetric displacement, a classification which I hope to show to be correct scientificially and practically. We have, then, in this country, no good reason for the adoption of any stroke-bore ratio other than that which can be shown to best meet our conditions. It is manifestly improper to classify all motors of even stroke and bore as short-stroke and all others as long-stroke.

If we take as the limits the ratios 1 and 2 and divide these into three classes we will have:

Short stroke	1. to 1.33	ratio
Medium stroke	1.33 to 1.66	"
Long stroke	1.66 to 2	"

This would be a reasonable classification for the sake of definition. Most American motors are in the first or short-stroke class.

Theory teaches us that rotative and piston speeds are limited ultimately by the strength of materials. Practice has taught us that with our present knowledge they are limited by other conditions also, such as lubrication, piston cooling and valve cooling; and that these limits are well within those set by the strength of materials.

To illustrate this point select a 4-inch bore by 5-inch stroke engine and take the explosion pressure at 325 pounds. The total pressure on the piston connecting-rod and bearings will then be 4082 pounds. It is a fair assumption that the connecting-rod must necessarily be strong enough to withstand this load. Now to find the revolutions such that the inertia of the piston equals 4082 pounds we resort to the formula

$$F = .00017\ W N^2 S$$

where F = Stress set up by piston
W = weight of piston = 3 pounds
N = R.P.M.

$$S = \text{Stroke in feet} = \frac{5}{12}$$

Reducing we have

$$N = 4500 \text{ R.P.M.}$$

I think that no one will contend that 4500 revolutions per minute would be a practical rotative speed for a 4-inch by 5-inch engine.

In this country today the practical maximum number of revolutions varies perhaps from about 1600 to 2000 according to the size of engine. For commercial car uses the tendency in maximum revolutions per minute seems to be still more conservative.

Before studying the question in preparation for this paper it had always been the belief of the writer that the long-stroke motor could not properly be run at as high a rotative speed as the short-stroke motor. This, I think has been the general opinion and was the view of the horsepower formula committee mentioned later. However, I have not been able to find any scientific or practical reasons supporting this view and **will attempt to explain later the reasons which seem conclusive to me why long-stroke motors may be run as fast rotatively as short-stroke motors of equal displacement.**

Committee Made Extensive Tests

As relating to this question I show some of the curves and tables of the horsepower formula committee representing the Institute of Automobile Engineers, the Royal Automobile Club and the Society of Motor Manufacturers and Traders. This was a very formidable committee, but its conclusions have been very severely criticised in many quarters. It made tests of 144 engines, 101 of which tests contain all the data required for comparing the effect of stroke-bore ratio in piston speed for values of R or ratio from 1 to 1.61.

CHANGE OF PISTON SPEED WITH VARIATION OF STROKE BORE RATIO R=S/D HIGHEST RECORDED B.H.P.

Number of tests	Stroke bore ratio	Piston speed at max. B.H.P.
15	1.00 to 1.08	1,303 ft. per min.
30	1.10 to 1.20	1,240 " " "
24	1.21 to 1.30	1,385 " " "
25	1.33 to 1.44	1,414 " " "
7	1.50 to 1.61	1,597 " " "
101 engine tests		

The formula deduced by the committee is:

$$\text{Piston speed } \sigma = 600\ (r + 1)$$

Such widely varying results do not seem to me to be an accurate basis of arriving at the proper comparative piston speeds of engine. No attempt was made to show that the conclusion is scientifically or reasonably correct. This is like trying to prove a scientific fact by popular vote. There must be some accurate way of making a proper comparison of piston speeds inasmuch as there are no unknown elements to be considered.

In order to discuss more clearly this and other questions pertaining to the paper, let us compare two engines of equal displacement but of varying stroke-bore ratios. I have selected a

4.5 x 4.5-inch stroke-bore ratio 1
and 3.57 x 7.14-inch stroke-bore ratio 2

Let us assume an equal rotary speed for both, and compare them as to vibration, noise, power, life, control, weight, cost and cooling. The engines, having the same displacement, are practically the same weight. The crankshafts, bearings, etc., can undoubtedly be made of correct size and strength; therefore, unless we find a wide divergence in the forces set up by inertia of the moving parts, we will not find a strong reason why one engine can be run faster rotatively than the other.

Vibration in a four-cylinder engine is caused by varying torque noticeable almost entirely at low speeds, lack of running balance of rotating parts, the effects of which increase rapidly with the speed and which are on the average a very noticeable form of vibration, the unbalanced inertia of the pistons due to angularity of the connecting-rods, and other vibrations due to lack of rigidity in crankshaft, etc.

The vibration due to angularity of the connecting-rods is the only one having a special relation to piston speed, and in high-class engines is the one most apparent. As it increases according to the square of the speed, it is most noticeable at high speed.

$F = .00017\,N^2WS$ — represents the force set up by inertia in each cylinder; as N is equal in both engines, the comparative vibration due to above-mentioned cause will be proportional to WS or the stroke × the weight of the piston, the piston pin and the upper half of the connecting-rod. So the engine in which WS is the smallest quantity will have the least vibration. Proper comparison of weights involves similar designs and purposes. In our practice we use pistons as follows:

4½ inches = 5.00 pounds
3⅝ inches = 2.625 "
3⅜ inches = 2.375 "

From these figures it would evidently be fair to take a 3.54-inch piston as weighing 2.5 pounds. **Theoretically pistons should weigh according to the cube of the bore and would do so if made of steel and machined inside and out.** Practically, using cast-iron pistons, the larger would be a little lighter than the proportional figures.

Piston Speed a Big Factor

The cubes of the bore of these two engines are to each other as 48.8 to 100; the practical weights, 2.5 pounds and 5 pounds are to each other as 50 to 100. It therefore seems that 2.5 and 5 must be substantially correct proportional weights. Our 4 1-2 x 4 1-2 rods 9 inches long weigh on the piston-pin end 1.25 pounds. A similar 3.57 x 7.14 rod 14 inches long should weigh on same end 1.5 pounds; therefore

$$W = 5 + 1.25 = 6.25$$
$$W' = 2.5 + 1.5 = 4$$
$$W\,S = 6.25 \times 4.5 = 28.12$$
$$W'\,S' = 4 \times 7.14 = 28.56$$

These figures are so near alike that we must assume the vibration in the two motors to be practically the same and that there is no basis for the belief that a long-stroke engine is a slow-speed engine on this account.

Now is there any reason to be found why the long-stroke engine canot be run as fast as the short-stroke? About the only other point to be considered in this connection is the friction between the piston and the cylinder. This is a function of the pressure and the stroke × the coefficient of friction, which gives the same result in both. We have then two mechanical machines in which the inertia of the moving parts sets up strains and vibrations of the same intensity and duration and which are resisted and absorbed by structures of equal weight and strength and in which the friction caused by such movement is the same.

The question of relative proper speeds is very important in connection with a proper discussion of the question. If it were conceded that of necessity either style of engine is essentially a slow-speed engine and could not be run so fast as the other, this in itself would show immediately an advantage of the one of higher speed capabilities; it would not show in any way that the high-speed motor was not just as good at low-speed work.

If we take the ordinary view of the question that the long-stroke engine must of necessity run more slowly, then to demonstrate its superiority it must first be shown that the slower speed is more desirable and next that at equal speeds it is a better engine. Further, unless it be conceded that the long-stroke motor has equal rotative speed capacity, it follows certainly that lighter, cheaper and more powerful cars can be built with the short-stroke motor.

In regard to noise, which is today perhaps the most important question relating to an engine, we note that both engines have the same rotative speed and the same displacement; therefore they must have the same size and lift of valves and cams. **So the only point of difference relating to noise will be the greater weight of the moving parts of the valve mechanism in the long-stroke engine, due to the greater distance from the valve-seat to cam; the difference is unavoidable, though small, and might amount to 10 per cent.**

The question of power speeds being shown to be equal depends on the thermal and mechanical efficiency and the thermal efficiency depends on the compression and wall surface exposed to heat of combustion.

Wall Area Is Important

The formula recommended for M.E.P. is $\eta p = 130\,(1 - 1.18/d)$.

It will be noted that the committee admits that the figures supply no evidence of increase of mean pressure with bore, but draws its conclusion from the fact that this is apparent on different engines of the same make and that it is a well-known fact that gases in large vessels lose their heat more slowly than when in smaller ones. The first deduction is open to all kinds of criticism and is admitted by the committee itself to be inaccurate. The second deduction is entirely wrong in application because the bore is not a measure of the volume any more than the stroke. **The real measure of the loss of heat is the ratio of the wall surface to the volume.** The committee might reasonably have said that the greater the displacement of the engine, the higher the M.E.P., compression being the same. To go as far as the committee did, and rate M.E.P. from 68.5 pounds per square inch in a 2.5-inch cylinder, to 99 pounds in a 5-inch, seems to be justified by neither theory nor the facts.

Further, to deduce the effects of wall surface on M.E.P. from results taken at or near maximum brake horsepower, which of necessity was at high rotative speeds, where the sizes of valves, piping and carbureters are by far the principal elements in such M.E.P., indicates a lamentable lack of perception of the problem involved.

In order if possible to get a more rational, practical view of this point, with the good aid of Coker F. Clarkson, I have collected all the data of horsepower curves of our American engines that I could get. I am pleased to say that very few refused this information.

In order to eliminate as many factors as possible and to get as nearly as possible the true capabilities of the engine, the M.E.P. was taken at 800 revolutions per minute, which represented in every instance practically the maximum M.E.P. at any part of the curve. At this speed the effect of valve piping and carbureter sizes is largely eliminated. Of course, the effect of time of valve setting is present in the results and very likely is mainly responsible for the variations. It will be noted, however, that the results are all within a very reasonable percentage of each other and close to what might be expected. No difference traceable to the size, stroke-bore ratio or internal surface as represented by the valve-in-head or T-head engine can reasonably be deduced.

Two figures are given, one for the bare results, the other with the size of the engine and the style of the head. Knight engines are classed as valve-in-head; T.H. = T-head, L.H. = L-head, V.H. = valve-in-head engine.

Size of engine	Style of head	Compression. % clearance to total volume	M. E. P.
4.75 x 5.5	V.H.	17	111
4.87 x 6	T.H.	21.2	100.5
5.5 x 5.5	T.H.	21.2	99.5
4.25 x 5.25	V.H.	22	90
4.25x 5	V.H.	22	90
5.75 x 5.75	T.H.	21.9	89
4.25 x 4.5	V.H.	22.4	95
4 x 5.94		23	101
5.37 x 6	T.H.	22.7	93
4.25 x 5	L.H.	23	93
3.75 x 3.75	V.H.	23	90
4 x 5.12	T.H.	23	89
4.5 x 4.5	L.H.	23.5	91
4.5 x 6	T.H.	24	97
4.5 x 5		24	93
4.5 x 4.5	T.H.	26	90
5 x5.5	T.H.	26	84
4 x 4	V.H.	27	83
4.25 x 5.5	L.H.	29	81.5
4.5 x 5	L.H.	24	81

I quote the following from a paper by L. H. Pomeroy read before the Institution of Automobile Engineers in December last:

"The writer has had two engines under observation during the past few months which only differed in respect to their valve arrangement, one having overhead valves, the other being of the orthodox type. The compression ratios were identical and every precaution was taken to eliminate disturbing factors. The M.E.P. in each case over a speed range from 600 revolutions per minute to 1000 revolutions per minute was substantially the same, about 96 pounds per square inch. The influence of marked changes in valve settings was also negligible."

Let us look a little into the theory of thermodynamic efficiency and see if it will give any light. **The regular losses in the engine are the mechanical friction, the heat loss to the jackets and the heat going out through the exhaust.** The heat lost to the jackets depends on the difference of temperature, the time and the internal surface of the engine exposed to heat. **The larger the engine the greater the volume in relation to internal surface and therefore the less the relative heat loss. Lengthening the stroke of an engine decreases the thermal loss, not because the stroke is lengthened but because the volume is increased.** Any increase in the size of an engine in the direction of either stroke or bore or both will decrease the thermal loss. It therefore follows that in any given engine the less the internal surface the higher the M.E.P., but both theory and practice show this to be a very small amount. Consider the adiabatic expansion curve in two instances. one of which has no internal surface at all and the other an ordinary engine with a jacket loss of 35 per cent. and an exhaust loss of 45 per cent.

Jacket Loss May Be Calculated

The difference in the mean pressure of these curves is about 15 pounds per square inch. Our practical problem then would be: If the difference between no jacket loss and the ordinary loss is 15 pounds per square inch, what is the difference in the case of two engines of a given difference in internal surface?

Our two engines, considering them as T-head with standard size valves, would have internal surface about as follows:

4.5 inches by 4.5 inches, 80 square inches at beginning, 143.6 at end of stroke.

3.57 inches by 7.14 inches, 71.8 square inches at beginning, 150.8 at end of stroke.

As the heat loss is a function of the difference of temperature and the surface, it is easy to figure that if the 3.57 by 7.14 had a jacket loss of 35 per cent., the 4.5 by 4.5 would have a loss of about 36 per cent. It is therefore doubtful whether there would be any difference in M.E.P.

If we had one of the engines with valves in the head, our comparison would be as follows:

4.5 by 4.5, 80 square inches at beginning, 148.6 at end of stroke.

4.5 by 4.5, 53 square inches at beginning, 121.6 at end of stroke.

Here there is a substantial difference in internal surface and we might expect a loss in one of 35 per cent. and in the other of 50 per cent. in the jacket, which might mean 5 pounds M.E.P. difference.

I have seen some curves indicating the surface exposed and the difference in temperature during the stroke. The initial temperature is taken at 3000 degrees absolute and the terminal at 1600 degrees absolute, and the jacket temperature at 212 degrees and 462 or 674 degrees absolute. In the case of the T-head the engine is losing heat at the end of the stroke 66 per cent. as fast as at beginning, and with the valve-in-the-head engine 80 per cent. as fast. Of course, actually the temperature would drop faster in the T-head motor.

Another very interesting reason why the M.E.P. does not increase with size was brought out by F. W. Lanchester, whom I quote as follows:

Heat Loss During Compression

"**There are two factors, other things being equal, that control the mean pressure—the compression ratio and the cooling loss.** If we prescribe some definite limiting value to the compression ratio to be employed, then it must immediately be conceded that the larger cylinder will show a higher mean pressure, owing to its cooling losses being relatively less than those of the smaller cylinder. Thus, firstly, in the smaller cylinder the actual compression will be lower, owing to the greater cooling during the compression stroke, and, secondly, the heat losses during the combustion stroke will be greater; and so the expansion curve will fall more rapidly. But, as a matter of fact, there is no definite prescribed compression value; the compression is limited by the question of pre-ignition. If an engine is given too high compression, pre-ignition will occur or short of actual pre-ignition the explosions will become of a detonating character, and the engine will be correspondingly noisy. The compression has then to be reduced. Now the smaller the cylinder the higher the compression ratio permissible, owing to the greater cooling during the compression stroke—in fact, not only may the compression ratio be increased but the actual compression may be higher; for the temperature of the charge at any given compression is actually lower. Consequently the small engine, though sacrificing mean pressure due to its greater cooling loss, will, if properly designed, receive some compensation from the higher compression that may be employed.

It is an interesting fact that over the range of sizes commonly employed in automobile work these two influences in many cases almost exactly cancel out. Thus in the Daimler sleeve-valve engine I have found it just as easy to obtain a given mean pressure in a small cylinder (70 millimeters diameter) as in a large one (124 millimeters diameter). Thus to obtain (at ordinary barometric pressure) mean pressure as shown by the brake in cylinders of the diameters given, the following compression ratios were employed, the figures representing the total volume in terms of the clearance volume.

Cylinder diameter in millimeters	Ratio
124	4.6
100	5.0
96	5.11
80	5.6
70	6.0

The maximum brake horsepower of our two engines figured from the formula of the above-mentioned committee is

4.5 by 4.5 —	1800 R.P.M.	96 M.E.P.	55 H.P.
3.57 by 7.14	1534	86	46

The deduction from the argument of the writer is that the variation is not worth mentioning. It must be evident that if the figures of the committee are taken that the long-stroke engine is an inferior engine.

The mechanical friction of our two engines differs only in the friction of the wristpin, the crankpin and the main journals. The piston friction being a product of the thrust, the stroke and the coefficient of friction, will be the same in the engines, as the thrust is proportional to the area of the piston and of course the area multiplied by the stroke is the same in both cases. Likewise the ring friction will be equal. The other frictions mentioned will be proportional to the area of the piston alone, crankshaft sizes being the same. This friction will a coefficient of .04 will be at 800 revolutions per minute about 1.25 horsepower for the 4.5-inch engine and .75 horsepower for the 3.5-inch engine, a difference of .5 horsepower.

Larger Piston Hard to Cool

The heat lost through the jacket is a measure of the size of radiator necessary. As to the effect of piston size on cooling it is undoubtedly true that the larger the piston the more difficult it is to keep it cool, but the limiting feature of our present high-speed engines, with necessarily large valves, is more likely the size of the exhaust valve. It is probable that a stroke-bore ratio below 1 might soon be reached where the piston would be more difficult to cool than the exhaust valve, but we are not dealing in practice with such stroke-bore ratios. **The tabulated data of American engines show the practice is to use as high compression in large engines as in small ones.** So far as the writer knows there have been no experiments in regard to cooling carried on which would show us the relative effects in large and small engines. The writer has never been satisfied that if this elemnt were taken into strict consideration, small engines would not be found superior to large ones in M. E. P. and horsepower per cubic inch of displacement.

The life of an engine is governed largely by its speed. Either type will show superiority in this respect at lower speed. **At equal speed there are to be noted two differences which must be considered in the design. The piston of the long-stroke engine, being shorter and yet subject to the same total friction, will necessarily wear faster. Likewise the bearings of the short-stroke engine, being subject to greater pressure at the same speed, will require more area. The friction and wear of valve mechanism cannot vary, as they should be the same in every respect.**

It might be interesting to note here that any increase of weight due to increasing the life of the piston in one case might possibly be balanced by an increase in the other piston from the desire to get better cooling.

As a purely thermal question there is apparently no reason why the stroke-bore ratio cannot be carried beyond even a ratio of two. But as to mechanical design awkwardness begins to be apparent at ratios beyond 1.33; and beyond 1.5 the objections become more or less acute, running into weight and expense without any compensating features. **Any extra long stroke involves too much weight in the valve mechanism and a strong temptation to too short connecting-rods to keep down the height and weight. With L-head engines a design beyond 1.33 exaggerates the valve pocket design. On the other hand, in block engines with two-bearing crankshafts long strokes shorten the distance between bearings and lessen the thrust, thus diminishing the necessary diameter of crankshafts; and in six-cylinder motors the length of motor is shortened.** It might be fair in placing general limits on the stroke-bore ratio to say that it is limited in one direction to 1 by the cooling limit of the piston, and in the other direction to 1.5 by the limits of mechanical adaptiveness.

Discussion by the Engineers

Professor Marshall, among other remarks, stated that the French engineers had apparently gone to the long-stroke motor and that a bore, stroke ratio of 1.5:1 was below the present average. In the speaker's mind, the main point in connection with horsepower was engine's speed and bore.

Professor Carpenter stated that there were certain relations to bore that were not considered. Increased speed gave more horsepower, but with engines of the same size and at the same revolutions per minute there was a falling off in the torque curve. **He also pointed out that the formulæ at present employed, namely, $\frac{D^2 N}{2.5}$ when changed and the divisor altered to 2 instead of 2.5 a better approximation of the horsepower was obtained for square engines. In the case of engines having a greater stroke than bore, he considered that by substituting the factor D^2 by D X L, L standing for the stroke. In the case of the engine having a longer stroke than bore he thought that instead of squaring the bore that it would be better to multiply the bore by the stroke.**

Chairman Alden stated that there were two schools of engineers in England, and during a recent visit abroad he was present at a meeting of the Institute of Automobile Engineers when a paper was read by Professor Watson, who had made some exhaustive tests upon a single-cylinder Daimler engine. It was admitted by everyone present at the meeting that these tests were more complete than any heretofore made, and theoretically they were excellent, but owing to the fact that the motor chosen was out of date, being 4 years old and badly worn, the test was not of much practical value. Mr. Lanchester, the engineer of the Daimler company, England, took part in the discussion and showed that the shape of the combustion chamber on present day engines had no particular bearing upon the horsepower curve.

Howard Coffin remarked that he did not think that foreign engineers could show the American engineer much; that conditions in England and France were peculiar. There was not the spirit of co-operation abroad and he thought that the work that was being carried on here was just as much to be depended upon as abroad. Mr. Coffin was of the opinion that the short-stroke motor could give more horsepower per pound of weight than the long-stroke motor.

Mr. Riker stated that he had studied the question of the tendency toward long-stroke motors in Europe and found that the crux of the problem was not one of design so much as compulsion. The horsepower of the engines in Europe form the basis for taxation, which was very heavy, and in order to give the buying public as much horsepower for a given bore as possible, thereby avoiding excessive taxation, the stroke had been unduly lengthened. Conditions in this country were entirely different. The buying public here demanded a car that it was possible to drive most of the time on high gear; also that vibration was most detrimental from a selling point; absence of vibration and high-gear driving could not be obtained satisfactorily in the long-stroke motor. Further the buying public in this country prefers six-cylinders.

Factory Miscellany

Ingersoll crankcase milling machine used by the Haynes Automobile Company, Kokomo, Ind.

WHEREVER it is possible to do two or more things at the same time money is being saved. In this age of economy a tool which can do this, and do it as well as another tool which operates on single jobs, is of the highest interest. The above photograph shows a milling machine which faces three sides of the Haynes crankcases at one time. One workman alone takes care of the machine and sends the work through. After this machine is through with a piece of work the latter is entirely finished and can go directly to the assembling room. When the three sides are done simultaneously in this manner, alignment is a simple problem and cause no further trouble.

EIGHT Plants for Queens—The Borough of Queens, N. Y., is to have eight new plants, which will affect the automobile trade in general. The factories planned and under way will employ about 20,000 hands. A list of these plants is as follows: Pierce-Arrow Automobile Company, Buffalo, N. Y., is erecting a four-story building on Freeman street, 200 feet by 205 feet, with extension 51 feet by 54 feet, the estimated cost is $300,000; the Goodyear Tire & Rubber Company, Akron, O., is to erect a building six stories high on Jackson avenue and Honeywell street, to cover 93,000 square feet of ground and to cost $250,000; the General Vehicle Company, Long Island City, N. Y., is building a $350,000 addition to its plant; it is now employing 550 men and will double the number when new plant is ready; the Simplex Motor Car Company, New York City, is to build a factory on Vernon avenue; the Edwards Motor Car Company, Long Island City, N. Y., has purchased a site and is preparing to build a large plant on Berden avenue just east of Dutch Kills Creek; the Ford Motor Company, Detroit, Mich., is to add five stories to its three-story plant on Jackson avenue which will cost $50,000; the American Locomotive Company, Providence, R. I., will double the size of its present plant on Jackson avenue by adding a second story to the building costing $40,000, and the Packard Motor Car Company, Detroit, Mich., is preparing to enlarge its big building on Thomson avenue; plans are not yet filed, but it is stated that two stories are to be added.

Mayer Carbureter Builds—The Mayer Carbureter Company, Buffalo, N. Y., is planning the erection of a factory in Detroit, Mich.

New Atlanta Tire Factory—The Interstate Automobile Tire & Rubber Company, Atlanta, Ga., is to erect in the near future a factory to manufacture its products.

Kentucky's Cincinnati Factory—Ground was recently broken in Cincinnati, O., by the Kentucky Motors Company, which is to erect a plant on that property.

Wolverine Supply Adds—The Wolverine Motor Supply Company, Detroit, Mich., has had plans prepared for the construction of a two-story, 74 feet by 84 feet brick addition to its plant.

Canadian Plant for Goodrich—The B. F. Goodrich Company, Akron, O., manufacturer of rubber tires, will build a factory at St. Catherines, Ont., to employ about 1,000 men. The town has given the company 17 acres of land and fixed the assessment at $10,000 for 10 years.

Shows, Conventions, Etc.

Feb. 15-22.........Albany, N. Y., Annual Show, State Armory, Dealers' Association.
Feb. 15-22.........Newark, N. J., Annual Automobile Show, First Regiment Armory, New Jersey Automobile Exhibition Company.
Feb. 16-23.........Richmond, Va., Annual Show.
Feb. 17-22.........Kansas City, Kan., Annual Automobile Show.
Feb. 18-19.........Madison, Wis., Annual Show, City Market Building, Dealers' Association.
Feb. 18-21.........Grand Forks, N. D., Annual Show, Auditorium, Dealers' Association.
Feb. 18-22.........Baltimore, Md., Annual Show, B. A. D. A.
Feb. 19-22.........Bloomington, Ill., Annual Show, Coliseum, McLean County Automobile Club.
Feb. 19-22.........Geneva, N. Y., Automobile Show, Armory, Louis Blumenstein.
Feb. 19-22.........Kalamazoo, Mich., Annual Show.
Feb. 19-23.........New Orleans, La., Annual Show.
Feb. 19-27.........Topeka, Kan., Annual Show.
Feb. 20-22.........Canandaigua, N. Y., Automobile Show, Louis Blumenstein.
Feb. 22-Mar. 1.....Brooklyn, N. Y., Annual Show, 23rd Regiment Armory.
Feb. 24-27.........Kansas City, Mo., Truck Show.
Feb. 24-Mar. 1.....St. Louis, Mo., Annual Show.
Feb. 24-Mar. 1.....Memphis, Tenn., Annual Show.
Feb. 24-Mar. 1.....Omaha, Neb., Annual Automobile Show.
Feb. 24-Mar. 1.....Paterson, N. J., Annual Show, Paterson Automobile Trade Association.
Feb. 24-Mar. 5.....Cincinnati, O., Annual Show, Music Hall, Cincinnati Automobile Dealers' Association.
Feb. 25-28.........Eau Claire, Wis., Annual Show, Armory, Dealers' Association.
Feb. 25-Mar. 1.....Syracuse, N. Y., Annual Show, Syracuse A. D. A.
Feb. 26-Mar. 1.....Fort Dodge, Ia., Annual Show.
Feb. 26-Mar. 1.....Glens Falls, N. Y., Automobile Show, Louis Blumenstein, Manager.
Feb. 27-Mar. 1.....Toronto, Ont., Annual Show, Toronto Automobile Trade Association.
March 3-8.........Bridgeport, Conn., Show, Park City Rink, B. B. Steiber.
March 3-8.........Denver, Col., Annual Show, Municipal Auditorium.
March 3-8.........Springfield, Mass., Automobile Show, New Auditorium Building, United Amusement Company.
March 3-18.......Des Moines, Ia., Annual Show, Pleasure Car Section, Coliseum, Dealers' Association.
March 5-8.........Tiffin, O., Annual Show, Tiffin *Daily Advertiser.*
March 5-8.........Louisville, Ky., Annual Show, Dealers' Association.
March 5-8.........London, Ont., Annual Show, Drill Hall, Louis Blumenstein.
March 8-15........Boston, Mass., Annual Automobile Show.
March 8-15........Columbus, O., Annual Show, Billy Sunday Tabernacle, Automobile Club and Traders' Association.
March 11-15.......Buffalo, N. Y., Commercial Vehicle Show, Auditorium, Automobile Dealers' Association.
March 12-15.......Ogdensburg, N. Y., Automobile Show, Louis Blumenstein, Manager.
March 19-26.......Boston, Mass., Annual Truck Show.
March 20-24.......New Orleans, La., Annual Show, N. O. A. D. A.
March 24-29.......Indianapolis, Ind., Annual Automobile Show.
March............Nashville, Tenn., Annual Show, Nashville Automobile Dealers' Association.
March............Pittsburgh, Pa., Annual Automobile Show.
April 1-6.........San Francisco, Cal., Motor Truck Show, Coliseum Hall. *Motor Field.*
April 5-19.........Pittsburgh, Pa., Annual Show, East Liberty Market House, Dealers' Association.

Race Meets, Runs, Hill Climbs, Etc.

May 30...........Indianapolis, Ind., 500-Mile Race, Speedway.
July 27-28.........Tacoma, Wash., Tacoma Road Races.
Nov. 24...........Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 26...........Savannah, Ga., Grand Prize Race, Automobile Club of America.

Foreign

March.............France, Sealed Bonnet, 3000-Mile Run.
March 31.........Montevideo, Uruguay, International Competition of Agricultural Motor Vehicles.
April.............Barcelona, Spain, International Exhibition.
May..............St. Petersburg, Russia, International Automobile Exposition, building of Michael Maneze, Imperial Automobile Club of Russia.

Bremer-Wilson Moves—The Bremer-Wilson Manufacturing Company, Chicago, Ill., has moved to 1475 Michigan Boulevard, that city.

San Antonio Club Opens—The San Antonio, Tex., Automobile Club had its formal opening on February 1. Dr. Frederick J. Fielding is president.

Fisk Tire in Winnipeg—The Fisk Rubber Company, of New York City, opened recently a completely equipped branch house in Winnipeg, Man.

Improvement in Cuero—The machine shop for the Texas Motor Car & Supply Company, Cuero, Tex., will be located in the west Main street building.

McGraw Tire Output Large—$1,160,000 worth of tires were manufactured and sold by the McGraw Tire & Rubber Company, East Palestine, O., during 1912.

Overland's Foundry—A $35,000 foundry, 100 feet by 296 feet, is to be erected on the Spear brick yard site in Toledo, O., by the Willys-Overland Company.

Frisco's Two Studebakers—Two Studebaker cars have recently been put in service by Uncle Sam in San Francisco, Cal., in connection with the parcel post.

Kentucky's Machine Shop—The Kentucky Motor Car Company, Cincinnati, O., has issued plans for a two-story brick and concrete garage and machine shop, to cost $50,000.

Detroit Dash Company's Fire—The plant of the Detroit Auto Dash Company, Detroit, Mich., was recently damaged by fire of unknown origin to the extent of $10,000. The plant, which employed about fifty men, will be shut down about a week as a result of the fire.

Universal's Addition—The Universal Motor Truck Company, Detroit, Mich., is preparing plans for an addition to its present factory building. The addition will cost $250,000 and will double the capacity of the plant.

Pilot Enlarges—The construction of the addition to the plant of the Pilot Motor Car Company, Richmond, Ind., was commenced recently and ground for the new 120-foot building was broken. The new building will be two stories high.

Fire at Goodyear Plant—Fumes of burning rubber greatly hampered the work of the firemen at a blaze which started in the reclaiming department of the Goodyear Tire & Rubber Company, Akron, O. The fire was caused by the explosion of an acid container.

Penn Plant Sold—At a bid of only $400 more than the $50,000 mortgage resting on the plant, the real estate of the bankrupt Penn Motor Company, New Castle, Pa., was sold recently at public auction. George Roth and J. M. Jack, of Pittsburgh, Pa., were the purchasers.

Women in Automobile Plants—The plant of the Ford Motor Car Company, Detroit, Mich., employs about 100 women in the magneto department, to wrap the coils, tin them, and the like. This department is the only one outside of the office where women are employed.

New Toledo Lamp Factory—A new General Electric Company, to be known as the General Electric Miniature Lamp Factory, will be located in Toledo, O., and be in operation by April 1. Automobile headlights and electric lights for all uses on such machines will be made by the new branch. The plant will employ 300 men at the opening.

Flanders Spending $1,000,000—Walter Flanders, now the head of the reorganized United States Motor Company, stated recently that the Maxwell Motor Company, Dayton, O., which succeeds it, will spend $1,000,000 annually among the Dayton factories for equipped brass cylinder work, or any kind of drop forging which is used in the automobile business.

Repair room of the Goodyear Tire & Rubber Company, Akron, O.

Benguet road in the Philippine Islands, showing one of the cars used in bus service in this region. There are eight cars on the line

FRENCH 1912 Automobile Exports—The following statistics of exports of automobiles from France are taken from an article published in the *Petit* of Havre: The year 1912 showed a decided advance in the automobile exports in comparison with those of 1911. These exports amounted to 230,167 metric quintals (metric quintal equals 220.446 pounds) as compared with 175,591 in 1911. The exports of industrial cars, farming wagons and heavy vans increased from 7,262 quintals in 1911 to 8,158 quintals in 1912. Among the countries of destination of these exports the United Kingdom stands first, having taken 60,765 quintals, as compared with 54,585 in 1911; Belgium follows with 55,799 quintals, as compared with 34,737 in 1911; Algeria with 21.640 as compared with 13,769 in 1911; Germany with 17,699, as compared with 14,624 in 1911; Argentina with 14,937, as compared with 9,265 in 1911, and Brazil with 11,994, as compared with 7,271 in 1911. The imports of automobiles into France, according to the same source of information, increased from 12,819 metric quintals in 1911 to 15,051 in 1912. These figures are all necessarily provisional and no valuation was given.

Westman with Henderson—E. E. Westman has taken a position as purchasing agent of the Henderson Motor Car Company, Indianapolis, Ind.

East Joins Timken—G. L. East has joined the publicity staff of the Timken Roller Bearing Company, Detroit, Mich., as assistant advertising manager.

Johns-Manville's Newark Office Moves—The H. W. Johns-Manville Company, New York City, announces the removal of its Newark, N. J., office to 239 Halsey street.

Trask with Marmon—C. A. Trask, formerly with the Henderson Motor Car Company, Indianapolis, Ind., recently joined the Nordyke & Marmon Company, Indianapolis, Ind.

Des Moines Show Plans—The Des Moines Automobile Show will be devoted only to the pleasure car end, although a few trucks may be shown. The show is to be held March 3.

Wants Motor Truck Prices—The Texas Motorway Company, C. L. Cade, engineer in charge, 511 Sumpter Building, Dallas, Tex., wants prices on motor trucks for passengers and freight.

Zink's Kerosene Carbureter—C. S. Zink of St. Louis, Mo., who has perfected an efficient kerosene carbureter, is in Indianapolis, Ind., trying to obtain permission to demonstrate it for various manufacturers.

McIntyre Building Partially Destroyed—Fire at Auburn, Ind., recently destroyed a three-story brick building belonging to the W. H. McIntyre Company. The loss on the building and its contents was about $100,000.

Bryant Resigns from Franklin—G. H. Bryant has resigned as advertising manager of the Franklin Automobile Company, Syracuse, N. Y. He is succeeded by W. M. Williams, who has been assistant advertising manager.

Bosch Appoints Two Distributors—The Bosch Magneto Company, New York City, has appointed the Kansas City Automobile Supply Company, Kansas City, Mo., and the Powell Supply Company, Omaha, Neb., as its distributors for its product.

Strauss Changes Position—M. F. Strauss, recently with the American-Marion Sales Company, New York City, has accepted a position with S. P. Townsend & Company, Orange, N. J., taking charge of their drafting department and general engineering work.

Leases Large Southern Garage—A. E. Reid, distributor of the Overland car in Louisville, Ky., has closed a lease for 5 years for the Olds Motor Works branch, which was recently abandoned by them and will take possession of the new $110,000 structure in the near future.

Two Indianapolis Changes—Two changes in location have taken place in Indianapolis, Ind., the A. & M. Service & Sales Company moving to Capitol avenue and Vermont street, while the Hunter-Hammond Automobile Company has moved into the quarters vacated by the A. & M. concern.

Burt's Los Angeles Home—The W. J. Burt Motor Car Company, Los Angeles, Cal., during the past week occupied its new home at Pico and Home streets. The new building is 60 feet by 155 feet and two stories in height, giving 19,000 square feet. W. J. Burt is state agent for the Auburn.

Automobiles in Yosemite Valley—Los Angeles automobilists are becoming more enthusiastic daily over the prospects of the wonderful Yosemite Valley being thrown open to automobiles by the Government. A telegram, stating their wants, was sent by the Los Angeles, Cal., Chamber of Commerce to the California Senators and Congressmen.

New Agencies Established During the Week

PLEASURE CARS

Place	Car	Agent
Amherst, N. S., Canada	Cole	F. A. Wilson
Armour, S. D.	Moon	T. W. Fotheringha
Avon, S. D.	Cole	J. P. Krall
Baltimore, Md.	Cameron	G. H. Wehr
Baltimore, Md.	Cole	Cole Sales Co.
Baltimore, Md.	Reo	R. H. Croxton
Baltimore, Md.	Stoddard-Dayton	Cole Sales Co.
Bardstown, Ky	Cole	Grigsby & Co.
Bristol, Tenn	Cole	Davis Sparger Auto Co.
Bncyrus, O.	Hudson	Samuel Hirtz
Buffalo, N. Y.	Havera	Barrett M. C. Co.
Camilla, Ga.	Cole	L. J. Hay
Chattanooga, Tenn.	Cole	Hirsch Bros.
Chicago, Ill.	Havers	Metallurgique M. C. Co.
Chicago, Ill.	Staver	T. J. Hay
Colnmbus, O.	Empire	E. L. Jacoby
Colnmbus, O.	Great Western	Charles Ross
Clarinda, Iowa	Cole	A. V. Hunt
Danbury, Conn.	Case	H. A. Hume
Davis, S. D.	Moon	William DeNoma
Des Moines, Ia.	Regal	Lyen, Christianson & Swanson Anto Co.
Easton, Pa.	Cole	LaFayette Motor Car Co.
Gladwin, Mich.	R-C-H	F. L. Prindle
Greensboro, N. C.	Cole	P. W. Richardson
Hartford, Conn.	Hupmobile	Curtis & Prowe
Hartford, Conn.	Locomobile	Buick Garage Company
Hartford, Conn.	Velie	Goldberg-Gastonguay Coal Co.
Howard, S. D.	Moon	S. T. Radcliff
Ivanhoe, Minn.	R-C-H	Schulz & Jensen
Kankakee, Ill.	R-C-H	O. K. Baldwin
Lehighton, Pa.	Cole	Serfas Motor Car Co.
Le Mars, Ia.	Cole	Marx & Marx Auto Co.
Lena, Ill.	Cole	Inman & Presse
Logan, O.	Ford	Cage Automobile Co.
Logan, O.	Hudson	Cage Automobile Co.
Logan, O.	Overland	Cage Automobile Co.
Louisville, Ky.	Premier	Clark M. C. Co.
Louisville, Ky.	Velie	E. H. Specht
Lyons, Neb.	Cole	Swanson Bros.
Madison, S. D.	Moon	C. J. Whitlock
McArthur, O.	Ford	M. C. Westfall
Middletown, N. Y.	Pullman	F. S. Pulver
Minneapolis, Minn.	Michigan	C. O. Jacks
Minneapolis, Minn.	Moon	Tri-State Automobile Co.
Minneapolis, Minn.	R-C-H	H. S. Haynes
Minneapolis, Minn.	Havers	A. F. Chase & Co.
Montreal, Que.	CarterCar	Rivet Motor Garage Co.
Moville, Ia.	Moon	Southwick & Maxfield
New Britain, Conn.	Case	C. A. Dennison
New Orleans, La.	Overland	Mobile Overland Auto Co.
New York City	Empire	John Moore & Co.
New York City	Havers	S. & M. Motor Co.
Northfield, Minn.	Cole	Tom C. Mabon
Norwalk, O.	Detroiter	J. E. Snable
Olympia, Wash.	Ford	W. E. Brensen
Oregon, Ill.	Moon	Oregon Auto Supply Co.
Ottawa, Ont., Canada	Cole	Pink, McVerty, Blackburn
Paris, Tenn.	Moon	E. E. Davis
Philadelphia, Pa.	R-C-H	Schumaker & Co.
Poplar Bluff, Mo.	Cole	C. Williams & Brothers
Princeton, Ill.	Moon	J. M. Ennis
Rock Rapids, Ia.	Moon	Rhose Bros.
Salem, Ore.	Cole	Chamberlain Bros.
San Francisco, Cal.	Chevrolet	Norman De Vaux
San Francisco, Cal.	Little	Norman De Vaux
Silver Creek, N. Y.	Cole	F. B. Porter
Stanford, Me.	Pullman	Ford & Johnson
Syracuse, N. Y.	Alco	W. R. Shaw
Syracuse, N. Y.	Paige-Detroit	Syracuse M. C. Co.
Syracuse, N. Y.	White	Syracuse Garage
Tacoma, Wash.	Flanders	Lamping & Garfield
Trement, Ill.	Cole	Koch & Tisch
Trenton, N. J.	Cole	Trenton Motor Car Co.
Wadena, Minn.	Cole	Baehr Brothers
Warren, O.	Cole	Morgan & Williams
Washington, D. C.	American	Cunningham M. C. Co.
Washington, D. C.	Marion	Cunningham M. C. Co.
Washington, D. C.	Metz	H. A. Rhine & Co.
Wasbington, D. C.	Nyberg	H. A. Rhine & Co.
Wilkes-Barre, Pa.	Pullman	Commercial M. C. Co.
Worcester, Mass.	Havers	J. R. Hawks

COMMERCIAL VEHICLES

Albany, N. Y.	Stewart Delivery	E. V. Stratton Co.
Baltimore, Md.	Service	Rittenhouse-Winterson Co.
Hartford, Conn.	Chevrolet	Buick Garage Company
Boston, Mass.	Mack & Saurer	International Motor Co.
Boston, Mass.	Standard	Whitten-Gilmore Co.
Boston, Mass.	Westcott	Learned-Kemp Co.
Bridgeport, Conn.	Brown	H. B. Gates
Bridgeport, Conn.	Standard	J. L. Carpenter
Seattle, Wash.	Standard	Pacific Car Co.

ELECTRIC VEHICLES

Baltimore, Md.	Ranch & Lang	Rittenhonse-Winterson Co.
Baltimore, Md.	Standard	Zell Motor Car Co.
Montreal, Que.	Baker	Stockwell Motor Car Co.

Schaffer, Treasurer Keeton—H. S. Shaffer has become treasurer of the Keeton Motor Company, Detroit, Mich.

Syracuse Show Large—The Syracuse Automobile Dealers' Association will hold its fifth annual exhibition on February 25. There are 166 exhibits listed, with a number of novelty booths.

Dunwoodie with Maxwell—David Dunwoodie of Dayton, O., will join the executive force at the head office of the Maxwell Motor Company, Inc., and take charge of the sales of its cars.

Goodyear's New Building—The Goodyear Tire & Rubber Company, Toledo, O., branch, is moving into its new building, corner Madison avenue and Fourteenth street. This concern will carry about a $500,000 stock of tires.

Motometer Opens Chicago Office—The Motometer Company, Inc., New York City, makers of the Motometer, the new device attached to the radiator cap for indicating to the driver the heat of the motor, has opened a Chicago, Ill., branch at 1322 Michigan avenue.

Electric Vulcanizer's New Officers—The Electric Vulcanizer Company, Minneapolis, Minn., has reorganized with new officers. It will sell tires as well as repair them. The officers are as follows: E. M. Thorsteinson, president; J. H. Dupont, secretary, and J. E. Brandon, treasurer.

Inter-State Club's Officers—The following officers were recently elected in the Inter-State Boosters Club, an organization in the Inter-State Automobile Company, Muncie, Ind.; C. P. Brockway, president; B. J. Cline, advisory board; C. V. Morse, chairman, and B. D. Vogel, secretary.

Deadwood's Automobile Show—An automobile show is to be given in the auditorium March 31, in Deadwood, S. D. The show is the outcome of the formation of the Black Hills Automobile Dealers' Association, attended by twenty dealers of the section, to promote the interests of the trade.

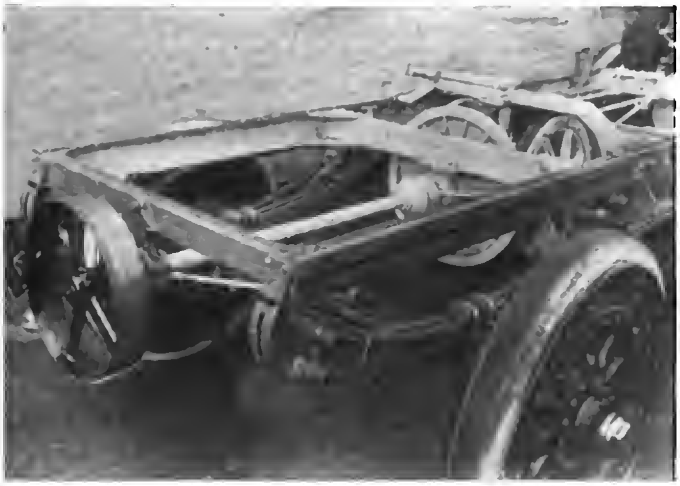
Bradley Invents Engine—Dr. A. Bradley of Albert Lea, Minn., has invented a new automobile engine, has tested it and found it to be practical for his use, developing 60 horsepower. The engine, 4-cylinder, 4-cycle, and has only two moving parts, not counting the crankshaft and the pistons.

Brazil to Improve Roads—Brazil is to have improved highways. The Empreza Autovairia Paulista has been granted permission by the government to construct a road between Sao Paulo and Santos, Brazil. Reports state that this company has floated a loan for this purpose, netting $650,000.

Minnesota Dealers' Association Formed—The Minnesota Retail Automobile Dealers' Association was recently formed in Minneapolis, Minn. It is formed to combat price-cutting by distributors and curbstone dealers and to eliminate the latter agent from the market. C. W. Jewett was elected president.

Long Island Club's Run—The Long Island Automobile Club will hold an informal run on Washington's birthday, to be counted in the competition for the trophy to be awarded to the member taking part in the most competitions during the season. The run will start from the club house and end at the Brooklyn automobile show.

View of the Rochester, N. Y., automobile show, held at Exposition Park



Rear view of Service truck, shown at Chicago, with its cushion wheels and pulley attachment for driving machinery

Plumb Sales Manager—F. W. Plumb has joined the Palmer-Moore Motor Truck Company, Syracuse, N. Y., as sales manager.

Hall Universal Manager—H. W. Hall has been appointed manager of the Boston, Mass., branch of the Universal Motor Truck Company.

Syracuse Club's Banquet—The Automobile Club of Syracuse, N. Y., is planning its annual banquet for March 6 in the ballroom of the Onondaga.

Crockett Locomobile Truck Manager—Frank Crockett has been appointed manager of the truck department of the Locomobile's Boston, Mass., branch.

Futtermans Control Superior Lamp—Harry, Myer and Abraham Futterman have taken over the control of the Superior Lamp Manufacturing Company, New York City.

Sarles Elected President—The North Dakota division of the Meridian Road Association has re-elected former Governor E. Y. Sarles as president and C. W. Graves as secretary.

Dart to Conduct Shows—F. W. Dart has completed an organization that will conduct shows throughout the country next season. Mr. Dart managed the recent Hartford, Conn., show.

Lakeside Show in April—The automobile dealers of the neighboring city of Auburn, N. Y., are planning for their annual show in the pavilion at Lakeside early in April. Details are now being perfected.

Harrisburg Club Elects—The Harrisburg Motor Club, Harrisburg, Pa., recently elected the following officers: W. E. Lauver, president; F. H. Bomgardner, vice-president, and J. C. Myton, secretary-treasurer.

Pope Chemical Wagons Ordered—Two chemical wagons have been ordered of the Pope Manufacturing Company, Hartford, Conn., by the Worcester, Mass., fire department. This will make three machines of this type in service.

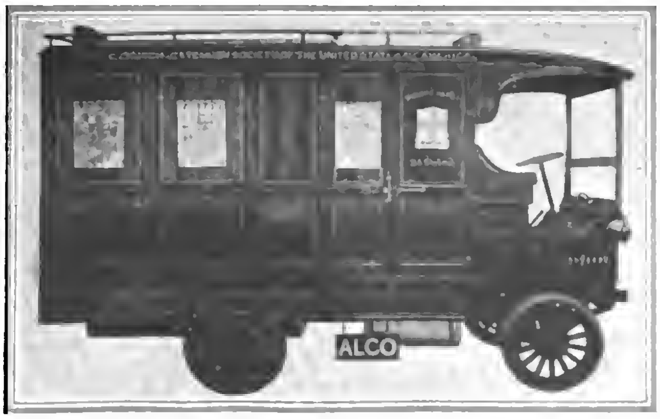
Bus Line in Lancaster—W. A. Arnold has purchased an automobile and will operate a bus line from Lancaster, Ky., to Nicholasville, Ky. This makes the second automobile line which has been put into operation between the two cities.

Denison Advertising Manager—G. H. Denison has assumed the post of advertising manager with the Dyneto Electric Company, the factory being at Elbridge and the business and sales office at No. 200 East Genesee street, Syracuse, N. Y.

Ithaca Wants Fire Trucks—A committee headed by City Judge Daniel Crowley has requested the fire commissioners of the city of Ithaca, N. Y., to recommend to the common council of that city the purchase of a combination hose and chemical automobile.

Lageson's Anti-Skid Cover—K. J. Lageson, Benson, Minn., has patented an anti-skid cover for vehicle wheels, to prevent skidding. It is to provide a chain tread of novel construction consisting of links shaped to fit the tread of the tire and having integral loop portions on two sides of the links that form projections, engaging the road surface and preventing side slipping.

Concrete Road Proves Success—C. E. Gordon, member of American Society of Chemical Engineers and official representative of the war department, recently spent several days at Fond du Lac, Wis., to inspect and investigate concrete street pavement, of which type that city has laid thousands of square yards, being a pioneer in the use of concrete for pavements. He was able to gain valuable information as to the durability of this type of paving, for the reason that some of it has been down for more than three and one-half years.



Alco motor chapel built for the Catholic Church Extension Society, showing the chapel closed

Automobile Incorporations

AUTOMOBILES AND PARTS

Altoona, Pa.—Keystone Motor Car Company; capital, $10,000; to deal in cars, and to carry on a general automobile garage and repair business. Incorporators: Albert E. Akers, president.

Augusta, Me.—American Automatic Protective Valve Company; capital, $400,000; to manufacture, sell and deal in valves and other devices. Incorporators: R. S. Buzzell, L. J. Coleman.

Brookville, O.—Brookville Auto Company; capital, $10,000. Incorporators: J. Ward Somers, Edward S. Somers, V. T. Somers.

Buffalo, N. Y.—Conover Limousine Top Company, Inc.; capital, $125,000; to manufacture automobile bodies, limousine tops, etc. Incorporators: Rowland J. Conover, Charles E. Anglim, James T. Gilbert.

Buffalo, N. Y.—Universal Mannfacturing & Carbonator Corporation; capital, $1,000,000; to manufacture automobiles, bicycles, etc. Incorporators: Edward J. Liebetrut, Charles A. Adolff, Henry J. Rosche.

Buffalo, N. Y.—Willard Commercial Car Company, Inc.; capital, $50,000; to manufacture and deal in commercial motor vehicles, etc. Incorporators: Robert A. Willard, John F. Schsmel, Reginald F. Penton.

Chicago, Ill.—Lydon Mfg. Company; capital, $25,000; to deal in automobiles, motors and accessories. Incorporators: S. Donahue, F. M. Donahue, W. E. Lyons.

Cleveland, O.—Diebold Products Company; capital, $25,000; to manufacture machinery and motor cars. Incorporators: Charles R. Diebold, Max Friedman, Louis P. Diebold, Martin W. Sanders, Mabel M. Hummel.

Cleveland, O.—Motor Van Delivery Company; capital, $10,000. Incorporators: Elizabeth Graham Stewart, S. T. Stewart John R. Caunter.

Columbus, O.—New Columbus Automobile Company; capital, $30,000; to manufacture motor vehicles; incorporators: Jesse J. Brown.

Columbus, O.—New Columbus Automobile Company; capital, $30,000; to manufacture and deal in motor vehicles. Incorporators: Jesse J. Brown, Lillian M. Brown, William E. McCannon, Charles E. Dennis, Edson B. Dennis.

Dover, N. J.—D. & H. Auto Company; capital, $25,000. Incorporators: J. M. Deatrich, J. G. Harris, L. Harris.

Fort Wayne, Ind.—Fox & Shryock Automobile Company; capital, $10,000. Incorporators: George T. Fox, William W. Shryock, Bartlett Shryock.

Huntington, W. Va.—Jarvis-Huntington Automobile Company; capital, $100,000. Incorporators: Mrs. R. J. Hoster, G. G. Hoster, T. I. Millard, R. D. Esaman, F. C. Pifer.

Indianapolis, Ind.—Simplex Vehicle & Gear Company; capital, $15,000; to manufseture vehicles and parts. Incorporators: Theodore Sanstrom, Maurice M. Kiefer, Samuel S. Helms.

Knoxville, Pa.—Hollis Automatic Traction Company; capital, $250,000; to manufacture and deal in motor vehicles.

Morristown, N. J.—Victor A. Wiss & Brother; capital, $50,000; to do a general automobile business. Incorporators: V. A. Wiss, T. H. Wiss, V. A. Wiss.

New York, N. Y.—Gotham Sight Seeing Corporation; capital, $1,000; to deal in automobiles and sight-seeing cars. Incorporators: George Laury, Louis Brown, David Lebowitz.

New York, N. Y.—H. M. S. Motor Company, Inc.; capital, $22,500; to deal in motors, engines, etc. Incorporators: Joseph J. Myers, Charles K. Starr, George P. Harvey.

New York, N. Y.—Veerac Motor Truck Company; capital, $10,000. Incorporators: Harry B. McGinley, Edward L. Whittemore, George H. Hinnau.

New York, N. Y.—M. & S. Distributing Company of New York; capital, $3,000; to manufacture and sell motors, engines, etc. Incorporators: Oliver P. Carpenter, Albert D. Bean, George A. Williams.

New York, N. Y.—Norwalk Motor Car Company of New York; capital, $35,000. Incorporators: P. Lyndon Bryce, Alfred L. Kirby, Edward S. Murphy.

Providence, R. I.—Lister, Smith & Walsh Company; capital, $50,000; to manufscture, sell and deal in automobiles.

Strathroy, Ont.—Royal Motor Company; capital, $500,000; to manufacture automobiles.

Automobile Incorporations

WHEELING, W. VA.—Lavender Auto Supply Company; capital, $25,000; to do a general automobile and motorcycle business. Incorporators: C. E. Lavender, R. M. Lavender, A. E. Kennard, Sr., Annie Kennard, A. E. Kennard, Jr.

GARAGES AND ACCESSORIES

BOSTON, MASS.—G. I. M. Vulcanizing Company; capital, $25,000. Incorporators: M. G. Commandy, G. I. Matthews.

BROCKTON, MASS.—City Garage Company; capital, $5,000. Incorporators: Bernard B. Winslow, Daniel Winslow, Arthur W. Curtis.

BROOKLYN, N. Y.—Bensonburst Auto Renting Company, Inc.; capital, $3,000. Incorporators: Louis Flatow, Harry Harrigan, Max Levey.

BROOKLYN, N. Y.—Yale Motor Cycle Company; capital, $1,000; to do a general motor cycle business. Incorporators: Charles Winkel, Irving M. Levy, Eno M. Levy.

CHICAGO, ILL.—National Tire & Repair Company; capital, $3,000; to do a general automobile repairing business. Incorporator: William E. Eckert.

HAMILTON, O.—Hamilton Taxicab Company; capital, $5,000. Incorporators: J. A. Weigel, Carl A. Weigel, George J. Kalhier, Louise B. Weigel, Caroline Weigel.

INDIANAPOLIS, IND.—Capitol Body Company; capital, $10,000; to manufacture automobile tops and fenders. Incorporators: Elmer Hinshaw, Frederick W. Henschen, Elmer W. Hughey.

INDIANAPOLIS, IND.—Northern Auto Company; capital, $10,000; to do a general garage business. Incorporators: John J. Clements, R. M. Fleming, L. H. Van Briggle.

INDIANAPOLIS, IND.—Simplex Appliance Company; to manufacture motor car lighters. Incorporators: William C. Hamilton, W. Lee Bird, Isaac Born.

LAFAYETTE, IND.—Tippecanoe Auto Club; to encourage persons in Lafayette to obey traffic regulations. Incorporators: Robert L. Sackett, Robert L. Jacques, William P. Heath, Bennet Taylor, Charles W. Hickman.

NEWARK, N. J.—Puncture Cure Sales Company; capital, $30,000; to manufacture devices for repairing tires. Incorporators: H. F. Kirk, F. B. Stewart, C. H. Stewart.

NEW YORK, N. Y.—Auto Center, Inc.; capital, $25,000; to deal in real estate for use in the automobile business, such as garages, show rooms, etc. Incorporators: Edward W. Forrest, Charles H. Fuller, Byron C. Thomas.

NEW YORK, N. Y.—Inter State Motor Express Co., Inc.; capital, $3,000; to operate automobile trucks. Incorporators: George D. Roedels, Joseph L. McGee, Mary M. Fynes.

NEW YORK, N. Y.—John Splitdorf Corporation; capital, $350,000; to manufacture electrical devices, especially for automobiles and gasoline engines. Incorporators: John Splitdorf, P. J. W. Kelley, A. L. Kull.

NEW YORK, N. Y.—Robert Thedford Garage Company, Inc.; capital, $25,000. Incorporators: Robert Thedford, George Glynn, Jaul R. Gordon.

ROCHESTER, N. Y.—Durno Manufacturing Company, Inc.; capital, $100,000; to manufacture mechanical appliances for automobiles. Incorporators: John H. Durno, John F. Turk, Milton Noves.

SAN BENITO, TEX.—Whittlesey Garage & Machinery Company; capital, $25,000. Incorporators: C. W. Whittlesey, James T. Valentine, J. Valentine.

TOLEDO, O.—Parsons Manufacturing Company; capital, $10,000; to manufacture automobile appliances and other novelties. Incorporators: George E. Seney, Irving E. Austin, Charles W. Parsons, Henry Parsons, H. F. Kier.

UNIONTOWN, PA.—Auto Service Company; capital, $5,000. Incorporators: C. W. Johnson, Fred A. Close, F. B. Hess, R. M. Campbell, Max Hannan, E. Gadd Snyder, J. C. Donahue, G. T. Love, D. D. Haroder, A. E. Corns.

WILMINGTON, DEL.—Colonial Tire & Rubber Co.; capital, $250,000. Incorporators: F. D. Buck, G. W. Dillman, B. M. Grawl.

CHANGES OF NAME AND CAPITAL

MIDDLETOWN, O.—Miami Cycle Mfg. Company; capital increased from $1,000,000 to $2,000,000.

TOLEDO, O.—Landmann-Griffith Motor Company; capital increased from $10,000 to $20,000.

Opens Supply Store—The Universal Auto Company, which heretofore has conducted a repair business, has opened a supply store in the new motor mart, Hartford, Conn.

Colgan Goes to Milwaukee—Henry Colgan, formerly head of the Waverley Electric Company's Louisville, Ky., office, will hereafter be in charge of Waverley sales in Milwaukee, Wis.

Alabama Fees $64,489—Sale of automobile licenses in Alabama has totaled $64,489 to date. Of this sum the state receives 60 per cent. The remainder is divided between the cities and counties.

L. I. A. C. Run to Count—The informal run to be held on Washington's birthday by the Long Island Automobile Club will be counted in the competition for the trophy to be awarded to the members taking part in competitions throughout the season.

America Leads Electrical Field—Three American electric manufacturing companies did a business of more than $170,000,000 in their fiscal years ending 1912, while two German companies, their competitors, did a business of a little more than $152,000,000.

Toledo Company Organized—The Parsons Manufacturing Company has been incorporated in Toledo, O., with $10,000 capital and will soon begin the manufacture of automobile appliances and other novelties. It is intended later to build a model factory in Toledo.

To Build Trucks in Savannah—The Merchants and Miners Transportation Company, Savannah, Ga., the wharves of which were recently burned, entailing a loss of a million dollars, is preparing to build in Savannah twenty motor trucks for use on the new terminals.

Special body constructed for 5-ton White truck designed for an iron and steel company. Note brackets for extra lengths

To Build Tires on the Coast—The Panama Rubber Company has been formed to build automobile tires in a Pacific Coast factory. The new company is organized with a capital of $1,000,000 and the men identified with it are prominently associated with the automobile and financial institutions of the West.

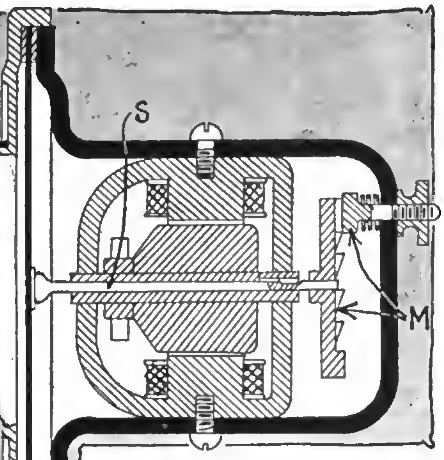
Wants Dissolution—George W. Grasser has petitioned for a dissolution of the partnership known as the Broadway Auto Shop, Toledo, O., alleging that on November 11 his partner William J. Eck abandoned the business. Grasser asks for the appointment of a receiver for the collection of accounts aggregating $732.52.

Denver Company Expands—The W. C. Hendrie Company, Denver, Col., has bought a 6-acre tract in Torrence, Cal., near Los Angeles, as a site for a $100,000 plant for the manufacture of automobile tires. The California climate is said to be especially favorable for the storage of rubber, which tends to dry out rapidly in Colorado.

Milwaukee Wants Cars—The finance committee of the Milwaukee, Wis., common council has recommended resolutions which call for the purchase of the following motor vehicles for municipal departments: Two light motor trucks for the water works department; three pleasure cars for the city engineering department; a touring car for the department of public works; a touring car for the street construction department, $1,200.

Wisconsin Roads School—The second annual good roads school of Wisconsin will be held under the direction of the Wisconsin State Highway Commission, in Madison, on February 18, 19, 20 and 21. At this time all officials connected with the expenditure of state aid for permanent highway improvement will be instructed in the administration of the state aid law, and told how the $2,500,000 to be expended in permanent highways in Wisconsin during 1913 can best be applied to produce the best results. John A. Haselwood, chairman of the commission, will act as chief instructor.

Alco motor chapel as it looks when open and ready for use, showing the altar



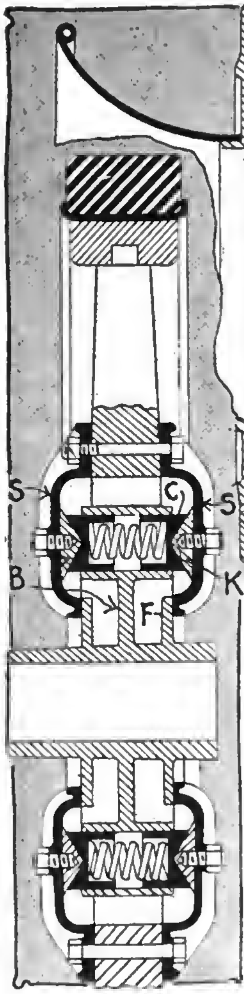


Fig. 1—Hutchison electric horn with button fitted to housing

Fig. 2—Lane mechanical wheel using cups which compress springs

ELECTRIC Diaphragm Horn—In which the vibration-producing mechanism is attached to the signal housing.

This electric horn, Fig. 1, consists of an actuating mechanism incased in a housing. The mechanism includes rotary shaft S and means for applying power to the same. In combination with this shaft is a diaphragm D and if power is properly applied by mechanism M the diaphragm is agitated, that is, vibrated.

No. 1,52,416—to Miller Reese Hutchison, Summit, N. J. Granted February 4, 1913; filed October 26, 1909.

Spring Wheel—To the hub of which parallel radial flanges are attached, between which the springs are in place.

In this wheel, Fig. 2, the hub carries two flat radial flanges F, a series of transverse bosses B extending between and radially beyond the flanges. The body of the wheel includes two side-plates S which embrace the bosses and co-operate slidably with the flanges. A series of cup pairs—cups C—are mounted for transverse slidable movement in the bosses, cones K being carried by the side-plates and co-operating with the cups. A spring between each pair of cups tends to force them apart in their co-operation with the cones.

No. 1,052,350—to Victor Edward Lane, Brooklyn, N. Y. Granted February 4, 1913; filed April 3, 1912.

Resilient Tire—Convolute springs take the place of air.

The rim R of this tire has a bracket B secured to its outer circumference, the bracket being of the cross-section shown in Fig. 3 formed with outwardly extending ends through which a pair of rods Q supporting spring bows S are laid.

No. 1,051,939—to Paul F. Wobst, Milwaukee, Wis. Granted February 4, 1913; filed August 6, 1912.

Multiple-Elliptic Spring—Consisting of several semi-independent spring units.

The spring suspension described in this patent, Fig. 4, consists of a number of sections S which are connected to a frame F and an axle A, by means of hangers H to which they are connected.

No. 1,052,233—to Phelps M. Freer, Detroit, Mich. Granted February 4, 1913; filed March 31, 1911.

Bumper Bracket—Consisting of doubly slotted members which hold on to the frame without bolts piercing the latter.

This bracket B, Fig 5, designed to support a bumper bar, is provided with a lug L adapted to engage the end of an automobile-frame side bar. A clamping member with an aperture is connected with B by a bolt E passing through that aperture.

No. 1,052,224—to Grant F. Discher, Milwaukee, Wis. Granted February 4, 1913; filed April 11, 1910.

Variable-Stroke Engine—A grooved cam varies the stroke.

The crankshaft S, Fig. 6, carries disks D on opposite sides of R. Adjacent disk faces are formed with parallel cam grooves. Disks are connected by pin P, having sliding engagement with R. Pin Q is guided by the groove and varies the piston stroke.

No. 1,051,917—to Ralph C. Root, Penlan, Va. Granted February 4, 1913; filed June 12, 1911.

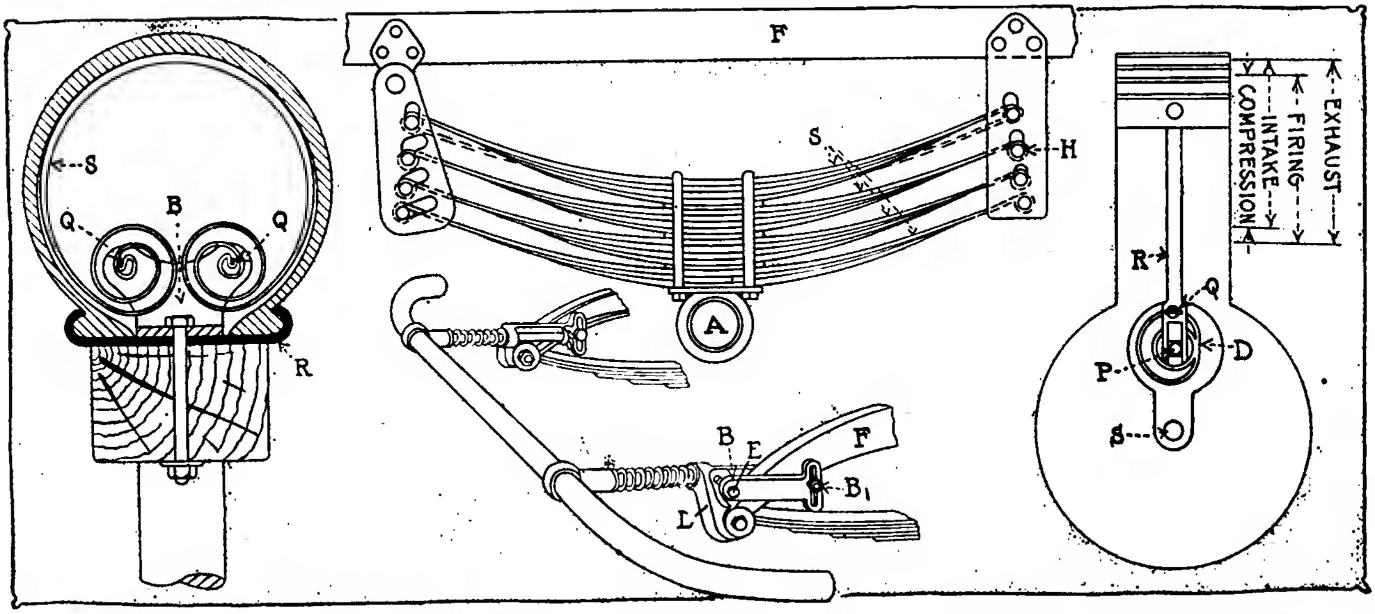


Fig. 3—Wobst resilient tire. Fig. 4—Freer spring. Fig. 5—Discher bumper bracket. Fig. 6—Root variable-stroke engine

The AUTOMOBILE

Motor Spirit To Solve Fuel Problem for the Passenger Car

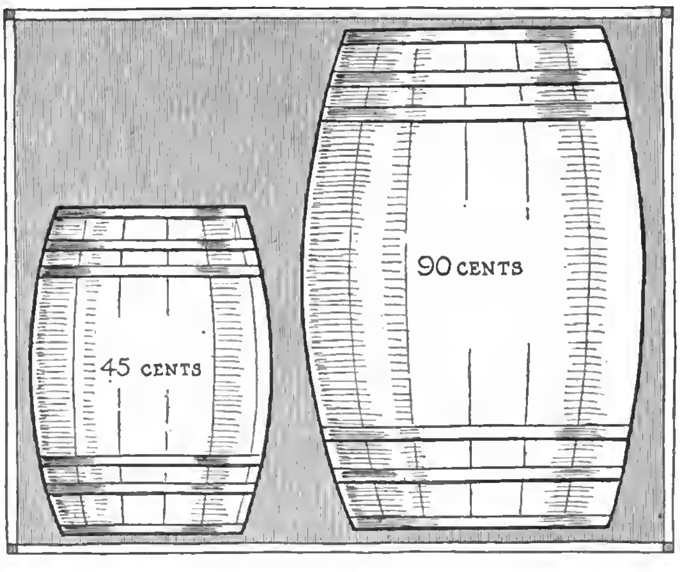
Its Substitution for Gasoline as a Fuel for Commercial Vehicles, Stationary Engines, Etc., Will Lighten the Overwhelming Demand—Present Production 15,000 Gallons a Day

CHICAGO, ILL., Feb. 24—July 3, 1912, gives promise of being recorded as an epoch-making day in automobile history. It was on this date that W. M. Burton, a director and general superintendent of the refinery of the Standard Oil Company of Indiana, made his application to the United States patent office for a patent covering a new method of manufacturing gasoline from crude oil, by which process it became possible to more than double the output of motor fuel from the crude product.

On January 7, 1913, the *Patent Gazette*, the official weekly publication of the patent office, contained a notice of issuing patent No. 1,049,667 to Dr. Burton, this patent covering in brief distilling the product at temperatures from 650 to 850 degrees Fahrenheit and under pressures of 4 to 5 atmospheres.

The process of distillation covered by this patent has been in operation since May, 1912, when the first distillate was produced. This distillate, officially labeled motor spirit, is now being produced in quantities of 15,000 gallons daily and by June it will be produced in much larger quantities.

As reported in last week's issue of THE AUTOMOBILE, motor spirit is a new product of crude oil, which is manufactured from the fuel oil residue, this being that portion remaining after gasoline, kerosene, lubricating oil and the other distillates have been taken off. This fuel oil was used by large industrial concerns instead of coal as fuel for heating their boilers. It constituted almost 50 per cent. of the crude volume. By means of Dr. Burton's new process, the Standard Oil Company of Indiana, to which the patent was assigned, is enabled to produce from the original crude oil a greater quantity of fuel for internal combustion motors. In a word, this company at its refinery at Whiting, Ind., a Chicago suburb, gets from the crude its regular 20 per cent. volume of gasoline and an additional amount of the fuel motor spirit, which spirit with a Beaumé gravity of 56 to 57 is very much the same as gasoline, excepting for a strong pungent odor.

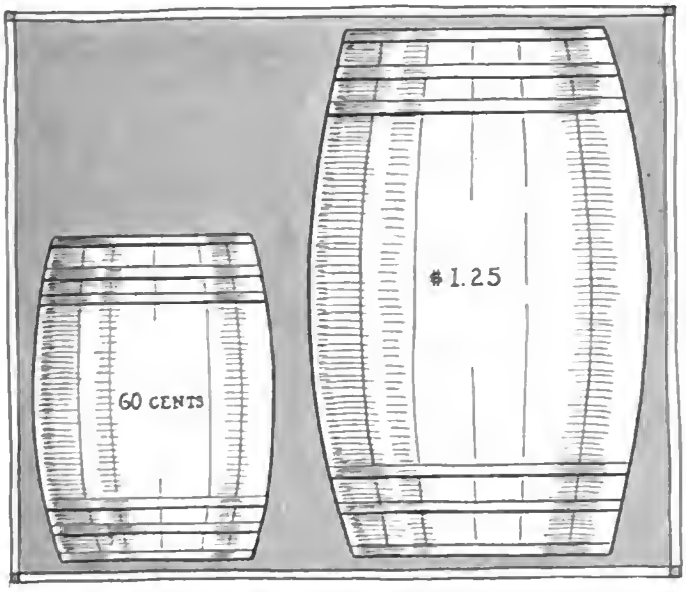


In round numbers, crude oil prices have doubled in the last 12 months. Kansas and Oklahoma crude, which a year ago sold for 45 cents a barrel at the wells, to day is selling at 90 cents

This motor spirit looks practically the same as the regular 59 Beaumé gravity gasoline which the automobilist has been buying all over the country during the past year. In color it has a slightly yellow tinge, which is not perceptible unless looked for; in fact, so closely does motor spirit resemble gasoline that if sample bottles of the two are placed side by side it calls for a careful scrutiny to distinguish one from the other when new. After the motor spirit stands for some days or weeks its yellow tint increases slightly.

The odor of motor spirit is scarcely so favorable. It is stronger and more pungent than gasoline. Once in the gasoline tank of a car a passenger cannot tell whether motor spirit or gasoline is being used, but should some be spilled on the car cushions or floor the odor might prove unpleasant until the fluid evaporates when the odor disappears. Its evaporation is much slower than that of gasoline, due to the higher boiling point of the motor spirit as compared with gasoline.

So far as carburetion is concerned, motor spirit offers few if any difficulties, not calling for additional carbureter refinements, but being adopted



Just 1 year ago Illinois crude sold at the wells for 60 cents a barrel. Today it is selling at $1.25

for the conventional gasoline carbureter by adjusting to give greater quantities of air in proportion to the fuel volume, an alteration made necessary by the higher boiling point of motor spirit and the greater number of heat units in it per volume when compared with gasoline. Cars fitted with dash controls for the auxiliary air supply are specially well suited for using this fuel.

Motor Spirit To Serve Trucks

There is a slight, light-colored smoky exhaust, not as pronounced as the bluish oil exhaust from many cars. Passenger cars using motor spirit have been traversing the Chicago boulevards for weeks without any interference from the police, who have instructions to arrest or put off the boulevard system any drivers of cars with smoky exhaust. The present grayish exhaust from motor spirit may be entirely eliminated by a better water-jacketing of the intake manifold between the carbureter and the valve chambers, this being done to prevent the condensation of the heavier parts of the motor spirit.

There is a slightly increased carbon deposit in the combustion chambers due to the use of the new fuel. This carbon, however, is of a relatively soft consistency and may be readily removed without resorting to scraping. Cars employing motor spirit continuously have experienced little more trouble from carbon deposits than those using more ordinary grades of fuel. It has been noted that scarcely as much motor lubrication is needed with the new fuel as with gasoline. Starting in cold weather is not attended with any greater difficulties than with gasoline.

Primarily motor spirit is not intended for the users of pleasure cars, but there is nothing to prevent its use by them as to many it will be attractive, being 3 cents per gallon cheaper and giving approximately 25 per cent. increased fuel efficiency. **Motor spirit is intended for motor trucks, for traction engines, for stationary engines and gas engines generally in which gasoline has been used during the past year, and due to which use the gasoline market has been so short of late. With motor spirit taking the place of gasoline for these fields, then the supply of gasoline will be obtainable for the passenger car field, and for which it will prove adequate for years to come unless unforeseen exigencies arise.**

Coming then as a substitute for gasoline in these fields the car owner should be able to rid himself of the nightmare of possible increases in the price of gasoline, such as were experienced in Europe last season, when local exigencies presented themselves. With the present supply of crude oil from the various American crude-oil fields, there is no necessity for any appreciable rise in gasoline prices during the coming season. Those who have given careful study to the subject anticipate a rise of a few cents, but should the present wild-catting in the crude oil fields result in sinking many productive wells it is certain that the price of crude may drop to the level of last year.

The phenomenal and unexpected increase in the price of crude oil has been largely responsible for the increase in the price of gasoline during the past year. In round numbers crude oil prices have doubled in the past 12 months. Kansas and Oklahoma crude which a year ago sold at 45 cents a barrel at the wells is today selling at 90 cents. One year ago Illinois crude sold at 60 cents per barrel at the wells and is today selling at $1.25.

The increase in prices of crude must not be looked upon as an exhaustion of the supply within the grounds but rather an increase of demand by the refineries beyond the producing capacities of the wells. Some years ago owners of crude oil wells were making little money. The supply was vastly in excess of the demand. With the increased demand due to increased use of automobiles, there came a drawing on the available stored crude supply, which was equal to the requirements of two seasons. Immediately the prices of the crude began rising and they have continued consistently ever since. With the increased demand and increased price there has been great activity in sinking wells in the crude territories; and this promiscuous sinking of wells, or wild-catting as it is known, may result in vast increases in crude supplies or it may not. Some experts on the supply of crude oil believe that there is not a sufficient quantity of crude west of the Rocky Mountains to meet the requirements.

That there was an embarrassing shortage in gasoline up to the present is borne out by statistics, which show that on January 1, 1912, some of the gasoline producing companies had many millions of gallons of gasoline stored for immediate use, whereas on January 1, 1913, some of these same concerns had practically exhausted their stored supplies and were furnishing fuel in a hand-to-mouth fashion. Rumors had it that the gasoline producers had failed to calculate on the gasoline consumption of motor trucks, but it is a matter of record that these producers had taken due recognition of this factor and were exerting every influence to ward off a situation, the shadow of which had been hanging over them for many months.

By traction engines, stationary engines, motor trucks, etc., using motor spirit the surplus of gasoline should begin accumulating. Statistics from a western state shows that during the past fall, the traction engines, used in threshing the grain and hauling it to market, consumed six times as much gasoline as the automobiles in the same territory; statistics further proved that stationary engines in elevators were using more gasoline than was sold direct to garages to the automobile industry. While this was true in the fall, winter brought on a different condition of affairs, one in which the consumption of gasoline by traction engines practically ceased and when they were large purchasers of gasoline, a large portion of which they retail to motor car users.

Many Possible Fuels Existing

Every shortage in fuel supply is certain to stimulate thoughts of the possible exhaustion of crude supplies, and the active brain soon becomes lost in the labyrinth of emergency possibilities. America has boundless fields of crude. Some of the better known crude oil fields are California, Texas, Kansas and Oklahoma, Missouri, Illinois, Ohio and Indiana and Pennsylvania. There is not a symptom of danger of immediate exhaustion of these, but should such be precipitated there are many foreign fields from which crude could be imported at reasonably low cost. But in the extreme if the crude oil supply were not adequate or entirely disappeared, then attention would have to be turned to the use of alcohol as fuel. Alcohol could be manufactured from corn, and the present output of gasoline could be replaced by alcohol and the amount of corn needed would not be over 3 per cent. of the annual crop.

The production of motor spirit today is entirely in the hands of the Standard Oil Company of Indiana, which owns the patent, and because of this it is very questionable if motor spirit will be marketed country-wide for a matter of a year or so. It will soon be marketed at many points in the territory between the Great Lakes and the Rockies. There are today upwards of 140 concerns producing gasoline and it will apparently be necessary for these to take out royalties if they intend to refine motor spirit.

The refining process is more difficult and costly than the refining of gasoline due to the pressure of 4 to 5 atmospheres used in the stills. At present there are a number of special motor spirit stills in operation and by June there will be many more producing, which will be a sufficient equipment to meet the expected demand. With these stills it will be possible to convert a considerable portion of the residue known as fuel oil into motor spirit, the final residue being a marketable product for other uses.

Dr. Burton has been working on the process for upwards of 3 years and has been materially assisted by Dr. R. E. Humphreys, chief chemist of the Standard Oil Company of Indiana, and other associates. Since the original product was secured many improvements have been made in it and it is certain that before another year has elapsed that others will be made. The present pungent odor could readily be eliminated, but its elimination would mean largely reducing present output, which would prove too expensive to the industry.

Motor spirit is at present being used by over a dozen different industrial concerns in Chicago, mostly in the operation of motor trucks. It has been used by some of these for a matter of 10 days in average winter weather and not the slightest difficulty has been encountered in its use.

Belgium's Status in Automobile Industry

BRUSSELS, Feb. 20—Official statistics show that there are 23 automobile factories in Belgium employing 5,217 workmen. In 1909 the Belgian production of chassis and motors was 2,171; in 1910 it was 3,020; in 1911 4,850; the returns have not yet been published for 1912. During 1912 Belgium exported automobiles and bodies to the value of $6,203,563, and during 1911 to the value of $5,108,290. Belgium is not self-sufficing in the matter of automobile construction, for in 1911 she imported French automobiles to the value of $5,495,280, and to the value of $8,660,640 in 1912.

In addition to the automobile factories there are 50 important body makers in Belgium employing 3,030 workmen. In 1909 they delivered 1,213 complete bodies; in 1910, 2,617 bodies, and in 1911, 3,496. The official returns show that in 1908 the number of automobiles registered with the police authorities was 9,840; in 1909 it was 11,500, and in 1910, 14,620. Figures have not been issued for the last two years.

New Aluminum Foundry to Open

WAUKESHA, WIS., Feb. 24—A new aluminum foundry, which will make a specialty of castings for the motor car and engine trade, is now being established at Waukesha, Wis., by Conrad Werra, of Manitowoc, Wis., a pioneer in the aluminum foundry business of Wisconsin, and until now general manager of the Aluminum Castings Company of America's Manitowoc works, formerly the Aluminum Foundry Company, which was founded and owned by Mr. Werra for 14 years. Mr. Werra has organized the Werra Aluminum Company of Waukesha and incorporated it for $110,000. With him is associated Alexander Pankratz, factory superintendent of the Manitowoc works, who resigned February 15 to become manager at Waukesha. The new company has leased the former Wisconsin Central ("Soo Line") car shops and division headquarters group at Waukesha for a long term of years and is now installing equipment which will make the plant one of the largest aluminum foundries in the Middle West, it being three times as large as the former Werra plant at Manitowoc. It will be ready for operations about March 15.

New York Merchants Want Car Factories

Merchants' Association Studying Automobile Industry with a View To Attracting Motor Vehicle Business

Freight and Labor Facilities Declared to Be Excellent—Bankers Would Support Healthy Enterprises

MERCHANTS of New York City, represented by the Merchants' Association of New York, founded to foster the trade and welfare of this city, want automobile and automobile accessory factories. Tuesday night, at an informal dinner attended by twenty of the representative automobile men of New York and vicinity, tendered by the industrial bureau of the association, the possibilities of securing factories in this line of business were discussed. Henry Morgenthau, chairman of the Industrial Committee, presided over the informal debate which took place after the dinner. Dr. E. E. Pratt introduced the discussion by giving a statement of facts which he had gathered from the leading automobile men of the city and the state bureau of labor. He pointed out the fact that skilled labor was readily obtainable in New York City in such quantities that the manufacturer was able to pick and choose. He also showed the transportation facilities to be of the best.

A point which brought out some discussion was the living facilities for the lower-paid labor. It was shown that in the Borough of Queens it is possible to secure four rooms and bath for a monthly rental of $14. This territory is within easy walking distance of excellent factory sites which could be secured at a cost in the neighborhood of $1,000 for a lot of 25 by 100 feet. This compares favorably, according to statements of those present, with other cities which have become automobile manufacturing centers in which living quarters of the laboring class are not only inadequate but are separated from the factory by transportation facilities which cannot meet the demand.

It was also stated upon the authority of men who have studied the banking situation in New York City very closely that, while the moneyed interest looked askance at investments in the automobile field during the early stages of the industry, it would now be comparatively easy for a substantial concern to secure a loan. This was stated to be particularly true of the motor truck industry. Maps were produced showing the enormous buying range of New York City, circles being laid out with New York City as the center. It was stated that within a radius of 400 miles 65 per cent. of the output of the motor vehicle factories is consumed. The association particularly dwelt upon the advantages of manufacturing trucks so that they could reach this vast market under their own power and thus save freight charges.

It was stated by several present from both the merchants' association's and the automobile men's viewpoint that New York offers unparalleled opportunities to the manufacturers of automobile tires and other accessories.

The fact that the Goodyear company has determined to distribute tires from Long Island City to help take care of the enormous consumption of the New York market was cited as an indication that these companies were beginning to realize the advantages of being close to the market.

Clifford M. Nouggy, formerly with the Stover Bicycle Company and also with the Daimler Manufacturing Company of Long Island City, is now with J. S. Bertz Company, New York City, importers of F. & S. ball bearings.

W. M. Lewis Retires

Mitchell-Lewis Motor Car Company's President and General Manager Succeeded by J. Winterbotham, Jr.

His Only Reason for Retirement Is To Give Entire Attention to Other Interests

RACINE, WIS., Feb. 24—Captain William Mitchell Lewis, president and general manager of the Mitchell-Lewis Motor Car Company, of Racine, Wis., on Wednesday, February 19, retired as active head of the company and is succeeded by J. Winterbotham, Jr. The only reason given for Captain Lewis' retirement is that he desires to give his entire attention to his other interests, which include the Racine Rubber Company, the Racine Daily Times Company, publishing the leading daily newspaper of Racine and other enterprises of equal or lesser importance. Captain Lewis established his offices in the Racine Times building immediately upon retiring from the motor works.

Reports of financial difficulties circulated in connection with the retirement of the president and general manager and since denied by company officials stated that the company had defaulted on the payment of the installment due on a loan of $2,500,000 made by the Mitchell-Lewis Motor Company 1 year ago and now due, and that Captain Lewis had been supplanted as head of the interest that the committee of bankers representing the institution which had advanced the $2,500,000 loan might take active charge of the direction of the company's affairs for the protection of the loan.

The Mitchell-Lewis Motor Company was organized and incorporated in 1910 with a capital stock of $10,000,000, being a consolidation of the Mitchell Motor Car Company and the Mitchell-Lewis Company, Ltd., the former being a manufacturer of motor cars and the latter a manufacturer of wagons. The interests of both companies had long been practically identical in a financial way. Captain William Mitchell Lewis was elected president and general manager, he having been president of the motor car company, and William T. Lewis was elected chairman of the board of directors, he having been head of Mitchell-Lewis Company, Ltd.

Hofwebers To Build Cheap Car

LACROSSE, WIS., Feb. 24—The Hoff Motor Company is being organized here by Joseph E. and August H. Hofweber, and will be incorporated with a capital stock of $1,000,000 to manufacture automobiles. The Hofwebers have gained the support of leading business and professional men in their project to build and market a pleasure car under the name Hoff, designed by them and to sell at $790 fully equipped.

Columbus Buggy Plan Not Ripe

COLUMBUS, O., Feb. 24—The committee named by the creditors of the Columbus Buggy Company of this city, which went into the hands of Daniel McLarin as receiver recently, will not formulate a plan of reorganization until after the appraisers named by the federal court will report on the assets of the corporation. It was believed that more intelligent work could be done by the committee after the appraisers' figures were made. The appraisers are expected to report in a few days.

Maxwell Plants Turning Out Cars

DETROIT, MICH., Feb. 24—The Maxwell Motor Company, Inc., is gradually getting its affairs in shape and squared away for the active manufacture of the several models which have been announced. The general offices at Warren and Woodward streets are being fitted out and will soon become the pulse of the big concern. The Brush plant is now running and will be devoted to the exclusive manufacture of the Maxwell 25. Equipment is being brushed up and machinery added here. At the Alden-Sampson plant, which has been more or less inactive since the reorganization proceedings were begun, all is activity again and trucks are being manufactured. The plant at Dayton, O., is operating at full force and is to turn out model 35. The Flanders plant is also busily engaged in the production of several models. Altogether the outlook is very favorable for a year of excellent production under the new régime in spite of the difficulties which have been handicapping the company in organization.

Findlay Plant to Original Promoter

FINDLAY, O., Feb. 24—The recent sale of the Findlay Motor Company plant to W. W. Edwards for $50,000, now turns out to be for Mrs. L. E. Ewing, of Cleveland, wife of the original promoter of the company. Mr. Ewing is on the ground attempting to dispose of the property. He announces that he is willing to take stock in the new company, of the purchaser of the plant who will buy it and reorganize the company.

Poss Company Assets To Be Sold

DETROIT, MICH., Feb. 24—Charles D. Todd has offered at private sale commencing today the entire assets of the Poss Motor Company, bankrupt, which were purchased from Referee in Bankruptcy Lee E. Joslyn at a hearing on February 21. The sale includes the good will of the Poss concern and the right to use the name. The property consists of nine finished Poss delivery trucks. ten chassis nearly completed, fifty-five various

Automobile Securities Quotations

During this week, the stock market recovered from the collapse experienced last week due to the outbreak of the tire strike and Firestone common advanced 40 and Goodyear common 65.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	150	175
Ajax-Grieb Rubber Co., pfd	..	..	95	99
Aluminum Castings, pfd	..	..	100	101
American Locomotive Co., com	35¼	37	32	32½
American Locomotive Co., pfd	104½	105½	104	104½
Chalmers Motor Company	..	..	135	145
Consolidated Rubber Tire Co., com	10	20	18	21
Consolidated Rubber Tire Co., pfd	25	40	..	86
Firestone Tire & Rubber Co., com	200	204	265	275
Firestone Tire & Rubber Co., pfd	108	110	103	105
Fisk Rubber Co., com	..	..	..	..
Fisk Rubber Co., pfd	..	..	102	103
Garford Company, preferred	..	..	99	100
General Motors Company, com	30½	31	32	32½
General Motors Company, pfd	74½	76	74	75
B. F. Goodrich Company, com	..	..	37½	39
B. F. Goodrich Company, pfd	..	..	94	96
Goodyear Tire & Rubber Company, com	338	342	365	375
Goodyear Tire & Rubber Company, pfd	108	110	..	100
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	5	15
International Motor Co., pfd	..	..	35	55
Lozier Motor Company	..	..	27	32
Miller Rubber Company	..	..	150	160
Packard Motor Company	104	107	102	105
Peerless Motor Company	..	..	120	125
Pope Manufacturing Co., com	40	43	..	30
Pope Manufacturing Co., pfd	74	77	..	75
Reo Motor Truck Company	8	10	11½	12½
Reo Motor Car Company	23½	25	20½	21½
Rubber Goods Mfg. Co., pfd	100	105	104	107
Studebaker Company, com	..	..	28	29½
Studebaker Company, pfd	..	..	88	93
Swinehart Tire Company	..	..	88	95
U. S. Motor Company, com	..	..	..	8
U. S. Motor Company, 1st pfd	..	..	..	65
U. S. Motor Company, 2nd pfd	..	..	..	35
U. S. Rubber Co., com	45	45½	59	60
U. S. Rubber Co., 1st pfd	109½	110½	104½	105⅜
White Company, preferred	..	..	103	107
Willys-Overland Company, com	..	..	61	67
Willys-Overland Company, pfd	..	..	91	98

types of bodies and other miscellaneous parts, in addition to several machine tools. The goods will be sold in parcels or as a whole if a suitable offer is made.

In purchasing the property from the referee, C. D. Todd paid $5,500 in cash and agreed to turn over 85 per cent. of the amount realized from the present sale. Assets of the Poss company amount to $37,297.86, according to the inventory.

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Exports for 1912 Were $28,308,118

WASHINGTON, D. C., Feb. 25—(*Special Telegram*)—The exports of automobiles and parts for 12 months ending December, 1912, totalled $28,308,118. The total for December, 1912, was $2,428,176, that for the 12 months ending December, 1911, was $19,178,484. Imports for 12 months ending December, 1912, were $2,275,406, a decrease as compared with the same period for 1911.

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Harroun Making Novel Carbureter

INDIANAPOLIS, IND., Feb. 24—Ray Haroun, the Memorial Day race hero of 1911, has incorporated the Ray Harroun Company for the manufacture of a heavy-fuel carbureter. The latter is a single-jet, automatic adjustment design, hot-air jacketed. The only regulation is by a dash control.

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The Bloomfield, N. J., factory of the Simms Magneto Company which was put in operation again after the reorganization of the company in fall, 1912, is now operating at the rate of fifty magnetos a day. The product is partly being shipped and partly laid up in stock. The manufacture of S-U carbureters is also proceeding at a fair rate and it is expected that the production of this accessory will be increased materially during the year.

Market Changes of the Week

Of the few changes in the markets this week tin was the most important, a drop of $1.37 per hundred pounds occurring, due to breaks and violent fluctuations in standard contracts at London. Lead was dull but steady being called for at $4.30 per 100 pounds. Bessemer steel rose $.50 per ton. Cottonseed oil suffered a loss of $.07 per barrel owing to the recent holiday. No new features of importance appeared in the market for scrap rubber last week. According to importers, the demand for foreign rubber holds up well, the request embracing all grades, and prices are apparently firm on both sides of the water. Automobile scrap is called for at $.09 7-8. Copper was weaker in all positions, with small buying of refined either here or in Europe. Both coppers fluctuated throughout the week, closing at Wednesday's prices. There were no changes in both Pennsylvania and Kansas petroleums.

Material	Wed.	Thurs.	Fri.	Mon.	Tues.	Change
Antimony, per lb	.08¼	.08¼	.08¼	.08¼	.08¼	....
Beams & Channels, 100 lbs	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	28.50	28.50	28.50	29.00	29.00	+.50
Copper, Elec., lb	.14⅝	.14⅝	.14¾	.14⅝	.14⅝	....
Copper, Lake, lb	.14¾	.14¾	.14¾	.14¾	.14¾	....
Cottonseed Oil, Feb., per bbl	6.35	6.30	6.25	6.28	6.28	—.07
Cyanide Potash, lb	.19	.19	.19	.19	.19	....
Fish Oil, Menbaden, Brown	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 gals	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime	.90	.90	.90	.90	.90	....
Lead, 100 lb	4.30	4.30	4.30	4.30	4.30	....
Linseed Oil	.50	.50	.50	.50	.50	....
Open-Hearth Steel, ton	29.00	29.00	29.00	29.00	29.00	....
Petroleum, bbl., Kansas crude	.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa., crude	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	....
Silk, raw Japan	....	3.72½	....	3.72½	3.72½	....
Sulphuric Acid, 60 Beaumé	.90	.90	.90	.90	.90	....
Silk, raw Italy	....	4.30	....	4.30	4.30	....
Tin, 100 lb	49.25	48.50	48.50	47.85	47.88	—.37
Tire Scrap	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	....

Akron Strike Is Broken

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All the Factories Are Ready for Active Work As Result of Return of 2,000 Men

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Goodyear To Start Work on Immense Plant—Goodrich Net Earnings for 9 Months $3,522,488

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AKRON, O., Feb. 25—(*Special Telegram*)—The backbone of the rubber workers' strike here started by the Industrial Workers of the World, which has been on 2 weeks, broke today when nearly 2,000 of the workers returned to work. The I. W. W. leaders were no longer able to hold the men. As a result of the stampede on the part of the men to get back to work all the factories will be in full running order in 2 or 3 days. It is claimed that the I. W. W. strike agitators will now move on to Paterson, N. J. The rush of men at the Goodrich, Diamond, Firestone and Goodyear plants was so great today that it was impossible to place them. At the Firestone plant, where the strike started, H. S. Firestone, president, said:

"The men are coming back faster than we can adjust our departments to care for them."

Announcement was made today that the Goodyear Tire and Rubber Company, now that the strike is over, will start work at once on the largest building in the country for rubber manufacturing purposes. It will be over 1,000 feet long and five stories high and will be built on the site of the present group of Goodyear buildings. It will employ 2,000 additional men. Indications at this time are that every rubber plant here will be running night and day within 2 days.

The Goodrich statement to stockholders today shows that the net earnings for 9 months were $3,522,488. After the preferred dividend of $1,519,505, or three dividends at the rate of 1¾ per cent. quarterly, there was remaining $2,002,984 for the common. This is at the rate of 3 1-3 per cent. for 9 months or 4.44 for a full year. There were paid out during the period two dividends of 1 per cent. each on the common, leaving $806,235 of undivided profits for the period.

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Studebaker Profits $2,313,245 for 1912

According to the yearly report of the Studebaker Corporation, South Bend, Ind., this company during the fiscal year ending December 31, 1912, had net earnings totalling $3,125,876.15. The interest on the companies 5 per cent. serial notes, discount and commission on the same and extraordinary expenses aggregated $812,631.01, leaving net profits of $2,313,245.14. The consolidated balance sheet of the company's affairs follows in extract:

Total capital investments	$30,402,083.75
Total current assets	24,049,796.86
Total	$54,451,880.61
Capital stock outstanding	$41,026,600.00
Minority stockholders' interests	28,300.00
Total current liabilities	11,069,728.43
Special surplus account	417,008.87
Dividends paid, etc	1,910,243.31
Total	$54,451,880.61

The automobile sales of the company showed a 10 per cent. increase over the year 1911.

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International's Giant Service Building

An eight-story service building affording 200,000 square feet of floor space and costing $1,000,000 is now being completed for the International Motor Company, at West End avenue and Sixty-fourth street, New York City.

Counter Suit Filed in Stromberg vs. Zenith

Infringement Suit On Between Two Firms—Counter Suit by Zenith—Ready for Taking of Testimony

Stromberg Will Not Come Up Before May 1—Zenith Suit Will Follow About a Month Later

DETROIT, MICH., Feb. 22—A new, interesting point in the patent litigation between the Stromberg Motor Devices Company, Chicago, and the Zenith Carbureter Company, Detroit, the former alleging infringement of its Ahara and Richard patents by the latter, which has recently filed a counter suit against the Stromberg concern for alleged infringement of the Bavery patent, has arisen from the fact that the Zenith counter suit is practically the first patent suit to be brought under the new rules of practice in the Federal courts which went into effect February 1 and which call for much simpler phrasing of bills of complaint than was customary under the old rules.

Both the Zenith and the Stromberg suits are now about ready for the taking of testimony, which will be proceeded with just as rapidly as possible, according to V. R. Heftler, president of the Zenith company. Apparently the last obstacle to prompt progress was removed last week when Judge Tuttle in the Federal court in this city, after commenting upon the desirable changes accruing from the new rules of procedure, overruled certain formal objections which had been raised by the Stromberg company's attorneys to the Zenith bill of complaint charging the former with infringement of the Bavery patent. Mr. Heftler states that the bill of complaint sought to conform with the new rules and was a genuine attempt to get away from the lengthy, labored and verbose phraseology which has in the past made patent procedure so difficult for a layman to understand.

The following is a quotation from Judge Tuttle's opinion:

"As is well known, no part of a bill of complaint for infringement of a patent, in the form that has become settled under the old equity rules, was more verbose and reiterative than the several opening paragraphs of a bill thus drafted and it strikes me that counsel for the complainant, in adopting the language found in the opening paragraph of its bill, has conformed in a most gratifying degree to the language and intent of the new rules in simplifying and abbreviating his bill of complaint. The motion to dismiss is therefore denied, and that part of new rule 29 calling for the filing of the answer within 5 days after the denial of such a motion as this, must be observed.".

Mr. Heftler states that the Stromberg suit will not come up before May 1, while the Zenith counter suit will follow about a month later.

Findlay Case To Go to Court

On April 17 the case of Flatow, Finn & Company vs. The American Truck Company, the Findlay Motor Company and the Ewing American Motor Company will be heard in Supreme Court, special term, part 2, New York City.

Flatow, Finn & Company, or as the company is now styled, the Commercial Auto Company, alleges that the defendants have violated a contract closed between the plaintiff and the first mentioned of the defendant companies, which provided that the Flatow concern was to have exclusive selling rights for trucks and parts made by the American Truck Company in the territory of New York City, Long Island, Westchester County, as well as Fairfield and New Haven counties, Connecticut. This arrangement was made during October, 1910. It provided, furthermore, that if the American concern sold any trucks or parts thereof in the above specified territory, the Flatow company was to receive the difference between the list and the net price of the goods sold. On the strength of this arrangement the Flatow Company adopted the name Commercial Auto Company.

Some time after this contract had been made the American Motor Truck Company consolidated with the Findlay company. About that time the plaintiff devised a scheme by means of which large quantities of trucks could have been disposed of; it consisted in the purchase of the New York Mail Company which handles the U. S. mail in New York City. The plaintiff now alleges that this scheme was put into practice about May, 1911, when the Findlay and American companies consolidated with the Ewing firm, forming the Lockport Stamping Company. Shortly after this had taken place the Lockport concern gave notice to the plaintiff that it cancelled the contract of 1910, on the grounds that other agencies in the metropolitan territory could give it better and more profitable representation. The Commercial Auto Company now claims that the deal with the New York Mail Company was put into practice by the Lockport concern and that this company made considerable money on the deal, which would have been due to the Commercial Auto Company according to its contract.

Prest-O-Lite Tests Trade Mark

SYRACUSE, N. Y., Feb. 22—The Prest-O-Lite Company has brought a test case in Municipal Court in this city in an attempt to stop the re-use of its tanks by automobile supply dealers. The action is against the Central City Rubber Company to recover a penalty of $100, under section 367, article 24, chapter 20 of the general business laws of the State. The Prest-O-Lite Company claims to have sole use of the trade-mark name Prest-O-Lite, filed with the secretary of state last December. The name is stamped on every tank sold, and the company contends that the tanks are never sold for the purpose of allowing them to be used again.

The complaint states that the Central City Rubber Company sold Frank J. Slattery a Prest-O-Lite tank February 4 and that it was filled with acetylene different from the original contents. The case will be called February 28.

Mezger Claims Red Head Infringement

Charles A. Mezger, New York City, maker of the Sootproof spark-plug, has filed suit against the Emil Grossman Company for alleged infringement of his patent, No. 700,147, dated May 13, 1902. Following are the claims which are alleged to be infringed upon by the Red Head plug design:

1. The combination of a chambered plug having a sparking point thereon and elongated conducting member forming the second sparking point and projected through the chamber and extending adjacent to the sparking point and a tubular shell arranged in the chamber of the plug and spaced from the walls thereof and from the sides of said elongated member, forming the second sparking point.

2. The combination of a chambered plug having a sparking point thereon, and elongated conducting member projected through the chamber and extending adjacent to the sparking point, a tubular insulation shell arranged in the chamber of the plug and spaced from the walls thereof and from the sides of said elongated member forming a second sparking point, an insulating tube at the base of the insulating shell, a means for holding the said elongated conducting member snugly within the shell and tube.

4. An electric igniter, comprising an elongated member forming a sparking point, and insulating tube inclosing the major portion of the exposed part of said elongated member, and said shell having an open space around its outer side and between its inner side and the said elongated member.

5. The combination of a plug proper having a chamber therein and a reduced passage leading therefrom, an insulating tube placed in the said passage and having a shell-like extension projected into the chamber of the plug and spaced from the interior walls thereof, and a rod projected through the tube and through the shell, said rod being spaced from the inner walls of the shell.

6. The combination of a plug proper having a chamber therein and a reduced passage leading therefrom, an insulating tube placed in the said passage and having a shell-like extension projected into the chamber of the plug and spaced from the interior walls thereof, a rod projected through the tube and through the shell, said rod being spaced from the inner walls of the shell, and being formed with an enlargement engaging a shoulder at the outer end of the shell, and means for exerting an outward pressure on the rod to hold the parts snugly engaged.

Railways Killed 9,387 in 1 Year

A bulletin published by the Special Committee on Relations of Railway Operation to Legislation on railroad accidents states that according to a report of the Interstate Commerce Commission, 3,953 persons were killed on railways during the year ending June 30, 1912; of these 318 were passengers and 3,635 employees of the railroads. Besides 5,434 trespassers were killed, bringing the total of fatal railroad accidents to 9,387.

While among the persons killed there were undoubtedly a high percentage of vagrants—it is estimated that in the United States some 500,000 tramps wander around—a large number of the people killed were farmers, workers and other decent citizens—in short, people about which society cares.

Another important point brought out in the bulletin is the fact that out of 50,000 persons killed and 53,000 injured on American railroads for the years from 1901 to 1910, inclusively, 33,000 were less than 21 years old.

The death accidents, together with the general loss caused by hoboes, could be materially reduced by the railroads' policing their tracks, and the state governments assuming the conviction and maintenance of tramps. The Bulletin, the number of which is 46, contains many interesting details and may be obtained by applying to the committee mentioned above, whose address is 1972 Trasportation Building, Chicago, Ill.

Three Score Motor Deaths a Week

OMAHA, NEB., Feb. 21—According to Chief Dunn, of the police of this city, an average of from fifty to seventy-five accidents a week are due to the automobiles operating in various cities of the United States. During the 5 weeks ending January 23, according to the chief, 1,230 persons were injured and 208 killed, among these sixty-two in New York.

Chief Dunn expects to submit his statistics to the National Association of Police Chiefs, which is active in reducing automobile accidents.

Congressmen Oppose Oldfield Bill

WASHINGTON, D. C., Feb. 26—(*Special Telegram*)—Representative Bulkley, of Ohio, of the House Committee on Patents will submit his report tomorrow, Thursday, signed by one-half of the committee members, strongly opposing main features of the Oldfield bill amending the patent laws. Mr. Bulkley's report attacks establishment of compulsory license system, the extinction of the right of the owner of a patent to treat license violations as infringements and the amendment of Sherman antitrust law as applied to those doing business under the protection of patents.

Smith Strike Is Short-Lived

MILWAUKEE, WIS., Feb. 24—After 3 days of negotiation, the strike of machine hands at the plant of the A. O. Smith Company was settled on Sunday, and on Monday morning every man who had walked out since the strike was called on February 19 was back at work. The retirement of a new foreman in the department in which the walk-out arose and whose personality was the sole reason for the trouble, resulted in a speedy settlement of the difficulty.

Changes to Hans Equipment Company

LA CROSSE, WIS., Feb. 24—The National Gauge & Register Company, La Crosse, Wis., has been reorganized, recapitalized and the corporate style changed to Hans Motor Equipment Company. A $50,000 factory building is now being erected at La Crosse to serve present needs and form the nucleus of a group of buildings to be established as needed. The Hans Equipment Company, manufacturing gasoline and oil gauges, crank case gauges, gasoline separators and strainers, air pressure pumps, oil sight-feed registers, gasoline and radiator tank filler caps and similar articles for automobiles, was organized at the National Gauge & Register Company by Edmund E. Hans at Minneapolis 2 years ago.

Monarch Motor Car Co. Incorporated in Detroit

L. G. Hupp Is President; Occupies Temporary Plant—Deliveries To Commence About May 1 Is Plan

Five-Passenger Touring Car of 30 Horsepower Will Be Built—Limbach Chief Engineer

DETROIT, MICH., Feb. 25—*Special Telegram*—The latest addition to Detroit's growing list of automobile manufacturers is the Monarch Motor Car Company, the articles of incorporation of which were filed with the Secretary of State on February 22. L. G. Hupp, who until recently was secretary and treasurer of the R-C-H Corporation, is president of the new concern. The other officers are understood to be well-known business men of this city, but announcement of the complete personnel of the organization is not yet made public. Mr. Hupp stated last night that a complete announcement of the plans of the company would be made on March 1 and that the temporary quarters are located on Scotten avenue in a plant formerly occupied by the Acme Electric Company, the latter concern having moved to another location. The chief engineer of the Monarch company is H. C. Limbach, who has been identified with both the engineering departments of the Studebaker Corporation and Cadillac Motor Car Company. Under his direction a five-passenger, 30-horsepower touring car will be built, to sell at about $1,000 fully equipped. According to present plans, deliveries to dealers will commence about May 1. A complete factory is to be built, which may possibly be ready for occupancy next fall, if all goes well. Mr. Hupp is a veteran manufacturer of the Motor Car Company and the R-C-H Corporation, although no longer connected with either of these enterprises. After leaving the Hupp Motor Car Company the Hupps, about 1 year ago, merged the Hupp Turner Machine Company, the Hupp Johnson Forge Company and the Hupp James Geyman Foundry Company, in all of which they were interested, and called the combination the R-C-H Corporation.

Aetna to Handle Motor Insurance

HARTFORD, CONN., Feb. 24—Morgan G. Bulkeley, president of the Aetna Insurance Company, appeared last week before the joint insurance committee to advocate amending the charter of his company for the writing of straight automobile policies, in addition to the liability and accident insurance for automobiles now handled by the liability department of his company. The Aetna company took up automobile insurance some time ago.

Twin City Cars Worth $12,400,000

MINNEAPOLIS, MINN., Feb. 24—Statistics prepared by H. A. Stuart, statistician for Minneapolis, show comparative automobile figures for the Twin City for final reports ending Dec. 3, 1912. Owned by private individuals and business concerns in Minneapolis there were 5,939 automobiles, or an average of one machine for every fifty-four persons. In St. Paul there were 2,251 automobiles, or an average of one to every 101 persons. At an average valuation of $1,500 for each machine the Minneapolis investment was $9,000,000 and the St. Paul figures $3,400,000. Allowing traveling space of 100 feet to each car, Mr. Stuart figures the Minneapolis machines would form a procession of 112 miles in length and the St. Paul cars of 42 miles. The city assessor's record showed 4,719 automobiles in Minneapolis May 1, 1912.

Oppose Increased Taxes

New York and New Jersey Organizations Active To Nullify Efforts of Anti-Motor Factions

Dealers Taking Up Legislation—Ohio Legislature Is Active—Pennsylvania To Buy Toll Bridges

THE New York State Automobile Association, through its legislative committee, of which Alvin A. Bender is chairman, is conducting a campaign against the increase of automobile registration fees advocated by Secretary of State Mitchell May of New York. The association maintains that the proposed increase is unjust, and while Empire State motorists are willing to submit to fair taxation, they are determined to oppose the proposed increase as outlined some time ago in THE AUTOMOBILE. If the proposed measure goes through a test case will be taken through the courts.

Incidentally, the Associated Automobile Clubs of New Jersey, the state association there, is opposing a similar increase of automobile fees. A bill has been brought in at the Trenton Legislature, advocating a wheel tax for all road vehicles, in order to offset the anti-automobile spirit now in evidence in Jersey politics. The present registration law of New Jersey has been taken through all state courts and been upheld on the reasoning that the state has the right to tax whoever and for whatever it chooses. A test case will be taken, in the near future, to the Federal courts to determine this matter.

Mitchell May, Secretary of State of New York, suggested that in order to effectively protect the public against irresponsible chauffeurs, that statutes relating to the examination and licensing of drivers be modified as follows: Every man applying for a chauffeur's license must file his application 10 days before he is examined, and his name and application is to be published conspicuously in the leading papers of the state so that parties in possession of such information as would cause the license not to be granted have an opporunity to turn that information over to the Secretary. Upon having passed his examination, the chauffeur is to be given a book, with his name, description and photograph, and space for immediate recording of every arrest for violation of the state motor law.

The Secretary has also suggested that no automobile should be taxed less than $10 a year, whereas now the minimum tax is $5; furthermore, that high-powered cars be charged more than the present maximum rate of $25. Truck licenses should be charged for from $5 to $50, depending on the weight of the vehicle. Secretary May claims that the income derived by the State of Massachusetts last year was almost twice that of New York State, and that if the same regulations were used in the Empire State as are in use in the Bay State $4,000,000 a year could be realized instead of $1,000,000, the total of the automobile taxes of 1912 for New York. Remembering that the $50,000,000 appropriation for state highways was largely due to the requirements of automobile traffic, Secretary May considers that automobilists should do their share in helping the state.

Unfortunately, it is easily foreseen, that this statute, even if passed, cannot perfectly solve the problem of the irresponsible chauffeur as it would in Germany or France. The reason is that in those countries there is a system of announcement by which the police authorities of the land are kept informed of the identity of every resident and citizen. Every man being required to have credentials must therefore prove his identity and cannot assume a false name as easily as here, if his purposes make such a course desirable.

The Automobile Dealers' Association, New York City, has arranged a meeting for February 26, 8 p. m., in the Hotel Woodward, in order to consider the present campaign of state officials to increase automobile taxation and to adopt resolutions on the proper course to be taken.

Live Automobile Legislation in Ohio

COLUMBUS, O., Feb. 24—The Ohio senate has passed three bills which were introduced by Senator Lloyd, which affect the driving of automobiles. The object of the bills is to protect automobile owners from joy riders. Penalties of 30 days to 6 months imprisonment and fines of $200 to $500 are provided for any person who refuses to render aid to any one after running them down with his motor car. A statute provides for the suspension of chauffeurs for drunkenness.

Workhouse sentences of 4 months and fines of from $100 to $500 are provided for any one convicted of taking an automobile without the consent of the owner. For removing any part of the necessary equipment of a car sentences of from 3 to 6 months and heavy fines are provided. For mutilating any part of a car heavy sentences and fines are provided.

A bill has been introduced in the Ohio General Assembly by Representative Tetlow making it a misdemeanor for any one to blow his horn and ring his bell in a loud and unnecessary manner in the residence districts of the cities.

A meeting of all of the automobile organizations of Ohio was held here February 19 for the purpose of taking part in pending legislation before the Ohio General Assembly. The meeting was held at the rooms of the Columbus Automobile Club where luncheon was served. After the meeting a legislative committee visited the governor who said he was for the bill now pending in the legislature basing the registration fees for automobiles on their horsepower. The governor said, however, that he was in favor of leaving the matter to a referendum vote of the automobile owners of the state. It was urged that the payment of registration fees to $30 or $35 on a car was double taxation and opposed to the spirit of the constitution.

Pennsylvania to Abolish Tolls

HARRISBURG, PA., Feb. 24—A number of bills were introduced in the Pennsylvania legislature this week. One was for the appropriating of $3,000,000 for aid of township road building and maintenance for 2 years. The senate has finally passed the bill turning over to the state highway department the $1,800,000 collected from automobile licenses for the past 2 years.

Senator Beidleman introduced a bill designed to rid the state of toll bridges. It authorizes the state to purchase by regular condemnation proceedings bridges over 1,000 feet in length erected over streams by corporations organized under general or special law for the use of which toll fees are charged. Senator Beidleman also presented another bill, authorizing the state highway department to erect wherever the need exists, free bridges in connection with the development of the state system of highways.

International Elects Directors

At the annual meeting of the Internal Motor Company, New York, held last week, the following directors were elected:

Edmund C. Converse, chairman, U. S. Steel Corporation; T. L. Chadbourne, Jr.; C. P. Coleman, William E. Corey, U. S. Steel Corporation; Otis H. Cutler, American Brake Shoe & Foundry Company; Harry W. Davis, Delaware Trust Company; Herbert H. Dean, Edward B. Smith & Company; William G. Dickerman, American Car & Foundry Company; Frederick H. Eaton, American Car & Foundry Company; W. T. Graham, Montgomery Hare, Arthur H. Lockett, Pomroy Brothers; Hunter Marston, Blair & Company; Ambrose Monell, International Nickel Company; Thomas E. Rush, Charles H. Sabin, Guaranty Trust Company; W. D. Sargent, Reading-Bayonne Steel Casting Company; Warren A. Wilbur, E. P. Wilbur Trust Company.

The officers elected after the directors are:

C. Phillip Coleman, president; William G. Dickerman, chairman of the executive committee; E. C. Converse, chairman of the board of directors; F. C. Richardson, treasurer; Vernon Munroe, secretary.

System Provokes Strike

Lockout in Renault Factory Due To Opposition of Workmen Against Stop-Watch Methods

Block Makes 5,000 Men Idle—Hudson Gives $100,000 for Transcontinental Road

PARIS, Feb. 15—Objecting to a system of timing factory operations with a view to higher efficiency, most of the men employed in the Renault automobile factory went on strike this week. The drawing office staff and sales department remained at work, and this so exasperated the strikers that they invaded the factory, drove out the men found there and caused considerable damage to machinery and fittings. At this turn of affairs Louis Renault gave the order for the entire factory to be closed, thus throwing 5,000 men idle. It is declared that thoroughly disgusted at the violence shown by his workpeople, Louis Renault has left Paris for Nice and is resolved not to return until his workpeople have adopted a more sensible attitude. Meanwhile, no work whatever is being done at the Renault factory, but building operations on the new factory now being erected by the river are continuing without interruption. The buildings are being guarded by police and gendarmes.

Knox Liabilities Are $1,286,409

SPRINGFIELD, MASS., Feb. 25—A schedule in bankruptcy was given out today by the receivers of the Knox Automobile Company, showing total liabilities aggregating $1,286,409, total assets, $1,380,386 and total unsecured liabilities, $1,261,907.

Hudson Gives $100,000 for Stone Road

DETROIT, MICH., Feb. 25—The Hudson Motor Car Company has agreed to donate $100,000 for the construction of the transcontinental stone road, the conditions being the same as in the case of the Packard and Willys donations.

E. V. A. A. Holds Monthly Meeting

The Electric Vehicle Association of America held its monthly meeting on February 25 at the United Engineering Societies Building, New York City. The principal speaker was James M. Skinner, whose subject was the Philadelphia thin plate battery, illustrated with lantern slides. An excellent description of the thin plates for battery uses was given. Extemporaneous talks were given by the different members of the association on subjects relating to the progress of the electric vehicles in the commercial field. Special interest was given the distribution of electric service stations throughout the country.

Schimpf to Visit Western A. A.

William Schimpf, chairman of the Contest board of the A. A. A., will leave New York for Los Angeles next week, in order to take up with the Western A. A. the situation of contest regulations in the West under the jurisdiction of the national body.

Automobile Dealers Hold Elections

At a meeting of the recently elected Board of Directors of the Automobile Dealers' Association, Inc., held in its rooms in the Hotel Woodward, on Thursday, February 20, 1913, Harry M. Bronner of the Edwards Motor Car Company was elected president, Arthur M. Day of the A. Elliott Ranney Company, vice-president, and Frank Eveland, of A. G. Spalding & Brothers, secretary and treasurer. The new board of directors of the association follows: Frank Eveland, N. J. Budlong, Arthur M. Day, Charles M. Brown, Harry M. Bronner, I. N. Uppercu, C. H. Larson, H. L. Stratton, Wm. C. Poertner, and W. Arthur Lesser. Charles A. Stewart continues as general manager.

Ths association appointed a special committee to look after the increasing legislative work. This committee consists of Arthur M. Day, Wm. C. Poertner and R. H. Johnston.

Two new members were elected: the Pope Motor Car Company to be represented by G. M. Stratton, and the Edwards Motor Car Company, to be represented by Harry M. Bronner.

Motor Truck Club Talks Shows

In a meeting held by the Motor Truck Club, New York City, on February 19, the members discussed the questions as to whether shows pay. Opinions were divided. Nevertheless, several members reported that the show time caused a more or less general disorganization of the factory and selling forces. The practice of giving away tickets to prospective customers, etc., also helps to make shows more expensive than they would be naturally. The consensus of opinion seemed to be, at any rate, that while truck shows had merits, undoubtedly their cost is high.

Joy Riding Not a Larceny

MILWAUKEE, WIS., Feb. 24—That joy-riding does not constitute larceny or theft of a motor car and theft insurance does not cover the damages arising from joy-riding, was the decision of Judge Cordes in Civil Court at Milwaukee in the case of William K. Murphy against the Hartford Fire Insurance Company to recover $400 damages.

Mr. Murphy gave his car into the hands of one George Murray to be taken to Beaver Dam, Wis., for overhauling. While the car was in Beaver Dam, it was alleged that two of Murray's friends took the car one evening and after a wild joy-ride damaged the machine $400 worth and abandoned it at the roadside. Mr. Murphy carried theft insurance, as well as fire protection, in the Hartford, and demanded restitution in the amount of $400. The insurance company denied his request, on the ground that the action of the joy riders does not constitute theft and that the car had not been stolen within the intent of the law.

Johnson Enforcing Anti-Smoking Ordinance

Fire Commissioner Johnson of New York City has taken active steps to enforce the rule which forbids smoking in garages. This rule, which had been issued some time ago, has hardly been enforced heretofore; but, as the commissioner's investigations show that during the first two weeks of February five garage fires took place in New York.

Chauffeurs Against Law Breakers

The Gasoline Engineers Protective Association of New York City, which is a chauffeurs' organization, has decided to take whatever steps tend to reduce the public evil produced by irresponsible chauffeurs. A letter published by the organization a few days ago contains the following passages.

"The object of this association is to eliminate joy riding and drunkenness and uncalled-for violation of city ordinances, to oppose and try to have repealed unjust laws, try and prevent unjust newspaper criticisms, to put the profession on a high plane, so that a chauffeur will not be discriminated against because of his calling. Any chauffeur is eligible to membership who can furnish bonafide references covering a period of not less than 2 years and can fill the requirements as prescribed by our constitution and by-laws in regard to character. Character is the most essential requisite in gaining admission to this order."

Brooklyn Show Opens With 300 Automobiles

Small Shows Throughout the Country Now On—Some of the Cities Have Their First Shows

Fine Attendances and Good Sales Are Reports From the Different Exhibitions

WITH more than 300 automobiles arranged on the main floor of the Twenty-Third Regiment Armory, the Third Annual Brooklyn Automobile Show opened on February 22, in the evening. This show, which will fill the armory for one week, is a local show in a way inasmuch as the Brooklyn Motor Vehicle Dealers Association consists of automobile dealers handling motor cars in the Long Island territory, including in several cases part of Connecticut and New Jersey. The magnitude of the show, however, gives it greater significance than the ordinary local show. The armory, which is fully as large if not larger than Madison Square Garden, is entirely filled up by the pleasure cars and trucks which are arranged in two blocks extending from one end of the armory to the other, and which are separated from each other and from the wall exhibits by two aisles. A number of automobiles are also exhibited in the entrance hall and several along the further end of the building. Along the length walls of the armory accessories and other minor exhibits have found space.

The attendance to the show exceeds all former records, the opening night saw 12,000 visitors and the following days approximately 7,000 each.

As before the decorations are simple but tasteful, consisting of white fabric arranged under the roof and bunting mounted on it in several places to heighten the effect of the white. The armory, this year, was almost too small to house the exhibits which were arranged quite closely, in fact, much more so than last year. It was on this account that several of the Brooklyn dealers did not take space at the show but had their own exhibitions at their stores along automobile row, one block from the armory, where the stores were attractively decorated.

Davenport Attendance Was 6,000

DAVENPORT, IA., Feb. 23—With a total attendance of 6,000 the 5-day exhibit of the fourth annual Tri-City Automobile Show came to a close tonight. There were fifty-nine cars in all, placed by twenty-five dealers of Davenport, Rock Island and Moline. Electrics were one of the most popular of the exhibits this year, five makes being represented. High and medium-priced cars appeared to attract the most attention and it was in these classes that the most sales were made. There was a good line of accessories on exhibit. This year every available square foot of exhibit space was taken up and several dealers were unable to secure show room. The booths were cut down in size to allow as many exhibits as possible. Owing to lack of room no trucks or factory exhibits were allowed. Dealers reported that the largest percentage of buyers were farmers or residents of small towns adjoining the tri-cities.

Syracuse Show Is Biggest Ever

SYRACUSE, N. Y., Feb. 25—(*Special Telegram*)—The largest automobile show in Syracuse history was opened tonight, at the Armory, by Mayor Schoeneck, with the record-breaking attendance of 9,000. There are forty-two pleasure car exhibits representing fifty-five makes and ninety-five machines. There are eighteen exhibitors of trucks with twenty-two makes and seventy machines. There are also thirty-two exhibits of accessories and aeroplanes. Every inch of exhibition space is utilized. For the first time since the annual shows were started here there is space taken by every Syracuse dealer. The prospect for a successful selling campaign is excellent; several sales were made tonight and large numbers of promising prospects were reported. A feature is the large number of visitors from suburban districts who intend buying cars. The sales of trucks bid fair to break all previous records especially for light delivery vehicles. In the pleasure vehicles the demand seems largely for medium-priced cars. Th show lasts the rest of the week. Harry T. Gardner is manager.

RICHMOND, VA., Feb. 24—The first automobile show held in the Horseshow building this week proved a success and many cars were disposed of. The display embraced thirty-one exhibitors who showed sixty-eight pleasure cars, and seven trucks and wagons. The cost of the exhibits was estimated at $750,000. The exhibitors used 14,000 square feet, and 70 per cent. of the cars exhibited had electric starting and lighting systems.

Baltimore Show Seen by 35,000

BALTIMORE, IND., Feb. 24—When the doors of the Fifth Regiment Armory closed Saturday night it was found that in round numbers 35,000 persons had paid for admission to see the exhibition during the five nights.

There were forty-three exhibitors at the show and more than 200 cars and trucks on the floor of the Armory. All of the dealers report a large number of sales but the record seems to have been carried off by the Ford Automobile Company, which reports the sale of 143 cars.

Many Sales at New Orleans Show

NEW ORLEANS, LA., Feb. 24—Attendance at the automobile show, which closed yesterday, was 20,000. This is somewhat less than on previous years, but is accounted for by the fact that previous shows have been held during the Mardi Gras season, when many visitors were attracted only by idle curiosity. This year, with the show being held during Lent, it is certain that the greater part of those who paid admission had some active interest in motoring. Actual sales made during the show were larger than during any of the previous shows. Another feature that was brought out plainly during the exhibition was the interest taken by residents of the smaller towns and country districts.

Seattle's First Show Success

The Seattle, Wash., show has been declared a thorough success. There was an average daily attendance of 4,500 to see the twenty-one different makes. During the week there were more than 100 actual sales made from the floor of the Armory. Among the distinctive exhibits was the Oakland, on a platform elevated just enough to give it prominence.

HARTFORD, CONN., Feb. 22—What promises to be the best automobile show ever held in New Haven opened this evening at the Second Regiment Armory. Attendance was good. A total of 125 pleasure cars and trucks are displayed. Dealers assert that they are doing a good business and all indications point to a very successful week.

During the first week of coming September the forty-first annual convention of the International Association of Fire Engineers will be held. A most complete exhibition of fire-fighting equipment is planned, and Commissioner Joseph Johnson, of the New York Fire Department, is the chairman of the convention committee.

French Grand Prix To Start on July 12

Remy Electric Company Offers Remy Brassard and Trophy for Winner in 200-Mile Race at Indianapolis

N. H. Van Sicklen To Be Connected with the Savannah Automobile Club in Official Capacity at Races

PARIS, Feb. 15—It has now been definitely decided that the French Grand Prix race shall be a 2-day event on Saturday, July 12, and Sunday, July 13. The first day shall be devoted to the 560-mile big-car race on a fuel consumption basis equaling 14.1 miles to the gallon, and for which eighteen cars are now regularly entered. On the second day there will be two races, one in the morning being for motorcycles of 350 and 500 cc. cylinder capacity, and one in the afternoon for cyclecars and motorcycles having a sidecar attached.

As a result of a visit to the course, it has been decided to abandon the proposed scientifically banked cross-road. The two main legs of the course run almost parallel and only 120 yards apart for a distance of over a mile before they unite at a point known as La Fourche. Instead of taking the cars round the existing hairpin, it was proposed to build a cross-road a quarter of a mile from the present turn, with such a banking that high speeds could be maintained. A close examination shows that, owing to the difference of level of the two roads to be united, this task would be both difficult and costly. In consequence, an ordinary cross-road with the angles rounded off and a slight amount of banking at the inlet and the outlet will be built. This road will have a cement surface. The original plan of building the grandstands around this cross-road will be adhered to, with the pits on the inside of the bend. Work has already begun on the course and it is expected that it will be in fine condition by July.

Minneapolis After A. A. A. Run

MINNEAPOLIS, MINN., Feb. 24—The trustees of the Automobile Club of Minneapolis met Tuesday noon to consider ways and means to obtain a guarantee fund with which to back an invitation to be extended by the Minneapolis Civic and Commerce Association for the 1913 national reliability tour of the A. A. A. to start from Minneapolis and run west, preferably over the northern transcontinental route laid out last summer by A. L. Westgard as far as Glacier. It is understood that the Great Northern road will operate one or two complete hotel trains to run along the route for three meals a day and night lodging if this route is followed. This route is similar to that of the 1911 tour of the Minnesota State Automobile Association as far as Helena. The proposed A. A. A. route would turn from Havre and run westward 180 miles. Satisfactory return freight rates on the automobiles is to be made and entertainment at the park which will make the occasion long to be remembered is promised if the proposed schedule is carried out. Dr. C. E. Dutton is chairman of the committee to arrange for a tour. Asa Paine, fifth vice president of the A. A. A., is vice chairman and E. C. Hillweg is secretary.

Van Sicklen to Work for Savannah Races

SAVANNAH, GA., Feb. 24—N. H. Van Sicklen, president of the Chicago Motor Club and of the Chicago Automobile Trade Association, will be connected with the Savannah Automobile Club in an official capacity when the Grand Prize and Vanderbilt Cup races are run over the Chatham County course during Thanksgiving week, according to an announcement authorized by Harvey Granger, president of the Savannah Automobile Club.

President Granger has written to the Chatham County commissioners requesting that they give their aid from this time forward to perfecting the automobile course, as they have done in the past. There is no doubt about the desired co-operation being granted. The commissioners have already announced to this effect. The course will be shortened to 12 miles, and will be made as nearly perfect as possible.

As soon as the accurate measurements of the course are received, the question of the piston displacement of the cars to be entered in the Vanderbilt Cup race will be considered. It is hoped to change this displacement from 600 to 450. In order to do this it will be necessary to secure the consent of William K. Vanderbilt. As soon as Mr. Vanderbilt is heard from the entry blanks for the races will be distributed. While the reduction in piston displacement would bar out of the Vanderbilt Cup race one or two high-powered cars, it would permit them to enter the Grand Prize race and would make the field in the Vanderbilt much greater than under the present rules.

Only one curve of the several that will be a part of the completed course will have to be banked. The other turns were banked for the previous races. The whole committee on course has met and determined upon the report of the sub-committee, which recommended a 12-mile course.

Remy Brassard for Memorial Day

INDIANAPOIS, IND., Feb. 24—The Remy Electric Company, Anderson, Ind., has consented to offer the Remy Brassard and Trophy as the prize to be awarded the car and driver which first completes 200 miles in the next 500-mile race on the Indianapolis Motor Speedway, on Memorial Day.

INDIANAPOLIS, IND.—Frank P. Fox, of the Frank P. Fox Company, has formally entered a Fox Special in the 500-mile race, nominating Howard Wilcox as driver. It will have a four-cylinder motor, 4.75 inches bore by 5.5 inches stroke, with a piston displacement of 389.9 cubic inches.

It is announced that a special prize will be given to the driver leading at 100 miles. This will be the Red Head trophy, offered by Emil Grossman, manufacturer of Red Head spark plugs. If the driver uses Red Head spark plugs he will receive from Grossman $10 a week for 50 consecutive weeks, in addition to the trophy.

Washington 300-Mile Truck Run

WASHINGTON, D. C., Feb. 24—A 4-days' motor truck reliability run will be held May 5-8 under the auspices of the *Washington Post*. The route, which will cover about 300 miles, has not been definitely determined, but will be over a section of the country which will give a diversity to the test. The classification will run from the smallest delivery wagon to the heaviest trucks. It is intended to interest government officials in the test run and to this end invitations have been extended to various officials to participate. Already a number of acceptances have been received, particularly from members of the general supply committee, which frames all the specifications for motor trucks and every other commodity purchased by the government. The run will be conducted under the rules of the A. A. A.

The initial 1913 run of the L. I. A. C. was held on February 22, from the home of the club to Finlayson's Hotel, Rockville Center. There were thirteen cars in the run, and fifty members participated. After returning to town in the evening the party started for the automobile show.

The Long Island Automobile Club plans a large number of contests for the coming season, and so far nineteen trophies have been received from various donors. The first competition will be held on April 5 and the second on April 20.

Digest of the Leading Foreign Journals

Silent Cam and Gear Action and Simple Oiling in Hotchkiss Motors—Cost of Tires and Fuel for Omnibuses—The Fuel Feed in Automobile Diesel Motors as Proposed by Malms—Improved Reciprocating Piston Pump for Fire Engines

FEATURES of Hotchkiss Motor—While the 18-horsepower Hotchkiss car, made by the arms company of the same name, is of very conservative design in the matter of following popular tendencies, some exclusive features are found in it. They relate mostly to the motor, though it is also noted that a special differential gear is employed to equalize the action of the wheel brakes. The motor has four cylinders, 95 by 130 millimeters, cast in one piece but with each cylinder completely surrounded by the cooling water. Silence of the valve mechanism is effected by the construction shown in Fig. 1. The tappet rods are in two tubular pieces, P and M, held apart and in continuous contact with the cam K below and the valve stem S above by means of the coil spring R, and the tubular space is nearly full of oil. When the cam K raises the roller G the two parts of the tubular tappet thus come together inside of the guide T. The construction permits an easy adjustment of valve lift by means of the thin washers L. The customary valve housing is also employed.

The camshaft is driven by mitre gear pinions from the crankshaft and drives in turn the pump and the magneto through similar pinions. To avoid vibration in this drive, the mitre gear wheel on the camshaft has its crown mounted upon the spider with a capacity for a slight elastic yield between these two parts, the mounting being effected by means of four small leaf springs secured radially to lugs on the spider and lugs on the crown.

The principle of the motor lubrication is that a force pump drives an excess of oil through a very large bore extending throughout the crankshaft with relatively very small lateral bores to the bearing surfaces, this arrangement having been found sufficient for obviating all chance of the first bearings in the circuit robbing the last ones of their quota of the oil. The pump is of the oscillating type, the piston being actuated by an eccentric on the flywheel-end of the crankshaft, immediately inside of the end-bearing. Its construction is shown in Fig. 2. The pump cylinder is pivoted by means of shaft G to a plate which is secured by eight bolts to the outside of the bottom of the crankcasing covering a hole in the latter, and the whole mechanism, excepting the plunger piston which remains suspended from the crankshaft, can be pulled out and cleaned if necessary after undoing these bolts. A sheet metal bell O is secured to the cylinder body and contains a filter P through which the oil must pass to reach the entrance ports H which are uncovered when the plunger D is raised. When the plunger goes down and has passed these ports, the oil is forced up through the bore I in the plunger, having no other exit, and at a certain point in the stroke passes into canals J and K in the eccentric and to the central bore L in the crankshaft. From the last crankshaft bearing a column of oil is piped to a pressure gauge on the dashboard. The excess oil forced out of the crankshaft bearings and the connecting-rod bearings serves for the splash lubrication of the cylinder walls, piston pin and camshaft. A safety valve Q in the pump barrel limits the pressures in this body. The amount of oil in the crankcase is ascertained by the old means of high-level and low-level trial cocks.—From *La Vie Automobile*, February 8.

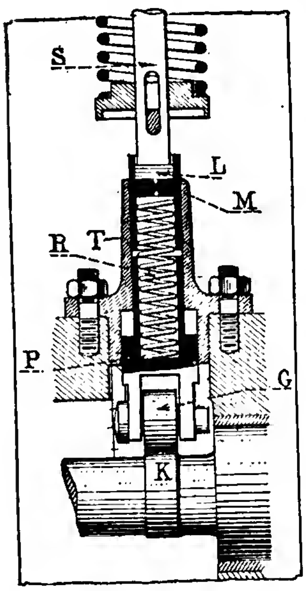


Fig. 1—Hotchkiss valve action

Spring Suspension—It is mentioned as a fact verified by experience that the front springs of an automobile affect the comfort of those sitting over the rear springs. For example, in a certain car an intolerable galloping motion developed over the rear axle whenever the vehicle was driven at medium or high speed over a lumpy road, and this trouble was remedied completely by adding two leaves to the front springs, stiffening them.—From *La Pratique Automobile*, January 10.

TIRE Cost Down, Fuel Cost Up—When the General Omnibus Company of Paris received its franchise, the estimate which was furnished the municipal council called for a little more than 1 franc of receipts and expenditures for one omnibus per kilometer, everything included. The results of operation fell a little below this estimate, and the expense per vehicle-kilometer is in fact at the present time slightly below 1 franc. Included in this estimate 0.20 franc had been allowed for tires and 0.12 franc for the fuel. In the actual operation these figures have now been reversed. The fuel cost exceeds 0.15 franc at a market price of 34 francs for 100 kilograms of benzol, a price which will soon be left far behind. [In Germany the consolidated benzol manufacturers have, on the other hand, agreed to keep the price of benzol at what it is now for a series of years.—Ed.] In contrast herewith the cost of tire maintenance, including first cost and renewals, has gradually gone down to 0.10 franc and should, it seems, not exceed 0.09 in the future. This result is greatly to the credit of the tire makers, who in two or three years have succeeded in raising the durability of the tires from an average of 12,500 kilometers of service, as it was during the first years of omnibus traffic, to 40,000 or 45,000 kilometers. Certain Bergougnan tires have even lasted for 68,000 kilometers. But it is to be noted that the first cost of these more durable tires is also considerably higher than that of the tires used at first. [The advancement in the economical results is perhaps, to a great extent, to be ascribed to a better understanding in suiting the tire dimensions to the work demanded of them.—Ed.] It is plain what a deficit the General Omnibus Company would have had to face if the tire makers had not come to its rescue. But the last word has not yet been said. The fuel prices continue to rise, and the economical difficulties are going to set in again without any hope this time of being able to offset the increasing fuel prices by a corresponding reduction in the tire maintenance cost.—From *Poids Lourd*, January 24.

Error in Chain Length Formula.—In the formula given in the issue of January 30 for calculating the length of a silent camshaft chain from the distance between crankshaft and camshaft, or vice versa, read π^2 (pi square) instead of the meaningless η^2 (eta square).

THE Adapting of Diesel Motors to Automobiles—An account was given in THE AUTOMOBILE of Jan. 16 and 23 of the difficulties which are met when an attempt is made to apply the Diesel principle and Diesel motor fuels to such relatively small and light high-speed motors as are required for automobile purposes and of the mechanical ways and means proposed by Engineer Otto Malms of Mannheim, Germany, for overcoming these difficulties—all of this being taken from an article in a German automobile journal. A doubt was expressed as to the complete efficacy of the fuel feed recommended by him and in consequence hereof a letter has now been received from Mr. Malms showing that the doubt was based on an incomplete understanding of his proposition. As the subject matter is of the deepest interest for the development of the automobile and its allied industries and for a final settlement of the mooted fuel and fuel-price question which is convulsing Europe and agitating America, the letter is translated herewith, while the reader is referred to the previous articles with regard to the details of the proposed construction. Mr. Malms writes in substance:

Editor THE AUTOMOBILE—I have read with interest your account of my treatise on "automobile Diesel motors." Your exposition of the subject shows that you have throughout understood everything as I meant to convey it, and I thank you for the pains you have taken in rendering it in English. Only with regard to the control of the fuel valves leading to the fuel nozzles has a small and easily pardonable error slipped in. If you read once more the passages in my original article which deal with this point you will find that in describing the fuel pump I said that a fuel valve arrangement must here be employed similar to that shown in Fig. 1 [Fig. 4 in THE AUTOMOBILE, Jan. 16], but that the valves must be operated with an invariable stroke and invariable timing, also that the period during which the valves remain open must be so extended that the four periods of the four valves in a four-cylinder motor will overlap, to the effect of producing a continuous fuel feed from the valves, corresponding to the continuous fuel supply from the pump. In other words, the fuel valve of each cylinder must not only remain open during the entire suction stroke, but also during a portion of either the compression stroke or the exhaust stroke.

As the pump at any given cam adjustment always delivers the same amount of fuel for each revolution and the fuel valves to the nozzles have unvarying periods of opening and closing, the amount of fuel fed to each of the cylinders MUST also remain invariable. In order to regulate this amount, the oblique cams are displaced and the amount of fuel supplied by the pump in a time unit is thereby increased or reduced. The same effect can be obtained by changing the gear ratio between the motor shaft and the pump shaft, for example by means of a friction gear. No difficulties can arise by this system, and it looks as if the described arrangement might be the only practical one for feeding strictly measured quantities of liquid fuel in the very small doses required.

I must add that a patent for this fuel feeding system has been applied for.

Thanking you in advance for correcting the little error by means of these explanatory remarks, I remain (*Signature.*)

The correction asked for by Mr. Malms is cheerfully conceded, although the necessity for it is due mainly to the ambiguous explanation of the feature referred to given by himself in his original treatise. What he said was, literally translated, as follows: "The distribution to the four nozzles of a four-cylinder motor is also in this case effected in the previously described manner as illustrated in Fig. 1 [Fig. 4 in THE AUTOMOBILE, Jan. 16] by means of a mechanically controlled fuel valve with equal stroke and equal period of opening for each nozzle, and with the open-periods of the valves somewhat overlapping."

This doubtful passage has now been explained by its author, and the explanation is so much more interesting as it shows that the proposed system is applicable only to motors having a sufficient number of cylinders to admit of keeping one or another of the fuel valves open all the time, and that the system therefore presumably is still better applicable to a six-cylinder motor than to a four.

With this explanation a highly important feature in the construction proposed by Mr. Malms remains undisclosed, however. The mechanical means by which the opening and closing of the fuel valves are synchronized properly with the cycle of the motor, whether the motor is running fast or slowly under variations of its load, and yet so adjusted that the open-period does not vary, are not at all described. And yet, a fuel valve motion of this nature can scarcely be characterized as obviously simple. Perhaps it might be effected by placing the needle of the fuel valve—each of them—under the influence of two springs, one stronger than the other, and having the opening of the valve effected by releasing the stronger spring of the two, so as to push back the weaker spring at a certain speed, determined by the difference in the springs, and raising the needle from its seat during the time required for this differential spring action.

But Mr. Malms does not say that this or any other definite method is the one which he proposes, and his proposition therefore remains mechanically incomplete at a very important feature, with regard to which, it may be inferred, information is for the present withheld for reasons connected with the patent protection which he desires to obtain. Assuming, on the other hand, that this important feature has in some manner been covered by the inventor, although it is not disclosed, and that no serious objections exist against feeding the fuel into the nozzles of the motor cylinders during periods bearing a very different relation to the strokes of the motor than that which is

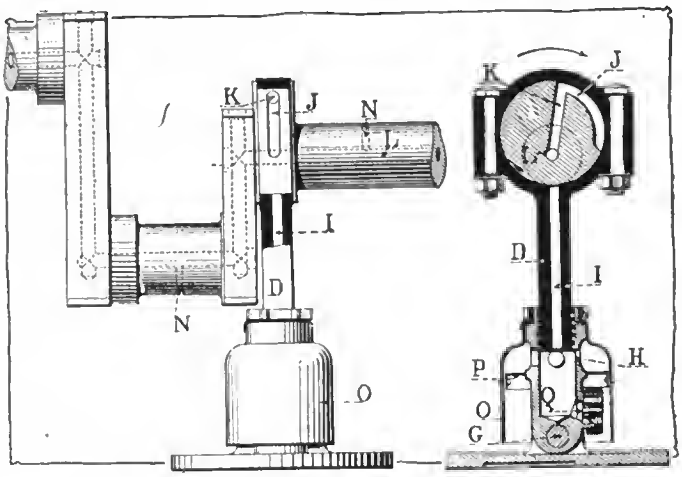


Fig. 2—Oil pump in crankcase of Hotchkiss 18-hp motor

observed in ordinary Diesel motors, the general mechanical scheme set forth by Mr. Malms must be admitted to be not only interesting and suggestive but of the greatest practical importance. But its value hinges perhaps on the undisclosed features.

IMPROVED Piston Pump for Automobile Fire Engines—The manufacture of fire engines is knocking at the doors of the automobile industry, claiming admission as a branch of production in which great progress may be effected, both mechanically and economically, by the same methods which have improved and cheapened automobiles. Closely studied this line promises perhaps better profits for a while than the manufacture of heavy trucks, since the competition in the fire engine line is with larger and heavier engines of greater complication and higher cost while in the truck line it is with a mode of transportation, by horses, usually calling for a smaller initial investment.

While it is the simple centrifugal pump driven from the automobile transportation motor which is responsible for moving fire engines into the automobile domain, it is noticed that the advantages of these pumps are now reacting to bring about improvements in other types of pumps, so that those, too, may be mounted upon ordinary light truck chassis or heavy automobile chassis with very few changes in details of construction. In this respect the Drouville four-cylinder piston pump, made at Nancy, France, must engage the attention of those interested in the movement. Many of the technical shortcomings of old-style piston pumps, as these have been used in fire engines drawn by horses or propelled by storage batteries, have been overcome or reduced in this construction. It discharges a stream of water with almost the same regularity as a rotary pump, moving the water continuously in the same direction. The construction is shown in two sectional views in Figs. 3 and 4, the latter being a section on the line XY of Fig. 4.

The four single-acting cylinders are placed in the form of a cross and are secured to a double bronze drum forming two concentric annular chambers in the outer one of which, *b*, the water is received from the supply hose attached at B, while the inner one, *c*, is the pressure chamber from which the streams are sent forth through hose attachments at CCC. The pistons F have two opposite leather facings securing water-tightness in both directions of movement. The bottoms of the cylinders are closed by the suction and pressure valves L and M, which are thus of maximum dimensions; they are made of molded rubber stout enough to resist the pressures. Opposite to the end of each cylinder and opening into the annular chamber *b*, a screening O is secured by gudgeons and screwbolts, and a bolt running through the axis of this cylindrical screening holds against the inner end of its frame a perforated metal plate which serves as a seat for the rubber valves.

The rods of each pair of opposed pistons are rigidly assembled and journaled upon a square frame mounted by means of two ball bearings on the crankpin of a central shaft which receives its motion from the motor shaft or the gear-box of the vehicle. The two middle ball bearings correspond to one pair of pistons and the two outer ones to the other pair, and the piston rods of the latter pair are forked so as to allow those of the other pair to pass them in the rotary movement of the crankshaft by which the pistons are actuated.

As the reciprocating movements of the four pistons take place successively and in the order of rotation, the current of water produced in the annular pressure chamber *c* always follows the same direction and is practically continuous. Nevertheless an air bottle, not shown in the illustration, is connected with the pressure chamber at the top of the drum and serves the more complete equalization of the water pressure in the fire hose, as in other less well balanced fire engine pumps of the reciprocating piston type. Usually provisions are made, as indicated in the illustration, for attaching three hose to each pump and the whole mechanism is mounted at the rear of the automobile frame with the drum in a vertical position and the hose nipples extending directly to the rear at the points marked C. A bypass valve, regulated by hand admits of ready reduction of pressures, so that the pump and the motor may continue to operate even if the hose nozzles are frozen up or otherwise clogged, but the safety offered in this respect is of course not quite equal to that which the centrifugal pump automatically affords. Still, the worst that can happen if hose does not burst and the Drouville pump is sufficiently robust to withstand the pressures which may arise when the motor is coupled to the low gear and the motor is running full tilt, is the stopping of the automobile motor.

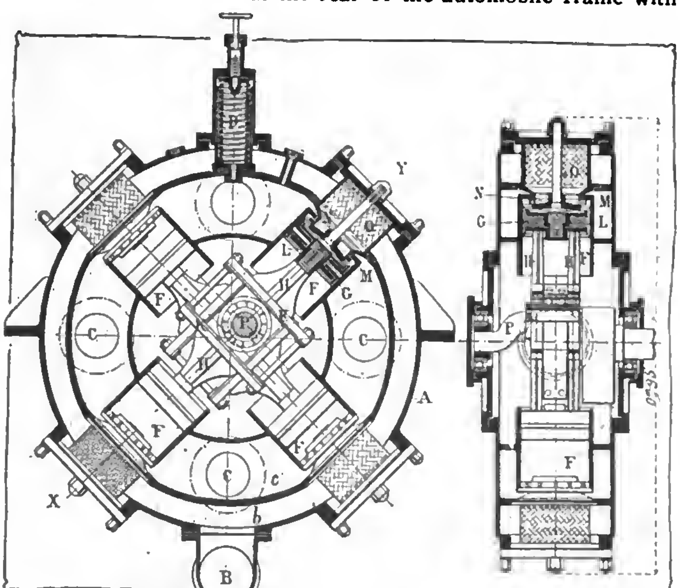


Fig. 3—Vertical section of Drouville, four-barrel piston pump for fire engines. Fig. 4—Section on line XY of Fig. 3

In comparison with other fire pumps of the reciprocating piston type, the Drouville construction presents improvements which are best realized by a summary of the requirements. There should be as little dead space as possible; the valves should be light and should have a minimum overlap on their seats, so as to reduce the difference between the resisting-pressure which acts on their largest diameter and the working-pressure which acts on the area of the aperture in the valve seat. These requirements apply to all water pumps depending on suction. For fire engine purposes additional ones are to be considered. A short stroke is bad, because it multiples the shocks which always accompany the reversal of the piston movement; and the average rotary speed should preferably be small to reduce the irregularity resulting from the transformation of a rotary into a straight-line movement. Finally, it is necessary for efficiency to avoid all narrow water passages, as the strangulation of the fluid involves a considerable loss of power which makes itself felt in a reduction of the working-pressure and a shorter reach of the stream.

Usually these requirements are very imperfectly met in fire engine pumps. In the Drouville construction, on the other hand, dead space is greatly reduced; the large valves minimize strangulation; their small weight, due to the material of which they are made, quickens opening and closing; the rotary course of the water in the annular channels counteracts eddies and shocks; and these good points make it practicable to use relatively small cylinders with a short stroke without experiencing the usual inconveniences from these technical shortcomings—which it is difficult to overcome without making the whole machine too cumbersome and heavy.

In practice the current type of this fire engine pump has cylinders of 140 millimeters bore and 80 millimeters stroke, and the speed corresponds to 300 to 400 revolutions per minute of the pump shaft, so that it may be operated with a gear reduction from a normal automobile motor of moderate power. In these dimensions the pump can handle 90 to 120 cubic meters of water per hour when used as a mere excavating pump and registers a manometer pressure of 80 meters of water (10 atmospheres). The depth from which it can draw the water can reach 8 1-2 meters [the theoretical maximum for a suction pump being 10 meters, corresponding to one atmospheric pressure], and it can throw a stream 50 to 60 meters horizontally and 35 to 40 meters vertically [presumably with the most favorable diameters of hose and hose nozzle, these dimensions not being specified in the account].—From *Le Génie Civil*, February 1.

INNER Tubes Improved by Glycerine.—The French firm making "Sparklets" tubes containing highly compressed carbonic acid gas to be used for the inflation of automobile tires now offers a small special can full of "Glysoto"—which is a liquid made from glycerine as a base—to be used once a year together with the "Sparklets" tube for the purpose of preventing the carbonic gas from escaping by exosmosis through the rubber wall of the inner tire tube. It has been found that this gas escapes more rapidly than common air at the pressures required for tires and that consequently the tire goes soft in quick order unless this new precaution is taken, and it has been found, on the other hand, that glycerine, of all viscous liquids, is one which does not injure rubber but on the contrary improves it and preserves it.—From *Omnia*, February 1.

Efficiency and Its Ends

Principles Applied Must Eliminate Waste of Energy Growing Out of Many Reasons

Co-operation of All Parties Involved in a Business an Essential of Success

THERE is a widely prevalent idea that scientific management as applied to garages, repair shops, stock rooms and so forth consists merely in the introduction of recording systems, principally composed of a number of blanks; on each of which as many details as possible are recorded. Take, for instance, the example of a repair shop; there, some forms are used to note the exact time spent by each man in the shop and on what individual jobs and other forms for recording the parts and tools used on the jobs, etc. This information is, of course, important; but frequently is taken for the end instead of the means to a higher end. This higher end is the constantly increased approximation of ideal establishment efficiency.

The word efficiency, which is now in the mouths of everybody, has been used and abused so much of late, that it should be worth while to make clear and definite the idea for which it stands. Making use of an analogy, it appears at once that efficiency in industrial and commercial operations means the ratio between the individual energy spent by a worker or a set of workers, independent of what their standing is, and the useful work accomplished. It is only the useful work which interests us directly, the remaining quantity of the individual effort spent being negative from an economic viewpoint. The ratio is therefore, akin to that proportion between latent heat of combustion of a fuel and the useful work delivered at the point where it is finally used, that is, crankshaft or roadbed.

The question of efficiency, looking on it from the point of vantage of the Business Man, resolves itself, then, into that of obtaining a maximum of useful work from a fixed quantity of effort exerted by a worker. Let us say that the energy spent by an average man in his daily work corresponds to the energy contained in .6 pound of carbon, or 8,400 British thermal units. This energy is spent during, say, 8 hours. The rate of energy expenditure may vary, but as a rule is fairly such as to be representable by a straight line, excepting a maximum at the start in the morning and a depression about noon. The average energy expense is therefore 1,050 British thermal units an hour. This expenditure is identical with the worker's effort, namely, action, accompanied by consciousness of a variable nature on the part of the worker. **The effort, however, which results in the expenditure of 1,050 British thermal units an hour is fixed. The variable nature of individual consciousness depends largely on the rate of energy expenditure, the nature of the work and the individual constitution—including in this term all the personal qualities—of the worker.** Consciousness includes, of course, all agreeable and disagreeable sensations, being both of a physical (bodily) and mental nature.

Exact Study of Workers Essential

Following is a truth, carrying conviction to every student of man and his work: The most advantageous state of individual consciousness, that is, to the individual himself, during work, obtains when the work is that best suited to a person's constitution—in the widest sense of the word—done at the rate best suited to his constitution; which latter is therefore the fundamental factor determining the result of a man's work. In other words, a man working—not loafing—at the rate and at the work which best suit his natural individuality will, under these conditions, turn out work of the highest efficiency within his possibilities. That is to say, under these conditions, the greatest possible quantity of the energy spent by him will be translated into useful work.

The problem which the scientific manager faces consists therefore in the finding of the best conditions under which the men directed by him should operate. A number of general experiences in this regard are, of course, widely recognized. Everyone knows that writing, typewriting and kindred work is easier and better done seated before a suitably built desk than standing. Again, the height of the worker and the desk introduce a number of possibilities determining the various results. Likewise, everyone knows that the average individual works easier in the early morning than in the afternoon or late evening, provided he had a normal amount of sleep before starting work, and for this reason the hardest work should always be done in the morning, when the worker's mind and body are in best condition to execute their tasks. It is further known that certain physical work such as marching is made much easier than otherwise by following a rhythm played or sung. Likewise reading, writing and calculating are made difficult by exactly the same expedients. But who knows exactly what and how much food is best taken for breakfast, lunch and dinner, to develop a person of greatest working efficiency? Or in which cases a man's efficiency is increased or decreased, by stimulating him in a friendly, severe or contemptuous way? Dozens of similar questions must suggest themselves to the man fit to be a scientific manager.

Great Managers Need Big Brains

Managers there are a-plenty, but few are scientific. Science, that is to say, knowledge, is the difference between the modern and efficient manager and the old-fashioned and unefficient one. To be a great manager, it is not only necessary to know how to give orders, but also what orders to give, to whom and when. The great, scientific manager must not only understand the requirements of business in general and his specific business in particular, but he must also have a fundamental understanding of economics, psychology, physiology and anatomy; not too much and not too little; he must be a specialist and a man of widely varied knowledge at the same time; and he must have the ability of forming original trains of thought and of understanding, criticizing and improving upon the thoughts of others. It is because of these manifold requirements, that the number of scientific managers of magnitude is small today; as in every other field of endeavor, many are called but few are chosen.

Truly scientific management is distinct from all other activities formerly known, in one way. As indicated in the above remarks, it recognizes that maximum industrial success and individual happiness are capable of being harmonized. Thus it makes possible the solution of the greatest problem which the world has known for the past forty centuries.

Coming back to the original subject of record systems and their importance, it stands to reason that unexact records are of no more value than none. It must, therefore, be impressed upon the men in charge of the system, that the exactness and truth of all records is of first importance. They must not only be convinced of this but also of the fact that the records benefit them as well as the business. They must see that their interests and those of the business are parallel. And there is no way of convincing them of this but by the truth. If scientific management is made a means for increased business and profit only, if it is thus fashioned into a hollow mockery of a splendid idea, it must not only accentuate industrial difficulties, but result in less business returns than could be obtained if the idea were taken up honestly.

Business, the sum total of great activity of today, needs men, men of the biggest caliber. Men of great conceptions, great power and, above all, men of immense courage. It takes less courage to accentuate than to annihilate differences. The business man of yesterday's every action did the first and nothing else; the business man of tomorrow will do the second thing.

A Brewery System

With Few Blanks, Complete Records of Full Truck-Operating Cost Are Being Obtained

All Records Are Made Out by People Other Than the Drivers

THE following record system used by the Lion Brewery, New York City, for keeping track of the work done by its automobile trucks and the cost of this work is a good illustration of how a truck fleet of medium size may be handled efficiently. The above-named brewing concern uses twenty-seven trucks, eighteen of which are of the gasoline type and nine electrics. Among the gasoline trucks, ten are 5-ton, five 3-ton and three 7-ton models. The electrics are all of the 3-ton type. This firm, which is gradually motorizing its entire delivery system, uses electrics for local deliveries and gasoline trucks for long-distance hauls, the average traveling capacities of gasoline vehicles being from 50 to 58 miles a day, and that of electrics from 20 to 25 miles, according to the company's records.

In considering the system of the Lion firm, one fact stands out strikingly and apparently advantageous. This is, that the drivers of the trucks are not troubled by attendance to the system. The latter covers travel reports, gasoline, oil and current consumption reports, repair reports and accounts of cost. In every case, the records are kept by the other party; gasoline-and-oil or current attendant, repair shop foreman, Jones recorder and accountant. This permits the driver to concentrate on his work proper without being bothered by details which really should be up to other people to attend to.

The principal forms of the system are: (1) the daily Jones recorder card; (2) the daily gasoline and work report; (3) the monthly record of weight carried and fuel used; (4) repair record; (5) yearly cost record, giving fuel, oil and weight carried, cost of repairs, etc., for every month and the whole year. Finally, a still more detailed cost sheet covering this information, together with averages calculated on their basis.

(1) The recorder card, Fig. 2, is used in connection with the well-known Jones recorder, being a blank of 4.13 inches diameter. In the case of the Lion Brewery, the blank is printed red on heliotrope paper, and the reverse side, not shown here, has spaces on which the date, truck number, driver number, route, number of miles traveled during the day, time of the truck being out of the garage, number of stops, gasoline used during the day, actual running time, time spent standing, weight carried during the day and special remarks are entered. When the truck starts out in the morning, the first three points of information mentioned are written on the back of the recorder blank. After the day's run is complete, the other data are entered, being obtained partly from the line made by the recorder pencil and partly from the data appearing on

(2) The daily gasoline and work record, Fig. 5. This form consists of a blank, 6 by 3.75 inches, printed black on thin yellow cardboard. The details which are required to form totals entered on the reverse of the recorder card are first entered on this card. The card is held by the checker in the garage who takes notations when the truck leaves and arrives. The weight is determined by the number of kegs of beer bottle boxes carried, which are of standard weight. The card provides for three trips a day, and this is ample. When the card is complete, the checker gets the gasoline report by seeing the entry in the book of the gasoline-and-oil man. This information being entered, the card is sent to the office, together with the recorder card where it is held in a reference file until the end of the month.

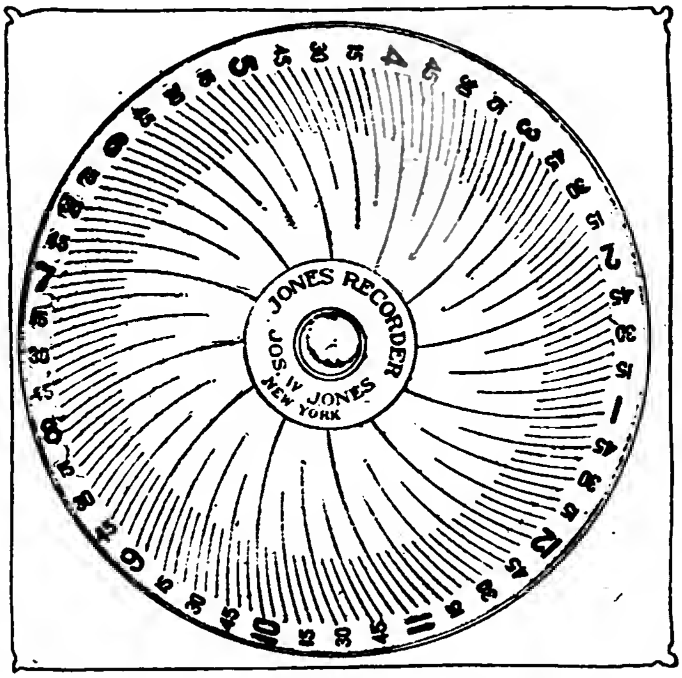


Fig. 2—Blank card used in Jones recorder

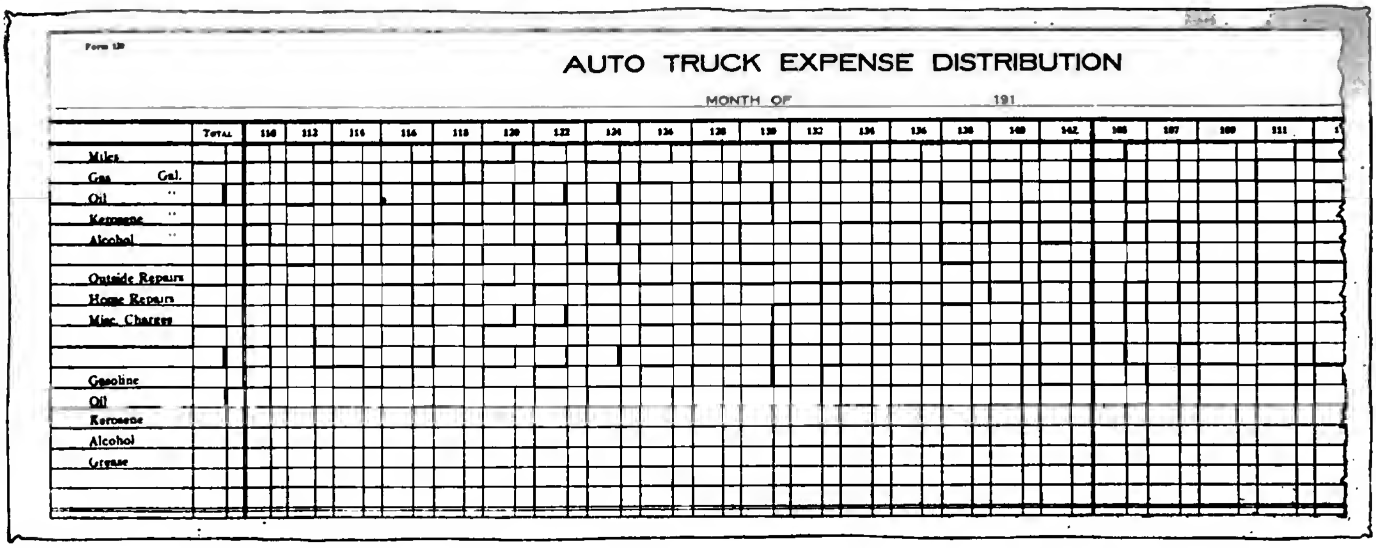
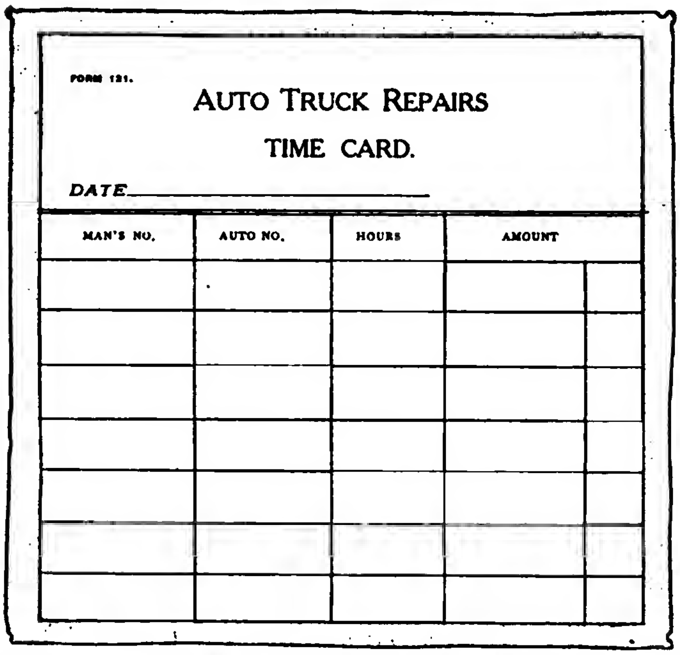


Fig. 1—Blank for keeping monthly records of full truck cost and all its individual items

(3) At that time, all the records are segregated and grouped by the trucks to which they refer, and the monthly report, Fig. 1, is made out. This form is printed on yellow paper, 17 by 5.25 inches, ruled red and blue and printed in black and all the various data are entered, for which space is provided.

(4) Repairs which are made in the shop of the Lion company are recorded on the repair form, Fig. 3. This form is 4.25 inches square, printed on thin white paper and lined blue and red. All that is entered on the form is the date on which the repair work was done, the number of the automobile repaired, the number of the workman in the shop who did the work and the hours spent by him on the job, together with the total cost of the repair which includes the labor and the cost of the material used for the work. These repair records are made out by the foreman of the repair shop, and when completed are signed by him and sent to the office of the company. Whatever repair work is done outside of the company's shop, is of course charged to the company and the office charges the various truck accounts with the total repair costs of each individual truck.

(5) At the end of the year the accounting department computes the records of each truck for mileage made, weight carried and gasoline used during the entire year. The form, Fig. 4, is used for this purpose and it is printed on both sides, giving


FORM 121.

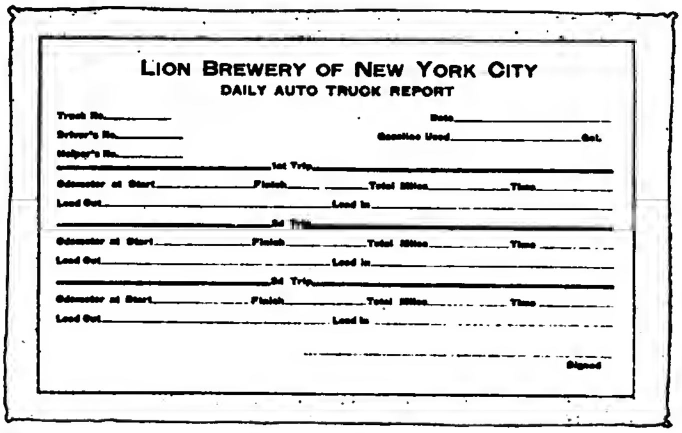
AUTO TRUCK REPAIRS

TIME CARD.

DATE

MAN'S NO.	AUTO NO.	HOURS	AMOUNT

Fig. 3—Repair card used in company's shop


LION BREWERY OF NEW YORK CITY

DAILY AUTO TRUCK REPORT

Truck No. Date

Driver's No. Gasoline Used Gal.

Helper's No.

1st Trip

Odometer at Start Finish Total Miles Time

Load Out Load In

2d Trip

Odometer at Start Finish Total Miles Time

Load Out Load In

3d Trip

Odometer at Start Finish Total Miles Time

Load Out Load In

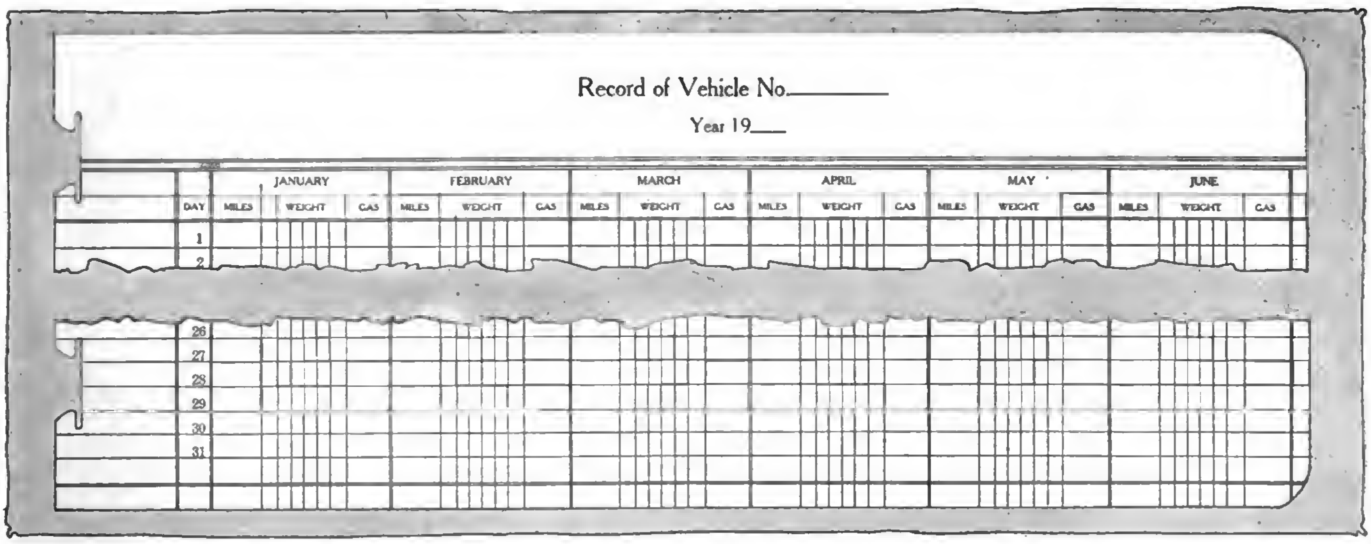
Signed

Fig. 5—Daily fuel, load and travel card

space for 6 months entries on each. The figures referring to the three kinds of data are entered on this form for every day of the year, so that it is easy to figure up the total weight carried and gasoline consumed during the year and to calculate averages on the basis of the mileage, both for the entire year and for periods of 1, 2, 3 or 6 months.

There is another form in use by the Lion company. This, however, does not appear on a specially prepared blank, but is made up after the end of the year and contains all the information summed up from the various forms described above. This general sumup is designed with thirteen columns, one for every month and a column for the total amounts of the year. The total amount of gasoline, oil and tires used by the company during each month are noted on this blank as are the weight carried, the mileage made, the hours run, the amount of repair work done, and the costs of tires used. All amounts of one kind appear in one line and in the thirteenth column are footed to a total. A second section of the report appears under these data and contains the monthly and yearly averages such as gasoline, oil, repair and tire cost per mile traveled and the weight carried per mile. Furthermore the average running cost per mile and the cost per ton are given on this report.

A special report form is used to keep record of the tires used by the trucks. One blank is used for every truck being marked with its number and on it spaces are provided for entering the following information relative to the tire on each of the four wheels of the truck. The date on which the tire was mounted on the wheel, the mileage for which it was used and its make and cost are entered on this form so that the company is in a position to get the most detailed information on tire cost on its trucks.

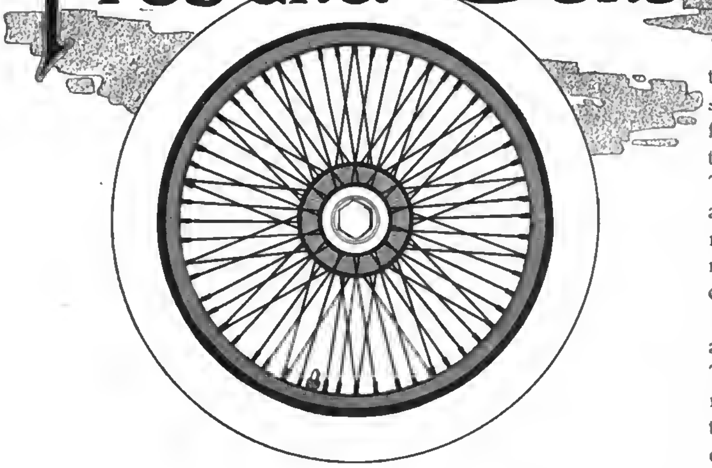

Record of Vehicle No.

Year 19

DAY	JANUARY MILES	WEIGHT	GAS	FEBRUARY MILES	WEIGHT	GAS	MARCH MILES	WEIGHT	GAS	APRIL MILES	WEIGHT	GAS	MAY MILES	WEIGHT	GAS	JUNE MILES	WEIGHT	GAS
1																		
2																		
26																		
27																		
28																		
29																		
30																		
31																		

Fig. 4—Fuel, weight and mileage record covering these data for every day in a full year

Pros and Cons of Wire Wheels



Triple Spoke Wheels Designed To Take Great Lateral and Driving Strains—Method of Carrying Spares

—

WIRE wheels were in use in the early days of the automobile. But the constructional methods of that time were not along lines that adapted this type of wheel to the peculiar road conditions required by the new vehicle. The wire wheel was therefore soon dropped on the superior showing of the wood artillery wheel, which continued to hold its position unchallenged until the introduction of the Rudge-Whitworth design in England.

Besides greatly improved construction, perhaps the feature which has contributed most to success of the modern wire wheel for automobiles is the invention of the triple spoke type, and it may be of interest here to outline the various functions of the three sets of spokes constituting the triple spoke wheel.

The vertical section, Fig. 1, shows the arrangement of spokes usually followed. It will be noticed that the outside set of spokes A is considerably dished, while the inner set C lies practically in a vertical plane. There are two reasons for this disposition of the spokes. First, the plane of tread is brought well over the inner end of the hub, thus keeping the wheel track small, and in the case of the front wheels preventing the dangerous strains that would follow on a large overhang of the steering knuckles; and second, the wheel itself is thereby rendered capable of resisting a great lateral shock. This latter point is brought in Fig. 2. Supposing the lower part of the rim to be subjected to a blow in the direction of the arrow, as when the car is brought up abruptly against the curb, practically the whole of the shock is taken in tension by the outer set of spokes A, the dished position of which render them peculiarly fitted to receive it. The spokes B and C, owing to their position are incapable of resisting such a blow to any great extent. Their function is almost wholly confined to driving and braking, although the slightly oblique position of the spokes B also offers resistance to lateral shock in the opposite direction. In automobile driving, however, a blow from the inside is rarely encountered.

All three sets of spokes radiate tangentially from the hub, but at different degrees corresponding to their respective functions. Thus the outer spokes A depart only slightly from a strictly radial lay-out, Fig. 1, and are not intended therefore to contribute to the drive from hub to rim. The spokes B and C are, on the other hand, arranged tangential to a circle almost as large as the hub flange to which they are attached. By this arrangement half of each set are in the best tensional position to take the driving strains, while the other half, issuing in the opposite direction from the hub, deal in a similar manner with the braking strains. This point is illustrated in the right-hand view, Fig. 1, in which the upper half of the wheel is shown only partially assembled, the spokes issuing in one direction not being shown.

The strains to which tangential spokes are subjected in practice is indicated in the diagram, Fig. 2. Here, two spokes are shown in the position they occupy in the wheel. When driving the hub in the direction indicated the existing tension of the right hand spoke is increased by a pull in the direction of the arrow, while the same turning force produces an opposite effect in the case of the other spoke, reducing its tension by the same amount. One of these spokes transmits the drive and the other offers the necessary resistance to braking strains. The function of each is quite distinct, one of them being out of action at all times.

—

Carrying Spare Wire Wheels

The means of carrying the spare wheels on a car equipped with the wire type is a similar problem to that met in the case of demountable rims. But there is this difference: The wire wheel, being complete with its hub, permits an easier solution owing to the fact that a simple stub or dummy hub is all that is necessary for a firm support. With the demountable rim

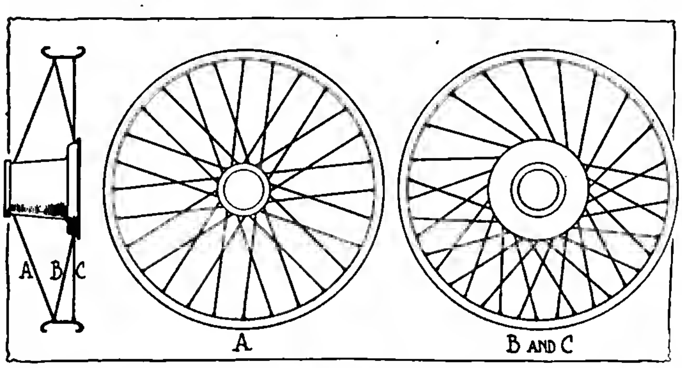


Fig. 1—Constructional diagrams of the triple spoke wire wheel, showing layout of spokes

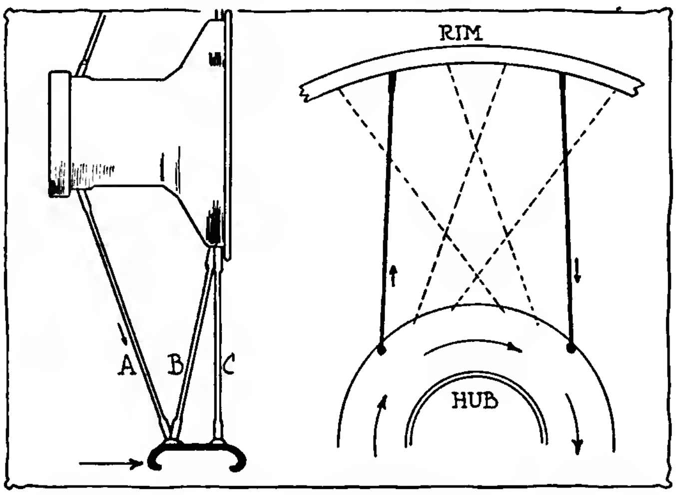


Fig. 2—Diagrams showing the lateral and tangential stresses imposed on wire wheels

the same rigidity of attachment can be secured only by the use of a framework or series of clips attached to a strong bracket. In either method, the difficulty of combining structural strength with sightliness is apparent.

It is true that although the dummy hub fixture has shown points of undoubted superiority in many European cars so fitted there are still large numbers of cars fitted with wire wheels in which the spare is carried in brackets of the type associated with spare tire carrying. The former method, usually applied in the running board position, has proved entirely satisfactory as far as the actual fixing is concerned. The dummy hub was arranged on a bracket mounted on the running board in such a manner that the tire did not come into contact with any part of the car.

The running board position for spare tire carrying, however, is rightly passing out of favor. The motorist is becoming more critical of the beauty of line in the appearance of his car and he wants also to be able to enter the car from either side. Carrying the tire in the position referred to offends in both these particulars.

An interesting method of surmounting these objections is that shown in Figs. 5 and 6. This consists of a dummy hub capable of taking two Rudge-Whitworth wheels, mounted at the back of a Lanchester car. A section is given in Fig. 4 in which the hub itself will be seen to consist of a plain hollow cylindrical stub, flanged at its inner end where it is bolted direct to the body of the car. Another flange, turned on the shaft provides an abutment against which the wheel hubs are tightened by means of a conical locknut exactly similar to those used in fitting the wheels to the axles. A distance ring, also conically faced is interposed between the two hubs, so that when tightened up both wheels are firmly centered and there is no possibility of moisture entering the interior of the hubs.

White Special Wire Wheel Hub

Fig. 3 illustrates a type of detachable wheel hub which is the subject of a patent application by J. M. White, Philadelphia. The special feature of this design is that it provides for both wire and wood wheels. The inner hub H, mounted on ball bearings, has eight splines S machined on its outer surface which transmit the drive to one or other of the alternative wheel hubs W and A. The wheels are centered and carried on the conical surfacs C, but the means of locking to the inner hub is not shown in the drawings. It is intended that both front and rear wheels have the same size hubs so that the wheels are interchangeable.

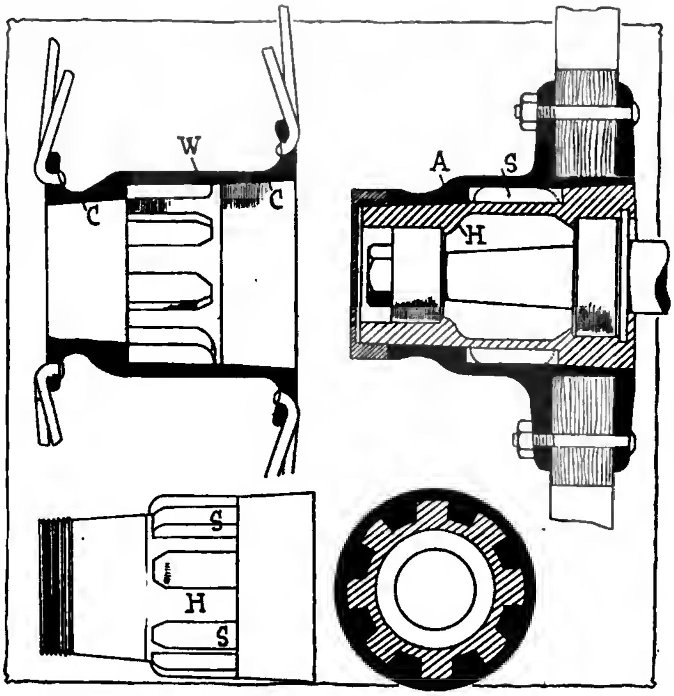


Fig. 3—White design of hub for use with wire or artillery wheels

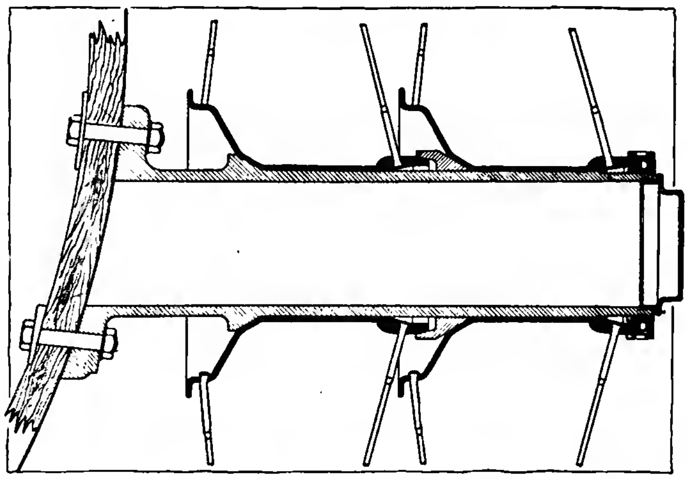


Fig. 4—Section through dummy hub designed to carry spare wheels

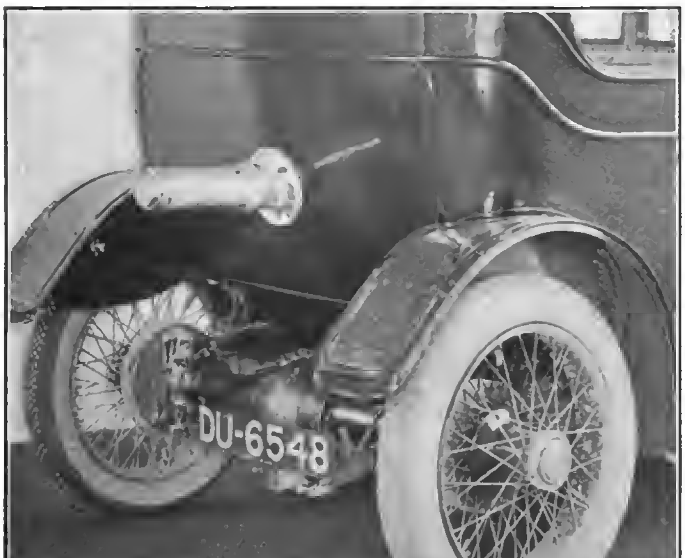


Fig. 5—Showing dummy hub carrier for spare wire wheels attached

Fig. 6—Two Rudge-Whitworth wheels in place on the carrier

Finding the Gear Ratio of the Car—Cutting Off Intake—Recharging Magneto Magnets—Specifications of Cylinder Oil—Putting on Electric Light—Wiring for Reduced Voltage—Inclosing Valve Action—New Lamps

Determining Gear Reduction

EDITOR THE AUTOMOBILE:—Will you tell me some simple way to find out the gear ratio of our Pope-Hartford car?

2—What would be the increase horsepower if gear ratio was raised from 2 to 1 to 3 to 1 and also if raised to 3 1-2 to 1.

We do not care to exact figures only approximately. This car has 36-inch wheels.

We have tested our car this way after being told it was geared too high. When turning flywheel around twice it turns rear wheel around 1 1-8 revolutions.

Danby Four Corners, Vt. W. F. OTIS & SONS.

—You may find the gear ratio by jacking up one of the rear wheels and turning the crankshaft over once. Put a chalk mark on the wheel jacked up and have a man note the rotation of this wheel while the crank is being turned as in Fig. 1. The wheel will turn twice as far as it would if both wheels were in operation owing to the action of the differential. It is therefore, necessary to divide the number of revolutions made by the rear wheel by 2. The number of revolutions of the motor required to revolve rear wheels once can then be readily found. If the rear wheel turns 1 1-8 times to one revolution of the crank the gear ratio can be found as follows: One-half of 1 1-8 is 9-16. We then have the proportion 9-16 revolution of wheel is to 1 revolution of wheel as 1 revolution of crankshaft is to number of crankshaft revolutions to revolve wheel once, or:

9-16 : 1 :: 1 : X or, $9X = 16$ and $X = 1$ 7-9.

This gives a gear ratio of 1 7-9 to 1. You have probably erred in your observation and ratio is 2 to 1. This would mean that your wheel revolves once to a revolution of the crankshaft instead of 1 1-8.

2—A change in gear ratio would not affect horsepower delivered by motor. When the gear ratio is made lower you will not have to shift as often.

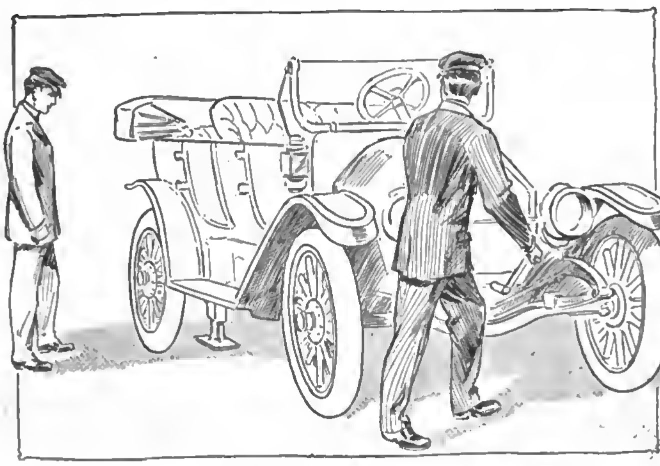


Fig. 1—Determining the gear ratio with one wheel jacked up. Differential causes the wheel to revolve twice as fast as if both wheels were jacked up

Changing Manifold Design

Editor THE AUTOMOBILE:—I have a 1913 five-passenger car, four cylinders, bore 3.25 inches, stroke 5 inches and it does not seem to have the power it should have, especially on an upgrade. I have changed the style carbureter to an old standard make and that made a great improvement, but I still have to drop to a lower gear on an upgrade. I thought of shortening the intake manifold, which is 11.75 inches almost straight up, about 1.5 inches, this I think is quite a draw. Would you advise this shortening? It will not interfere with the gravity feed to the carbureter.

Bayonne, N. J. OLD SUBSCRIBER.

—If you can change the manifold of your car without affecting the feed of the gasoline to the carbureter it would be a good idea to do so. It is an advantage to have the carbureter as near the engine intake as possible because it cuts down the recondensation of the gasoline in the upper part of the manifold. This is great source of power loss and hence should be avoided if possible. If the gasoline tank is carried fairly low however, it will be impossible to make the change in the manifold length because it will lift the carbureter to such a height that when the gasoline supply is low and the car is on a stiff upgrade it will be impossible for the gasoline to flow from the tank to the carbureter. You can get around this by changing the location of the tank also if so desired. If the tank is swung on the rear of the car as in some makes that are still using gravity feed it would be well to change the location to a point beneath the front seat or under the cowl. Generally when the tank is carried on the rear of the car the gasoline is fed to the carbureter by a pressure system of air taken from the exhaust pressure or from the compression pressure in the cylinders.

When the gasoline leaves the carbureter it is atomized and is in such a condition that it is very readily vaporized. When it comes in contact with the walls of the manifold, however, there is a marked tendency for the gasoline to go back to a globular state. This means that the gasoline will enter the cylinders in a condition that is very bad as far as securing the maximum power is concerned. The evils of gasoline in globular form may be readily determined by analysis of the exhaust gas products. It will be seen from this that the unburnt products thrown out of the cylinder are higher in percentage than when the gasoline is fully vaporized.

Had Hot Engine, No Spark

Editor THE AUTOMOBILE:—After a 20-mile run with a Ford T, I had much difficulty in starting. Could find nothing wrong, but had no spark. A bystander said that was a frequent occurrence with a hot engine. Was he right? In that event would the use of batteries be advisable?

Dixon, Cal. A SUBSCRIBER.

—The bystander was wrong. It is much easier to start a hot engine than a cool one. The trouble was probably that the spark-plugs were full of soot or that the magneto needs recharging. The plugs should be cleaned regularly or else they will become foul and it will be impossible for the spark to jump the gap across the points. After a time the magnets in a permanent magnet machine become weak. When this occurs the current generated at low speed is so slight that it does not furnish a hot spark. It would be best for you to take the car to the nearest Ford service station and have the magneto examined with a view of finding out whether the magnets need recharging. It would also be a good idea to go over all the wiring to see if there are not some terminals which are fastened so loosely as to be a source of loss of the electric current.

Good Oil for Northway Motor

Editor The Automobile:—What are proper specifications for oil to be used on 40 horsepower Northway motors? We have been very much interested in your oil tests and before giving our contract for this year would like your advice on an oil suitable for our use as we use quite a little and have had trouble with some makes of oil running uniform one barrel good and next barrel no good.

2—Kindly tell me the difference between a three-quarter floating and a floating rear axle?

Coatesville, Pa. W. G. Y.

1—Specifications for a good cylinder oil such as laid down by the Society of Automobile Engineers are as follows:

Specific gravity ....28 to 32 Baumé
Flash point above ....400 degrees
Fire test not less than............450 degrees F.
Viscosity at 100 degrees F. Sayboldt meter not over 300 seconds.
Viscosity at 210 degrees F. Sayboldt meter between 40 and 50 seconds.
Carbon residue not over ....50 per cent.

2—As far as actual performance and working stresses are concerned the three-quarter floating axle is the same as the floating. In the floating axle the end is free from the wheel and by simply removing the hub cap the axle can be withdrawn while in the three-quarter floating axle, the axle shaft is keyed to wheel. In the latter axle the wheel and axle shaft can be pulled out together. The weight of the vehicle is carried in both cases by the axle housing.

Suggests Revolution Counter

Editor The Automobile:—Engines are designed to get best results, power, economy, wear, etc., at what may be called a normal speed or revolutions per minute. So why not have an indicator on dash or somewhere in sight, showing what the engine is making as to revolutions, just as on a steamboat? Most amateur drivers have no idea of the speed at which the engine is turning.

New York City, N. Y. F. H. Hobbs.

Wants Electric Light on Car

Editor The Automobile:—What are some of the best independent electric lighting systems which can be installed on a motor? My car is a 1912 Overland, Model 60 F.

2—What candlepower globes are best for the headlights? I expect to do some country-road work. What power globes for side and tail lights, also for small dash lights?

3—What will be the current consumption of the lights you suggest?

4—What style and size of lights would you suggest?

5—What will be the approximate cost of this system?

6—What should it cost to have an 80 or 100 ampere-hour storage battery charged?

7—Would it be possible to charge such a battery off a 200-volt D. C., and how would one go about it to cut down the current?

Lincoln, Neb. C. J. F.

—1—Any of the independent generators which are now on the market will render sufficient current to operate a lighting system for your car. It should be installed by an expert, however, as it is necessary to fit a regulating device in order that the

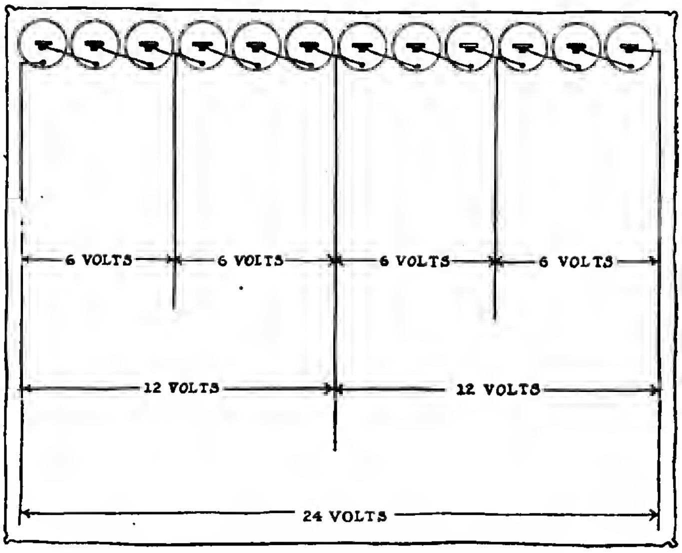


Fig. 2—Wiring twelve 2-volt cells for reduced voltage

voltage delivered by the generator will be practically constant at all speeds. This is an absolute necessity in order that the charging rate of the storage battery be correct or in order that the filaments of the light will be protected against the possibilities of blowing out on account of excessive electric pressure. In case you desire to fit a storage battery and lamps without a generator this is also possible and may be done by yourself. This will avoid the necessity of fitting any extra parts to the car or motor in order to drive the generator but will involve the trouble of charging frequently.

2—The headlights could be 21 candlepower each, the sidelights 3 candlepower and the tail light 2 candlepower. The dash lamp could also be 2 candlepower.

3—With the head and tail lights lit, 44 candlepower would be produced with a 6-volt current at 7.42 amperes. With side and tail lights 8 candlepower would be produced at a current consumption of 1.68 amperes. With all lights lit 50 candlepower would be produced at 8.68 amperes.

4—Six-volt lamps of the above candlepower would be good because they are standard and can be secured anywhere.

5—The cost would vary according to the battery and fittings. It is impossible to state a definite figure without knowing details.

6—The cost for charging an 80-ampere hour battery is 50 cents.

The cost for charging a 100 ampere-hour battery is also 50 cents In either case 25 cents is charged should it be necessary to add water.

7—You could use the current supply you mention very well by simply inserting a rheostat in the line to reduce your voltage to about 12 at an ampere flow of about 16 in the case of one type of well-known battery. It will be necessary to follow the maker's instructions exactly as regards charging rate. The rheostat to take care of this work would cost about $25.00.

Fuel for Racing Cars

Editor The Automobile:—What ingredients and what proportion do racers use for fuel in racing? Is it injurious to the motor? Where on a Ford car should open ports be put in? What are the advantages of open ports in racing? How could the holes be plugged? What is a good make of carbureter to use in speed work?

Carsonville, Mich. R. A. McGregor.

—Racers with rare exceptions are using ordinary gasoline of about 65 test. The days of doped fuel are past and discountenanced in racing circles. Open ports act as an auxiliary exhaust valve to clear the cylinder much quicker than would be possible with the one exhaust valve. The open port valve has also been practically abandoned. The port is placed in the cylinder at the bottom of the stroke so that when the piston reaches the bottom of the stroke it uncovers the port and allows the gases to escape quickly. The area of this port should be about the same as the area of the exhaust valve. The height of the port in the cylinder wall should be such that the piston uncovers the port simultaneously to opening the regular exhaust valve.

Wiring for Reduced Voltage

Editor THE AUTOMOBILE:—Is it possible, and if so, how are the connections made for a storage battery of 12 cells to be at the same time:

Connected in 1 group, 12 cells in series, giving say 24 volts.

Connected in 2 groups in parallel, 6 cells in series in each group giving, say 12 volts.

Connected in 4 groups in parallel, 3 cells in series in each group, giving, say 6 volts.

Several of the wiring diagrams in connection with self-starters you have recently published seem to call for this arrangement in whole or in part. To the amateur it seems an impossibility to be done without the aid of a pair of wires from each cell to a controller and I see no mention of that. It would seem in the absence of further explanation that once connected as above in four groups in parallel that the addition of other connections to put these groups in series would be useless; that current would continue to take the shortest path and only give the 6 volts.

New York City. D. W. SEAVER.

—The arrangement of the wires is that shown diagrammatically in Fig. 2. In a 24-volt storage battery all that is necessary where a current of 12 volts is required is to wire in such a manner that half the cells are in use. In the illustration the cells are shown as if they were ordinary dry cells. The same rule applies to the storage battery, however, the wiring being taken off half the cells to secure two 12-volt lines. When 6-volt lines are required the 12-volt lines are divided in the same manner as the 24-volt line is divided by taking one wire from the center of the cells making up the voltage to be divided. In the same way any dry battery may be subdivided.

Grease Leaks Into Crankcase

Editor THE AUTOMOBILE:—Will you please tell me how to prevent heavy oil or grease working from timing gear case into crankcase on a model K Pullman motor? I am sure there is no way except through front crankshaft bearing. The cases are packed with a fibre paper packing, the front bearing cap has felt packing between that and case. Therefore it must work through bearing. This causes the motor to be plugged full of carbon about every 500 miles.

Hammondsport, N. Y. I. J. BRUNDAGE.

—It is practically impossible to prevent a leakage of grease from the timing gears into the crankcase. As you state, it works through the bearing and therefore no amount of packing will help the situation. The only answer to the problem is to lubricate the timing gears with the same lubricant that you use in the cylinder. If you are troubled perpetually by the leakage of the grease into the crankcase the best thing to do would be to tap a lead into your oil pump line and allow the lubricating oil to circulate into the timing gear case. The overflow of the oil from the timing gear case should take place from a spot above the line of mesh with the gears so that they run submerged. The overflow of oil passes into the crankcase and mingles with the oil there.

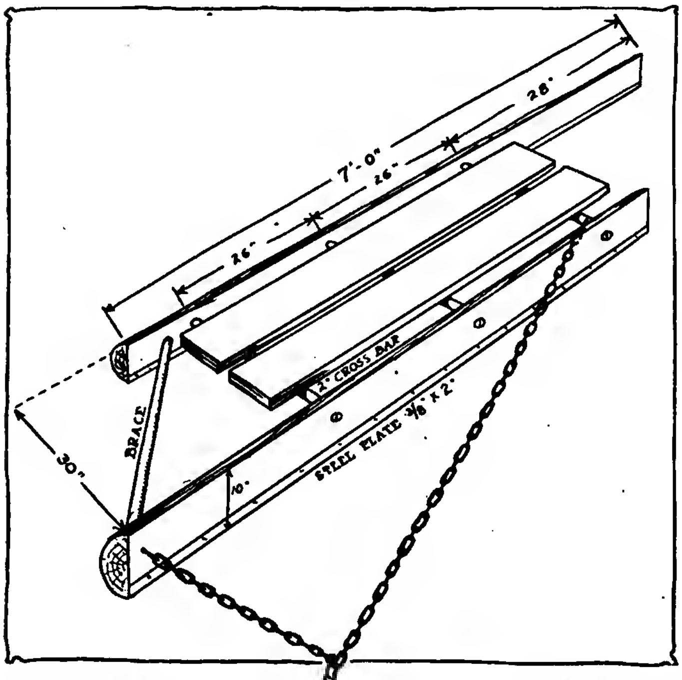


Fig. 3—Correct dimensions for split-log drag, showing construction

How to Inclose Valve Action

Editor THE AUTOMOBILE:—May the following be classed as a new one? The writer thinks there are many owners of old cars without inclosed valve stems, who would be glad to know a simple, cheap and quick method of silencing valve action and keeping out dust and dirt. See Fig. 5.

Take an ordinary paper tube such as is used for mailing drawings, blueprints, or calendars, and cut to proper length, make tight fit lengthwise, split tube its full length and spring it around the valve stem and spring, close with a wire or better a light hose clamp. Paint the tube black or aluminum and there you are, dust proof and sound proof. Cost about 10 cents, labor one hour. To keep tube from becoming oil soaked shellac or varnish inside and outside before putting in place.

New York City, N. Y. OLD TIMER.

—This is not only a new one, but if carefully done should be a very useful tip.

Split-Log and Plank Drags

Editor THE AUTOMOBILE:—Would you kindly tell me the difference between the split log and the plank drags? I understand that both of these are used with great success on dirt roads and as there is a stretch of bad road in this vicinity that we would like to smooth out, I would like to see an illustration of both these drags in order to determine which would be easier to construct. It would also help if you could furnish the dimensions recommended by the best makers of these devices.

Danville, Va. READER.

—The two forms of drag are very much alike except that, as the names imply, one is made from planks and the other from a split log. The two devices are shown in Figs. 3 and 4. The details of their construction can be gathered better from these illustrations than by any other means. They are very useful for dirt road work and when frequently run over the road render it superior to many of the artificial surfaces.

Installing Lighting System

Editor THE AUTOMOBILE:—I would like to equip my 1910 model 17 Buick with electric lights, two 16-candlepower headlights, one 2-candlepower for rear. Could I light them from an 80-ampere, 6-volt battery? If so, how long would it light without having to be recharged? I am using a magneto on a stationary engine which puts out 14 volts. Would it charge the battery? How long would it take? What is the life of a battery?

Sutherland, Iowa. LAWRENCE FLINDERS.

—It would be possible and practical to run your lighting system from an 80-ampere-hour storage battery and light your head and tail lights. That is provided you have some source handy from which to recharge the battery. The battery would last approximately 14 hours with the tail and headlights burning and 225 hours with just the tail light.

The magneto of which you speak cannot be used to store the battery. A magneto generates an alternating current and therefore cannot be used for storing the battery. A study of the four articles on electric lighting and cranking appearing in issues of January 16, 23, 30 and February 6 will make this matter clear.

The life of a storage battery is indefinite. It will last as long as you give it proper care.

New Carbureter on Hupmobile

Editor THE AUTOMOBILE:—I have a Breeze carbureter on Hupmobile. Will another make carbureter do better? If so, what make?

2—Will a fan be an improvement on the machine?

Jamestown, N. Y. CHAS. J. NORQUIST.

—1—The Breeze carbureter should give you entire satisfaction with the Hupmobile car. There is no necessity of changing unless you wish to experiment.

2—The fan in the Hupmobile is contained in the flywheel and is sufficiently efficient unless you have some extraordinary work to do. If it is necessary to be perpetually climbing on low gear, the addition of another fan would help to keep the motor cool.

Use of Condensed Gasoline

Editor THE AUTOMOBILE:—Kindly inform me what difference there is between gasoline refined from crude oil and that condensed from natural gas, as applied to its use in motor cars?

I can buy 76 actual test gasoline, condensed from the natural gas at the wells, for about the same price as I am now paying for 54 gasoline refined from crude oil.

What changes, if any, should be made in the carbureter. Will this condensed gasoline be in any way harmful to the cylinders or other parts of the engine? In fact, I should like your opinion as to the apparent benefits to be derived from this condensed gasoline.

Is gasoline distilled from natural gas more dangerous to handle or use in an automobile engine than the same test gasoline refined from crude oil, and why?

Chicao, New Mexico. W. H. DAVIS.

—Any hydro-carbon that you can burn will be good to use in your carbureter. The lower the gravity of the gasoline that you can burn, the more power your motor will develop because there are more heat units in the heavier gasoline. The refined gasoline would be better because there is more power in it. There is no danger in handling the condensed fuel as it is not brought into actual contact with flame. It is very volatile and hence must not be brought into a room with any other artificial light than electricity. The condensed fuel would not harm the engine or the carbureter.

It would not be wise to mix the two fuels because they are so different that the more volatile condensed fuel would be evaporated quicker and would leave the other fuel behind. The whole matter lies in the one rule of handling the lowest gravity fuel that you can successfully run through your carbureter.

Has No Cylinder Compression

Editor THE AUTOMOBILE:—I ground all my valves and timed same properly, decarbonized the cylinders with Presto-carbon remover, let each cylinder application stay in one hour and noticed there was no apparent leakage either at valves or around the piston, so I took it for granted that my rings must be all right. I tried all cylinders one at a time with a compresso-meter gauge, three cylinders had only 15 pounds, two had 40 and one absolutely none.

The engine is of the Premier make 6-60 and runs only 900 miles. The only trouble I have had is that one of the pistons seized and I think possibly it may have been the very one that now has no compression.

Bangor, Me. P. R. WILEY.

—It is very possible that the cylinder in which the piston seized has been spoiled. It might be that it will require reboring in order to restore it to proper condition. It is stated by those using liquid carbon removers that compression is generally low for a short time until the motor has been run for awhile.

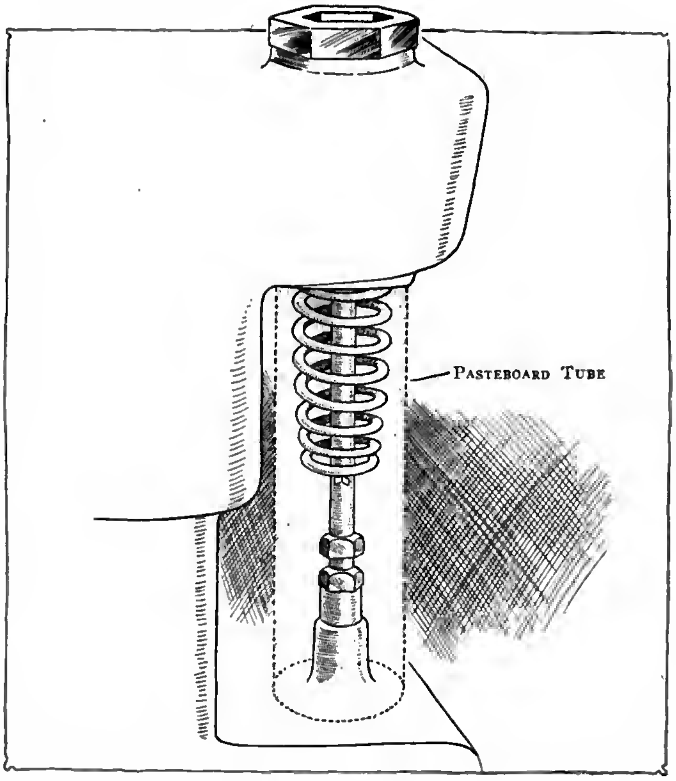


Fig. 5—Inclosing valve action by means of pasteboard tube

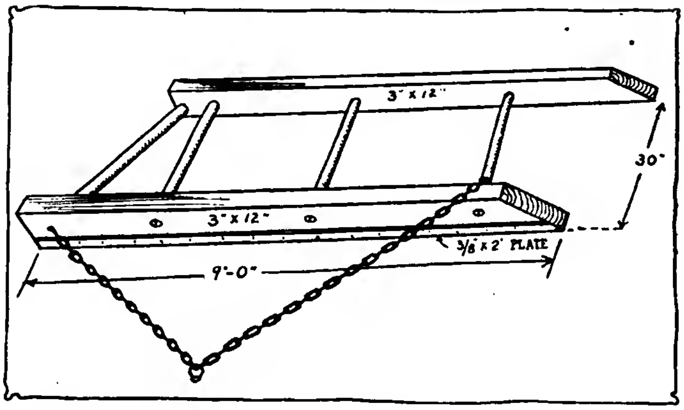


Fig. 4—The plank drag, a parallel to the split-log drag

It then improves. You should have the defective cylinder examined after running for 200 or 300 miles and seizing if conditions did not improve at the end of that time. The rings may possibly have become lined up so that the slots are opposite each other, allowing the compression to leak through the resulting groove.

Roads from Florida to D. C.

Editor THE AUTOMOBILE:—Being a reader of THE AUTOMOBILE, I take the liberty of asking you to send me any data you may have regarding the roads between Florida and Washington, D. C., as I am now touring in Florida and wish to drive there on my way home to Rochester, N. Y.

Daytona, Fla. WILLIS N. BRITTON.

—The roads along this route are better than they ever have been but it must be particularly emphasized that this statement does not mean very much. There are some very bad stretches of sand through Georgia in the neighborhood of Atlanta and Augusta. In Florida also there is much sand. The first part of the trip fair roads may be expected. At this time of the year the best course lies through Richmond, Raleigh, Pinehurst and Condon. Between Raleigh and Pinehurst some good stretches may be expected.

Demountable and Quick Detachable Rims

Interest in These Types of Rim Has Grown to an Unprecedented Extent During the Past Year and the Various Makes Were Very Much in Evidence at the Recent New York and Chicago Shows

ONE of the developments of the past year sufficiently noteworthy to be dignified as a tendency in automobile construction is the use of rims specially designed to facilitate the removal and application of tires, or, in other words to minimize the roadside troubles of the automobilist. These devices may be classified under three heads: First, the detachable type, in which the rim is arranged permits of removal of the tire without the physical effort required by the old style clincher rim; second, the quick detachable, in which the inner bead ring is secured in place by means of a locking ring, and third, the demountable type, in which the rim may be removed from the wheel.

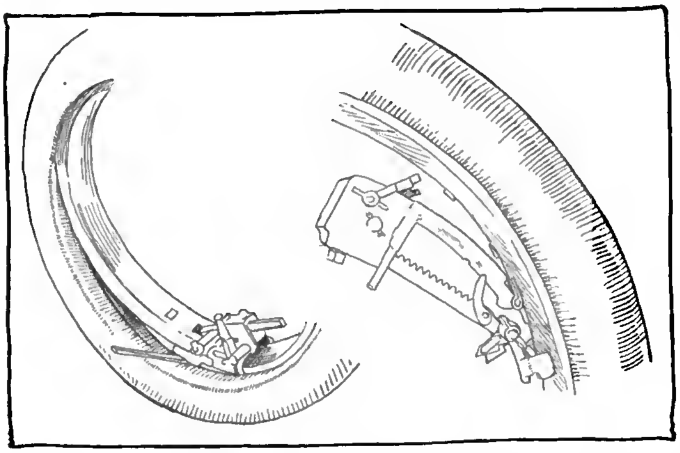
There are three classes of detachable rims—those in which two sections separate and allow the tire to be removed; those in which one side ring of the rim may be expanded and removed, as distinguished from the quick detachable type with its locking ring; and those of the expanding type which may be contracted to allow the tire to slip over the side rings. Specific advantages are being claimed for each of the three types.

Quick detachable rims may be classified as of three types, straight-sided, clincher and universal, which will take either straight or clincher tires, though there are a few special types such as the old-style clincher, in which inner lugs secure the tire to the rim, and the Fisk bolted-on type, which is fastened by bolts through the heavy tire base. Each of the latter types is used on demountable rims.

The most common variety of demountable rim is that in which bolts hold the rim in place on the wheel, the number of bolts used varying with the different makes of rim. Sliding lugs held in place by the bolts are sometimes employed to secure the rim, while in some the bolts hold wedges which, besides preventing side motion of the tire, expand it to set firmly.

In some rims the wedges are short and correspond with the bolts in number. In others the wedge is in the form of a single ring which it is necessary to remove before demounting the rim. In some cases, the wedge or wedges engage only one side of the rim while in other constructions they act on faces on both sides of the rim.

At the automobile shows an unusual amount of interest was shown this year regarding the various types of rims, in how little time they could be removed and replaced and in the principles of operation. In fact, so pronounced has been the demand for something of this sort to lighten the burdens of the puncture-provoked automobilist. Some of the leading devices for 1913 are briefly reviewed herewith, being taken up in alphabetical order for the most part throughout the descriptions, although for various reasons it was not practicable to do so in every single instance.



Segments of Booth demountable rim, showing the new power tool, which is a development of the past year

Alpha—Unusual Ring Operation

The demountable rims made by the Alpha Rim Company, New York City, consist of but three parts, the rim proper, the felloe band and the expanding flange ring. The felloe band is permanently fastened to the felloe and its back face is beveled while there is an annular channel on the front. This channel contains an expanding ring, which, contrary to usual practice, contracts to permit the removal of the rim from the wheel and expands to lock it in position. The rim is of the split type and is provided with two lugs which pass through the felloe band, being permanently connected by two toggle levers which are jointed together, the smaller having a square socket. The device is operated by inserting a special tool of simple design in this aperture. When the toggle is expanded it lies close to the rim where it is out of the way and self-retaining. It is the off-center position of the toggle when locked which comprises the locking feature, the tightness of the levers increasing in proportion to the increase in the strain on the locking ring.

The rim is of the ordinary clincher type and is provided with two bevels on its inner surface, one to correspond with the back bevel of the felloe band and the other to engage with the locking ring. To dismount the rim, the tool is inserted in the square socket and turned down. This contracts the ring, permitting the rim to be removed from the wheel.

Ashley—Novel Locking Attachment

The Ashley wire wheel has a demountable rim which is carried upon a felloe band, the principal novelty of the device consisting of the locking attachment. The rim is pushed onto the felloe band where it rests on a raised bead at the back. The front side of the rim contains a groove and in the felloe band, fitting into this groove, there is a split ring which is contracted or expanded by turning a toggle nut. By tightening the nut the two small lever arms, which are seen in the illustration, cause the ring to move laterally.

Baker—Adds a Bolt for 1913

The Baker bolted-on demountable rim consists of a permanent rim shrunk onto the felloe and a split rim which is held in position on the permanent rim by means of six bolts and wedges. Last year only five bolts were used per wheel. Five are still used for wheels under 36 inches but most of the wheels fitted with demountable rims are no smaller. The rim cannot stick to the wheel after the bolts are backed out and the wedges are turned out of the way. A sleeve forces the wedge out when the bolt is backed off which prevents sticking of the wedge. There is also a space of .192 inch between the rim and the wheel band which keeps the rim from sticking on the wheel. The inner tube is passed through the split ring, the split occurring close to the valve. On either side of the split there are two bosses and the rim is held rigid by means of an anchor plate.

Booth—New Power Tool for 1913

Booth rims are continued for 1913 by the Kelsey Wheel Company, Detroit, Mich. With the exception of the development of a new power tool for removal of the tire from the rim, no changes distinguish this year's product from that of 1912. With each set of rims are furnished an extra joint pin and drift pin and a brace wrench. The demounting feature of the Booth rim is as follows: Lugs passing through slots in the felloe band secure the rim to the wheel. Two gears, driven by an irreversible worm, spread the lugs so as to hold the rim firmly in place. In removing the rim the worm is turned in the opposite direction, contracting the lugs so that they may be drawn through the slots. Booth rims are made for either wood or wire wheels and with both clincher and straight-side quick detachable rims.

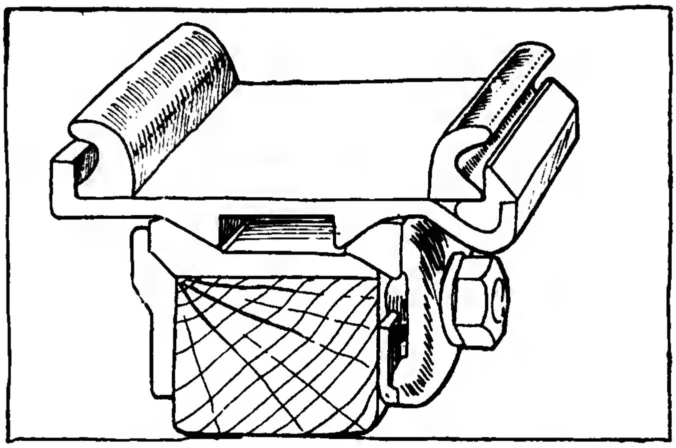
Detroit—Many Improvements This Year

For 1913 many improvements are apparent on the Detroit demountable rims which are manufactured for the Detroit Demountable Rim Company in the plant of the Weston-Mott Company, Flint, Mich. The wedges have been made smaller and more compact than formerly and the number of nuts which it is necessary to loosen before removing the rim has been reduced to four. The bolt has also been turned about so that now it is a part of the rim base while the nut only is operated. When the nuts have been loosened the short wedge members may be pulled outward, permitting the rim to slip over them.

A special type of expanding ring is employed in the construction of the detachable rim. This is locked by a cross-tree which turns to engage two buttons on the inside of the rim. The openings for the buttons are cut at an angle so that as the cross-tree is turned the rim is expanded. Dirt and water are prevented from entering the casing by a small filler segment of the rim which is secured to the locking cross-tree. For contracting the rim if it should become rusted, a special tool is furnished.

Firestone—Q-D Demountable

These rims are of the quick detachable demountable type. The permanent rim is shrunk on to the wooden felloe and is beveled at both sides. The demountable rim is also beveled, one side resting upon the inner bevel of the rim, while the outer bearing is formed by a V-shaped clamping ring being placed in position and held by six clamps and nuts. By removing the nuts and clamps the clamping ring can be removed and the rim with the tire on it changed. The detachable feature consists of two concentric rings, one overlapping the other. The outer ring is split and fits into a depression in the rim. After the tire has been deflated and it is desired to remove the shoe, by pressing the inner ring against the tire, the split ring can be taken away, allowing the clincher side ring to be removed.



Section through Firestone quick detachable, demountable rim, showing bevel feature on permanent and demountable rims

Fisk—Only Three Parts

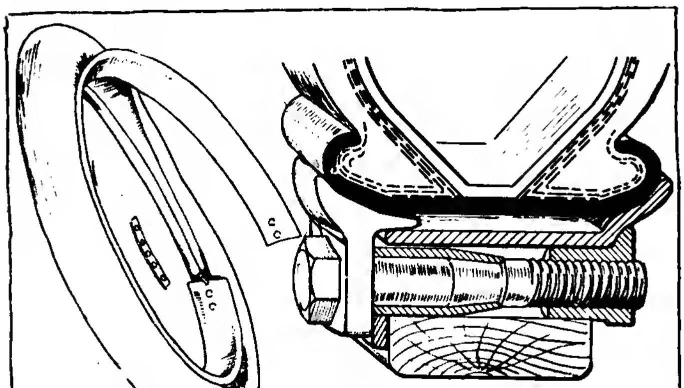
A special rim is necessary for use with Fisk bolted-on tires made by the Fisk Rubber Company, Chicopee Falls, Mass. This consists of but three parts, a felloe band with a wide outside bevel, the flat tire rim to which the tire is bolted and an expanding ring. The latter is of the wedge-shaped type secured by means of bolts through the wheel felloe. A dowel pin, .5 inch in diameter, engages a hole in the felloe band, preventing creeping. An angle valve makes it unnecessary to insert the valve on applying the rim and acts as a protection for the valve.

Funk—Bolted-On Demountable

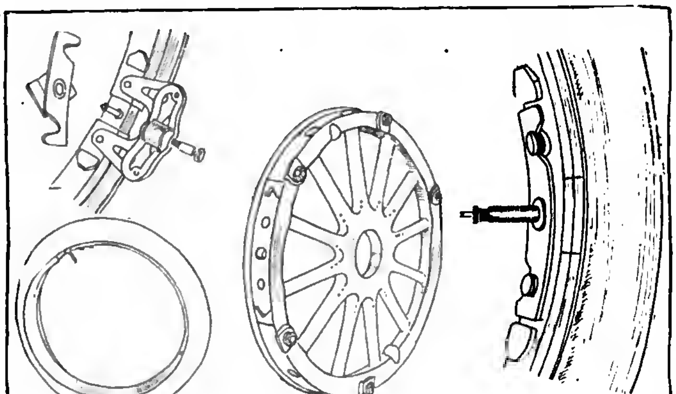
Manufactured by the Englebert Tire Company, New York City, the Funk rim is of the bolted-on demountable type used in connection with the contracting type of quick detachable rim. No filler segments are necessary with this rim as it is of the overlapping contracting variety which, when expanded, forms a complete ring. The rim is secured to the wheel by five bolts and locking lugs, the removal of three of these permitting the demounting of the rim. For removing the tire from the rim a special breaking tool for overlapping and contracting the rim is provided.

Healy—No Felloes Are Used

Rims from the factory of the Healy Rim Company, Brooklyn, N. Y., are distinguished from practically all others in the field by the fact that no felloes are used on the wheel to which they are fitted. They are of the straight-sided, or clincher type, the steel rims being secured to the spokes by means of steel yokes which inclose the ends of the spokes. There are two parts to these yokes, one of the legs being fastened by a bolt and lock washer. Loosening all but a few of the bolts permits of turning the loose



Section through the Baker bolted-on demountable rim, together with view showing removal of tire



Details of the Detroit rim, the view at the upper left giving an idea of the cross-tree used on the expanding ring this year. Turning the cross-tree expands the ring legs of the yokes out of the way and removing the rim.

J-M

The Johns-Manville Company, New York City, has combined demountable and quick detachable features in the J-M rim. The rim and the felloe band are the principal factors in the demountable element. There is a bevel on the back of the felloe band against which the rim is jammed, being locked in position by six retaining lugs on the front of the band. When the nuts on top are loosened and the wheel revolved three of the six lugs drop clear of the rim. Then the nuts are tightened to keep them so and the wheel is turned in the opposite direction. The remaining lugs drop in a similar manner and then the rim may be removed.

There are two parts to the rim proper, the outer being rigid and the inner split. These parts overlap, being held together by dowel pins in the outer ring engaging holes in the inner ring. The tire is removed from the rim by prying up the ends of the inner ring so that it may be slipped off the dowels and the two parts of the rim separated. Among the special features of this type of demountable rims is its light weight.

Lambert

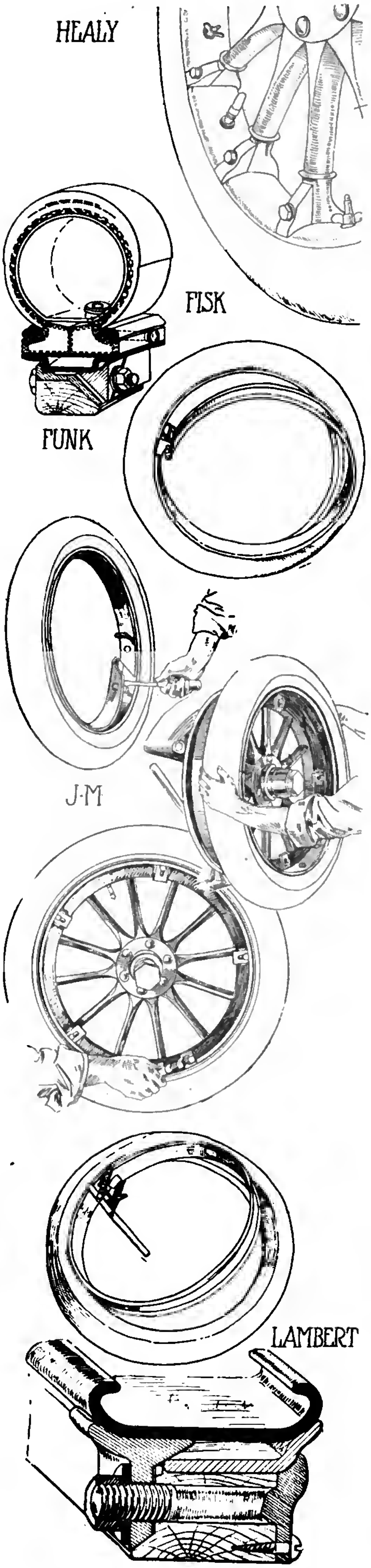
The Lambert rim, manufactured by the American Rim Company, Detroit, Mich., is composed of a felloe band secured to the wheel felloe with a bevel seat for the rim at the back. The operation of demounting is extremely simple, a single nut removed by a socket brace permitting the rim to be lifted from the wheel.

The rim is secured to the wheel at six points, the first being the adjusting wedge which is fastened to the felloe by a bolt. The mounting and dismounting lug is opposite this, being different from the adjusting wedge in that the bolt has a special locking device. This is released by means of the socket brace and automatically locks the bolt on the withdrawal of the tool. Of the four other securing pads, two are fastened to the rim and two to the felloe band.

The dismounting lug is locked by means of a ratchet disk, integral with the bolt head, which is engaged by a spring-actuated pawl on the wedge. There is a flange on the locking bolt which positively forces the rim from its place when the bolt is unscrewed. This is an advantage when the rim becomes rusted. A special tool is used to contract the rim in detaching the tire.

National

This rim is of the quick detachable type and is simple in construction. The main body of the rim is shrunk onto the wood felloe and two endless steel rings are employed. The outer edge of the rim is beveled, thereby facilitating the fitting of a tight tire. The endless rings are reversible and permit the use of clincher or straight-sided type tires. No tools are required in connection with this rim. The rim is punched with ten holes beneath which there are a series of lugs attached to ten pieces of spring steel, which in turn are riveted to the inside of the rim. It is claimed that the internal pressure in the tire forces the outer rim against the lugs, thereby preventing these from moving while the tire is inflated. Upon deflating the tire it is possible to press the lugs back with the thumb and after these have been disengaged the outer rim can be removed from the tire.



Newmastic

The Newmastic rim, manufactured by the Newmastic Company, New York City, was one of the new things brought out at last year's show and was described in THE AUTOMOBILE at that time. It is of the no-felloe type, steel castings on the ends of the spokes directly supporting the rim, being secured to the latter by means of clamps controlled by means of bolts. The great decrease in weight due to the elimination of the felloe is one of the principal advantages claimed for this type of rim, another being that the wheel is automatically reset every time the rim is changed. Either quick detachable or clincher rim may be used. The Newmastic company is now getting ready a new design of rim, specially adapted for tires filled with Newmastic. The purpose of this new rim, which is of the demountable type, is to permit of varying the pressure in the filler. This end is obtained by constructing the rim of two sections or rings which are in wedge engagement with one another and which may be so positioned by manipulating a bolt mechanism that the width of the rim becomes variable. As the width is decreased, the tire filler is thereby put under increased pressure, and vice versa.

Presto

Presto demountable rims, manufactured by the Presto Inter Rim Company, of Boston, Mass., operate by simply pulling down a lever, which expands the locking ring and forces it off. The rim is made in all standard sizes and will fit all straight-side clincher or solid tires. A spare tire is carried upon a rim which fits over the permanent rim attached to the felloe band. In order to hold the demountable rim in position a split rim is employed which fits into a groove and by the aid of a toggle lever, the lugs at the points where the ring is split are drawn together or released, according to whether it is pushed up or down.

Stanweld

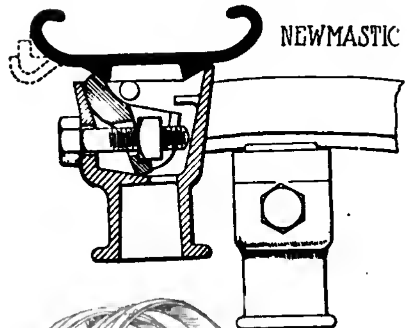
These rims are manufactured by the Standard Welding Company, of Cleveland, O., either in the quick detachable or demountable types for wood or wire wheels. The principle on which the quick detachable operates is as follows: The body of the rim is permanently shrunk onto the wheel felloe and the latest type has two floating rings, having concave and convex sides, making it possible to use either straight-side or clincher tires. The inner side ring is endless, the outer side ring is split transversely and is tongued and grooved into the rim base. The ends on this ring have L-shaped lugs which protrude through holes made in the rim base. The lugs are locked by means of a cam which operates with a lever. The lever forms a latch and is made of spring steel; by removing the latch with the aid of a screw-driver the split ring can be pried off and the tire removed.

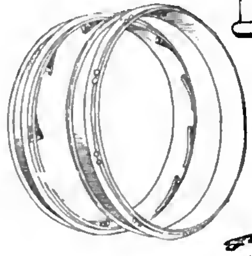
The demountable rim manufactured by this company consists of a rim the base of which is split circumferentially, each section having a series of lugs which are locked together by two semicircular slotted spring rings. One end of each ring is securely riveted to the wider section of the base and the free ends of both rings are locked by means of a swinging latch which in turn is securely fastened by a smaller cam latch. In order to remove a tire from the rim it suffices to press the catch back when the half locking rings can easily be pried away from the main body of the rim. The rim slides over a metal base which is shrunken to the felloe band and securely retained in position by six wedges giving radial and lateral support to the rim.

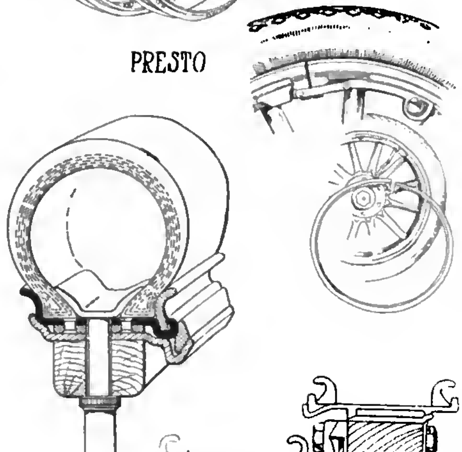
The number 40 Stanweld demountable rim is what is known as quick detachable demountable, it being possible to remove the tire without removing the entire rim as well as to remove the rim with the tire on it. The inner and outer ring can be made to serve for either the clincher or straight-bead type.

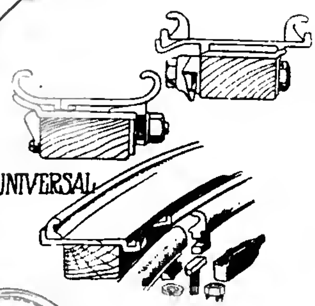
Standard Universal

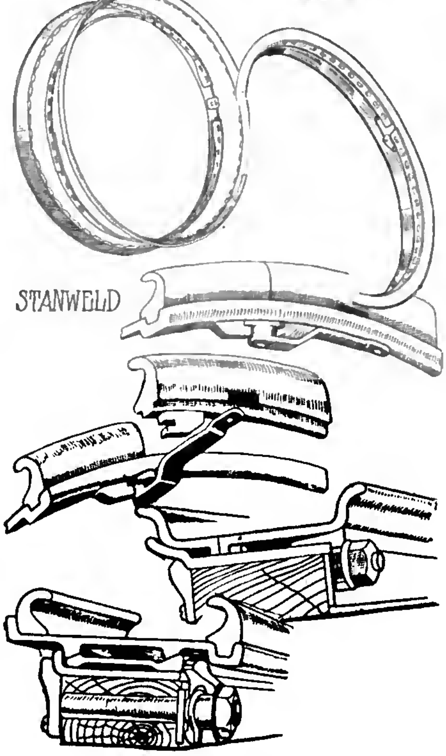
Standard Universal rims are manufactured by the United Rim Company, of Akron, O., in both quick detachable and quick demountable forms. The body of the rim is shrunk permanently on to the felloe of the wheel. The inner ring is continuous. The front side ring is split transversely and is tongued and grooved to the rim body, the ends being held together by means of two L-shaped lugs, a cap and a tee-bolt, all notched into the rim, forming a positive lock. To protect the threads of the tee-bolt, an acorn nut is used in connection with it. The Number 3 quick detachable rim is split circumferentially and the two parts are held together by a series of bayonet hooks on one side with corresponding lugs on the other. In order to prevent rotary motion in opposite directions of the two parts a safety latch is provided and a special tool is used to lock and unlock the rims.











The quick detachable demountable type of rim consists of a felloe band shrunk permanently onto the wooden felloe of the wheel and has at each outer edge a concentric cone section or frustrum which gives continuous support to similar frustrums, on the inner surface of the rim body. The securing device consists of six rotary clamps so designed that two turns of each clamp nut automatically forces the rim home, centers it laterally and locks in position.

Changing to Demountables

Many automobilists who appreciate the convenience of carrying an inflated tire ready to place on the wheel at a moment's notice are changing to demountable rims. These represent not only those who are using the old form of clincher tire but also those who use the more modern quick-detachable rim. The cost of making the change is not very high and amounts generally to only $15 above the cost of the demountable rim.

When the wheelwright gets the order for the change he has to set about preparing a new felloe which will accommodate the demountable form of rim. The felloe for this style of wheel is thicker than the felloe used with the quick-detachable, and, in order to prepare a given diameter wheel for the thicker felloe the spokes have to be cut off all around. It is for this work that the charge is made.

The inflated tire is placed on the spare rim and carried in most cars on a rigid frame fastened to the rear of the chassis. In order to secure a stiff connection and to prevent the tire from wobbling and disturbing the steering of the car, the bracket used for holding the tires is made in a unit with the side frame members. In case of a blowout or other tire disaster it is not necessary to take the tire off the rim or to spend time in fitting on a new tire. The old rim with the damaged tire is simply slipped off and the rim with the inflated tire put in its place. The time of a tire change is reduced from 15 minutes or more, to 5 minutes.

The arduous labor of removing and repumping a tire even on the simplest form of quick-detachable rim will no doubt prompt many to make the change during the coming season. There are many who have wanted the demountable rim which has most of the good features of a spare wheel, but who have not known that it was not only a possible, but a very cheap job, to change over from one type to the other. On cars using smaller tires than the 34 by 4 inch, there is no doubt that the cost would be correspondingly less.

One of the worst features of oversize tires has been the difficulty of changing them. In the demountable rim, however, this work can be done in the garage and not on the roadside under a broiling sun or a pelting rain.

Among the New Books

Many New Technical Books of Interest To Motorists and Others—Good Fiction Also Available

Annual Report of the Smithsonian Institute Contains Many Contributions of Value to Science and Literature

WITH the approach of the delightful spring touring season, which in spite of muddy roads is always one of the most enjoyable of the year, the motorist who takes care of his own car is prone to devour what literature he can lay hands on before starting actual work in preparation for many miles of traveling through the budding country.

The following works which are at the disposal of those inclined to remain in the rocking chair fleet for just a little while longer embrace almost every field from the engineers' handbook to the fascinating fiction which uses the motor car as the basis of its plot.

ANNUAL REPORT OF THE BOARD OF REGENTS OF THE SMITHSONIAN INSTITUTION, showing the operation, expenditure and condition of the institution for the year ending June 30, 1911. Printed at the Government Printing Office, 1912.

This report contains the annual letter from secretary of the Smithsonian Institution, as well as that of the Board of Regents. An outline of the studies taken up through the year is given. A report of the different bureaus showing the progress of researches in the various arts and sciences is also given. Among the interesting papers contained in the report are: The Age of the Earth, Organic Evolution, and Traveling of High Speeds. The latter article being by Hele-Shaw should be of especial interest to automobile enthusiasts.

CHANGE GEAR DEVICES. By Oscar E. Perrigo. Published by the Locomotive Publishing Company, of London. 81 pages, 5 by 8 inches; illustrated by numerous explanatory line cuts. Price, $1.

This booklet deals with the change gear devices employed in driving a lathe or other cutting tool at speeds suitable for the work in hand. The early part of the work gives a history of lathes and lathe development and also a résumé of the more important change gear patents applied for in the early days of lathe history. Different methods are described in full and illustrated by simple diagrammatic drawings.

PETROL AIR GAS. By Henry O'Connor. Published by Crosby, Lockwood & Sons, London. Second edition. 100 pages, with numerous tables, illustrated by electrotypes. Price, 1 shilling, 6 pence.

This work consists of seven chapters and deals on the use of petrol or gasoline gas for lighting and cooking. It is useful from an automobile standpoint in that it gives valuable data on the combustion of gasoline gas, which has come into extensive use for country house lighting.

THE MECHANICAL WORLD POCKET DIARY AND YEAR BOOK FOR 1913. Published by Mechanical World, Emmott & Company, Ltd., 65 King street, Manchester, England. 530 3.5 by 6-inch pages. 6 pence net.

The primary aim of this work is to fill the gap which is bound to occur in the memory of the best of us after leaving college. Various formulæ and tables are given which will be of interest to all those concerned in mechanical engineering. A chapter on gas engines is of interest to those in this line of work. In this chapter are given the different formulæ for the design of crankshafts, bearings, flywheels, connecting-rods, etc.

TEXT-BOOK ON MOTOR CAR ENGINEERING, in two volumes. By A. Graham Clark. Published by D. Van Nostrand & Company, New York. 437 5 by 8.7-inch pages. Cloth, $3.

Taking up the principles and construction of the gas engine in the first four chapters of the book, the author proceeds to give an outline of the entire designing problem of the gasoline engine. The fifth and sixth chapters are devoted to fuels and carburetion, while the seventh chapter deals with thermodynamics of the gas engine. After concluding the general discussion on gas engines and the theories which are an important factor in the design of the gas engine, the author proceeds to take into consideration the construction of such essential parts as the magneto, control system, cooling system, brakes, bearings, etc. The final chapter is devoted to a study of the electric car, taking up especially the suspension of the motors, the construction of the various types of motor and the methods of controlling the various speeds.

THE GASOLINE MOTOR. By P. M. Heldt. Published by the Horseless Age Company, New York City. 506 5 by 8-inch pages; illustrated by more than 300 zinc etchings and several half-tones. Price, cloth, $4, with supplement.

This work is in twenty-one chapters and an appendix. The early chapters of the book are devoted to a theoretical discussion of the fuel and the cycle upon which the motor operates. A chapter is also given on the conversion of reciprocating intro-rotary motion. The balance of motors is also discussed at length. The remainder of the book is devoted to the design of each specific part of the automobile engine and is so arranged that the student may cover the ground at home or the designer may use the work for a handbook in the office. Another volume dealing with the chassis, etc., is to come soon.

FROM THE CAR BEHIND, by Eleanor M. Ingram. Published by the J. B. Lippincott Company, of Philadelphia. 306 pages, with illustrations in color by James Montgomery Flagg. Cloth, $1.50.

A delightful piece of fiction wound around an improbable plot. For summer reading it should be acceptable anywhere. The hero of the story is a wealthy young amateur racing driver who, through a combination of circumstances for which his cousin is really at fault, is forced to leave home in disgrace. At the end of the story, however, his vindication is complete and in the final triumph a very exciting cup race figures in which the Mercury, driven by the hero, Corrie Rose, proves the winner.

A TEXT-BOOK OF PHYSICS. Edited by A. Wilbur Duff; Contributed to by A. Wilbur Duff, E. Percival Lewis, Charles E. Mendenhall, Albert P. Carman, R. K. McClung and William Hallock. Published by P. Blakinston's Son & Company. 680 5 by 8-inch pages; illustrated by 600 line cuts. Cloth, $2.75.

As a text-book this work should be of great use where the more advanced study of physics is carried out. The book is divided into six sections. The first section of the book is given over to mechanics and the properties of matter, second to heat, third to electricity and magnetism, fourth to radioactive developments, fifth to sound and sixth to light. No new theories have been advanced in this work, which is a text-book in all senses of the word. The book is complete in all departments and forms an excellent basis of study to the subject taken up.

BEVEL GEAR TABLES. By D. Ag. Engstrom. Published by the Norman W. Henley Publishing Company, of New York. 65 5 by 8-inch pages of tables and explanatory matter. Price, $1.

The first few pages are given over to a discussion of tooth elements, for both circular and diametric pitches. Construction of bevel gears and a calculation are also given. The main tables, which take up thirty-seven pages, are devoted to the outside diameter, a placing distance outside cone radius, face angle, edge angle, cutting angle and number of cutter.

NATIONAL TUBE COMPANY'S BOOK OF STANDARDS. Published by the National Tube Company, Pittsburgh, Pa., under date of 1913. 558 4 by 7-inch pages. Price, in flexible leather binding, $2.

In this edition of the handbook, which is much larger than those issued by the National Tube Company, all the dimensions and data pertaining to tubular goods are given. A glossary of terms, which covers thirty-eight pages, is also given. The data secured in the work has been taken from reliable engineering sources and should be exact.

Motor Fuel Engages Attention of Indiana S. A. E.

INDIANAPOLIS, Ind., Feb. 24.—One of the most interesting meetings the Indiana branch of the Society of Automobile Engineers has held in many months was that at the Claypool Hotel in this city last Tuesday night. There was a large attendance and the subject was Motor Fuel. The principal speaker was John A. Secor, expert with the M. Rumely Company, Laporte, Ind., manufacturers of an oil tractor.

William G. Wall of the National Motor Vehicle Company arranged the program and to him is due the credit of obtaining Mr. Secor to address the meeting. Mr. Secor's subject was Kerosene Engines, and he spoke in part as follows:

The power-driven vehicle can no longer depend on its present fuel. The demand for gasoline has overtaken production. During the last decade the oil market has been readjusting itself to radically new conditions. This has been brought about by many new applications of oil products for developing heat and power. Crude oil was formerly looked upon simply as the raw material for the production of illuminating and lubricating oils.

The introduction of the Daimler motor opened up an entirely new market for the lighter oils, gasoline and naptha, which developed within the short period of 10 years into larger proportions than the most optimistic oil man ever dreamed of. Under these conditions the inexorable law of supply and demand brought about a price level for the volatile distillates far in excess of former values.

Advance Due to Inevitable Law

United States government reports show that the advancing price of gasoline is due solely to the laws of supply and demand. No corporation or combination of corporations is responsible for the fact that demand has overtaken production, and that further increases in price are now impending.

American gasoline and naptha were formerly obtained solely from high grade paraffine crudes of Pennsylvania and Ohio. These are the most valuable oils in the world, and highest grade Pennsylvania crude now actually brings the same price as refined kerosene in bulk.

But unfortunately Pennsylvania production has fallen from 33,000,000 barrels in 1891 to about 9,000,000 barrels at the present time. However, at present prices even this decreased production represents over $18,000,000.

Ohio has decreased in production from 24,000,000 barrels in 1896 to less than 9,000,000 barrels during the year last past.

Again, the zenith production of Indiana was in 1904 over 11,000,000 barrels but the present yield shows a shrinkage of nearly 90 per cent. from maximum.

The United States Geological Survey states that the general decline in production "would doubtless have been much greater but for the effort to apply laws of supply and demand by increases in prices. Prices advanced so greatly during the year as to stimulate drilling, even in the old New York and Pennsylvania pools, and so checked the decline. Formerly this plan has not been so successful. In the mid-continent fields also it checked the decline, so that the product will come within 4,000,000 barrels of the maximum output.

Canada also has fallen off one-third from her highest production of 5 years ago, and the only new field in sight is Tampico, in Mexico, which has grown from nothing 3 years ago to 6,000,000 barrels in 1912.

About the only home fields not showing decreased output are in California and Oklahoma. Three-fifths of the total yield now comes from these two states. And even the increased output of Oklahoma was insufficient to prevent a continuous reduction of stock on hand in 1912. Ninety per cent. of the entire output of more than 220,000,000 barrels were crudes which yield a very low percentage of gasoline.

The following market prices of Eastern, Mid-Continent and Western crudes are fairly indicative of their relative gasoline content:

State	Per Barrel
Pennsylvania	$2.05
Indiana	1.23
Oklahoma and Kansas	.83
California	.35

These prices of crude oil were correct as of January 25, 1913. Since that time Pennsylvania crude oil advanced 7 cents a barrel on each of 3 successive days, standing now at $2.50, and $3 oil is freely predicted.

In order to obtain a single gallon of gasoline from refinable California petroleum, it is necessary to produce as by-products 9 gallons of kerosene and 30 gallons of residual oils. Notwithstanding the steadily increasing output of Western oil the price of gasoline on the coast continues to advance. It is now 30 cents per gallon at retail.

There are five different methods of increasing the normal visible supply of gasoline.

One is importation. The Standard Oil Company has imported some Russian naptha, but Russia has no more to spare, as her own soil output is diminishing to such an extent as to increase the price 100 per cent. in the last 2 years, and to warrant the Russian Government in the promotion of alcohol production.

Another and more promising means of obtaining gasoline is by increasing the total yield of American crudes. A yearly production of 300,000,000 barrels in the United States is probably being approached faster than even oil men generally believe. But the largest increase in the production of gasoline in one year has never been more than 5 per cent. while the production of power-driven vehicles will, in all probabilities, represent an increase this year of around 100 per cent. Furthermore, as already shown, the supply of gasoline yielding crudes is rapidly decreasing and the increased crude output will consist of Oklahoma and California asphalt oils, having insufficient gasoline for existing requirements.

The third means of supplementing the gasoline supply is the production of gasoline from kerosene. Chemists have known for some time that it was entirely feasible to extract gasoline from the chemically complex kerosene; as well as from coal, coal tar and even wood; it is simply a question of cost and of the profitable disposal of resultant by-products. Gasoline is now being made from kerosene in increasing quantities.

A fourth source of gasoline supply is its manufacture from natural gas by compression, and its subsequent condensation to a liquid form. It is claimed that this process produced 13,000 gallons in 1910, which was increased to 50,000 gallons in 1911 and about twice as much in 1912. Some of the richer gases produce as much as 8 gallons per 1,000 cubic feet but the average is from 3 to 5.5 gallons. By triple and quadruple compression up to pressures as high as 400 pounds, very light liquids up to 85 degrees Beaumé are produced, these being slightly more stable than the products of fractional distillation.

Lowering the Beaume Gravity

The fifth and last means of increasing the available gasoline supply is by lowering its Beaumé gravity. It is probable that the specific gravity of commercial gasoline will be dropped another notch by next summer. Much of the liquined-gas gasoline is used for blending with heavier distillates, and it naturally requires other than gravity tests to determine the characteristics of such blended gasolines.

Mexico a Source of Fuel

During 1912 Mexican Oil Fields Produced 15,200,000 Barrels of Oil—One-Sixth Available Output

TAMPICO, MEX., Feb. 24.—In view of the enormous increase in the consumption of gasoline as a result of the automobile industry and the general development of the uses to which gasoline engines are being put, a review of the possible sources of supply of the crude oil is probably of interest at this time.

Much of the Mexico oil is not of a refining grade, but it is a fact that at least three of the greatest producing fields in the Tampico region are now gushing forth oil of 20.5 degrees Baumé and that the oil of another one of the fields is 28 degree Baumé, while that of the Isthmus of Tehauntepec is 40 degree Baumé. All of these are oils that can be refined.

Only Part of Possible Production

During the year 1912 the Mexico fields produced approximately 15,200,000 barrels of oil, which was about one-sixth of the available output of the wells. This production may be regarded as remarkable in view of the fact that the transportation and marketing facilities are as yet very limited and the known oil-producing territory in a comparatively small state of development. The production for the year was confined practically to two of the larger companies and their allied interests. These are the Mexican Petroleum Company and its subsidiary, the Hausteca Petroleum Company, and what is known as the Pearson interests, comprising the English firm of S. Pearson & Son, Ltd., and the Mexican Eagle Oil Company. While there are more than forty companies, firms and individuals now operating in the East coast territory situated within a range of 160 miles of the port of Tampico, only a few of these concerns are on a producing basis so far as the actual marketing of their product is concerned. While the output of the different fields in the Tampico region for 1912 aggregated approximately 15,200,000 barrels, this production only represents a comparatively small part of what is now available.

It is claimed that there are enough producing wells capped, owing to the fact that there is not at this time a means of transporting the oil to market, to have brought up the yield for the year to perhaps six times what it was. In proof of this statement it may be cited that two of the wells which afforded, during the year, the bulk of the total yield were only permitted to flow a small portion of their capacity and that had these two wells alone been thrown wide open they would have given a total output aggregating, it is said, probably fully 90,000,000 barrels of oil. Of course, this is not taking into consideration the possibility that their flow might have been exhausted had this been done. One of these wells is that of the Mexican Eagle Oil Company situated in the Potrero del Llano field, State of Vera Cruz. While it has a proved flow of 110,000 barrels per day, it was kept throttled down during the year to a production of only about 15,000 barrels per day and difficulty was experienced in taking care of this quantity of the fluid. The other phenomenal well is that of the Hausteca Petroleum Company situated in the Juan Casiano district and having an available daily output of about 100,000 barrels, it is claimed, but which was held down to a flow of 28,500 barrels daily. This latter well has been flowing at that rate for nearly 3 years without a single day of interruption.

In the Juan Casiano field the Hausteca Petroleum Company has eight capped wells which have an aggregate capacity, it is pronounced, of more than 16,000 barrels daily. It is now drilling several other wells in that field. This company and the Mexican Petroleum Company had in storage on January 1, 1913, approximately 7,000,000 barrels of oil. Their contracts during 1912 called for a daily delivery of 30,000 barrels and the two companies entered the new year with outstanding contracts aggregating 60,000,000 barerls, of which 35,000,000 barrels are for consumption in Mexico and 25,000,000 barrels for consumption in the United States. The average selling price of the product is 50 cents gold per barrel. During 1912 the sales of these two companies were approximately 8,700,000 barrels, or about 700,000 barrels per month. This is just double the sales of the two companies for the year 1911.

The Mexican Petroleum Company is having constructed and will place in service during the first 6 months of 1913 six oil-tank steamers, two tugs, two barges and other floating equipment. The cost of providing this fleet of oil-carrying vessels, which will have an aggregate capacity of about 275,000 barrels, will be about $2,000,000. The company has also adopted plans for erecting a refinery at Tampico for the production of naphtha and light gasoline distillate at a cost of about $300,000.

During the year 1912 the Hausteca Petroleum Company completed the construction of an additional oil pipe line from Juan Casiano to the loading racks at its deepwater shipping point. It also finished the construction of a private narrow-gauge railroad giving the oil field a transportation outlet of this character. It is now constructing a railroad from Cerro San Geronimo to Cerro Azul, and is laying pipe lines from Juan Casiano to Cerro Azul and to Tres Hermanos.

The Mexican Petroleum Company was also active during the year in exploiting other localities and it carried on some small development work in its original field at Ebano, where it has a small refining plant that is devoted chiefly to the production of asphaltum residue that is used largely in street paving in Mexico.

The Pearson interests brought in eight wells in the Potrero del Llano field during the year, but they are all, with the exception of the so-called 110,000-barrel gusher, tightly capped pending the establishment of additional transportation facilities.

The Mexican Eagle Oil Company has also contracted for a large fleet of oil-carrying vessels and will place it in service during the present year.

Next to the Potrero del Llano and the Juan Casiano fields the most activity during the year was in the Panuco and Topila fields, which are situated adjacent to the Panuco River, a short distance above Tampico. In these two last-named fields the East Coast Oil Company, which is owned by the Southern Pacific Railway interests, led in development operations. It has a number of producing wells in those two fields and they are connected with loading racks on the Panuco River by means of pipe lines.

300,000 Acres Added in 1912

The Texas Company, which has its headquarters at Houston, Tex., the Gulf Refining Company and several other of the large oil-producing and pipe line concerns of the United States acquired oil land holdings in different districts around Tampico during the year and are actively engaged in the preliminary exploitation of same. Some of these companies have already established lines of vessels between Tampico and ports in the United States and are engaged in the regular business of transporting the crude oil to those foreign markets.

There was added approximately 300,000 acres to the oil-producing territory in the Tampico region during the year 1912. The gravity of the oil of the different fields is as follows:

Ebano, 11 degrees, Baumé; Panuco, 12.5; Caracol, 12.5; Topila, 15; Juan Casiano, 20.5; Potrero del Llano, 20.5; Tanghuijo, 20.5; Furbero, 28; Isthmus of Tehauntepec, 40.

Shipments of oil during the closing months of 1912 from all the oil fields were at the rate of about 1,500,000 barrels per month.

The Mexican Eagle Oil Company is now shipping oil through the port of Tuxpam at the rate of about 600,000 harrels per month.

200,000 Cars Per Year

N. A. Hawkins, General Sales Manager of the Ford Motor Company, Tells The Company's Story

DETROIT, MICH., Feb. 21—Just what it means to manufacture 200,000 complete automobiles in 12 months was told by N. A. Hawkins, general sales manager of the Ford Motor Company, at the dinner of the Adcraft Club and the Board of Commerce at the Cadillac Hotel last night. In a story bristling with big figures and full of the romance of business Mr. Hawkins touched upon the marvelous growth of the Ford plant from a pigmy to a giant. Ten years ago the company was capitalized at $28,000 and did an annual business of $200,000. Today it is the largest automobile factory in the world; has a capitalization of $30,000,000 and sells annually $200,000,000 worth of automobiles in all parts of the world.

"Ford profits," said Mr. Hawkins, "are equivalent to maximum industrial earnings on a capitalization of $200,000,000 and on this basis could probably, before its twentieth anniversary, return the equivalent of this amount to its shareholders. The January sales of Ford cars were nearly $9,000,000 or more than twice the gross receipts of the Grand Trunk railway system for the same month. In the last four months we did a business of nearly $30,000,000 and 2 of those 4 months were not very good ones.

Highly Efficient Organization

"The Ford company has all the elements of a successful enterprise. It manufactures a useful article; its company is properly organized; it is amply financed, entirely within itself, to successfully carry on its operations; its business policy is clear and well defined; its management is capable, tactful and honest; its factory is well designed, fully equipped and suitably located; its product is perfect in design and quality; its selling force is efficient, the largest of its kind in the world, and backed by plain, honest advertising, with complete service to owners.

"The Ford is an organization of all young men. Not an executive head has been added to a single department of the business in more than 6 years, during which period the output of cars and annual sales have nearly doubled each year. All this great business has been built up from an original cash capital of only $28,000 and without ever borrowing a dollar or issuing any paper. We used banks only as depositories to lock up money and earn interest, and this season in planning a production of 200,000 cars we never consulted with a banker.

"We are at present employing in our factories and at our branch houses 18,061 men, and all day workers, not a piece worker in the plants, and disbursing monthly about $700,000 for payrolls. Every day, except Saturday, is pay day, and our average runs between $30,000 and $35,000 daily.

"Our factory, which now covers practically 65 acres, is about as complete and up-to-the-minute as modern architecture and latest machinery and labor-saving appliances can make it.

"Our going inventories of raw materials, parts, accessories, etc., are running along now at an average of about $7,000,000, and, mind you, every car that we build each day is shipped the same day, so none of this amount is for finished cars. Our total net assets are close to $25,000,000.

"June 24 last a schedule of manufacturing our 1913 output was decided upon. To handle this production we require 1,000,000 lamps, 800,000 wheels, 800,000 tires, 90,000 tons of steel, the hides of 400,000 cattle to furnish the leather for upholstering the bodies, the hair or bristles from 6,000,000 hogs to stuff into the upholstering, 12,000,000 hickory billets for wheel spokes, nearly 2,000,000 square feet of glass for the windshields, 750,000 pounds of soft soap, 15,000 tons of molding sand to make our castings, 2,000,000 cubic feet of gas per day for heat-treating, etc.

"January 13 last we built and shipped 1,336 finished model T's—a business for one day amounting to nearly $700,000 and requiring more than 200 freight cars to handle the shipments, or five full train loads of more than forty cars to the train.

"On the basis of the mileage from Detroit to New York City—if we had delivered this day's output to our New York branch by driving the cars overland, we would have had a procession of model T's—just a half a mile apart—and when the first car was coming into New York the last one would be leaving the factory.

"During January we built and shipped 17,601 finished cars—a net volume in dollars and cents of nearly $9,000,000—more cars than we built and shipped during the first 5 months of last season. By the end of February the close of our first 5 months for 1913—we will have shipped more than 56,000 cars as against 17,555 for the same period a year ago.

"In spite of our increased facilities for producing, our daily orders are in excess of our daily output as evidenced by the fact that in spite of all the great shipments we have made we still have on file for immediate attention 38,326 orders or a sufficient quantity to take us through to April 10, at the rate of 1,000 cars a day.

"Our traffic manager recently advised that we would require 35,000 freight cars to move our 1913 output.

"According to our output this season and according to the most authentic estimates of other car makers, we will produce every other car that is built in this country during 1913.

"One day last week we gave one tire concern our check for a little less than $2,000,000 and every other single part that goes into the construction of our cars bears a similar comparison to the completed job—from cotter pins and lamps to springs and tops—so that you can get some idea of quantity production.

"By September 30 we hope to have at least 400,000 satisfied users voicing our sentiments. Four hundred thousand Ford owners means 400,000 voters for good roads, because most Ford owners are their own drivers—and when good roads are linked up all over the country, I hate to think about our annual production to supply the demand for these individual Ford transportation lines.

"The great demand for Ford cars has not heen brought about without a fair amount of advertising and careful study of the selling problems."

Cost of Fire Chief's Runabout

YONKERS, N. Y., Feb. 21—The Yonkers fire chief and the 1st and 2nd assistant chiefs, or deputies, have been given three 4-cylinder, 28-30 horsepower gasoline runabouts, equipped with electric cranking, electric lights, electric horn, fire gong, buggy-top, etc. These were installed in October, 1912, and since that time enough data have been gathered to warrant a comparison between the horse and the automobile in this particular capacity.

First assistant Chief Baker furnished the following data to a representative of THE AUTOMOBILE. The figures are arranged in tabular form below. As may be seen, the result in actual cash saving per month, speaks well for the automobile.

MONTHLY SAVING ON CHIEF'S RIG-HORSE VS. MOTOR

HORSE		MOTOR
Feed ....$.33 per day		Gasoline ...$.17 per day
Shoeing ..... .26 per day		Oil .... .05
—		Grease .... .03
Total ...... .59		—
Total motor. .25	$.34 daily saving	Total .....$.25
—	30 days	
$.34. daily saving	—	
	$10.20	
	Saving per month	

Gasoline....$.17	per gal.,	1 gal per day
Oil......... .60	per gal.,	2 gal per month
Grease...... .15	per pound,	3 oz. per day

Two other points in favor of the machine, mentioned by Chief Baker, are first: the hill climbing power of the runabouts. In a city having the seven hills of Rome, the value of this point cannot be over estimated. The second point is the speed with which they enable the executive to reach the scene of the fire.

Schermack Spring Wheel Acts on New Principle

Road Shocks Are Absorbed By Lateral Movement of Flat Steel Springs Held Under Tension and Oppositely Aligned—Vibration Absorbing Qualities Tested By Schermack Resiliograph

AN entirely new spring wheel design is that of the Schermack resilient wheel, the general construction of which is shown in Figs. 1 and 2. This new type of spring wheel consists of a hub section or inner wheel A, and a rim section or outer wheel B. The latter carries a standard rim on which a solid rubber tire is mounted. The two sections are provided circumferentially with aligned projecting flat steel springs or brackets C, bolted with two bolts each on alternately opposite sides of the two rims A and B. These springs are mounted in such a manner that each spring on one rim is under tension and is oppositely aligned with one on the other rim and on the opposite side thereof. These flat radial springs C acting horizontally are connected in pairs to the outer and inner rims by laterally-arranged steel bars or bolts D, the ends of which are provided with steel balls working in socket connections E, which are fixed to the flat springs C. These cross bars, together with their ball and socket connections, take up throughout the circumference of the wheel any load either vertically or sidewise which may be placed upon them. It follows from the construction of the wheel that side loads are more easily carried than vertical loads, since the lateral strength of the wheel is seen to be greater than the vertical.

The principle of the Schermack wheel may be gained from inspection of the two sections in Fig. 1. That on the left shows the normal condition of the device when no vertical load is applied to the hub. It will be seen that the bar connections D are horizontal when the wheel is in its normal position, and that when under load they are inclined throughout the circumference of the wheel, as shown in the right hand section. When under load the bars work up or down, depending on their temporary location as referred to the road surface. Under load the horizontal distance between the bar ends is less, since any inclined line is greater than the perpendicular distance between the vertical planes of these bar ends. It is therefore evident that any motion of the ends of the bars means a horizontal pull on the flat springs and their consequent bending in.

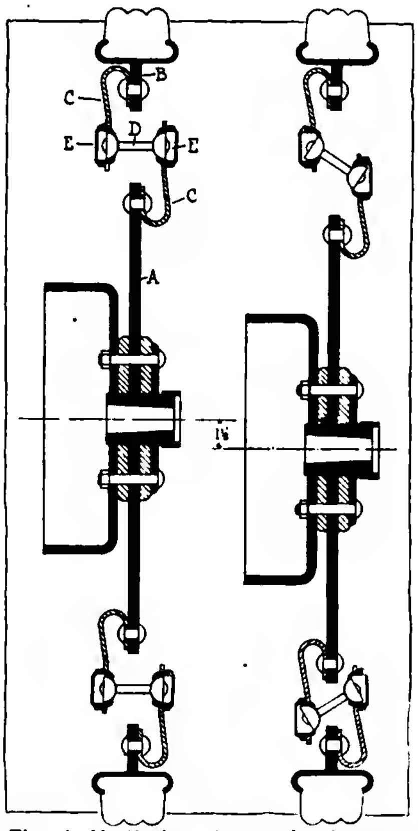


Fig. 1—Vertical sections, showing the wheel in free position and under load

Fig. 2—View of the Schermack spring wheel fitted to car, showing how the flat steel springs are disposed

The ball and socket joints which are packed with grease are used for preventing the bars D from being cramped or from having any other pull acting upon them except that in the direction of their axes. The springs C are designed to be under tension even when there is no load upon the wheel, and they have sufficient strength to react under any imposed stress.

It will be seen that when there is a starting load imposed upon the wheel there is a tendency for the inner wheel to revolve within the outer portion. But since the connected springs C are mounted alternately on the two portions of the complete wheel, it is evident that when the inner wheel is revolved, one bar pulls in one direction while the next one pulls in the opposite direction. Thus each two pairs of interconnected springs pull against one another, nullifying their action and causing the outer and inner wheels to move together, with only a slight give, much the same as that of a wire wheel construction under the same conditions.

A feature of the Schermack construction which is commendable is that the flat springs C are always under tension. There is, therefore, no possibility of any rattle of the parts or of their working loose under ordinary conditions of travel. Further, the construction makes it impossible for any spring or set of springs to carry more of a load than any other set. There are eighteen sets of springs around the circumference of a wheel, hence each set carries .055 of the total load under all sorts of circumstances.

The Resiliograph

For the purpose of proving that its steel spring wheels when equipped with solid rubber tires have the proper vibration absorbing qualities the

Schermack Wheel Company has devised an ingenious apparatus which is called the resiliograph, and which is shown in Fig. 5. Fig. 3 also gives a view of the device, as attached to a motor car equipped with the Schermack wheels.

It has already been explained that the Schermack wheel consists of two circular sections, an inner wheel attached to the hub and an outer one which carries the rim and tire. It is evident that when revolved without load in some way (by jacking up the wheel) the two sections have a common center. But when a load is applied, the center of the inner member drops below the normal center, which is the true center of the outer wheel and which is always fixed. The actual working or live center of the wheel being the center of the inner wheel, it fluctuates continually in relation to the true or dead center of the outer wheel, as already mentioned, in an amount in proportion to the car's weight, or as the roadbed varies.

This is what the resiliograph was designed to do. A cross bar CB, Fig. 5, is attached to the outer rim of the wheel, as shown in Fig. 3, bolting to it at N_1 and N_2. This bar has a bearing at its center, which bearing is also at the exact or dead center of the wheel. This bar supports the sleeve end of the long bar S, the front end of which is supported on the running board in a spring buffer. See Fig. 3. This bar S carries the two drums X and Y on which the paper record is made by means of the pencils shown. When the wheel revolves, the cross bar CB also revolves, but the bar S remains stationary, it, together with the recording mechanism, being in fixed relation to the dead center of the wheel. The bar CB in turning drives the integral pulley V, a belt from which passes the motion to P_1. Another belt from the shaft of P_1 conveys the power to pulley P_2, which is on the shaft of the driving drum X. Thus, the revolution of the wheel causes the paper to move horizontally from one drum to the other.

A shaft passing through the sleeve V attaches to a short lever V_1 on the inside of the wheel. To this lever, an arm W is pivoted as shown. This arm is slotted at its lower end to receive a pin which is fixed in the center of the hub. This pin, which is also in the exact center of the inner portion of the wheel, represents the live working center of the wheel, and it is continually moving up and down, as explained above. Its movements are transferred to the slotted end of arm W, which in turn transfers them to the other end of the shaft and to arm W_1 on the outside of bar S. Arm W_1 connects with the recording pencil through the rod R. It is now seen that when the wheel revolves the drum X winds up the paper, while the pencil traces the vertical movements of the inner portion of the wheel. The pencil Z is stationary and is used to trace the dead center of the wheel, which point becomes a horizontal line when drawn out, and which can be used as a reference line or base line.

By the use of the instrument, many interesting diagrams showing the fluctuations of the inner portion of the wheel under various road conditions have been taken, appearing as shown in Fig. 4. These indicate that the wheel absorbs jars, shocks and vibrations in much the same way as does the pneumatic tire.

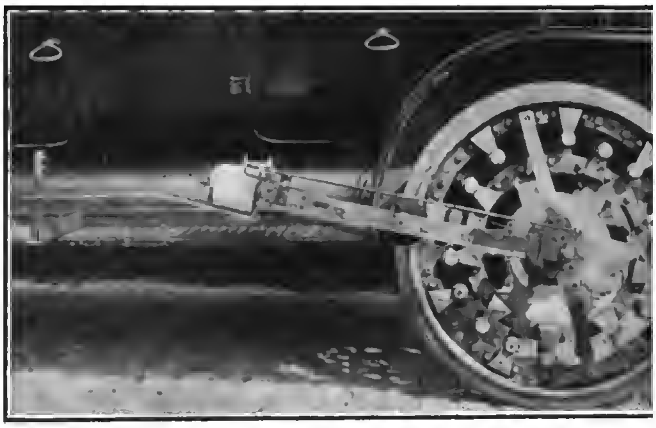


Fig. 3—Schermack resiliograph in position for testing the vibratic absorbing properties of spring wheel

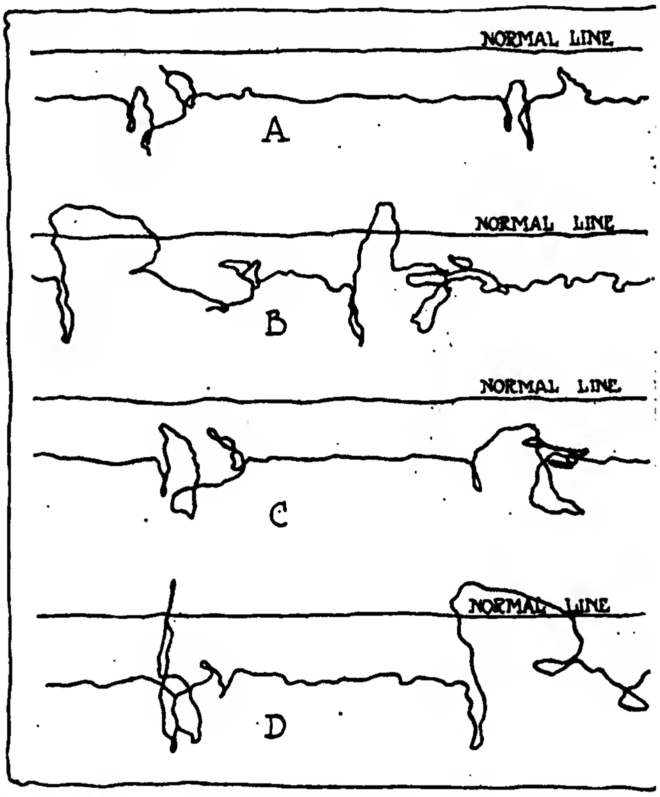


Fig. 4—Series of test charts obtained by the use of the resiliograp under the following conditions:

A and B—Empty car over 1 inch blocks 12 feet apart at speeds 8 and 15 miles per hour respectively

C and D—Loaded car over 1 inch blocks 12 feet apart at speeds 8 and 15 miles per hour respectively

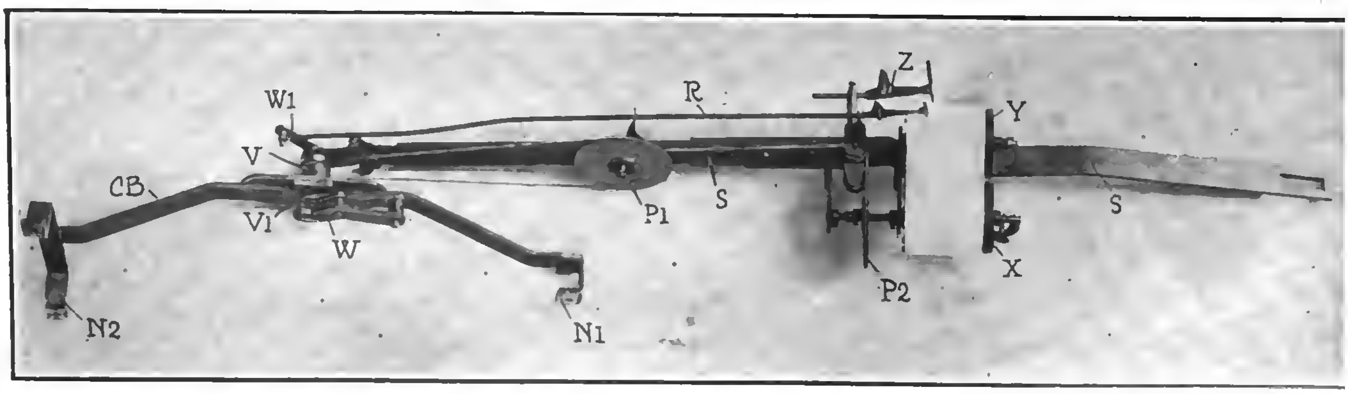
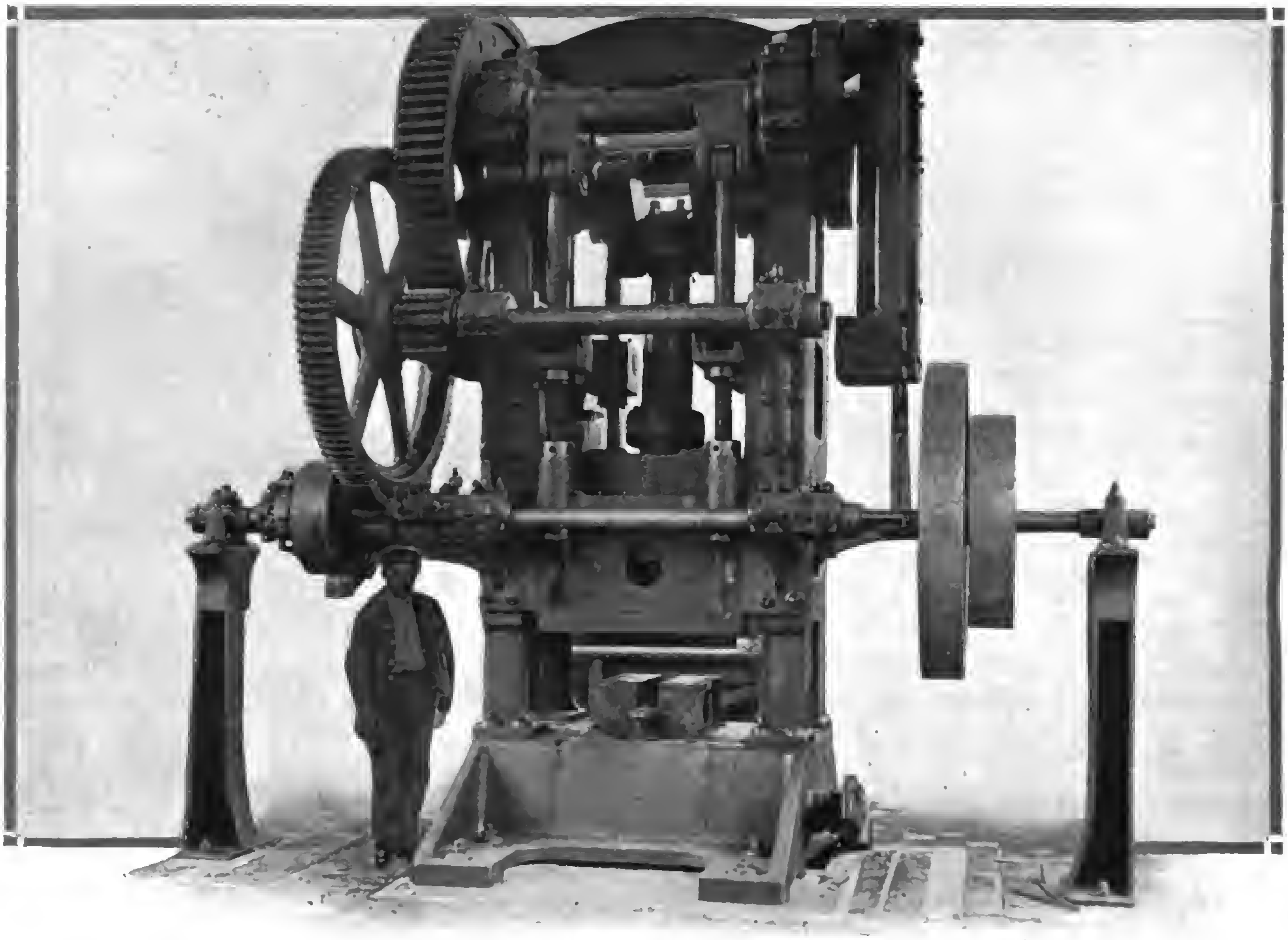


Fig. 5—Detail of Schermack resiliograph showing pencils and strip of paper on which the records are taken

Factory Miscellany



Largest power press in the factory of the Ford Motor Company, Detroit, Mich. It is used in making magneto coil supports

THE machine shown herewith is used in the manufacture of the magneto coil support for Ford cars. The Ford magneto is housed within the flywheel, and is of peculiar shape and heavy design. The services of this huge die are required in its manufacture. As may be seen in the illustration, the machine is more than 2.5 times the height of a man of ordinary stature and is about as long as it is high. The instrument converts rotating into reciprocating motion of a heavy crank and connecting-rod. The lower end of the connecting-rod holds the hammer which acts upon guides in the same manner that the piston in the motor cylinder is actuated. As may be seen, drive is by means of heavy gear wheels and a horizontal shaft which is carried by bearings supported on two posts which render the shafting independent of hammering shocks. This power press is the largest employed in the Ford factory and is one of the main factors in the quantity production scheme of this concern. It is said that one Ford car passes through the assembly department of the plant every fifty seconds and it is by the aid of such machines as these that the speed of the output is maintained.

OVERLAND'S Building Plans—The Willys-Overland Company, Toledo, O., is arranging for the erection of a new five-story administration and general office building in that city at an approximate cost of $150,000. Specifications call for a five-story building with basement 200 feet by 80 feet in dimensions. It will be constructed of brick, steel and hollow tile and will be fireproof throughout. Another small factory addition is soon to be made at a cost of $2,500, a permit having already been issued for the work.

Ford's Mammoth Boston Building—The Ford Motor Car Company, Detroit, Mich., intends to erect a building with something over 100,000 square feet of floor area in Boston, Mass., for the assembling of its cars, and will begin work in the near future.

Motor Trucks for Maxwell—It is rumored that the Maxwell Motor Car Company, Detroit, Mich., has put out some tentative inquiries in New York City for machine tools to be used in refitting the old Brush plant in Detroit. It is understood commercial trucks will be manufactured.

New Plant for Batavia—The Baker Gun & Forging Company, Batavia, N. Y., recently entered into a contract by which the Jamesville Manufacturing Company's business will be brought to that city. It is expected that plans will be considered for the removal of the Jamesville plant to Batavia and provisions for the big changes in the present plant are now under discussion. The Baker concern manufactures automobile electric starters as well as guns.

Nyberg to Increase Capacity—At the annual meeting of the board of directors of the Nyberg Automobile Works, Chattanooga, Tenn., held recently, plans were made to increase the capacity of the plant to meet the demand for the Nyberg cars. It is probable that a new site will be selected and new buildings erected. Another decision was made at the meeting, this being to manufacture in the future nothing but high-grade, six-cylindered cars.

The Automobile Calendar

Shows, Conventions, Etc.

Feb. 24-27.........Kansas City, Mo., Truck Show.
Feb. 22-Mar. 1.....Brooklyn, N. Y., Annual Show, 23rd Regiment Armory.
Feb. 24-Mar. 1.....St. Louis, Mo., Annual Show.
Feb. 24-Mar. 1.....Memphis, Tenn., Annual Show.
Feb. 24-Mar. 1.....Omaha, Neb., Annual Automobile Show.
Feb. 24-Mar. 1.....Paterson, N. J., Annual Show, Paterson Automobile Trade Association.
Feb. 24-Mar. 5.....Cincinnati, O., Annual Show, Music Hall, Cincinnati Automobile Dealers' Association.
Feb. 25-28.........Eau Claire, Wis., Annual Show, Armory, Dealers' Association.
Feb. 25-Mar. 1.....Syracuse, N. Y., Annual Show, Syracuse A. D. A.
Feb. 26-Mar. 1.....Fort Dodge, Ia., Annual Show.
Feb. 26-Mar. 1.....Glens Falls, N. Y., Automobile Show, Louis Blumenstein, Manager.
Feb. 27-Mar. 1.....Toronto, Ont., Annual Show, Toronto Automobile Trade Association.
March............Indianapolis, Ind., Spring Automobile Show, State Fair Grounds, Indianapolis Automobile Trade Association.
March............Nashville, Tenn., Annual Show, Nashville Automobile Dealers' Association.
March............Pittsburgh, Pa., Annual Automobile Show.
March 3-8.........Bridgeport, Conn., Show, Park City Rink, B. B. Steiber.
March 3-8.........Denver, Col., Annual Show, Municipal Auditorium.
March 3-8.........Springfield, Mass., Automobile Show, New Auditorium Building, United Amusement Company.
March 3-18........Des Moines, Ia., Annual Show, Pleasure Car Section, Coliseum, Dealers' Association.
March 5-8.........Tiffin, O., Annual Show, Tiffin *Daily Advertiser.*
March 5-8.........Louisville, Ky., Annual Show, Dealers' Association.
March 5-8.........London, Ont., Annual Show, Drill Hall, Louis Blumenstein.
March 8-15........Boston, Mass., Annual Automobile Show.
March 8-15........Columbus, O., Annual Show, Billy Sunday Tabernacle, Automobile Club and Traders' Association.
March 10-15.......Columbus, O., Opening Week, Columbus Automobile Trades Association.
March 11-15.......Buffalo, N. Y., Commercial Vehicle Show, Auditorium, Automobile Dealers' Association.
March 12-15.......Ogdensburg, N. Y., Automobile Show, Louis Blumenstein, Manager.
March 17-22.......Norfolk, Va., Annual Show, Armory Building, Norfolk Automobile Trade Association, Inc.
March 19-26.......Boston, Mass., Annual Truck Show.
March 20-24.......New Orleans, La., Annual Show, N. O. A. D. A.
March 24-29.......Indianapolis, Ind., Annual Automobile Show.
April 1-6..........San Francisco, Cal., Motor Truck Show, Coliseum Hall, *Motor Field.*
April 5-19.........Pittsburgh, Pa., Annual Show, East Liberty Market House, Dealers' Association.

Race Meets, Runs, Hill Climbs, Etc.

May 5-8...........Washington, D. C., Motor Truck Reliability Run, *Washington Post.*
May 30...........Indianapolis, Ind., 500-Mile Race, Speedway.
July 1............Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Association to the Pacific Coast.
July 27-28.........Tacoma, Wash., Tacoma Road Races.
Nov. 24...........Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 26...........Savannah, Ga., Grand Prize Race, Automobile Club of America.

Foreign

March.............France, Sealed Bonnet, 3000-Mile Run.
March 31.........Montevideo, Uruguay, International Competition of Agricultural Motor Vehicles.
April.............Barcelona, Spain, International Exhibition.
May..............St. Petersburg, Russia, International Automobile Exposition, building of Michael Maneze, Imperial Automobile Club of Russia.
July 12...........Amiens, France, Grand Prix Race.

Marathon Factory Completed—The factory of the Marathon Tire & Rubber Company, Cuyahoga Falls, O., is completed.

Pilot's Addition—The Pilot Motor Car Company, Richmond, Ind., has awarded plans for an addition which will be 46 feet by 120 feet and two stories high.

Fiat Will Increase Factory—The F.I.A.T. Company, Poughkeepsie, N. Y., will increase the size of its automobile factory with 30,000 square feet of additional floor space.

Reorganize Automobile Works—J. G. Cleary, of Milwaukee, Wis., who recently purchased the Findlay Motor Works, will probably reorganize the company and put it in operation at once.

Chandler Selects Site—It is announced that the Chandler Motor Company, in which Detroit, Mich., men are interested and which has recently been organized, will build a plant in Cleveland, O., the site having been secured along the Belt Line Railroad.

Scharf Gearless Building—The Scharf Gearless Motor Company, Richmond, O., which was recently incorporated with a capital of $10,000 by G. W. Worden and others, is planning the erection of a plant for the manufacture of a new gearless motor.

Overland Buys Toledo Land—The Willys-Overland Company, Toledo, O., by a recent purchase of $10,000 worth of land has secured complete control of all property between West Central avenue, where the large factory is located to the boulevard. The land was purchased with a view to future expansion of the factory.

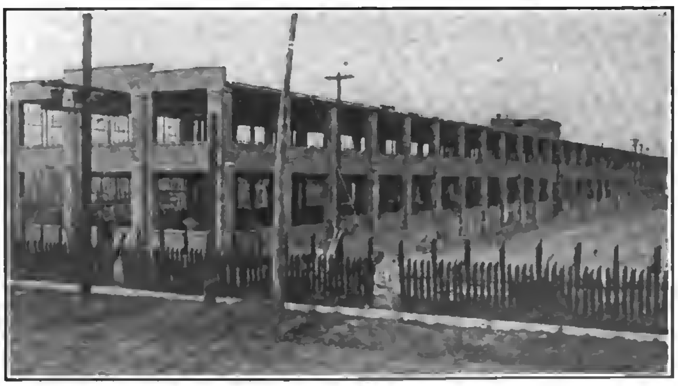
Wilboken Establishes Quarters—The Wilboken Manufacturing Company, Milwaukee, Wis., recently incorporated for $50,000, has established headquarters and a factory at 248 Reed street for the manufacture of air compressors for automobiles, electric air compressors for garages and other purposes and a line of mechanical specialties. G. C. Knaak is president and general manager.

Garage Equipment to Build—The Garage Equipment Manufacturing Company, Milwaukee, Wis., has been granted a permit to build a $7,500 addition to its works. The company is just getting back into its normal stride after the fire early in January. The addition will make possible more nearly an approximation of production in relation to orders on hand.

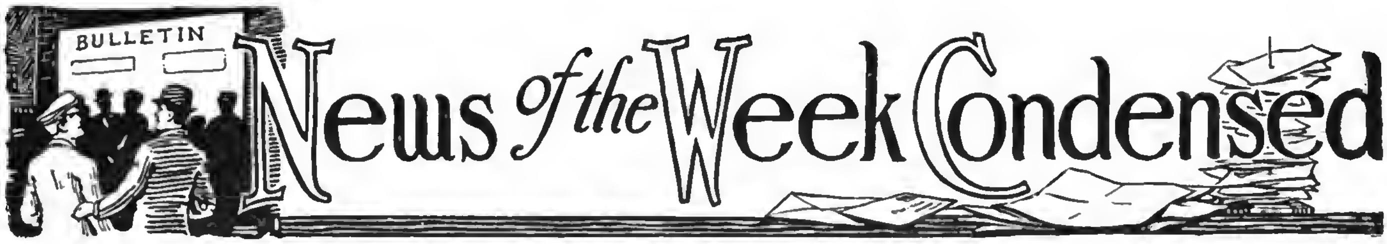
Ford's St. Paul Plant—Factory architect Graham of the Ford Motor Car Company, Detroit, Mich., recently went to St. Paul, Minn., to look over the site purchased by that firm. It was originally planned to hold a large retail store on a site in Minneapolis and to erect a big assembling plant also there, but a difference of opinion arose and so the Ford people are now thinking of building the factory in St. Paul.

Maxwell Offices Moved—The offices of the Maxwell Motor Car Company, Dayton, O., will be removed to the North Dayton, O., plant. Additional employees are being taken on at the plant and President Walter Flanders states that the output this year will be between 20,000 and 25,000 cars. The Maxwell company will use $500,000 worth of drop forgings a year and plans are being made for opening up a foundry to furnish them.

Erie to Have Plant—George McLaughlin, of Erie, Pa., has organized a company, capitalized at $100,000, to manufacture motor trucks, ranging in capacity from 1 to 4 tons. Twelve carloads of material, which will arrive in the near future, have been purchased and manufacturing will commence as soon as the necessary machinery arrives and can be installed. Until a larger and more suitable building can be obtained, the present plant occupied by Mr. McLaughlin will be used.



One of the recent additions to the plant of the Motor Car Manufacturing Company, Indianapolis, Ind.



AGAINST Reckless Driving—The Legislative Committee of the St. Louis, Mo., Automobile Club has presented to the House of Delegates the views of 750 of its members on the proposed new ordinances which affect the automobile user. The letters all expressed a sentiment against reckless driving. The club wants better traffic conditions.

Perry Has Club—Fifty motorists of Perry, N. Y., have formed the Perry Automobile Club.

Millikin Sales Manager—J. F. Millikin has joined the Spokane, Wash., Auto-Truck Company in the capacity of sales manager.

Ridler Pope Sales Manager—F. M. Ridler has been appointed sales manager of the Pope Manufacturing Company, Hartford, Conn.

Lyons Manager Capitol Body—W. A. Lyons has been made general manager of the Capitol Body Company, recently organized in Indianapolis, Ind.

They Certainly Need Them—Automobiles that are bullet-proof are being advertised by a dealer in Mexico City, Mexico, who knows what the public wants.

Washington Franklin Firm Moves—S. S. Smith & Company, Franklin's dealers in Washington, Ia., recently moved into new quarters on South Marion avenue.

Diefenderfer Manager N. Y. Lozier—A. G. Diefenderfer's appointment as manager of the New York City branch of the Lozier Motor Company, has been announced.

Little Sales Manager Borland—W. C. Little, assistant sales manager of the Lozier Motor Company, Detroit, Mich., goes to the Borland-Grannis Company, Chicago, Ill., on March 1. His new position will be that of sales manager.

Cross Holly Sales Manager—The Holly Brothers Company, Detroit, Mich., carbureter maker, announces the appointment of C. W. Cross as sales manager. Mr. Cross was formerly with the General Motors Truck Company.

Brady General Manager—The Aluminum Castings Company, Cleveland, O., announces the appointment of Charles Brady as general manager of the aluminum foundries.

Baldwin with Stewart-Warner—R. H. Baldwin, formerly with the Standard Speedometer Company, has joined the Stewart-Warner Speedometer Corporation's forces, Chicago, Ill. He will be connected with the Detroit, Mich., office.

Want Roads Cleared—The Connecticut Automobile Association, Hartford, Conn., will lend all effort for the enactment of a bill providing that road side brush, small trees, vines and low-lying branches at corners, intersections, curves and the like be removed to provide a clear vision.

Newark License Office to Move—On May 1 the Newark, N. J., office of the New Jersey State Motor Vehicle Department will move with the N. J. Automobile and Motor Club to the corner of Central avenue and Halsey street.

Motors in Railway Coaches—Railway coaches propelled by gasoline motors will be placed in service by the Chicago, Milwaukee & St. Paul Railway Company on March 1 between Milwaukee, Pewaukee and Waukesha, Wis. Five coaches will comprise the initial equipment of the division.

Martin from Firestone to Stewart—F. H. Martin, recently with the Firestone Tire & Rubber Company, has accepted the position of Eastern sales manager of the Stewart-Warner Speedometer Corporation, Chicago, Ill., and will assume his new duties on March 1, with headquarters in New York City.

Chauffeurs' Bureau in Hartford—The establishment of a chauffeurs' bureau is under advisement by the Automobile Club of Hartford, Conn. It is the intention to keep a file of complete data which would have a tendency to weed out the undesirable sort.

Jacksonville to Atlanta Tour—A representative of the Board of Trade of Jacksonville, Fla., is authority for the statement that arrangements are almost perfected for a tour from Jacksonville to Atlanta for the grand opera week in April. The tour will be made by 100 cars. The scout car for the tour will leave Jacksonville some time in the near future.

A three-seater torpedo on Bellanger chassis. This car is built by the Gregoire Company, Poissy (S-O) et Asnières (Seine), and carries a Daimler-Knight motor. Marquis de Soriano, a leading Spanish sportsman, is at the wheel

New York Got $1,000,000—That the automobile yielded more than a million dollars in revenue to N. Y. State during 1912 is disclosed in the report of the Secretary of State's office for the past year. The registrations were divided as follows: pleasure vehicles, 95,484; commercial cars, 9,767; dealers, 1,716, and exempt vehicles, 295. The revenue collected for the year was $1,047,678, an increase of $132,155 over 1911.

Electrical Society Will Meet—The Society for Electrical Development, New York City, will hold a meeting on March 4 and 5 in the large meeting room in the Engineering Societies Building, 29 W. 39th street, that city. The society has been organized to assist in the development of the electrical industry throughout the country. A number of papers dealing on modern electrical problems will be read at the meeting by prominent men in the industry.

Connecticut Foreign Trucks Registered—As was expected the intention of putting through the Connecticut legislature a bill compelling foreign motor trucks to be registered in that state has caused much comment. Among other factions the Connecticut Automobile Association made up of state clubs affiliated with the A. A. A. are loud in denunciation of the proposed measure. The contention is that the bill is a direct contradiction of the state association avowed policy to make Connecticut a wide open state.

New Western Automobile Rates—Application of the new automobile insurance rates in the West has been postponed until March 15, before which time the two Eastern members of the executive committee of the Western Automobile Underwriters' Association will have been selected and a conference, can be held for an adjustment of the entire situation. The important changes from the present agreement are that the limitation of agents is made two instead of three, all features of automobile insurance are covered instead of only fire and theft.

Foreign Credits—A book of very practical value to every firm engaged in the export trade or planning to enter the foreign field has recently been issued by the Bureau of Foreign and Domestic Commerce. It deals with the credit problem. An important series of consular reports from all parts of the world is included. In these reports American consular officers describe fully the local credit conditions. Copies of the book, special agents series No. 62, may be obtained upon application to the superintendent of documents, government printing office.

New Agencies Established During the Week

PLEASURE CARS

Place	Car	Agent
Ayr, N. D.	Henderson	Ayr Auto Co.
Barnesville, Minn.	Henderson	C. C. Dunn
Bellwood, Pa.	Henderson	R. D. Bell
Brooklyn, N. Y.	Henderson	Central Motor Car Co.
Casey, Ill.	Henderson	C. W. Shimel
Columbus, O.	Stutz	Emil Stutz
Dayton, O.	Stoddard-Dayton	C. J Scbellmann
Dubuque, Ia.	Pullman	O. S. Montz
Des Moines, Iowa	Henderson	Guarantee Motors Co.
Dover, N. H.	Pullman	Pershaley & York
East Liverpool, O.	Buick	Tri-State Gar. Co.
Emerson, Neb.	Moon	Lindering & Kerwin
Emmett, Neb.	Moon	O. B. Lawrence
Enfield Center, N. H.	Henderson	Myrl L. Currier
Fennimore, Wis.	Ford	Horton Automobile Co.
Findlay, O.	Buick	W. E. VanEmanhas
Findlay, O.	Metz	Lundy & Bartonhave
Findlay, O.	Reo	Collingwood & Edwards
Fremont, Neb.	Moon	A. Koyen
Fresno, Cal.	Paige-Detroit	Roullard-Brown
Hackensack, N. J.	Moon	Chas. H. Lary
Harrisburg, Pa.	Hupmobile	Ensminger Gar.
Harrisburg, Pa.	Mitchell	Ensminger Gar.
Harrisburg, Pa.	Overland	Andrew Redmond
Hartington, Neb.	Moon	Nelson & Roskopf
Hazelton, Pa.	Henderson	H. J. Cuyle & Son
Irene, Texas	Henderson	Geo. J. White
Kalamazoo, Mich.	Imperial	J. H. Duffany
Kewaskum, Wis.	Studebaker	Nicholas Remmel
Lancaster, Wis.	Ford	Horton Automobile Co.
Lancaster, Wis.	Overland	Horton Automobile Co.
Lisbon, N. D.	Moon	W. L. Divet
McCall, S. C.	Henderson	R. L. Adams
Milwaukee, Wis.	Henderson	P. V. Denster
Minneapolis, Minn.	Henderson	Minnesota Motor Car Co.
Napa, Cal.	Henderson	Anger & Knox
New Albany, Ind.	Pullman	F. T. Slider
Niobrara, Neb.	Moon	E. L. Gillbam
Oakland, Cal.	Henderson	W. E. Hall Motor Car Co.
Olympia, Wash.	Reo	Blaine Esham
Paducah, Ky.	Pullman	H. J. Livingston
Patch Grove, Wis.	Ford	Horton Automobile Co.
Philadelphia, Pa.	Henderson	Frank Le Flem
Plainview, Neb.	Moon	Geo. W. Kirk
Portland, Ore.	Maxwell	W. C. Garbe
Portland, Ore.	Rambler	G. W. Nelson
Quitman, Ga.	Henderson	Blue Ribbon Garage
San Francisco, Cal.	Empire	McCullough Bros.
San Francisco, Cal.	Mitchell	McCullough Bros.
San Jose, Cal.	Paige-Detroit	Dixon & Evans
Sea Cliff, L. I., N. Y.	Moon	Geo. Fleither
Seattle, Wash.	Michigan	J. F. Campbell
Seattle, Wash.	Rambler	N. J. Morehouse
St. Louis, Mo.	American	General M. Co.
Syracuse, N. Y.	Ford	Perl Devendorf
Syracuse, N. Y.	Moon	King Auto Co.
Thornville, O.	Krit	R. G. Swartz
Tamaqua, Pa.	Henderson	Geo. Pugh
Utica, N. Y.	Franklin	E. F. Benedict
Westport, Conn.	Henderson	C. E. Betts
Wilmington, Del.	American	F. W. Ayres Gar. Co.
Wilmington, Del.	Overland	F. W. Ayers Gar. Co.
York, Pa.	Mitchell	J. W. Richley

COMMERCIAL VEHICLES

Portland, Ore.	Selden	H. L. Keats
St. Louis, Mo.	Garford	Motors Corporation
St. Louis, Mo.	Lauth-Juergens	Muehling M. C. Co.
St. Louis, Mo.	Lippard-Stewart	Brinkman M. C. Co.

ELECTRIC VEHICLES

St. Louis, Mo.	Century	Raymond Mancha

White with Cole—J. L. White has joined the Cole Motor Car Company, Indianapolis, Ind., as purchasing agent.

Copper on Moon Staff—George Copper has joined the testing staff of the Moon Motor Car Company's factory in St. Louis, Mo.

East with Timken—G. L. East has become assistant advertising manager of the Timken-Detroit Axle Company, Detroit, Mich.

Skinner Opens Store—Richard C. Skinner, Connecticut representative of the Hood Rubber Company, has opened a store in Hartford, Conn.

Hathaway Kelly Manager—D. C. Hathaway has been appointed manager of the Kelly-Springfield Motor Truck Company's branch at Cleveland, O.

Potts Cole Motor Inspector—The Cole Motor Car Company, Indianapolis, Ind., has appointed E. R. Potts as chief motor inspector at the Cole plant.

Meade Superintendent Moon—J. J. Meade is the new superintendent of the motor building department of the Moon Motor Car Company, St. Louis, Mo.

Joyce Philadelphia Manager—James Joyce has been appointed manager of the Philadelphia, Pa., branch of the Kelly-Springfield Motor Truck Company, Springfield, O.

Detroit Supply House Purchased—The stock of the Detroit Motor Supply Company, Detroit, Mich., which has gone out of business, has been purchased by Heyn's Bazaar, that city.

Open Sheet Metal Works—W. A. Lang & Sons have opened a sheet metal works at 513 North Hamilton street, Saginaw, Mich., where they will do automobile radiator and muffler repairing.

Rohde Sails—O. J. Rohde, with a corps of magneto experts, sailed recently to Europe to establish headquarters in London, England, where they will attend the wants of those who are using the products of the Splitdorf Electrical Company, New York City.

Jones Buys Moyer Agency—G. W. Jones has purchased the controlling interest in the Moyer Automobile Company, Des Moines, Ia. Mr. Jones was manager of the United Motors Des Moines Company up to the time it was taken over by the Flanders interests.

Johns-Manville Salesmen's Conventions—Following a long-established custom, the 600 or more salesmen of the H. W. Johns-Manville Company, New York City, assembled in annual conventions on various dates from January 2 to February 8 in their respective districts to learn more about the products they sell.

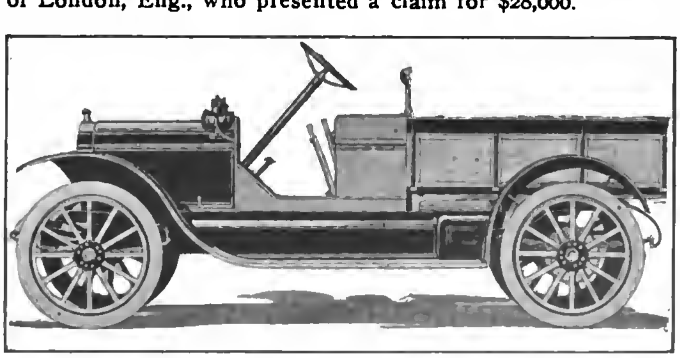
Automobiles on the Lakes—Automobile travel on the lake steamers last year was very large. During the season 1912 there were carried on Lake Champlain 1364 cars, as against 100 the previous year. On Lake George the increase is even more marked, there being transported in 1912 1335, as against 520 the year before.

Big Garage Fire—The garage and warehouse of the Manhattan Garage & Express Company, doing a public garage, car storage and trucking business, Milwaukee, Wis., was totally destroyed by fire February 12. Twenty-three cars of private owners were destroyed. The loss is $65,000, partly covered by insurance.

Fire in Washington—More than $9,000 damage was sustained by David S. Hendrick, G. R. Cowie Company and the Motor Truck Corporation, Washington, D. C., when a fire broke out Friday afternoon in the Hendrick garage. Of this amount $5,000 was sustained in damage to cars and the remainder to the buildings.

Made-in-Racine Show in June—A mammoth Made-in-Racine exposition, in which the automobile, truck and parts trades will have particular representation, will be held in the largest auditorium of Racine, Wis., in June under direction of the Commercial Club. Incidentally the club will wage a campaign to advertise Racine industries by means of pamphlets.

Commercial Rubber in Receiver's Hands—The New York Commercial Company, New York City, a large importer of crude rubber, whose assets, according to a financial statement issued recently, were $6,495,000, was put in the hands of the receiver recently. The application for receivership was made by J. N. Taylor, counsel for A. H. Alden & Company, Ltd., of London, Eng., who presented a claim for $28,000.



New light delivery truck recently announced by the Thomas B. Jeffery Company, Kenosha, Wis., manufacturer of the Rambler car. This car is distinguished by its unusually low price

Abolition of grade crossinga in France. Entrance to the old grade crossing at Lieuaant, on the Paris-to-Fontainebleau main road. Thia crosaing has been abolished by the building of a road over the railway by the P. L. M. Railroad Company

New road over railway to avoid the grade crossing at Villeneuve St. Georges, on Paris-Fontainebleau road. The P. L. M. Company has to abolish all grade crossings on its lines, thia being one already completed

Automobile Service in Medellin—A concession has been granted by the Columbian government for the establishment of public automobile service in Medellin.

Fees Larger in 1913—Fees collected by the secretary of state in the automobile registration department exceed the returns of 1912 by $6,000 for the months.

Fire Engine for Abeline—A motor-driven fire engine is to be purchased by Abeline, Tex. The city council authorized a maximum expenditure of $7,500 for the new engine.

Case Continues Racing—The J. I. Case Threshing Machine Company, Racine, Wis., manufacturing Case cars, will continue its track and road racing campaign during 1913.

Bus Line in Bedford—The Bedford Motor Bus Company is being organized at Bedford, Ind., to install a motor bus service. Four Buick cars each with a capacity of twenty passengers will be installed.

Lima's Speed Limit 15 Miles—A speed limit of 15 miles per hour has been made by a recent ordinance in Lima, Peru. The number of automobiles in the Peruvian capital is increasing rapidly.

Bus Line at Unionville—An automobile bus line has been established at Unionville, Conn., and will conduct a regular schedule between that town and Collinsville, carrying passengers and freight.

Newark Orders Fire Engine—The fire company at Newark, Del., has decided to order a $7,500 triple combination automobile fire engine from the United States Fire Apparatus Company, Wilmington.

Lander Manager Hagstrom—Upon the retirement of P. E. Zimmerman as manager of the Hagstrom Brothers Manufacturing Company, Lindsborg, Kans., this company will now be under the management of Mr. Charles Lander.

Panama Rubber Elects Officers—The following officers were elected by the newly organized Panama Rubber Company at San Francisco, Cal.; W. D. Newerf, president; W. E. McCune, first vice-president; J. S. Benner, secretary, and J. F. Roe, treasurer.

California Registrations Increased—The registration of automobiles for January, 1913, at Sacramento, Cal., presents some interesting figures. During the first month of the year 2,790 automobiles were registered, as against 2,594 for the same month of last year, a gain of almost 200.

Uruguay's Bus Lines Successful—The successful operation of motor buses in Montevideo, Uruguay, has caused a most favorable impression. An appropriation of $350,000 has been made by the government for the purchase of more vehicles of this type, which will run on regular schedules from the capital to points in the interior.

Havana Wants Two Ambulances—Two automobile ambulances have been authorized by the municipal council of Havana, Cuba. The sum of $10,000 was set aside for their purchase. No purchase will be made for several weeks in order that an opportunity may be given for the receipt of bids from companies in the United States and in France.

Washington's Road Fund—The first step toward raising by direct taxation a public road fund, which will reach $10,000,000 in the next 2 years was taken in the house of representatives at Olympia, Wash., recently. The measure passed fixes the road levy at 1½ mills. This will net approximately $3,000,000. There is already $1,000,000 unexpended in the state highway fund.

Ohio Road Bill Passed—The Ohio senate enacted a law styled the Weiser bill, which validates road improvement

Automobile Incorporations

AUTOMOBILES AND PARTS

Columbus, O.—New Columbus Automobile Company; capital, $30,000; to manufacture automobiles. Incorporators: Jesse J. Brown, L. M. Browu, W. E. McConnonn, C. E. Dennis, E. B. Dennis.

El Paso, Tex.—Longwell Automobile Truck and Sales Company; capital, $10,000; to deal in motor trucks. Incorporators: J. J. Longwell, H. M. Andreas, J. A. Tays.

Huntington, W. Va.—Jarvis-Huntington Automobile Company; capital, $100,000; to manufacture and sell automobile and motor trucks and operate a garage. Incorporators: Mrs. R. J. Poster, G. G. Poster, R. D. Seaman, T. L. Millard, F. C. Pifer.

Indianapolis, Ind.—Northern Auto Company; capital, $10,000; to deal in automobiles. Incorporators: J. J. Clements, R. M. Fleming, L. H. Van Briggle.

Jacksonville, Fla.—Gallatin Motor Company; capital, $10,000; to deal in automobiles. Incorporators: H. T. Phillips, Harry Botts.

Lima, O—Gladwill Crossley Motor Company; capital, $10,000; to deal in automobiles. Incorporators: A. J. Gladwill, C. E. Crossley, F. N. Holland, H. J. Blsnd and J. W. Roby.

Lockport, N. Y.—Amper Electric Company; capital, $25,000; to manufacture automobiles and automobile locks. Incorporators: T. D. Robinson, E. W. Jones, C. L. Nichols.

Milwaukee, Wis.—Oakland-Wisconsin Motor Company; capital, $50,000; to deal in automobiles. Incorporators: R. A. Creek, A. H. Small, N. M. Creek.

Mobile, Ala.—Mobile Overland Automobile Company; capital, $5,000; to conduct a general sales agency. Incorporator: Norman Richards.

New York City.—K-E-W Manufacturing Company; capital, $5,000; to deal in automobiles. Incorporators: John Jacobs, W. W. Ward, J. A. Bednarik.

New York City.—Willets Service Company; capital, $50,000; to deal in automobiles and motor trucks. Incorporators: W. C. Willets, Marius Jurgensen, Estelle M. Naylor.

New York City.—E. C. Pardee; capital, $65,000; to deal in engines and motors. Incorporators: K. T. Frederick, C. R. Dewey, L. F. Sniffin.

Oshkosh, Wis.—Oshkosh Automobile Dealers' Association; capital, $1,000; to conduct s wholesale and retail business in automobiles, to promote and conduct exhibitions of automobiles. Incorporators: J. A. Crum, F. S. Hoaglin, A. Thom, W. F. Scoular.

Petersburg, Va.—Virginia Motor and Machine Company; capital, $10,000; to manufacture automobiles and parts. Incorporators: W. E. Wells, C. F. Denton, J. B. Andrews.

Richmond, Va.—Waynesboro Automobile Company; capital, $15,000; to deal in automobiles. Incorporators: B. E. Watson, J. B. Young, H. M. Hanger.

Saratoga Springs, N. Y.—Ross-Ketchum Company; capital, $18,400; to deal in automobiles. Incorporators: J. A. P. Ketchum, N. B. Ross, J. W. Northrup.

Uniontown, Pa.—Automobile Service Company; capital, $5,000; to paint, repair, buy snd sell automobiles and motor vehicles. Incorporators: C. W. Johnson, Fred A. Close, B. F. Hall.

West Allis, Wis.—Auto Transfer Company; capital, $5,000; to operate an automobile express and transfer line throughout West Allis, the manufacturing suburb of Milwaukee, and between West Allis and other suburbs.

Wilmington, Del.—Lewis Motor & Engineering Company; capital, $200,000; to manufacture automobiles and parts. Incorporators: G. D. Hopkins, G. W. Dillman, S. M. Crawl.

GARAGES AND ACCESSORIES

Bangor, Me.—Penobscot Garage Company; capital, $10,000; to carry on a garage business. Incorporators: A. J. Shorey, C. H. Shorey.

New road over the railway at Villeneuve St. Georges, on the Paris-Fontainebleau road, avoiding the use of the grade crossing. This is part of a scheme of the Paris, Lyon, Mediterranean Railway Company to abolish all grade crossings on main lines

Spot on the main road from Paris to Fontainebleau at which a dangerous grade crossing existed. This has now been abolished by the P. L. M. Railroad Company building a bridge over the line

contracts which cover 25 counties and comprise hundreds of miles of improvement. The supreme court annulled the Garrett law which by implication invalidated the road contracts.

Davis Locomobile Truck Advertiser—W. H. Davis, Jr., has been placed in charge of the truck department advertising of the Locomobile Company of America, Bridgeport, Conn.

Fort Dodge Show Opened—The second annual Northern Iowa Automobile Show opened at Fort Dodge, Ia., recently. The Fort Dodge Dealers' Association is running the show.

Childs Promoted—H. P. Childs, branch manager of the International Motor Company, Philadelphia, Pa., was recently promoted to be assistant Eastern sales agent of the company.

Jacox Loses Manager—M. M. Wilcox, General Manager of the Jackson-Church-Wilcox Company, Saginaw, Mich., has resigned to become interested in the manufacture of automobile accessories.

Holland With Anderson Electric—The Anderson Electric Car Company, Detroit, Mich., announces the appointment of W. E. Holland as manager of its mechanical and electrical research department.

Studebaker In New Home—The Studebaker Corporation, Detroit, Mich., has taken possession of its new wholesale branch at 61 Pierce street, Washington, D. C., giving it a capacity of 41,000 square feet on one floor.

Receives Russian Gold Medal—The Pullman Motor Car Company, of York, Pa., has received the third annual gold medal from the Russian Government for Pullman cars entered in the recent government exhibition.

Dunlop Manufacturing Fabricord Tires—The Dunlop Tire & Rubber Company, New York City, recently reached an agreement with the Century Rubber Company for the exclusive use and manufacture of Fabricord tires in Canada.

By Way of Correction—In the January 16 issue of The Automobile the Packard truck should have been described as having roller bearings on the rear axle instead of ball bearings, and also the outside drive coupe model should have read cabette model.

New Omaha Association—An association by the name of the Automobile Supply Jobbers' Credit Association, was recently formed in Omaha, Neb., for the purpose of protecting its members in matters of credit and for the betterment of trade conditions in that territory. C. G. Powell was elected president.

Bus Monopoly Under Attack—A blow at the New York City stage-coach monopoly is aimed in a bill introduced in the Legislature, the intent of which is to allow prospective competitors of the Fifth Avenue Stage Coach Company to operate lines throughout Manhattan and to open up routes in the other boroughs.

Missouri Clubs After Garagement—The St. Louis Automobile Manufacturers' and Dealers' Association, jointly with the dealers of Kansas City and St. Joseph, has introduced in the Missouri legislature a bill to give a lien on automobiles for storage and repair charges. The bill guards the owners from overcharging by unscrupulous repair men.

New Canadian License Bill—A new bill is being prepared in Canada which calls for the repeal of all present legislation in regard to licensing automobiles and suggests a scale of weights and rates as follows: 30 cents per 100 pounds on cars up to 2,000 pounds in weight, 40 cents per 100 pounds on cars up to 4,000 pounds, and 50 cents per 100 pounds on cars over 4,000 pounds.

Automobile Incorporations

Brooklyn, N. Y.—Cumberland Garage Company; capital, $25,000; to engage in garage business. Incorporators: W. L. Gray, A. W. Wilmarth, Marie F. Wilmarth.

Brooklyn, N. Y.—Caton Garage; capital, $10,000; to carry on a garage business. Incorporators: Frank Lemmer, John Carlson.

Buffalo, N. Y.—Conover Limousine Top Company; capital, $125,000; to manufacture automobile tops and bodies. Incorporators: R. J. Conover, C. B. Anglin, J. T. Gilbert.

Chicago, Ill.—Lacy Motor Delivery Company; capital, $10,000; to carry on an automobile delivery. Incorporators: Herbert Decker, Franklin H. Lacy, Samuel J. Richman.

Cleveland, O.—National Garage Company; capital, $20,000; garage automobile livery and general automobile trucking. Incorporators: J. A. Nally, G. A. Gardner, G. L. Williams, E. G. Nally.

Columbus, O.—Automobile Protective Association Company; capital, $5,000; to guard owners against the theft of their automobiles or parts thereof, etc. Incorporators: William Loster, M. A. Capute, H. H. Switser, E. L. Richards, A. O'Hara.

Detroit, Mich.—Universal Wheel Company; capital, $250,000; to make a demountable type of wheel. Incorporators: J. P. Lavigne, W. F. Woodhouse, John Wynne, Jr., J. J. Knight.

Lynchburg, Va.—Sterling Electric Company; capital, $5,000; to deal in electric accessories. Incorporators: A. N. Carroll, J. C. Oakes, E. B. Templeton.

New York City—No Shock Wheel Company; capital, $400,000; to deal in automobiles, tires, automobile parts, etc. Incorporators: J. W. Ebbs, R. H. Waddell, A. A. Kelley.

Nashville, Tenn.—Capitol Body Company; capital, $10,000; to manufacture automobile bodies. Incorporators: Elmer Hinsbaw, R. Cogbill, Fred W. Henscben, W. A. Lyons, Elmer W. Hugbey.

Peru, Ind.—Peru Tire & Rubber Company; capital, $25,000; to buy and sell automobile and other tires. Incorporators: C. E. Miller, Oliver J. Tilettl, Ira H. Stanter and Lee Miller.

Rochester, N. Y.—Central Motor Supply Company; capital, $20,000; to deal in automobile supplies. Incorporators: P. B. Barager, R. F. Close, William Wood.

Richmond, Va.—Craig Transfer and Motor Car Company; capital, $5,000; to carry on an automobile transfer business. Incorporators: M. C. Boyden, W. W. Johnson, J. P. Jones.

Sherbrooke, Ind.—Connecticut Mills Company; capital, $1,000,000; to manufacture auto tire fabric.

Washington, D. C.—Dispatch Taxicab Service; to carry on a taxicab service. Incorporators: C. E. Miller, Claude E. Miller, G. W. Pierre.

Youngstown, O.—Youngstown Automobile Show Company; capital, $1,000; to hold automobile shows.

CHANGES OF CAPITAL AND NAME

Bowling Green, O.—Century Auto & Garage Company; capital increased from $6,000 to $15,000.

Bowling Green, O.—Bowling Green Motor Car Company; capital increased to $100,000.

Detroit, Mich.—Commerce Motor Car Company; capital increased from $50,000 to $100,000.

Buffalo, N. Y.—Willet Engine & Carbureter Company; change of name to the Willet Engine & Truck Company, Inc.

Toledo, O.—Toledo Tire & Repair Company; change of name to the Toledo Tire and Supply Company.

Toledo, O.—Mather Spring Company; capital increased from $100,000 to $300,000.

Xenia, O.—Baldner Automobile Manufacturing Company; capital increased from $5,000 to $150,000.

CARBURETER—in which a venturi tube is used, the diameter of which is varied by a ball contained in the second section of the venturi passage and supported by a cross pin.

The subject matter of this patent is a carbureter Fig. 1, the casing of which contains a main air inlet A from which the air passes through an angular venturi passage over a gasoline nozzle N, and thence through the throttle way to the intake pipe of the motor. A throttle of the butterfly type serves for regulating the quantity of mixture fed to the motor and a ball B, contained in the second section of the venturi passage and supported by a cross pin Q serves to accentuate the suction effect.

No. 1,052,897—to James M. Dayton, Torrington, Conn., assigned to Excelsior Needle Company, Torrington, Conn. Granted February 11, 1913; filed April 9, 1910.

Automobile Tire Tread—The band carries a channeled member supporting links which engage the road bed.

This patent refers to a tread band design as that shown in Fig. 2, where the tire is fitted with a tread based plate B, which is formed with projections B 1. The holes C 1 of a channeled member C engage the projections C 1 and a series of links L are in place in the channel and their surfaces in contact with the road surface. Between each two adjacent runs of links leather strips are in place and transverse rods R hold the links in the channeled member C.

No. 1,052,560—to John Carter Barry, Harrow, England. Granted February 11, 1913; filed October 14, 1910.

Automobile Engine Cleaner—Consisting of a rotary hammer which is carried in a flexible casing and driven by a suitable motor.

Fig. 3 shows the engine cleaner described in this patent, which consists of a flexible shaft F equipped with a handle H and a hammer K, which is directly and rigidly secured to the free end of F. The hammer K has an unbalanced portion on one side of the shaft center and by means of a suitable motive power the shaft may be rotated, thereby producing a series of successive blows on the surface being cleaned.

No. 1,053,007—to George Calvert, Stoke Newington, London, England, assigner to Mechanical Decarbonizer Syndicate, Ltd., London, England. Granted February 11, 1913; filed March 7, 1911.

Valve Compressing Tool—Consisting of a tongue with suitably designed terminals.

The tool shown in Fig. 4 consists principally of two members which are connected in the fashion of a tongue. One of these members has an elongated slot with an orifice extending into the same, there being a lateral recess in the member extending from the slot; a forked terminal formed on the member is disposed at an angle to the body of the same. The second member has a terminal which is adapted to be introduced into the slot, at the lateral recess, mentioned above. A terminal of the second member is greater in width than the slot, but less in width than the slot and the recess; the other terminal of the second member is forked and positioned at an angle to the body of the member, in which the latter are formed a number of orifices. A pin is in place in the orifices in the first and second members.

No. 1,052,941—to Charles Nyberg, Huntington, N. Y. Granted February 11, 1913; filed October 25, 1911.

Automatic Carbureter—in which a gate valve designed for throttling the motor is connected to the fuel needle to maintain a constant fuel-air ratio.

This carbureter, Fig. 5, consists of a casing C, which is formed with a float chamber F and a carbureting chamber D, the bottom of the latter being designed with an extension formed with the passageway P. This passage communicates with the float chamber and a guide way is formed in the carbureter chamber D; in this guide a gate J is mounted and provided with a needle valve extending through the upper end of the passage P, so as to be capable of closing the same when the gate closes the guide of the carbureting chamber. By this means the intake of air and gasoline are simultaneously operated and a constant ratio of gasoline and air is maintained at all speeds.

No. 1,053,136—to Carl R. Daellenbach, Ellwood City, Pa. Granted February 11, 1913; filed January 27, 1911.

Treating Battery Separators—Consisting in the impregnating of the wooden separators sulphurous salt solution.

This process consists in the treating of wood separators for storage batteries. The separators are immersed in aqueous solution of neutral sodium bisulfate while the solution is maintained at a temperature between 100 and 175 degrees C. The products of decomposition are washed from the treated wood after which the wood is dried under pressure.

No. 1,052,851—to James M. Skinner, Philadelphia, Pa., assignor to Philadelphia Storage Battery Company, Philadelphia, Pa. Granted February 11, 1913; filed March 13, 1912.

Vehicle Wheel—The spokes of which are formed of flat springs secured at their ends to the felloe and to the hub, respectively.

In this wheel the spring spokes are formed from flat strips of springs metal, one end of which is secured to the felloe. The main portion of each spring is curved and is doubled upon itself so as to form an eye; an auxiliary spring portion is curved on a flatter curve than the main spring and its free end only bears against the concave side of the main spring portion, being slidable on the same.

No. 1,053,889—to Joseph Frank Starbuck, Philadelphia, Pa. Granted February 18, 1913; filed April 24, 1912.

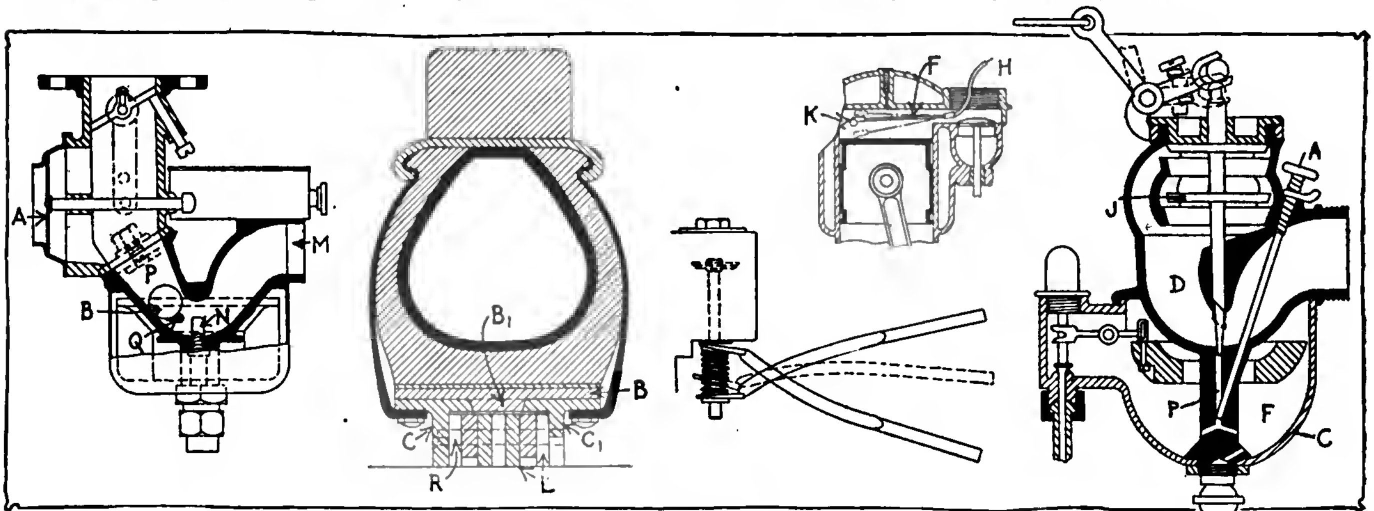


Fig. 1—Dayton carbureter. Fig. 2—Barry tread. Fig. 3—Calvert engine cleaner. Fig. 4—Nyberg tool. Fig. 5—Daellenbach carbureter

From the Manufacturer

Claim Internal Gears Are Superior to Outside Meshing Gears—Are Less Exposed to Breaking Strain

Magnetic Type of Controller Is Used on the Ohio Electric as Well as a Dynamic Brake

NEW YORK CITY—Editor THE AUTOMOBILE:—Recent announcements and demonstrations of the new Magic crescent sliding and poppet valve motor, designed by Martin Fischer, of Zurich, Switzerland, and the discussion of same at the recent meetings of the Society of Automobile Engineers, has caused much comment among automobile manufacturers and considerable interest is also being evidenced in the new Magic gear which will be used in conjunction with the motor. This is an internal gear and is a radical departure from the stereotyped change-speed gear.

Since its first try-out over 3 years ago it has proved an unqualified success, according to the makers.

The principal gear forming one piece with the driving shaft is on one end connected by a cardan joint with the clutch, and reposes at the other end in a square shifting block having large ball bearings. The high gear is obtained by the main driving pinion acting as a jaw clutch, no reduction gear wheels being in mesh, thus giving an ideal direct drive. The other speeds, first, second and third, are obtained by progressively bringing the main pinion directly into mesh with one of several internal gear rings with teeth cut conically, always having their center of generation in the cardan joint, thus doing away with the customary secondary shafts, the numerous gears usually employed, locking arrangements, springs, etc. In this way, this brings about the saving of at least 5 to 6 per cent. in general efficiency.

For the reverse drive, a small pinion is inserted between the main wheel and the internal gearing used for the first speed. The meshing of the main pinion with the internal gears is effected by shifting the end block on which there is a guide stud whch moves in the grooves of a horizontal plate. This stud also takes up any side pressure from the teeth, preventing any lateral displacement of the main pinion. The shaft of the internal gear rings reposes on two large ball bearings, one of which is mounted over the direct drive, and the other exactly under the foot-brake thus securing always a gentle and noiseless braking effect, and insuring accuracy of mesh.

Superior efficiency of the internal gears over outside meshing gears is what is claimed for the gear. With the internal gearing, there are always more teeth in mesh, consequently each tooth has to transmit a smaller amount of power and is correspondingly less exposed to breaking strain; or, if desired, an equal strength can be obtained as compared with outside meshing gears by having smaller gears. For every speed below direct, only two gears are in mesh.—MOTOR AND GEAR IMPROVEMENT COMPANY.

Control lever of the Ohio electric

Control for Electric Pleasure Vehicles

TOLEDO, O.—Editor THE AUTOMOBILE:—Most motors on electric vehicles are series wound. There should be at least four speeds: two starting speeds, with resistance in the circuit; one running speed, with the fields in series; and one runnng speed with the fields in series parallel. If additional speeds are desired, each of the above running speeds may be modified by shunting. It is agreed among engineers that a constant voltage should be maintained instead of using low voltage for low speeds and high voltage for high speeds. The net efficiency is greater because the loss due to heat in the resistance on the starting speeds is not as great as the loss in the efficiency of the motor, due to low voltage. Batteries will get out of balance if run in parallel and various other complications ensue.

The most common type of controllers are of the drum type. The Ohio electric controller is of the magnetic type, by means of which small currents controlled by a little disk conveniently located on the steering lever, operate magnets, which in turn operate the large currents which drive the motor. General Electric contactors are used. This type of control is growing in popularity for certain types of street cars and large power plants, as it is very rugged and will last a life time without burning out.

Dynamic brakes are used on some cars. On the magnetic control of the Ohio electric, a dynamic brake is operated by a small button located in the controller, and the degree of braking is governed by a small mechanical governor. This will hold the car on the steepest hill, down to 3 miles an hour if desired, without using the pedals.—OHIO ELECTRIC CAR COMPANY.

Harking Back a Decade

FROM THE AUTOMOBILE of February 21, 1903:

The yelping, howling and barking of dogs, the cracking of rifles and ringing of bullets against metallic targets, the puffing and rattling of gasoline motors in operation and the pounding of carpenters' and decorators' hammers characterized in an aural way the opening of the second annual sporting goods, automobile and dog show of the Tri-State Sportsmen's Association now in full swing at the Detroit Light Guard Armory.

The good roads movement has a delightful breadth of scope, but great things move slowly. It is particularly puzzling how it can be arranged rationally to a national rather than a local issue, so long as the long haul is distinctly monopolized by the owners of the excellent long-distance roads, the railways.—Editorial.

There is a politician in Wisconsin who, for unknown reasons, has a grudge against the owners of automobiles, and has decided that the state needs a law pertaining to that class of vehicles. Assemblyman Moldenhauer, who is from the northern part of the state, on February 3 introduced in the assembly a bill providing that all owners of automobiles must obtain a state license, for which they must pay $1.

THE AUTOMOBILE

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Hail to Motor Spirit

THE automobile industry should give careful consideration to the new fuel, motor spirit, announced in THE AUTOMOBILE a week ago, not because this fuel is specially intended for passenger car use but rather because its use in traction engines, stationary engines, motor trucks and for scores of other purposes will take the drain of these departments off the gasoline field and so leave this field to the passenger car.

Motor spirit is not primarily intended for passenger cars, but rather for the above uses. Statistics from North Dakota and other large agricultural states show that in the agricultural seasons the traction engines consume six times more gasoline than automobiles, this being specially true during the threshing period. It is also true that stationary engines are large consumers. A motor truck operating nearly 8 hours per day uses vastly more fuel than a passenger car running but a few hours per day. Motor spirit is better for all of these fields than gasoline. Motor spirit is better because it costs approximately 3 cents per gallon less and in addition it gives 25 per cent. greater efficiency.

At present the pungent odor is the one suggested argument against the use of motor spirit for passenger automobiles. This is not serious, not nearly so serious as imagined, and it is a certainty that there will be thousands of users of passenger vehicles running on this fuel because of the reduced price and the greater efficiency. There is not the slightest reason why the odor of this fuel should be objectionable, excepting when spilled on cushions or floors, and only then because it is much slower to evaporate than standard gasoline.

The manufacture of the present fuel must be considered a great boon to the motor industry and if it never were used in a passenger car it will still do its work of preventing any great increase in the price of fuel. The recent increases in the fuel price, amounting to in all 50 per cent. within the last year, have led some buyers to give special consideration to whether they would purchase a six-cylinder car or not, owing to the added cost of operation.

The National Shows

TWO or three automobile makers have been denouncing the national automobile shows held annually at New York and Chicago on the ground that they have outlived their usefulness and that to-day they are unnecessary expenses, in that the makers pay for approximately 60 per cent. of the attendance and that they are forced to expend enormous sums in daily advertising which could be expended to much greater advantage at other periods of the year.

On the face of it these two reasons for discontinuing shows appear inadequate as they are conditions that can be corrected by the makers themselves with scarcely any difficulty. The manufacturers make their advertising appropriations and it rests entirely with them how they should expend such appropriations and when; the purchasing of admission tickets to the shows for distribution among prospective buyers also rests with them.

The two national shows have played a wonderful part in the building up of the industry to-date and their discontinuance would be an injury at the present time. There is not any reason why shows cannot be continued for at least 5 years yet. The French industry imagined it could do without its annual show. It was discontinued for a year and the makers lost out so deplorably that there was a general call-together for the show. What is true in France is true in America, in spite of the fact that conditions are different in the two countries.

The fault with many manufacturers lies in themselves. They do not prepare for the show. They go into it in an expensive unprepared fashion and come home with barren regrets. The value of the show to the maker depends on the energies and preparedness with which the maker goes into it. A company generally gets from a show what it goes after. Those concerns not drafting out definite policies and perfecting plans will naturally reap regrets and they deserve to. The other concern that plans its show campaigns as carefully as its new season model, makes every preparation in advance; goes after its business systematically; drafts a complete show program and lives up to it; and, in a word, makes the show a value rather than going passively, looking for disappointments and receiving them in wholesale quantities.

The AUTOMOBILE

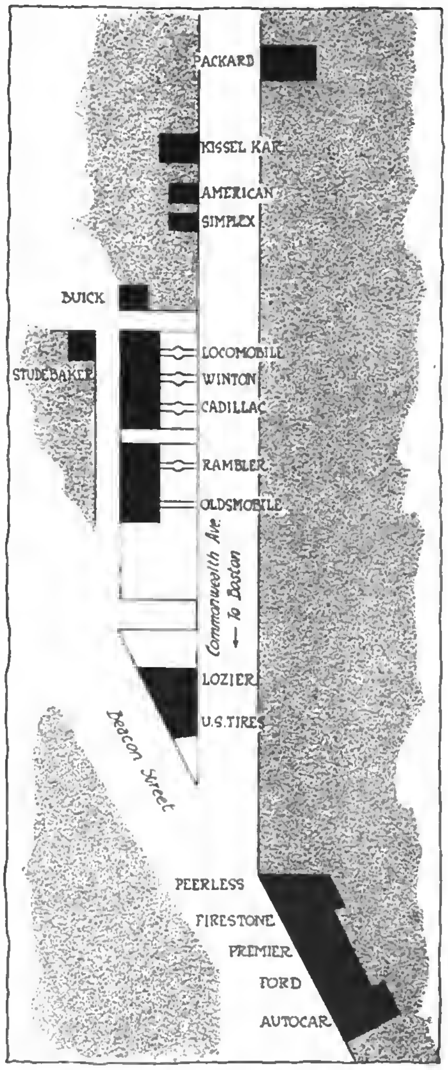
Service Plants for Boston Owners

The Hub Develops a Service District—New Buildings Represent Outlay of $1,750,000

BOSTON, MASS., March 1—No city in the country is doing more real service for the users of motor cars than Boston. The dealers and branches in the Hub long ago realized that to keep the good will of the men who bought motor cars there should be something more than merely a place where an owner could go in with his car, have a few jugs of oil, gasoline, and water poured in; a bit of grease daubed here and there; and a rag run over the body, work that any man with no knowledge of motors or mechanics could do.

So they started building places that would make adequate service stations. As a matter of fact it is believed that the title "service station" or "depot," was coined in Boston by Alvan T. Fuller. In this connection also it may be said that the Packard agent brought out also the phrase "renewed cars." At any rate when he built his big building in the Back Bay—a structure that many believed was to be a mausoleum of his hopes because of its size, cost and distance from the city proper and which was called "Fuller's Folly"—he had put over the door "service depot" and insisted that this name be used in his publicity notices.

Since he migrated many others have followed suit. As a result you can look along Commonwealth avenue and Beacon street today and within half a dozen blocks see at one glance service stations whose total value is more than $1,750,000. And if one were to look about and find the places in Cambridge where the Pope-Hartford, Stevens-Duryea, Chalmers, Hudson, Alco and others have buildings; the 6 acres of land just bought by the



Showing concentration of service stations in the Fenway district of Boston

Ford; the 150,000 square feet purchased for the Pierce-Arrow, the big shoe machinery building that was a colossal failure until turned over to motor service depots; the Bickerstaff street building; all these and a number of others scattered about the city it would total up several more millions. For the purpose of illustrating this article, however, it was decided to take the structures on a parallel line in the Fenway district all within a few blocks, as indicative of the vast growth, as the space of the article would not permit going into all details throughout the city. It shows, too, that the old order changes, for a few years ago no one ever dreamed of going out in the Fenway, more particularly for salesrooms. Yet thousands of feet of vacant land was available there needing only a pioneer, and once the threshold was crossed there followed the others.

Beginning at the extreme end with Mr. Fuller's Packard agency, that place represents an investment of about $300,000 for property alone. If one includes the stock carried it will jump to half a million easily. This big four-story building running back a couple of hundred feet is a real monument to progress in the motor industry. Yet even now it is too small for the Packard business, so plans have been drawn for additional wings to take care of the increase.

Across the way on the right a short distance down is the new home of the Kissel-Kar for the makers decided that Commonwealth avenue was none too good for this purpose. It is a two-story structure at the corner of two streets with a great deal of light and space about it, and rep-

LOCOMOBILE, WINTON AND CADILLAC

PACKARD

STUDEBAKER

PEERLESS, PREMIER, FORD, AUTOCAR AND FIRESTONE TIRES

resents a value of land and buildings of about $150,000. Some idea of its location may be gleaned when it is known that the White company, of Cleveland, after looking all over Boston and Cambridge for an available site has just purchased the lot beside the KisselKar for a new home, securing about an acre of land on which to erect a structure. Adjoining this is the home of the Marion and American, a one-story building running back some distance, also the new Simplex salesrooms and service depot. These two places represent more than $100,000, and a similar amount or more is tied up in the building of the Columbia Tire & Tool Company and the Hume carriage building. While these are not service depots they are devoted to the motor industry.

Going down the avenue there looms up in the sky the name "Buick" before anything else is seen, the service depot of that make being located around the corner on Lawton street. Across the street stands the long structure housing the Locomobile, Winton and Cadillac, while in the rear is the Studebaker structure. The Buick building is a four-story structure that has been in use the last few years and this represents a valuation of $65,000. That of the Studebaker is rated at $48,000.

The home of the Locomobile, Winton and Cadillac is one of the striking buildings in the city setting back as it does so many feet. The Locomobile occupies the Western end, the Winton the center and the Cadillac has just taken the easterly section. This structure having two stories and basement is well lighted and admirable in every way. It is taxed for $300,000. Excellent, too, are the Studebaker and Buick structures, although on a different plan because of the more restricted area.

Truck Industry Kept in Mind

Directly to the east of the Cadillac is the new home of the Thomas B. Jeffery company where are housed the Rambler cars. When it was built the Jeffery people had in mind the truck industry coming with its pleasure cars and so there is plenty room to take care of the latest Jeffery product. The Rambler has moved into its now home within a few months and it is not taxed yet, but it represents an outlay for land and buildings of perhaps $200,000 or more. Joined on to the Rambler is the Oldsmobile branch. This, too, is a new home and one finds it quite complete although only half the length of the Rambler. This is a building that when taken in hand by the assessors next May will be rated with its land at more than $100,000.

Standing in front of the Oldsmobile one can see the new building opened a week ago by the Lozier Motor Car Company. the Eastern end of which is occupied by the United States Tire Company. Here again the property values are high for it is at the junction of Beacon street and Commonwealth avenue and this will be another fine plum for the assessors to tax, the Lozier building alone being worth with its land well above $100,000. The Paige-Detroit will be marketed there, too.

Directly across the street where Commonwealth avenue crosses Beacon street stands another of the big monuments to the industry in the handsome Peerless plant. This was erected a couple of years ago, and for some time like a sentinel it guarded the eastern end of the Fenway while the Packard stood guard at the western end. This structure is assessed for $260,000. It seemed such a good investment for Governor Eugene N. Foss, of Massachusetts, who owns it, that he erected the Autocar building close by which is rated at $170,000. And the demand came along for others and so the genial governor said to his architects and builders to keep up the good work and in between was added the Ford, Premier and Firestone tire building rated at $115,000 and the handsome Peerless structure was no longer left alone.

To get some idea of what it means to have motor structures in this vicinity it may be said that Beacon street, beginning at the State House, whose gilded dome looms up in the distance from any of these structures is the home of the real blue blood aristocracy of Boston along the stretches to the Peerless building. So, too, is Commonwealth avenue, said to be one of the widest boulevards in America, and so laid out that it is included in the Boston Park system. As the city grew and homes were not to be had, apartments began to go up out in the Fenway where the motor structures are now rearing their heads. And looking back a decade one finds that the thought of business buildings in the Fenway was an abhorrent idea; one that would be scoffed at as unworthy of attention, while the owners of the land were not expecting to do any great developing for half a century. It was property that was eating its head off in taxes without a return even from letting billboards as a desecration.

Having erected service depots the men in charge have simplified matters in the way of giving real service these days. The Packard agency has such large facilities that it is possible to do more in the way of arranging for detail work in checking the car in and out than some of the other depots. For instance with four floors to work with more is needed than two, and so the matter of detail may be more comprehensive, but that does not necessarily mean that any better work is done than in some other places. For example, in the Packard building a car may go to the second, third and fourth floors for various requirements, while at the Locomobile it goes up one floor only. Therefore, it is not necessary to have such detail cards in the Locomobile branch as in the other. Manager Blake, of the Locomobile simplifies matters by passing out a blank on which is marked the work to be done, and this is sent to the owner for ratification before work is started. He reads it, and if agreeable he signs it so that there need be no dispute afterward on the charge. A time ticket stamps the car going in and out.

System at the Packard Station

In the Packard agency, when a car comes in a printed card is filled out giving the details of what is needed in the way of repairs. Then a long strip of tags are stamped, and the information card is put in a leather case and hung on the side. The tags are distributed to the workmen and whenever one man needs something or other he presents his duplicate tag and it is stamped and verified. A metal tag, not unlike a number plate, is hung on the car and a floor man coming along sees this and takes it to where it belongs, for a letter tells whether it is front or rear. The idea, like others, is to save time instead of having some one tell verbally or the floor man guess, where a car is going, and perhaps have a mixup of orders necessitating a car's being sent to the wrong floor. When the car is to be thoroughly overhauled it is stripped and every little thing on it is tabulated in duplicate and then put in a locker. The owner gets one of these check-up slips. If in but for a few days and the chauffeur is to work on the car on the lower floor—the only place a chauffeur or an owner is allowed—the robes, extra tires, etc., are checked just like baggage at a railroad station, and this eliminates any dispute about them, for they are locked in a separate closet. Everything is thoroughly systematized so that the car is sent along from one department to another, and when the work at one place is ended the man in charge of the department checks it off on the card while the tag of the workman is hung in a socket until the entire repairs are completed and all the tags are in place except one. This is the tester's tag, the last of all. He takes the car out and if he pronounces it O. K. it is stamped by the man at the office where the car first came in and the tag hung up on a board. Finally, a card is hung on the car that indicates it is ready for its owner, and he is notified to call for it. If he calls before the work is finished a telephone call to the department where the car is located will tell by a glance at the information card about how much longer the car will be in the shop. It is an extremely interesting system where no words are wasted; where men do things by reference to instructions before them; and where there can be no argument afterward because of the tabulations and checking up as the car proceeds from one department to another. Other service stations, too, have splendid systems, such as the Peerless, which was described in detail some time ago with a story on its new Boston branch.

RAMBLER AND OLDSMOBILE

KISSEL KAR

BUICK

LOZIER, PAIGE-DETROIT AND U.S. TIRES

N. Y. Bills Menace Motorists

Empire State Automobilists Dread Effects of Pernicious Legislation Threatened at Albany—Acts Would Mean Discrimination Against Private Owners and Members of Trade Without Opportunity of Offering Defense or Obtaining Hearing

¶ Bill No. 548—Every chauffeur must furnish to the Secretary of State a $500 surety company bond......*This means that all owners will be required to furnish such bonds for all of their chauffeurs.*

¶ Bill No. 649—All chauffeurs applying for registration must be photographed and have finger prints taken so that these may be compared with police records before the license is granted......*This assumes that all chauffeurs are criminals before they get their license to drive.*

¶ Bill No. 649—All tail lights shall be so connected that the switch for operating them cannot be controlled from the inside of the car......*With electric lights it would be necessary to stop the car, get out and operate a switch to light the tail lamps.*

¶ Bill No. 649—The Secretary of State shall have the power to revoke or suspend licenses with or without a hearing......*This would take away from every owner any possibility of defense.*

¶ Bill No. 842—The owner of a motor vehicle is held liable for damages to persons or property and no defense to any action brought shall be that the vehicle was being operated by an unauthorized person......*According to this, if your car is stolen and the thief in trying to escape kills a pedestrian or damages property, the car owner is liable and cannot use as a defense the argument that the thief was operating the vehicle.*

¶ Bill No. 567—The violation of a speed regulation by a motorist becomes a felony instead of a misdemeanor as at present...... *According to this any owner or driver who inadvertently exceeded the exact legal speed would be obliged to go to jail instead of paying a fine.*

¶ Bill No. 429—Every operator of a motor car must furnish a bond of $2,000 with the Secretary of State before his car can be registered or himself licensed......*Why?*

¶ Bill No. 896—Every motor vehicle in a first-class city with 1,000,000 inhabitants must come to a full stop in front of all fire houses; all street surface and steam railroad crossings; and all school houses, between 8 and 9 in the morning, 12 and 1 in the afternoon, and 3 and 4 in the afternoon......*With such an ordinance street congestion would be such as to imperil human life and stagnate traffic.*

¶ Bill No. 1067—The registration fees for passenger cars shall be doubled and the fees for commercial vehicles shall be $5 per ton load or fraction thereof......*At present the registration fee for a commercial vehicle is $5 per vehicle. At present there is not any registration fee for horse vehicles.*

¶ Bill No. 637—For an entire new automobile act to take the place of the present Callan law, which would include licensing motor cycles with automobiles and changing the penalties for violations of the law, etc.

¶ Bill No. 225—To increase the age limit for licensing chauffeurs from 18 to 21 years and reducing the registration fee from $2.00 to $1.00, at the same time making the owner liable for some of the fines which would be imposed on the chauffeurs under the act.

THESE excerpts from bills introduced into the New York State legislature show how motor-mad not a few of the legislators at Albany have become during the present session, and also give an indication of the acute seriousness of the situation, should any of these bills be enacted into laws.

It is impossible to understand just why such useless proposed legislation should be introduced: Sometimes it is due to ignorance, sometimes to a wrong viewpoint of the legislator, and other times for mere publicity. Irrespective of what has prompted the present legislators, one fact remains, namely, that motorists in New York State and owners of commercial vehicles must co-operate to combat many of the bills from which the above excerpts are taken, otherwise the Empire State will be placed under a serious handicap in automobiling.

It is difficult to conceive why the rate of registration on commercial vehicles should be increased from $5 per vehicle, as it is at present, up to $5 per ton, or fraction thereof, load, which the vehicle would carry. At present a 5-ton truck pays $5 per year license, but under the new law it would pay $25 per year. This legislation is apparently based on the assumption that the amount of damage done to a road is in proportion to the weight of the load. In this the legislators have entirely overlooked the one fact that road destruction is largely due to improper adhesion, such as skidding, which largely occurs at higher speeds than the 5-ton truck operates at.

Not infrequently the 1-ton truck damages the road as much as the 5-ton machine, because of the higher speeds at which it travels. The present proposed legislation assumes that road destruction is in direct proportion to load carried irrespective of width of tires, distribution of weight, etc.

If our legislators were to follow out the same policy in taxation in other avenues of life, it would mean that our school taxes would be graduated per family, according to the number of children attending school. That is, the property owner with a family of six would pay six times as much as the other owner having one child in attendance at school. Still further, it would mean that taxes for fire department service would be pro rated with those having fires, so that a concern having ten fires in the year would pay five times as much as another concern having two fires; and still further, concerns not having any fires would not be compelled to carry any of the burden. Amplifications of the peculiar operation of such a law could be carried much further.

In a word, the legislators are approaching the registration problem from an incorrect angle. Heavy horse wagons with narrow steel tires destroy the road. The calks in the horses' shoes destroy the road surface, forming little depressions in which the water collects. On the other hand, it has been proven in France and America that where special roadways intended for motor traffic have been created and horse traffic prohibited therefrom, that these roadways endured; whereas it is almost impossible to furnish a suitable road surface which will withstand mixed traffic. Legislators should recognize the motor car as an established means of communication, and one superseding the horse in many departments of commerce, and as such it is imperative on them to build roads and legislate in all fairness to it. It is wrong to let the horse truck go license-free and increase the fees on motor trucks.

The motor vehicle is a new factor in individual and freight transportation; it is one of the dominant forces that sprang into prominence with the growth of this century; it is a factor that is going to increase from year to year until the end of the century and beyond; and it is because of the position it has taken in human existence and in the world of commerce that legislators must not try to surround it with horse vehicle environments and compel it to carry the burden that rightfully should be shared by horse vehicles.

Some of the legislators introducing these bills claimed to have been prompted by the number of accidents caused by commercial motor vehicles and also motor passenger vehicles. In view of this argument it can be cited that there are in New York but twenty-five motorcycle policemen and these are all in citizen's clothes. The best method of preventing accidents would be to install a motorcycle force of 100 uniformed policemen, and with such a force it is a conservative estimate that accidents would be reduced more than one-half in a month's time.

To-day there are plenty of regulations surrounding the operation of motor vehicles. What is wanted is a better enforcement of existing laws rather than a multiplication of them. Compelling a motor vehicle to stop in front of every fire house or every school will not eliminate accidents. Horse vehicles have meen maiming as great a number in metropolitan centers as motor vehicles and yet legislators have not seen fit to even call for the registration of horse vehicles, much less horse drivers. Carelessness of pedestrians is to an enormous extent one of the leading causes of accidents. If, instead of trying to pass legislation compelling every motor vehicle to come to a full stop in front of a school, the legislations were aimed at placing a uniformed traffic policeman, or two if necessary, in front of each school house a better result would be obtained.

The passage of legislation as outlined in the excerpts already referred to would be a disgrace not only to the motoring interests of the State of New York but the entire electorate.

A hearing on this varied program of motor legislation is scheduled for Albany on March 13. Before that date every motorist should obtain the ear of his legislator and senator and see to it that he sees the motor vehicle in the position it at present plays in the development of transportation both passenger and freight. Each motor truck owner should register his influence against such legislation because of the dangerous situation it would create. Every dealer should co-operate in the movement to prohibit the passing of such bills. Makers of passenger cars and trucks should write their dealers in New York State; clubs should take up the opposition to these bills; and every business organization should do its part to see that unjust legislation such as this, unjust as it is to both maker and owner, is decisively defeated.

Dealers Organize To Meet Proposed Legal Measures

C. T. Terry Explains the Several Bills to Members of New York Association

AT a meeting of the Automobile Dealers' Association, Inc., at the Hotel Woodward, New York City, on February 26, the various automobile bills which have been introduced at the New York State Legislature at Albany at the opening of the present session were explained by Charles Thaddeus Terry. After going into the necessary detail, Mr. Terry explained why most of these bills if put into practice would be absolutely detrimental to the automobile industry and trade in the entire state. As has been reported repeatedly in THE AUTOMOBILE, the essence of the principal bills is that automobile registration fees be increased to two and a half times their present amounts and that the most rigid regulations be put in force against automobilists who were unfortunate enough to meet with mishaps on the road.

Among the interesting information brought out by Mr. Terry was the citation of a part of a bill which provides that whenever a chauffeur applies for a license the local police authorities may take his thumb prints with a view of comparing them to the records of the rogues' gallery, thus considering the automobile driver as a probable criminal from the beginning.

Another bill proposes that whenever an automobile owner is granted a license for driving his car he should file in the office of the secretary of state a bond amounting to $2,000, to serve as a guarantee of his law-abiding demeanor. Out of this bond any injuries or damages shall be paid and if the owner should become guilty of a criminal offense this bond would serve as a means of calling him to the bar.

Still another and equally ingenuous scheme has been introduced by a state senator. It provides that every chauffeur before being licensed shall file a bond of $500, guaranteed by a surety company; in other words, he must pay in advance for the possibility of an offense, an unprecedented course. Which, however, would no doubt prove of great advantage to surety companies.

What appears to be impudence Simon-pure constitutes the essence of a bill of considerable volume enumerating some twenty-five or thirty instances in which the secretary of state, at his discretion and without a hearing, may suspend or revoke a license granted to an automobile owner or driver. Such concentration of power in the hands of one man without any responsibility on his part to a body elected by the people is also an unheard-of innovation.

The following proposed measure should appeal to every thinking citizen:

Automobilists, when traveling through towns having 1,000,000 population or more, should bring their automobiles to full stop when passing a fire engine house, or a schoolhouse between 8 and 9 in the morning and 2 and 3 in the afternoon, excepting Sundays. The Solon who conceived this bill obviously forgot to make provision to except, in addition to Sundays, the seven National holidays which fall during the school season, as well as the 70 days of the summer during which the schools are closed in all cities. A first offense against this wise regulation, if the same be enacted, would cost an automobilist $25, a second offense $50 and a third $100 or 30 days in prison or both.

Another good idea: Any person registering as the owner of an automobile shall be primarily liable for any injury to persons or damage to property caused by his automobile, no matter whether driven by himself, his agent, a member of his family or an individual not authorized by him. That is to say, if a man's car is stolen while the owner is inside a house and if the thief driving the car kills a person on the highway and the number of the automobile is noted by a passer-by, the owner may be indicted for murder, manslaughter or whatever name the bill proposes for such an offense.

One feeble light in this otherwise impenetrable night of thoughtlessness—to use no stronger word—is the proposition that every vehicle using the public highways should display, from 1 hour after sunset until 1 hour before sunrise, a light which is plainly visible in front of the vehicle and in the rear of the same. This proposed measure includes, of course, horse-driven vehicles of every description.

Mr. Terry made it clear that concerted action on the part of automobile manufacturers, dealers, accessory makers and jobbers, owners and chauffeurs is necessary to prevent such legislation from being enacted and to prevent also the registration fees from being raised 150 per cent. over what they were in 1912. The Automobile Dealers' Association is preparing a protest against all unreasonable legislation now pending and will conduct an efficient campaign, including posters, to be conspicuously displayed in business places of automobile and accessory dealers, etc.

Complete List of Exhibitors at Boston Show

More than 300 Makers of Cars and Accessories To Display Their Products at New England's Representative Exposition

Anderson Electric Car Co. of Boston. Boston, Mass.
Adams & Company, J. Q. .... Boston, Mass.
Aetna Life Insurance Co. .... Boston, Mass.
Ajax-Grieb Rubber Co. .... New York City
Allen Wrench & Tool Co. .... Providence, R. I.
American Locomotive Co. .... Boston, Mass.
American Storage Battery Co. .... Cambridge, Mass.
Andrews-Dykeman Co. .... Boston, Mass.
Arnold, N. B. .... Brooklyn, N. Y.
Automobile Supply Mfg. Co. ...... Brooklyn, N. Y.
Auto Parts Co. .... Providence, R. I.
Automobile Dealer & Repairer ..... New York City
Am. Kushion Kore Tire Co., Inc. .. Buffalo, N. Y.
Armstrong & Curtis Co. .... Somerville, Mass.
Abbott Motor Co. .... Detroit, Mich.
American Motors Co. .... Indianapolis, Ind.
Albany Lubricating Co. .... New York City
Bartlett, Edwin E. .... Boston, Mass.
Bennett & Ricker Co., The. . No. Cambridge, Mass.
Bailey & Co., Inc., S. R. .... Boston, Mass.
Batavia Rubber Co., The .... Batavia, N. Y.
Baum's Castorine Co. .... Rome, N. Y.
Bell, Bayers & Woodbury .... Boston, Mass.
Borland-Grannis Co., The .... Chicago, Ill.
Boston Tire & Rubber Co. .... Boston, Mass.
Bowman Co., The J. W. .... Boston, Mass.
Bowser & Co., S. F. .... Fort Wayne, Ind.
Boyd, F. Shirley .... Boston, Mass.
Boyd Motor Co. .... Boston, Mass.
Buick Motor Co. .... Boston, Mass.
Burn Boston Battery & Mfg. Works, Boston, Mass.
Bergdoll Motor Co. of Boston ...... Boston, Mass.
Binney, J. A. .... Boston, Mass.
Briggs-Detroiter Co. .... Detroit, Mich.
Buffalo Electric Vehicle Co. .... Buffalo, N. Y.
Baker Motor Vehicle Co. .... Cleveland, Ohio
Cadillac Automobile Co. of Boston. . Boston, Mass.
Cataract Rubber Co., The .... Boston, Mass.
Champion Ignition Co. .... Flint, Mich.
Chandler & Farquhar Co. .... Boston, Mass.
Clark Foundry Co. .... Rumford, Maine
Clark, Carter Auto Co. .... Jackson, Mich.
Coes Wrench Co. .... Worcester, Mass.
Columbia Lubricants Co. of N. Y. . New York City
Columbia Tire & Top Co. .... Boston, Mass.
Connecticut Tel. & Elec. Co. ...... Meriden, Conn.
Connell & McKone Co. .... Boston, Mass.
Consolidated Rubber Tire Co. ...... New York City
Cook's Sons, Adam .... New York City
Coward Auto Supply Co. .... Boston, Mass.
Cramp & Sons Ship & Engine Bldg. Co., Philadelphia, Pa.
C. R. G. Mfg. Co. .... Saugus, Mass.
Crowell Chemical Co. .... Beverly, Mass.
Curtis-Hawkins Co., The .... Boston, Mass.
Case Threshing Machine Co., J. I. . Boston, Mass.
Cutting Motor Car Co. .... Jackson, Mich.
Cole Motor Car Co. .... Indianapolis, Ind.
Columbia Motor Car Co. .... Hartford, Conn.
Chevrolet Motor Co. .... Detroit, Mich.
Chalmers Motor Co. .... Detroit, Mich.
Columbus Buggy Co. .... Columbus, Ohio
Dayton Motor Car Co. .... Dayton, Ohio
Dayton Airless Tire Co., The .... Boston, Mass.
Daniels, Smalley .... Boston, Mass.
Dean Electric Co., The .... Elyria, Ohio
Diamond Rubber Co., The .... Akron, Ohio
Dixon Crucible Co., Jos. .... Boston, Mass.
Dodge Motor Vehicle Co. .... Cambridge, Mass.
Double Fabric Tire Co. .... Auburn, Ind.
Dover Stamping Mfg. Co. .... Cambridge, Mass.
Dutton Motor Co., Inc., F. A. ...... Boston, Mass.
Donovan Motor Car Co. .... Boston, Mass.
Davis Carriage Co., Geo. W. ...... Richmond, Ind.
Dunn Ray Co. .... Boston, Mass.
Eagle Oil & Supply Co. .... Boston, Mass.
Eavenson & Sons, Inc., J. .... Camden, N. J.
Edison Storage Battery Co. .... W. Orange, N. J.
Eisner-Lenk Co., The .... Boston, Mass.
Electric Storage Battery Co., The, Philadelphia, Pa.
Empire Rubber & Tire Co. .... Trenton, N. J.
Endurance Tire & Rubber Co. ...... New York City
Elliott Motor Engine Co. .... Waltham, Mass.
Ernsdale Worsted Co. .... Clinton, Mass.
Fairbanks Co., The .... Boston, Mass.
Federal Rubber Mfg. Co. .... Cudahy, Wis.
Fiat Motor Sales Co. .... Boston, Mass.
Firestone Tire & Rubber Co. .... Akron, Ohio
Firestone-Columbus Buggy Co. .... Columbus, Ohio
Fisk Rubber Co., The .... Chicopee Falls, Mass.
Flentje, Ernst .... Cambridge, Mass.
Forbes, Walter J. .... Boston, Mass.
Ford Motor Co. .... Boston, Mass.
Franklin Motor Car Co. .... Boston, Mass.
Fuller, Alvan T. .... Boston, Mass.
Ford Co., Percy .... Boston, Mass.
Gabriel Horn Mfg. Co. .... Cleveland, Ohio
Garford Co., The .... Elyria, Ohio
Grinnell Electric Car Co. .... Detroit, Mich.
Gibney Rubber Co., James L. .... Philadelphia, Pa.
Goodrich Co., The B. F. .... Akron, Ohio
Goodyear Tire & Rubber Co., The .... Akron, Ohio
Gray & Davis, Inc. .... Boston, Mass.
Grady & Co., J. W. .... Worcester, Mass.
Globe Wrench Co. .... Ipswich, Mass.
Habich Co., G. E. & H. J. .... Boston, Mass.
Harrington-Thompson Motor Cars, Inc., Boston, Mass.
Harris Oil Co., A. W. .... Providence, R. I.
Hartford Suspension Co. .... Jersey City, N. J.
Havers Motor Car Co. .... Port Huron, Mich.
Haynes Automobile Co. .... Kokomo, Ind.
Havoline Oil Co. .... New York City
Haws, George A. .... New York City
Heinze Electric Co. .... Lowell, Mass.
Henley-Kimball Co., The .... Boston, Mass.
Hillman Auto Supply Mfg. Co. ...... Boston, Mass.
Hoffecker Co., The .... Boston, Mass.
Holden, George N. .... Boston, Mass.
Hollander Motor Co. .... Boston, Mass.
Holtzer-Cabot Electric Co., The. . Brookline, Mass.
Homo Co. of America .... Philadelphia, Pa.
Holt & Beebe Co. .... Boston, Mass.
Hood Rubber Co. .... Watertown, Mass.
Hopewell Bros. .... Newton, Mass.
Hoyt Carburetor & Auto Co. .... Boston, Mass.
Henderson Motor Car Co. ...... Indianapolis, Ind.
Hudson Motor Car Co. .... Detroit, Mich.
Hupp Motor Car Co. .... Detroit, Mich.
Ideal Motor Car Co. .... Indianapolis, Ind.
Imperial Automobile Co. .... Jackson, Mich.
Ingersoll-Rand Co. .... New York City
International Acheson Graphite Co., Niagara Falls, N. Y.
International Metal Polish Co. .... New York City
Inter-State Automobile Co. .... Boston, Mass.
Invader Oil Co. .... Boston, Mass.
Jackson Motor Car Co. .... Boston, Mass.
Jeffery Co. of N. E., The Thos. B. . Boston, Mass.
J. M. Shock Absorber Co., Inc., The, Philadelphia, Pa.
Jones Speedometer, The .... Brooklyn, N. Y.
K. D. Motor Co. .... Brookline, Mass.
Kelleher, J. J. .... Dorchester, Mass.
Keystone Lubricating Co. .... Boston, Mass.
Kilham, J. F. .... Beverly, Mass.
Kobeler Sporting Goods Co., H. J. . Boston, Mass.
Knox Automobile Co. .... Springfield, Mass.
Krit Motor Car Co. .... Detroit, Mich.
Kelly-Springfield Tire Co. .... New York City
Lapoint Co., The J. N. .... New London, Conn.
Lawrence & Stanley Co. .... Boston, Mass.
Leather Tire Goods Co. ...... Niagara Falls, N. Y.
Lee Tire & Rubber Co. .... Conshohocten, Pa.
Lenox Motor Car Co., Inc., The .... Boston, Mass.
Lewis, C. B. .... Cambridge, Mass.
Linscott Motor Co. .... Boston, Mass.
Linscott Supply Co. .... Boston, Mass.
Little Motor Car Co. .... Flint, Mich.
Locomobile Co. of America, The .... Boston, Mass.
Lochler Die Casting Co. .... Brooklyn, N. Y.
Lovell-McConnell Mfg. Co. .... Newark, N. J.
Lozier Motor Co. of N. E. .... Boston, Mass.
Lunt Moss Co. .... Boston, Mass.
Laidlaw, Wm. R., Jr. .... New York City
Marathon Motor Works .... Nashville, Tenn.
Maxwell-Briscoe Motor Co. .... Auburn, R. I.
McCue Co., The .... Buffalo, N. Y.
MacAlman, J. H. .... Boston, Mass.
MacDonald, Donald N. .... Boston, Mass.
Maguire Co., The J. W. .... Boston, Mass.
Marburg Bros. Inc. .... New York City
Meyers Bros. .... New York City
Metz Co. .... Waltham, Mass.
McFarlan Motor Car Co. .... Connersville, Ind.
Mercer Automobile Co. .... Trenton, N. J.
Michelin Tire Co. of Mass. .... Boston, Mass.
Michigan Motor Car Co. .... Kalamazoo, Mich.
Middleboro Auto Exchange ..... Middleboro, Mass.
Mitchell Lewis Motor Co. .... Racine, Wis.
Miller, Chas. E. .... New York City
Moore Smith Co. .... Boston, Mass.
Morrison-Ricker Mfg. Co. .... Grinnell, Iowa
Moon Motor Car Co. .... St. Louis, Mo.
Morse & Co., Alfred Cutler .... Boston, Mass.
Mossberg Co., Frank .... Attleboro, Mass.
Motor Parts Co. .... Philadelphia, Pa.
Motor Vehicle Pub. Co. .... New York City
Motor & Accessory Mfrs. .... New York City
Motz Tire & Rubber Co., The .... Akron, Ohio
Moyer, H. A. .... Syracuse, N. Y.
Motor Car Mfg. Co. .... Boston, Mass.
MacDonnell, Webster .... Haverhill, Mass.
National Tube Co. .... Pittsburg, Pa.
Neale, A. F. .... Boston, Mass.
National Motor Vehicle Co. ...... Indianapolis, Ind.
New Departure Mfg. Co., The ...... Bristol, Conn.
N. Y. & N. J. Lubricant Co. .... New York City
Norton Co. .... Worcester, Mass.
New England Motorcycle Co. .... Boston, Mass.
Nordyke & Marmon Co. .... Indianapolis, Ind.
Nyberg Automobile Works .... Anderson, Ind.
Oakland Motor Co. .... Boston, Mass.
Oldsmobile Co. of Mass. .... Boston, Mass.
Orona Mfg. Co. .... Boston, Mass.
Packard Motor Car Co. .... Detroit, Mich.
Pantasote Co., The .... New York City
Peerless Motor Car Co. of N. E. ... Boston, Mass.
Paige-Detroit Motor Car Co. .... Detroit, Mich.
Pennsylvania Rubber Co. .... Jeannette, Pa.
Phila. Grease Mfg. Co., The .... Boston, Mass.
Piel Co., The G. .... Long Island, N. Y.
Pierce-Arrow Motor Car Co., The. . Buffalo, N. Y.
Pittsfield Spark Coil Co. .... Dalton, Mass.
Pope Mfg. Co., The .... Hartford, Conn.
Premier Motor Car Co. of N. E. .... Boston, Mass.
Pyrene Co. of New England .... Boston, Mass.
Presto Inter Rim Co. .... Boston, Mass.
Peacock & Co., Clarence N. .... New York City
Randall-Faichney Co., The .... Jamaica Plain, Mass.
Raymond Engineering Co., Inc. ..... Boston, Mass.
R. C. H. Corporation .... Boston, Mass.
Reinhart, George W. .... Boston, Mass.
Regal Motor Car Co. .... Detroit, Mich.
Reo Motor Car Co. .... Lansing, Mich.
Reliance Speedometer Co. .... Boston, Mass.
Remy Electric Co. .... Anderson, Ind.
Republic Motor Co. of Mass., Inc. .. Boston, Mass.
Republic Rubber Co., The ...... Youngstown, Ohio
R. & L. Co., The .... Boston, Mass.
Roberts-Sherburne, Inc. .... Boston, Mass.
Robinson & Son Co., Wm. C. ...... Boston, Mass.
Rose, P. R. .... Boston, Mass.
Russell Co., T. F. .... Boston, Mass.
Russell Co., The W. L. .... Boston, Mass.
Rose-Harvey Co. .... Boston, Mass.
Rauch & Lang Carriage Co. .... Cleveland, Ohio
Salman, John A. .... Boston, Mass.
Sawyer Oil Co., Howard B. .... Boston, Mass.
Schoen-Jackson Co. .... Media, Pa.
Seamless Rubber Co., The .... Boston, Mass.
Shannon, T. R. .... Hartford, Conn.
Shaler Co., C. A. .... Waupun, Wis.
S. G. V. Co. .... Reading, Pa.
Simms Magneto Co., The .... New York City
Smith, Fred S. .... Boston, Mass.
Splitdorf Electrical Co. .... Newark, N. J.
Standard Auto Supply Co. .... Boston, Mass.
Standard Thermometer Co. .... Boston, Mass.
Standard Tire & Rubber Co. .... Boston, Mass.
Standard Welding Co., The ...... Cleveland, Ohio
Standard Woven Fabric Co. ...... Worcester, Mass.
Stanley Motor Carriage Co. .... Newton, Mass.
Stevens-Duryea Co. .... Chicopee Falls, Mass.
Stearns Co., The F. B. .... Cleveland, Ohio
Steel Specialties Co. .... Boston, Mass.
Stevens, W. H. .... Boston, Mass.
Stewart & Clark Mfg. Co. .... Chicago, Ill.
Stromberg Motor Devices Co. .... Chicago, Ill.
Stutz Motor Car Co. .... Boston, Mass.
Speedwell Motor Car Co. .... Dayton, Ohio
Swinehart Tire & Rubber Co., The ... Akron, Ohio
Texas Co., The .... New York City
Tobey, Wm. L. .... Boston, Mass.
Townsend & Co., S. P. .... Orange, N. J.
Tyer Rubber Co. .... Andover, Mass.
Tyler Bros. Corp. .... Boston, Mass.
Tiffany Co., D. C. .... Boston, Mass.
Underhay Oil Co. .... Boston, Mass.
Underhill Co., The .... Boston, Mass.
United Motor Boston Co. .... Boston, Mass.
United Rim Co., The .... Akron, Ohio
U. S. Light & Heating Co., The .... New York City
United States Tire Co. .... Boston, Mass.
Vacuum Oil Co. .... New York City
Valentine & Co. .... New York City
Veeder Mfg. Co., The .... Hartford, Conn.
Velie Motor Vehicle Co. .... Boston, Mass.
Vesta Accumulator Co. .... Chicago, Ill.
Voorhees Rubber Mfg. Co. ...... Jersey City, N. J.
Walker Lithograph & Pub. Co. ...... Boston, Mass.
Walpole Tire & Rubber Co. .... Boston, Mass.
Ward & Sons, Edgar T. .... Boston, Mass.
Waverly Co., The .... Indianapolis, Ind.
Warner Instrument Co. .... Beloit, Wis.
Weed Chain Tire Grip Co. .... Boston, Mass.
White Co., The .... Boston, Mass.
White & Bagley Co., The .... Worcester, Mass.
Whitten-Gilmore Co., The .... Boston, Mass.
Willard Storage Battery Co., The. . Cleveland, Ohio
Wing Motor Car Co., F. E. .... Boston, Mass.
Winship, W. W. .... Boston, Mass.
Winton Motor Car Co., The .... Boston, Mass.
Willys-Overland Co. .... Toledo, Ohio
Wolverine Lubricant Co. .... Boston, Mass.
Wayne Oil Tank & Pump Co. .... Boston, Mass.
Westcott Motors Co. .... Boston, Mass.
Williams & Co. .... Boston, Mass.
Woods Motor Vehicle Co. .... Chicago, Ill.
White, Harry C. .... Boston, Mass.

Desperados Fail To Win Tire Strike

Imported Agitators Merely Prolong Trouble for a Period of 7 Days—Loss Estimated at $50,000,000

AKRON, O., March 4—(*Special Telegram*)—Imported agitators into Akron, many being among the most desperate characters in the country, have been the means of prolonging the strike among the rubber workers here for another week.

A week ago the strike was broken and there was a great rush on the part of the thousands of men and women to get back to work. Then came the imported strike leaders and sensational demands by one of the local newspapers for a state senatorial investigation of the rubber factories here and the conditions leading up to the strike.

The senatorial committee has been in session here 3 days. All sessions are being held at the Portage Hotel and are open to the public. Many of the strikers, members of the I. W. W., have related their alleged grievances. The testimony from the men has demonstrated the fact that higher wages are paid in Akron rubber factories than in any other similar factories in the country. Many of the common laborers have testified that they received from $3.50 to $5 a day. None of the testimony from the strikers was substantiated, the charges made by the strikers being that they were poorly paid and mistreated. In the meantime one of the Socialist editors, a leader in the strike, has been arrested for inciting a riot and has been sent to the workhouse.

Two desperate characters have been fined and imprisoned for carrying red flags through the streets and many other imported strike leaders have been arrested. Announcement was made tonight that "Big Bill" Haywood will arrive in the city to try and pull together the remnants of the I. W. W. that has fallen to pieces. The chairman of the I. W. W. executive committee resigned tonight and threatens to make sensational exposures of the I. W. W. later. All of the sessions of the state probe committee are being daily attended by head officials of the local rubber companies. Frank A. Seiberling, president of Goodyear Tire & Rubber Company, was the first of the manufacturers to appear before the state probe committee this afternoon. Seiberling has furnished committee with every possible information. He testified today that out of 21,500 people employed in Akron Rubber factories there are now 11,700 at work and hundreds returning daily. Every plant in city is fast resuming normal conditions. Local rubber manufacturers say that they will never recognize the I. W. W. Estimates were made today that over $50,000,000 have been lost to stockholders and the city as result of strike. Saloons, which have been closed over a week in the city, were opened again today. The parades which were features of the strike a week ago have been called off. Interest is centred on the coming of Haywood. Police are prepared to arrest Haywood when he comes. The senate probe committee is disgusted with the probe and has said that Akron rubber factories are the best in the country.

Hartford Maxwell to Build Six

HARTFORD, CONN., March 4—The Maxwell Motor Company, Inc., successor to the Columbia Motor Car Company, continues to increase its manufacturing force and is hiring men every day, a great majority being the old workmen who have been with the company for years. The company is also installing considerable new machinery, and has in transit a carload of such with more to follow in a few weeks. The policy is to continue adding to the equipment as fast as required and to replace much of the old machinery with the latest types.

The company is going to confine its efforts to the Knight sleeve-valve motor and in addition to its four-cylinder model expects to market a six-cylinder one sometime in June. This six, using cylinders cast in threes, will have a bore of 4.5 inches, a stroke of 4.5 inches, and a 139-inch wheelbase. It is the purpose to completely equip this model with all accessories necessary for transcontinental travel, including an electric lighting and starting system. The car will list touring car bodies at $5,000.

The company expects to also market Knight-motored cars of smaller motor sizes and to be sold at correspondingly lower prices than those listed at present. The entire product of this company will be handled by a separate list of dealers from those handling the other products of the Maxwell Motor Company, Inc., and it is planned to have a separate selling organization with headquarters at the Hartford plant.

Hartford Tire Men Convene

HARTFORD, CONN., March 1—Forty-six service department heads of the United States Tire Company met at the Hartford Rubber Works plant this week for a 3-day session. The attending service managers are from the various branches throughout the eastern district. The object of the meeting was to discuss service in relation to the tire user. Talks were given by officials of the company. The local plant was inspected. The service department of the United States Tire Company has assumed large proportions within the past year.

Chalmers to Issue $1,500,000 in Stock

DETROIT, MICH., March 1—The Chalmers Motor Company plans to issue $1,500,000 in 7 per cent. preferred stock at a meeting of the stockholders to be held the middle of the month. The proceeds from the issue are to be used merely as a reserve fund for protection against contingencies, and not to pay off any existing obligations as was stated in some quarters.

Sixty-five representatives of banking institutions in various parts of the country inspected the factory today to ascertain whether they could handle the issue. As their opinion was favorable, there is no doubt that the issue will be formally authorized at the coming stockholders' meeting. Although a meeting of the stockholders was held today, the matter of the issue was merely brought before it, no definite action being taken at this time.

Court Upholds Consolidated Rubber Co.

On March 3, Judge Coxe, of the U. S. District Court, Southern District of New York, rendered a decision in favor of the Consolidated Rubber Tire Company, and the Rubber Tire Wheel Company, against the Diamond Tire Company, of New York, the Diamond Tire Company of Ohio, the Diamond Tire Company of West Virginia, the B. F. Goodrich Company, of New York, A. H. Marks, W. B. Miller and G. Work, to restrain the defendants from disposing of a quantity of tires, held by them which constitutes an infringement under the Grant patent, which expired Feberuary 18. The complainant also has a decision authorizing him to have destroyed the stock which is held by these companies, and also the Kokomo Tire Company, of Indiana. There is a suit now against the Diamond Rubber Company, in the U. S. District Court, Northern District of Ohio.

Detroit Is Short of Cars

Branch Office of N. A. A. M. Doing Good Work in Securing Cars for Use of Automobile Manufacturers

Members of the Trade Rendering Excellent Co-operation in Securing Data Covering Needs of Transportation

DETROIT, MICH., March 3—Since its establishment by the National Association of Automobile Manufacturers at the convention held in this city last fall, the Detroit office of the Association's traffic department has played an important part in the shipments of motor cars from this city and the return of the empty freight cars. During January the office was concerned in the shipment of between 5,000 and 6,000 carloads of automobiles. Figuring that each of these cars averaged four machines, the total shipment of automobiles from this city during January was somewhere between 20,000 and 24,000. These figures are conservative as some of the freight cars contained as high as eight machines. On the other hand, some of them carried only three.

According to J. A. Gardner, manager of the Detroit office, the greatest work of his department lies in the securing of the return of the special automobile box cars to this city for reloading after they have reached their destinations. The automobile industry is handicapped so far as its freight cars is concerned, since shippers of many other lines of merchandise can make use of the automobile cars equally as well, if not better, than they can the regulation box cars with side doors. On the other hand the motor car maker can use only the specially constructed cars. As a consequence, it keeps the traffic bureau busy tracing the special cars and preventing them from being purloined before they can be returned for further service to the automobile makers.

The Detroit traffic office is working to great advantage to the automobile makers. Mr. Gardner states that there has really been little or no car famine here this winter, although off and on there has been somewhat of a shortage. With the increasing shipments of spring goods in all lines there is beginning to be a slight curtailment of the freight car supply, although the bureau does not look for any great shortage.

Lyons-Knight To Build Cars

INDIANAPOLIS, IND., March 5—The Lyons Atlas Company, one of the four American Knight licenses, and which heretofore has confined itself to building the Lyons-Knight motors, has decided to embark into the car manufacturing field as well. This comes out in the announcement made today that the Lyons-Atlas people have purchased the sample cars, parts, drawings and patterns of the Knight engined cars which were designed and developed during the last 18 months by Harry A. Knox, of Springfield, Mass. Mr. Knox and his draughtsmen have been brought on from the East and already have been given quarters in the local plant and the new car will be brought out under the direction of Mr. Knox. Both sixes and fours will be built and the car will be featured by a worm-drive axle, left steer, center control, electric starter, electric lighting equipment and gasoline tank on the dash. The transmission is embodied in the rear-axle housing. Deliveries will begin in 6 weeks.

Knox Liability Schedule Filed

SPRINGFIELD, MASS., March 1—The schedule of liabilities filed this week in the United States District Court at Boston by Albert E. Smith, treasurer of the Knox Automobile Co., which assigned on September 27 last for the benefit of its creditors, shows but two secured creditors. The total liabilities are put at $1,286,409 and the assets at $1,380,386. There are more than 500 unsecured creditors. Here are the larger ones, some of them being well-known firms in the motor industry, makers of tires and parts:

Estate of Alfred N. Mayo, Edward O. Sutton, Harry G. Fiske and W. T. Schell, administrators. Promissory notes for money loaned, with interest	$926,500
First National Bank, Boston	40,000
Chicopee National Bank, Chicopee	30,000
National Exchange Bank, Hartford	6,000
Keely-Springfield Tire Co., New York	3,756
W. E. Wright, Springfield, salary	1,775
Cape Ann Tool Co., Pigeon Cove	3,007
Fisk Rubber Co., Chicopee Falls	80,473
W. F. Galle & Co., Cincinnati	5,025
Goodyear Tire & Rubber Co., Akron, O.	5,813
W. J. Kells Mfg. Co., New York	$3,792
E. R. Merrill Spring Co., New York	4,316
Merrimac Paper Co., Lawrence	1,195
Millbury Steel Foundry, Millbury	3,359
New Haven Carriage Co., New Haven	2,828
Ross Gear & Tool Co., Lafayette, Ind.	2,434
A. O. Smith Co., Milwaukee, Wis.	7,003
Spring Perch Co., Bridgeport, Conn.	5,482
Standard Oil Co., New York	2,300
Timken Detroit Axle Co., Detroit	4,959
Wyman & Gordon Co., Worcester	2,594
English & Mersick Co., New Haven, Conn.	6,196

The assets of $1,380,386 consist of incumbered real estate valued at $268,300, the estimated value of the patents and stock in trade put down at $750,000 and the estimated value of the machinery, fixtures, tools, etc., used in the manufacture of automobiles.

INDIANAPOLIS, IND., March 3—Judge Albert B. Anderson, of the United States District Court, has denied a petition filed some time ago by Indiana creditors asking that the Maxwell-Briscoe Motor Company, which had a plant at Newcastle, now owned by

Automobile Securities Quotations

As was to be expected, the much reduced tension obtaining at Akron caused a fairly general restitution of old prices of tire stocks during this week, Firestone common advancing 25, Goodyear common 25, Miller 35, Swinehart 7 and U. S. Rubber 4. Fisk preferred was the only tire issue which sold down, and the loss of 2 points appeared to be insignificant in every respect. Automobile manufacturing securities, including Chalmers, General Motors, Studebaker and Willys-Overland also scored advances.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	150	175
Ajax-Grieb Rubber Co., pfd	..	..	95	99
Aluminum Castings, pfd	..	..	99	101
American Locomotive Co., com	33	33½	36¼	37
American Locomotive Co., pfd	105	105¼	104½	105½
Chalmers Motor Company	..	..	135	145
Consolidated Rubber Tire Co., com	10	20	20	25
Consolidated Rubber Tire Co., pfd	25	40	..	83
Firestone Tire & Rubber Co., com	200	205	290	305
Firestone Tire & Rubber Co., pfd	108	110	102	104
Garford Company, preferred	..	..	98	100
General Motors Company, com	31	32	30	31
General Motors Company, pfd	75	76	77	78
B. F. Goodrich Company, com	..	..	43	43½
B. F. Goodrich Company, pfd	..	..	99	100
Goodyear Tire & Rubber Co., com	338	342	390	395
Goodyear Tire & Rubber Co., pfd	108	110	102	104
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	5	15
International Motor Co., pfd	..	..	35	55
Lozier Motor Company	..	..	27	30
Miller Rubber Company	..	..	186	190
Packard Motor Company	104	107	102	105
Peerless Motor Company	..	..	120	125
Pope Manufacturing Co., com	40	43	..	30
Pope Manufacturing Co., pfd	74	77	..	75
Reo Motor Truck Company	8	10	11¼	12½
Reo Motor Car Company	23½	25	20½	21½
Rubber Goods Mfg. Co., pfd	100	105	104	106
Studebaker Company, com	..	..	31	32½
Studebaker Company, pfd	..	..	88	93
Swinehart Tire Company	..	..	95	102
U. S. Motor Co., com	..	..	..	8
U. S. Motor Co., 1st pfd	..	..	..	35
U. S. Motor Co., 2nd pfd	..	..	..	65
U. S. Rubber Co., com	46	47	63	63⅜
U. S. Rubber Co., 1st pfd	110	110½	105½	106
White Company, preferred	..	..	103	107
Willys-Overland Company, com	..	..	64	69
Willys-Overland Company, pfd	..	..	93	97
Fisk Rubber Co., com	..	..	..	..
Fisk Rubber Co., pfd	..	..	100	104

the Maxwell Motor Co., be adjudged bankrupt. He has also dissolved an order restraining the removal of any property from the Newcastle plant or from the jurisdiction of the court. It was shown in court that the petitioners had assigned their claims, which have since been satisfied, to Henry V. Poor and that the court had no jurisdiction in the matter.

There was an absence of new developments of importance in the crude rubber situation yesterday. Trading in the leading markets of the world continued sluggish so far as the consuming demand was concerned. Manufacturers in some cases are believed to be carrying small supplies, but they seem to be sufficient for their needs, and few in the trade expect to witness any increase in the demand in the near future. Here in New York the market was devoid of new features of interest. The attitude of both the buyer and the seller seems to be a waiting one. Up-river fine was calling at $.95.

BUFFALO, N. Y., March 5—The entire plant of the Thomas company will be sold at an unrestricted sale covering the dates of March 17 to 22 inclusive. The sale will be handled by J. E. Conant & Company on the premises.

NEW YORK CITY, March 5—As reported exclusively in THE AUTOMOBILE of last week, the Merchants' Association, of New York has been studying the automobile situation with a view of bringing the industry to this city. The results of this study have been so promising that the industrial committee has now definitely decided to take vigorous steps to interest both new and old manufacturers.

Market Changes of the Week

Tin proved to be the most important change in the markets this week, gaining $.15 per hundred pounds. Starting on Wednesday at $47.75, it fluctuated sometimes $.25 below Wednesday's price, but pulled itself up to $47.90 on Tuesday. An easier tone was developed in refined copper yesterday, with less buying of electrolytic in Europe and fewer orders from domestic consumers, but prices were without essential changes, electrolytic and Lake rising $.00 1-4 and $.00 1-8 per pound, respectively. Linseed remained quiet but steady, although going a drop of $.03 on Saturday. Lead remained constant at $4.30 per hundred pounds. Cottonseed oil trading on the local market yesterday was of rather insignificant volume. Price changes were also unimportant. Offering of crude were not large, but there was no demand from refiners. The consuming demand continues light. It experienced a gain of $.05 per barrel. Forcing scrap rubber remains in a firm position.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.	.08¼	.08¼	.08¼	.08¼	.08¼	.08¼	....
Beams & Channels, 100 lbs.	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Copper Elec., lb.	.14⅝	.14⅝	.14⅝	.14⅝	.14⅞	.14⅞	+.00¼
Copper, Lake, lb.	.14¾	.14¾	.14¾	.14¾	.14⅞	.14⅞	+.00⅛
Cottonseed Oil, bbl.	6.30	6.36	6.36	6.36	6.37	6.35	+.05
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil, Menhaden, Brown	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 gals.	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime	.90	.90	.90	.90	.90	.90	....
Lead, 100 lb.	4.30	4.30	4.30	4.30	4.30	4.30	....
Linseed Oil	.50	.50	.50	.47	.47	.47	—.03
Open-Hearth Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Petroleum, bbl., Kansas crude	.88	.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa., crude	2.50	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	....
Silk, raw Italy	....	4.30	....	....	4.30	4.30	....
Silk, raw Japan	....	3.70	....	....	3.70	3.68	—.02
Sulphuric Acid, 60 Beaumé	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb.	47.75	47.50	47.57	47.60	47.80	47.90	+.15
Tire Scrap	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	....

International Co. Report

Earnings for the Year Amount to $590,149 After Deducting All Operating and $222,850 for Buying Machinery

Investigations Made by Committee Which Reports Conditions Highly Favorable for Sale of Trucks Next Year

NEW YORK, March 4—The annual report of the International Motor Company for the year ending December 31, 1912, shows a net earning of $590,149, and in a letter President C. P. Coleman of the company addressed to stockholders, he states that orders for the past year have increased 95 per cent. in quantity and 96.6 per cent. in value; and the shipments during the year show an increase of 78 1-3 per cent. in quantity and 72.6 per cent. in value.

At the end of the fiscal year the balance available for dividends was $499,048 equal to 7 per cent. on the preferred stock and an additional 4.39 per cent. on the common. The income account for the year including subsidiaries:

Net earnings after deducting all expenses and depreciation	$590,149
Interest	91,101
Surplus	$499,048
Preferred dividends (three)	185,260
Balance	$313,788
Special and extraordinary charges	117,151
Surplus	$196,637

In his report on the business of the year, President Coleman says: "At the end of the year there were remaining on hand unfilled orders amounting to $712,243 in sales value. During January, 1913, the company's sales approximated $250,000, or twice the amount of the same month in 1912.

"It has been necessary during the past year to assimilate and rearrange the several organizations taken over so as to produce one working as a whole. This has been, in a large measure, accomplished, and we close the year with an organization very much strengthened. The effect of this will be felt even more strongly during the coming year.

"In Greater New York there are now in service approximately 1,200 of our trucks.

"Owing to the increase of 95 per cent. in our orders during the past year, and the rapid growth of the motor truck industry, additions were made to our Mack plant at Allentown, Pa., and to our Saurer plant at Plainfield, N. J., for buildings, machinery and shop equipment representing an outlay of $222,850.

"You will note that, although this is our first year, when it was necessary to incur the expenses incidental to an organization period, the net earnings for the year, after writing off liberal amounts in connection with the organization and acquisition of the component companies, are largely in excess of the requirements of 7 per cent. on the outstanding preferred shares.

"The growth of the business and the necessity of carrying out certain contracts for materials made by our predecessors materially increased our investment in inventories and necessitated additional cash. This was accomplished in accordance with the plan of which you are advised by our letter of December 12, 1912.

"Your board of directors felt that because of these requirements, and for the development of the company's business, it was advisable to waive payment of preferred dividends, this action being taken after consultation with the holders of a large majority of the stock, who gave their approval.

"We have recently made a very careful canvass of the general market situation for motor trucks, through our own organization and otherwise, with the result that we feel warranted in concluding that the demand for motor trucks will be largely in excess this coming year over that of the previous one."

S. A. E. Talks Kerosene

Bennett's Experiments on Coal Oil Produced Results —Legislation Is Mentioned

Committee on Rims Named

NEW YORK CITY, Feb. 28—Kerosene and the kerosene carbureter were the subjects of discussion at a meeting of the Metropolitan Section of the Society of Automobile Engineers last night, where A. C. Bennett, of the Wilcox-Bennett Carbureter Company, Minneapolis, was the principal speaker.

In his address to the members Mr. Bennett gave many interesting particulars of practical experiments he has recently conducted with a view to evolving a satisfactory carbureter for the heavier fuel. The commercial possibilities of such a carbureter are generally recognized. With the increasing price of gasoline its introduction at an early date is becoming almost a necessity.

The greatest difficulty encountered in an attempt to use kerosene as a fuel in explosion motors, Mr. Bennett pointed out, was that of breaking up the fluid into sufficiently fine particles before entering the cylinder. There is a considerable difference in this respect between the operation of gasoline and kerosene. In the first vaporization takes place immediately after leaving the carbureter, whereas in the case of kerosene the fuel is in a state of spray throughout the inlet passages and until its entry into the cylinder. The real problem, therefore, is to devise a means of reducing the fluid to the finest possible particles, and in order to do this, Mr. Bennett found that a high velocity of inlet flow was desirable. This was accomplished by using a much smaller manifold than is general practice with gasoline engines, and also by opening the inlet valve late so that the partial vacuum created would induce a faster flow through the carbureter jets and manifold passages. Easy curves in the manifold are of no benefit. In fact, in the experiments in question fins were introduced for the express purpose of making the passages more difficult so that the breaking up of the fuel was more thorough. A multiple-jet carbureter was used and the kerosene before entering was heated. The air, on the other hand, was allowed to be drawn in cold. Water was then added in small quantities from a hand-controlled jet. It was found that the necessity of adding water varied according to the design of engine. Without it preignition is liable to occur in most engines. The compression was not altered for the kerosene experiments. But it was found necessary to provide more clearance for the piston owing to the greater heat encountered by its upper surface.

Little Trouble with Carbon

The question of carbon deposit was dealt with by Mr. Bennett. Results showed that with a careful choice of good lubricating oil and the correct positioning of the spark-plugs very little of the trouble usually associated with the word kerosene was experienced. An important point, however, is that the spark-plugs be not pocketed, but located in such a position that the points are swept by the gases. The points themselves should be of fine wire, arranged so as to minimize the accumulation of carbon as clean plug-points are absolutely essential.

In conclusion, Mr. Bennett expressed his belief in kerosene as a solution of the impending shortage of gasoline for pleasure car purposes by utilizing it as a fuel for all stationary and truck motors. A short discussion followed in which various members of the society took part.

Another matter decided at the meeting, on the suggestion of C. F. Clarkson, was the formation of a committee of three to inquire into the existing and proposed legislation affecting motorists. The three members appointed were: W. P. Kennedy, H. G. McComb and A. J. Slade.

The appointment of officers for the ensuing year was also part of the business transacted. J. A. Anglada was re-elected chairman of the governing committee; Herbert Chase, treasurer, and M. B. Pope, secretary.

At the annual meeting of the Society of Automobile Engineers held recently a committee was appointed to consider an improvement in the rim situation for pneumatic tires, the members of the committee being as follows: Henry Souther, chairman; H. L. Barton, G. G. Behn, T. W. Guthrie, F. H. Moyer, C. E. Reddig, W. C. State, J. G. Vincent, C. B. Whittelsey and C. B. Williams. This committee, which as a sub-committee or division of the Standards Committee of the society, will hold a meeting in Cleveland, O., on March 12 for the purpose of organization and hearing the views of representatives of some fifty pneumatic tire, wheel rim, steel bands and motor cycle manufacturing companies.

Napier Great on Benzol

LONDON, ENG., Feb. 26—The S. F. Edge, Ltd., London, has made a horsepower test with a motor designed for the 15-horsepower model Napier, the result being that the power developed by gasoline was 28.3 and by benzol 28.6 horsepower. Of gasoline, .75 pint was used for every horsepower developed, while only .70 pint benzol was needed for the same power output. This test would indicate benzol to be a satisfactory fuel, provided the price be brought below that of gasoline.

Working on Kerosene Carbureter

MILWAUKEE, WIS., March 1—That the Wisconsin Engine Company, Corliss, Wis., a large machinery and engine manufacturing concern which recently filed a voluntary petition in bankruptcy, was working on a kerosene carbureter, is divulged by the schedules of assets and liabilities just filed. Patterns, patents and drawings of the carbureter are listed as worth $5,000. As the assets are $909,000 and liabilities only $315,000, it is believed the concern will be speedily rehabilitated and the kerosene carbureter it is working on will eventually be marketed. Edward T. Adams, formerly president of the company, is the designer.

A Manufacturer's View

INDIANAPOLIS, IND.—We believe that the consumption of fuel is to a great extent a personal equation to be solved by each individual motorist. Our records show that the best economy for brake horsepower hour, was obtained with a fourteen to one on ratio and with this setting no carbon monoxide could be detected in the exhaust. We believe that this ratio will not please the driver who is always in a hurry to get away and delights in dashing around slower vehicles, *but for each percentage of carbon monoxide emitted in the exhaust from an overly rich or snappy mixture, a net loss of 4 per cent. in fuel will be suffered.*

The majority of cars will emit as high as 10 per cent. of carbon monoxide, which represents a waste of nearly 40 per cent. of the fuel fed to the motor. Also speed means horsepower, and if speed is desired, economy cannot be obtained, at least the maximum.

It has been determined by repeated tests that it takes more gasoline to get speed and power than the amount necessary to get the highest efficiency.

Therefore, in all models of carbureters, it is best to use as weak a spring as possible, and to have the gasoline adjustment just strong enough to keep the motor from firing back into the carbureter. If it is desired to get the most miles per gallon, it is the best practice to have the carbureter so that when the throttle is opened suddenly the motor will spit back once or twice, but if the throttle is opened slowly there will be no such backfire.—GEORGE T. BRIGGS, Wheeler & Schebler.

Hup Wins Swedish Run

Is the First Out of Sixty-Six to Cover 738-Mile Course in Reliability

English Daimler Second

PARIS, France, March 4—*Special Cable.*—Of the sixty-six entries in the Swedish reliability trials, which started in Sweden on February 23 and covered 1181 kilometers or 738 miles, number one Hupmobile, which was first to start in the contest, was first to reach the finishing line. The second car was an English Daimler; the third, a Swedish car, the Scania Vabis. In the contest were nineteen American machines, thirty Germans, five English, two Swedish, four Belgians, four French, and two Italians.

Prince William of Germany, who was a contestant in the run, finished with a small penalization against him.

Little snow was encountered during the trials but the greatest difficulty was experienced with the ice coating on the hills, due to which it was thought at one time it would be advisable to postpone the trials.

Average Accident Statistics for 1912

NEW YORK, March 5—Statistics covering the number of persons killed in Greater New York by motor vehicles, horse vehicles, and trolley cars as compiled at the coroner's office for 1910, 1911, and 1912, show that there has been a heavy increase in the numbers killed by motor cars and trolley in 1912 as compared with 1911, whereas the number killed by horse vehicles decreased materially in 1912. The average of figures obtained from different sources is:

Vehicles	1910	1911	1912
Motor	144	141	216
Horse	219	245	184
Trolley cars	153	128	163

These figures are an average of those compiled from three different sources in New York City, the figures compiled differing so that the above represent a fairly accurate condition.

Chicago Firms Test Motor Spirit

CHICAGO, ILL., March 3—With a view to determining the value of its new fuel, Motor Spirit, in actual service, the Standard Oil Company, of Indiana has distributed quantities of the latest substitute for gasoline among some of the large truck users in Chicago and elsewhere. Some of the trucks have been operating on Motor Spirit for a period of 2 weeks and that it is meeting with favor is attested by the fact that of the twenty-one concerns in Chicago, originally supplied with one or two barrels of the fuel for test, twelve have been well enough satisfied to re-order supplies of the new fuel.

Chicago, in particular, has been favored with weather which provides a rigorous test; cold, snowy and blustery days and sharp winds have been the rule during the past month. This, combined with the fact that motors must be kept slightly warmer with the Motor Spirit than with gasoline perhaps has prevented the new distillate from making the showing it otherwise would have made. However, many of those who have tried it find that there is little difference between it and gasoline. The chief complaint of the truck operators themselves seems to be the smell. Those who carry their supply of fuel under the seat seem to be the only sufferers in this respect. In the matter of mileage opinion seems to be divided.

Two concerns have actually tested the new fuel in service. These are Marshall Field & Co. and The Chicago Union Lime Works. The first concern had bad results, finding that they were unable to throttle down and had to use gasoline to pull their truck out of a snow drift. The second concern, which adjusted the carbureter to meet the requirements of Motor Spirit, had excellent results. It is evident that in using the new fuel about double the quantity of air must be used.

NEW YORK CITY, March 5—The high cost of gasoline has not affected the automobile industry alone. This is evidenced by the fact that the Dryers and Cleaners Association has resolved to combine their efforts with the New York Garage Association in their campaign for cheaper gasoline. A meeting of these two associations will be held tomorrow evening to map out a plan of action.

Omaha Show Breaks All Records

OMAHA, NEB., Feb. 27—With three times the number of paid admissions and several thousands more in attendance for the first day, as compared with previous years, the eighth annual automobile show, held under the auspices of the Omaha Automobile Show Association, in the auditorium, began with a rush Monday that forecasts the biggest success of any show ever held in Omaha or in the Middle West.

Not alone in attendance is this Omaha show a record breaker. Manager Powell is authority for the statement that one make of car brought 1,000 sales during the first 3 days.

BROOKLYN, N. Y., March 3—The third annual show which closed here Saturday, was a success. The official attendance figures have not yet been published, but it is said that close to 100,000 people visited the armory. A number of sales were closed by all exhibitors, the show proving much more of a buyers' affair than the New York show, although there seemed to be less ready money on hand than at the 1912 show.

HARTFORD, CONN., March 1—A dividend of about 50 per cent. will be returned to the dealers who exhibited at the recent Hartford automobile show held at the first regiment armory by Hartford Automobile Dealers' Association. This fact became known at a meeting of the dealers held at the Heublein this week.

Many Sales at Syracuse

SYRACUSE, N. Y., March 1—The fifth annual automobile show closed today with a total attendance for the 5 days of nearly 21,000, a record-breaking figure. Over seventy-five pleasure cars were sold during the show and about twenty-five trucks, this being the best record ever made at a Syracuse show. A large number of prospects were reported by the dealers and the outlook for the spring business is said by the dealers to be the best it has ever been. The farmers did considerable buying of both pleasure cars and of trucks. Generally considered, the industry in central New York is bigger and better than it has ever been.

MADISON, WIS., March 1—The Madison Automobile Dealers' Association has decided to give a third annual motor show in 1914, following the successful second annual event held February 19, 20 and 21 in the city market. The attendance was more than 4,000 and retail sales were made in large numbers. It is hoped that a larger building will be available by next year.

TORONTO, ONT., March 4—The 10-day annual automobile show, which closed Saturday night, proved by far the most successful exhibition ever held in Toronto. At least 70,000 people viewed the cars on exhibition. It is estimated that about $1,000,000 worth of cars were disposed of during the exhibition.

Manufacturers in Germany Cautiously Preparing for the Technical Perfecting of American and British Motor Starters—French Small Cars Built for Economy of Upkeep—Water Injection Baffles Control—Philosophy of Skidding—Tantalum

AMONG Motor Starters—While the German automobile industry as a whole is inclined to take distance from the idea of installing a motor-starter apparatus in every car and fears the cost, the complication and the weight, it begins to recognize that the subject must be studied in order to keep pace with the development in America and England where a completely practical solution may be found any day by reason of the great amount of work devoted to the subject. It is also realized that the connection of an electric starter with an electric lighting system for a car and with the ignition system of the motor presents possibilities which have not been exhausted and which may justify the carrying of a storage battery, even if the latter must weigh at least 200 pounds in order to stand up to the work required of it. The similar connection existing between lighting and starting by means of acetylene gas is also becoming recognized, though with some misgivings as to whether the acetylene lighting system, with its tubular connections to the individual lamps, will be able to compete with the electric system in the long run. With this uncertainty in view, a preference is discernible for starting-systems by which the gas introduced in one or more of the cylinders for starting purposes may be either acetylene or a normal gas mixture produced from gasoline or benzol, but the necessity of firing any gas charge so introduced again points to the need of an electric battery, though not a large one, unless the magneto-exciters already in the market are developed so as to operate with unfailing certainty. On the whole the arguments for the different systems are looked upon as so intricately involved with technical progress not yet fully accomplished that the simplest possible apparatus supplemented with a starting crank for emergencies looks like the best chance for the immediate present to a conservative German manufacturer dealing with a conservative public.

The Ashford starter which meets this view fairly well is described by the London correspondent of *Allgemeine Automobil-Zeitung*. It consists in a hand-operated pump, for drawing gas mixture from the carbureter and pressing it into one of the cylinders, combined with a sparking apparatus for igniting the charge. It can be used with acetylene if preferred. The pump is placed with its handle protruding horizontally from the dashboard toward the driver while the barrel of the pump and the piping are under the motor hood. Pulling the handle out fills the barrel with the charge and pushing it back drives the charge into one of the cylinders. The position of the handle determines which cylinder the charge shall reach and where the spark shall be fired. As shown in the drawing, Fig. 1, four pipe connections, A, B, C and D, each with a check valve, serve for attaching tubes leading to the combustion chambers of the four cylinders. The mixture arrives from the carbureter through F, and the lateral branch E thereon leads to a special small gasoline reservoir, so that, if necessary, a specially rich mixture may be provided. At the other end of the pump there are seen four wire posts, *a*, *b*, *c* and *d*, which are wired to the sparkplugs of the cylinders, and there is secured to the pump piston rod, below the handle, a conductive projection (as indicated in the auxiliary sketch with Fig. 1) between which and any of the four terminals a spark gap may be formed when the handle is turned so as to bring the projection opposite to the terminal. By this simple means the cylinder which is in position for an explosion is located.

At starting, the handle is first turned till a spark jumps across the gap at one of the terminals. Then the handle is turned still a little further, to a mark indicating that the pump now is in line for connection with the cylinder thus picked out as the right one to connect with. This done, the pump handle is pulled out sharply and at once pushed back again, and, as the piston works in unison with an internal distributer device which bars three of the four pipes, A, B, C and D, the gas mixture reaches the right cylinder, where it is ignited. The ignition may be taken care of either by means of a magneto-starter device or, more conveniently, by a battery with induction coil and vibrator. The high-tension wire is in this case laid from the coil over the distributer of the magneto.

If the motor is not started at the first attempt, the pump action may be repeated, and it is also possible, the German correspondent asserts, to load each of the four cylinders separately from the pump, to the extent determined by the positions of the motor pistons, before turning the pump handle into the position producing ignition.—From *Auto-Technik*, February 14.

THE Water Injection Theory—At recent trade exhibitions in Saint Petersburg and Jekaterinoslav in Russia extensive practical trials were conducted of a large number of stationary and marine motors, and in many of these motors certain devices for injecting water or steam into the cylinders, together with the fuel, were incorporated. The objects of water injection are (1) to contribute to the cooling of the cylinder walls and the combustion chamber, so as to obviate premature ignition, (2) to increase the compression of the explosive charge and thereby the economy of operation and (3) to obviate incrustations of carbon. The results of the trials showed very conclusively, however, that no means have yet been devised for regulating the water or steam injection so as to have it correspond, as it should do, to the variations in the work demanded of the motors. Only in the case of very skilful operation was the economy of the motor enhanced, and then only for limited periods. None of the automatic regulations proved available. A very considerable formation of coke in the combustion chambers was the uniform experience in motors of widely varying construction. When steam was employed instead, coal tar was formed. A whole kilogram of coke was taken from the ignition bulb of one motor. Ignition by incandescent bulb was a feature in a considerable number among the motors, and where this bulb communicated with the combustion chamber by a narrow neck the eventual result was invariably that the motor became stalled, because the carbon deposit coated the interior of the bulb and the temperature of the latter fell so low that the charges were no longer ignited. The reliability of the motors was in all cases enhanced when the water injection feature was eliminated.—From a detailed account of the trials, in *Gasmotorentechnik*, February.

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FOUR-CYLINDER Six-Horsepower Construction—Among the very small cars built in France this year to meet the "American invasion" or those popular requirements of whose commercial importance this invasion is the sign, one called Le Zèbre (the zebra) is the smallest, at least if only those with four-cylinder motors are considered, and its general plan as well as some of its construction details are of interest to show the mechanical and other means which appeal to French builders when the object is to secure the trade of those who must cultivate economy in their luxuries. While the makers of the Zèbre offer a single-cylinder car of five horsepowers for 3,000 francs and a four-cylinder car of ten horsepowers for about 6,000 francs, it is the four-cylinder car of six horsepowers which is considered the most characteristic and which was the pet of visitors at the recent Paris show. It is offered for 4,000 francs and is intended strictly for a maximum load of 225 kilograms, representing the weight of two passengers with light baggage, and it is guaranteed to make an average speed of 48 kilometers per hour, while using only 6 liters of gasoline and one-third liter of lubricating oil for a run of 100 kilometers. The dimensions of all parts of the chassis are pared down to sustain the economy of maintenance through a minimum of total weight while at the same time making room for a certain technical completeness which is considered of value to the user and therefore indispensable.

It is especially in the motor that this purpose has resulted in some notable departures from the construction customary for larger vehicles. The bore of the cylinders is 2 inches and the stroke 4 inches. To place valves of the size required by modern technique in the usual manner in a motor of these diminutive proportions was found impracticable, and they are therefore placed in two rows, as shown in Figs. 2 and 3. In order to reduce the volume of the combustion chambers somewhat, the valves are placed at a small angle with the axes of the cylinders. The spark plugs are located directly opposite to the induction valves. The camshaft is placed between the two rows and controls the tappet rods by means of little levers so arranged that the same cam successively operates the exhaust and the admission of the same cylinder. The exhaust manifold is bolted to the side of the block casting, while the intake pipes to the individual cylinders combinedly form the intake manifold at the rear end of which the carbureter is attached.

The thinness of the pistons made it inadvisable to secure the piston pins in them, and these are therefore integral with the connecting-rods and turn in the pistons.

The crankshaft is built up of three parts, comprising two cranks with counterweights and a central plate to which the crankpins are secured by cone joints and cotters. The first result of this construction is to modify the order of firing, since the first piston must move with the second instead of with the fourth. The lightness of the pistons offsets the poorer balancing which would be expected with this arrangement. As a matter of fact, it is stated, no vibration is noticed in the vehicle in whatever manner the motor is operated, the explanation being that the reactions due to the inertia of the cylinders are very small compared to those which might result from an unsymmetrical crankshaft, and also that the reactions from the exhaust upon the block-cast cylinders counteract the vibrations which the pistons might tend to produce. The firing is in the order, 1, 3, 2, 4, instead of the usual 1, 3, 4, 2.

The connecting-rods have no knuckles in two parts but a simple eye, with a bushing, as in single cylinder motors, and are mounted upon the crankpins before the crankshaft is assembled.

The oil reservoir is mounted upon the dashboard and the oil is placed under pressure by means of an air pump, the flow being regulated by a needle valve.

As the crankshaft is mounted in ball-bearings between the cylinder casting and the crankcase-trough, it is easily removed together with the connecting-rods and pistons. The three-speed gear-box and the wheel axles are also provided with ball-bearings throughout.—From *Omnia*, February 15.

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TANTALUM, a New Material—For the tools of the draughting-room and for many purposes in the laboratory the use of tantalum as a standard material is now open for consideration. Tantalum was first employed industrially in 1905, and was not popularly known before that time. It was used for the filament of the tantalum incandescent lamps which have now won a broad market. The metal is produced from an oxide of tantalum ore which is not rare. Recently other uses for this material have been developed. Its fusion point is very high, and its resistance to chemicals coupled with its ductility, which renders it practicable to roll it into thin sheets and draw it into fine wire, suggested its use for dental instruments, and it is reported that a whole line of fine tools in this class is now manufactured. These tools are not affected by iodine and do not ir-

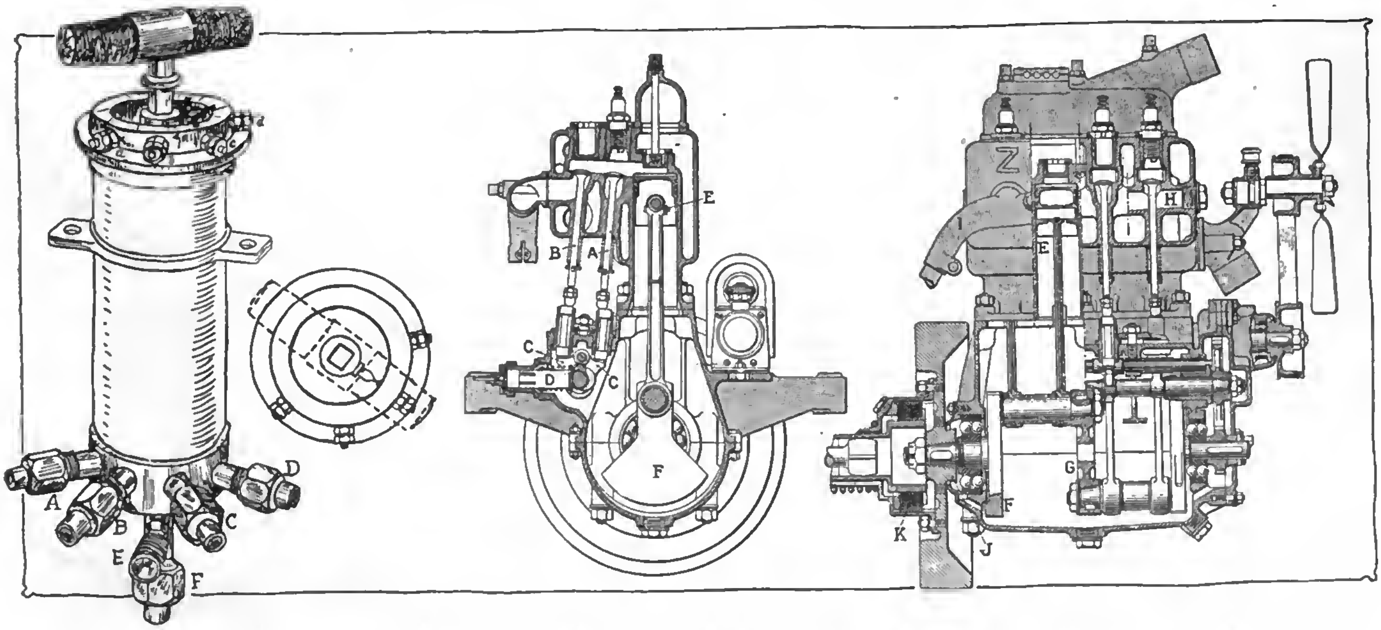

Fig. 1—Fuel pump for Ashford motor-starter. Figs. 2 and 3—Transverse and longitudinal sections of Zebre four-cylinder, six-horsepower motor with built-up crankshaft and other unusual features

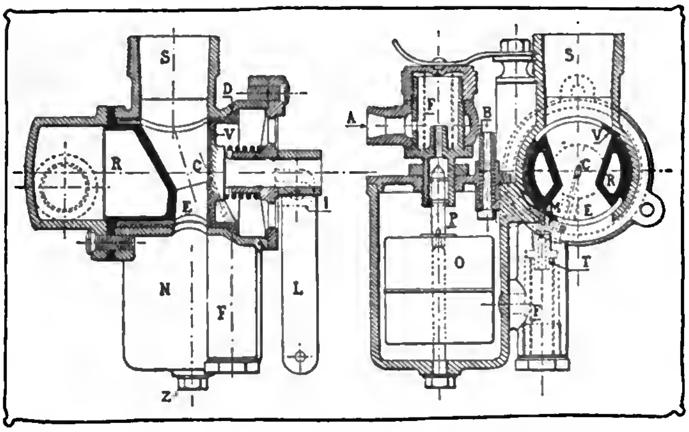

Fig. 4—Edelweiss carbureter with direct fuel control

ritate the gums. Writing-pens are also made of tantalum and are as elastic as steel pens while not subject to rust. Though exposed to corrosion from ink for several weeks, even if the ink contains acid, the new pens remain perfectly unchanged. Probably the material will soon be used for fountain pens to the exclusion of the much more expensive gold, over which it also has the advantage that it can be split, bent and shaped as freely as steel, while, also like the latter, it can be hardened by simple heat-treatment and in this manner can be made very resistant to wear.—From *Elektrochemische Zeitschrift,* January.

SKIDDING and Skewing—A lengthy study of the phenomena of skidding and skewing of automobiles by Henry Petit is summarized by the author in a number of conclusions among which the following may be of interest:

The fact that lateral adherence of a wheel to a road surface is much reduced when the wheel is kept from rotating may be utilized for making very rapid turns at high speed by applying the brakes to the rear wheels for a moment and allowing the centrifugal force to turn the vehicle around its front wheels. In case the front wheels skew to one side, the driver can utilize the same force which causes the front wheels to skew to correct the position and direction of the vehicle, by applying the rear wheel brakes, as the rear portion of the vehicle will then probably skew in the same direction as the front portion.

A vehicle whose wheel gauge is twice as large as the height of the center of gravity is practically secure against upsetting from centrifugal action, unless one of the wheels is positively prevented from skewing by a rut or other obstacle to transverse motion.

Among anti-skid tire treads those armored with metal studs have the advantage for certain road conditions and those made of rubber with larger projections and larger intervals between projections for other road conditions, the object being always to have the projections penetrate through a muddy layer to firm ground.

The differential, which is often accused of causing skidding, has on the contrary an action which is very efficacious to prevent it. Owing to its presence, the two wheels on the same axle are scarcely ever slipping at the same time. One of them continues to turn and its higher resistance to transverse motion holds the vehicle in line. If the two wheels were turned as a unit, the braking of one or both of them would remove the greater part of the lateral road adherence. It is this fact which renders it dangerous to apply the brakes on the wheel hubs harshly.

When the object is to avoid skewing as much as possible on all kinds of road surfaces, one of the driving wheels should be shod with a smooth tire and the other with an anti-skid tire, in which case one of the wheels will practically always continue to turn where the surface is slippery. But this provision, on the other hand, is poorly adapted to prevent slippage and loss of traction.

Slippage of rear driving wheels occurs most readily as the result of a braking effort, while a strong acceleration of the motor has a smaller effect in this direction. This is reversed if the front wheels are drivers; slippage will then occur mostly at the starting of the vehicle.

An excellent braking system is that adopted for the Argyll cars and consisting in coupling a brake on one of the rear wheels with another applied to the front wheel on the opposite side of the vehicle. In this manner, one front wheel and one rear wheel are always left free to turn, and the direction of the vehicle is not affected.—From *La Technique Automobile et Aérienne,* February 15.

CARBURETER with Direct Fuel Control—At two 15-minute tests conducted at the laboratory of the Automobile Club of France the carbureter shown in Fig. 4 and known as the Edelweiss developed 8.72 and 8.97 horsepowers in a four-cylinder Renault motor of 75 millimeter bore and 120 millimeter stroke running at 1091 and 1098 revolutions per minute. The consumption was 3.468 and 3.512 kilograms per hour of "motoline" fuel which has a specific gravity of 0.725. On the lowest adjustment the motor ran at 180 revolutions per minute. Accelerations were instantaneous.

The characteristic of this carbureter is the direct regulation of the fuel feed obtained by means of the rotary valve V in which there are openings E for the air intake and S for the gas mixture. It is tightly fitted on the seat D and upon its circumference there is formed a groove M which broadens out progressively, so as to present a small or a larger cavity—according to the adjustment of the valve—opposite the aperture in the seat through which the fuel is received, being first drawn from the nozzle T. The latter is made in several interchangeable sizes adapted for different motors. From the small end of the groove M a bore takes the fuel to the hole C opening into the carburation chamber of the carbureter at the point where the suction from the cylinder is strongest. When the valve is wide open, the communication from nozzle T to hole C is direct, and when the valve is turned the openings E and S are both gradually closed while the discharge of fuel is at the same time moderated by the modified position of the groove M. The shape of valve V may be realized when it is observed that the part of the illustration represents a section along the broken line SZ of the other part. RR indicates the provision for preheating the gas charge from the cooling-water or the exhaust gas. Several filters F are provided at the entrances of the gasoline to the float and from the float to the jet. It is stated by the testing engineer that condensation of the fuel vapor is avoided, even at lowest throttling, by reason of the high speed of the air current at the hole C.—From *Bulletin Officiel,* January.

The Song of Wire Wheels.—The soughing sound which is sometimes emitted by wire wheels, and which resembles that which comes from a ship's mast that bends in a strong breeze, is due to the elasticity of the rim which causes the spokes to rub where they touch one another. By greasing the spokes at the intersections the sound is reduced or obviated.—From *La Pratique Automobile,* January 10.

ABSORPTION of Driving Stresses—In about 75 per cent. of the automobiles shown at the last Paris salon the provisions for absorbing torsion and driving-thrust from the rear wheels were of one or the other of two types. Either the casing of the axle and the drive shaft transmits the thrust and absorbs torsion, and in this case the drive shaft has only one universal, while the springs have shackles in front and are secured to the axle by a joint admitting of some motion; or the springs serve all the three purposes—absorbing thrust, torsion and road shocks—have no shackles in front and are rigidly secured to the axle, while the drive shaft has two universals. Constructors are about evenly divided between these two systems.—G. Leroux in *Bulletin Officiel,* January.

Tire Carriers for 1913

More Attention Being Given to Neat Appearance and Rigidity—Single and Double Types

A MOST noticeable tendency in the automobile practice of the past few years has been the constant effort [illegible] towards improving the appearance of the car as a whole. The automobile of today presents a much more pleasing effect than its predecessors of only a year or two ago, Perhaps the chief contributory cause for this improvement has been the attention paid to continuous lines in the design of the body, and in addition the elimination or concealment as far as possible of external parts, such as gear change levers. But a serious stumbling block to the intentions of the artistic designer was met in the shape of the spare tire.

The spare tire is an absolutely necessary equipment for a touring car. Unfortunately it is not in itself a thing of beauty, and the designer's first thought was therefore to get it stowed away out of sight. It is here that the difficulty is encountered; the modern automobile is a compact mechanism, lacking in internal spaces large enough to provide the necessary accomodation.

A makeshift solution to this problem of the satisfactory disposal of the spare tire which became widely adopted was that of carrying it in a vertical position on the running board. This position can claim very few merits and several disadvantages. Among the latter the chief is that the major portion of the running board is monopolized by the presence of the tire and the adjacent side door rendered useless. But there is the further disadvantage of detracting considerably from the graceful appearance of car. For these reasons it is not surprising that a more suitable and less conspicuous position was sought. On the majority of cars at the present time provision is made for carrying the spare tire or tires at the rear, and an inspection of the various methods of support show that much careful attention is being given toward the perfecting of this detail.

A characteristic of the rear tire carriers to be seen on this year's cars is the more rugged construction and the better means of firmly securing the tire or demountable rim. The amount of vibration and overhung weight of a rim fitted with a tire suspended on brackets projecting from the rear of the body is liable of underestimation. This was evident in many of the earlier designs.

The most common form of carrier is that in which three points of support are given to the tire. But there are besides those in which a scoop-like cradle embraces a sufficient portion of the circumference to form a strong seating, and also another type where the rim only is gripped, the tire not being touched. Both single carriers and double ones are in evidence, and there are

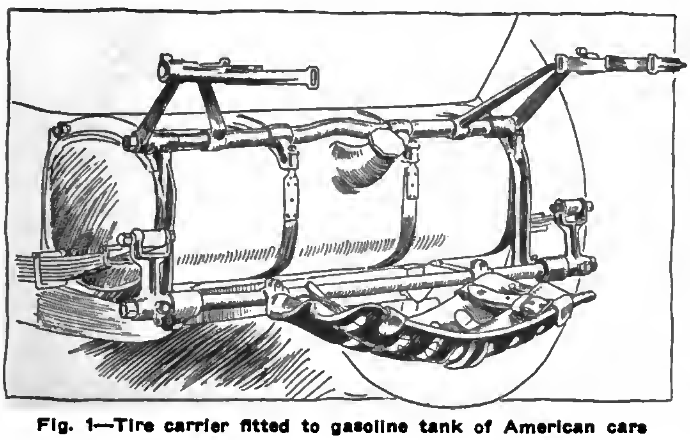

Fig. 1—Tire carrier fitted to gasoline tank of American cars

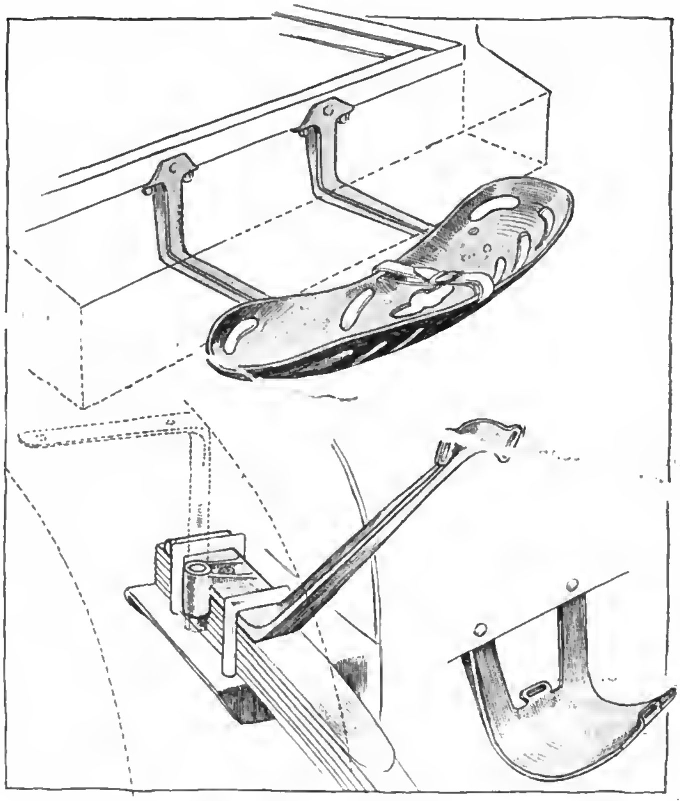

Fig. 2—Upper illustration shows Velie carrier in which the brackets form a support for tool-box. Below: Side and center tire brackets on Henderson cars, showing use of bracket base as clamping plate for spring and also as receptacle for fender carrier

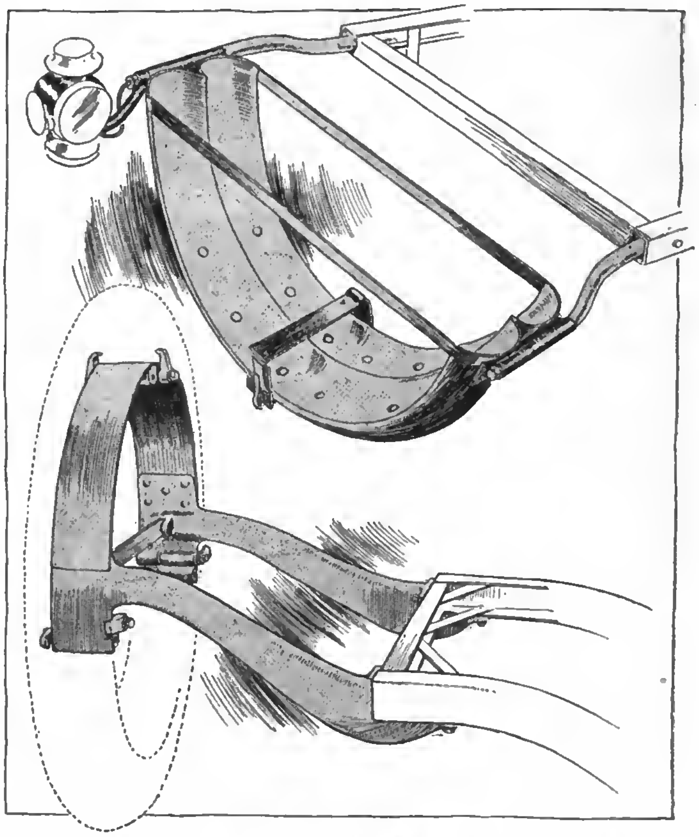

Fig. 3—Above: Double-tire carrier at rear of Oldsmobile, supported on tubular brackets and provided with a means of locking in the spares. Below: Rear carrier on Havers Six, which supports spare by clamping on rim. The brackets are made to form a continuation of the chassis lines

also many designs adaptable for carrying either one or two tires as required.

Other points of interest in considering these brackets are the means of clamping the tire into the carrier. In some designs a hinged clasp surrounds the tire; in others the ordinary leather strap is relied on. The former method permits the introduction of some form of lock to prevent theft, while the leather strap method, which is in the majority, ensures absolutely tight fastening irrespective of differences in the size of the tire.

Another interesting feature of the latest designs of tire carriers is that of saving weight by utilizing the brackets for some other purpose. Thus in one make the brackets form a support for a tool box, in another a support for the tail lamp is incorporated, while in a third the same frame extension to which the carrier is bolted forms an anchorage for the suspension of the gasoline tank.

The accompanying illustrations do not exhaust the many interesting types to be seen on the 1913 cars, but they are sufficiently comprehensive to indicate the extreme variety of methods of carrying spare tires.

American

A method of utilizing steel tubes to strengthen the gasoline tank and at the same time form a structure on which to mount the brackets of a tire carrier is shown in Fig. 1, being that adopted on the American cars. The side brackets are malleable castings to which the tires are fastened by leather straps. As shown in the illustration the accessibility of the filler cap of the tank is not interfered with in any way by the presence of the spare tires.

Velie

Fig. 2 shows two types, the upper being that fitted to the Velie cars. This consists of a malleable casting in the form of a cradle conforming with the curvature of the tire, riveted to a pair of steel angle brackets which are bolted direct to the frame. It will be noticed that the brackets are utilized as a support for a tool box, which conceals them and so conduces to the neat appearance of the back of the car. This desirable feature is further enhanced by the fact that the carrier itself, having no projecting parts, is also scarcely visible when a tire is in place. Ample provision is made for drainage and dissipation of moisture by a number of ventilating holes.

Henderson

The lower illustration in Fig. 2 shows an ingenious method of adapting side carrier brackets to the Henderson cars. The base of the bracket is made to answer the purpose of a clamping plate for the rear springs. In addition, a boss cast on the base provides a socket for the angle support of the fender. The lower central tire bracket, also a malleable casting, is shown. Both are intended for use with leather straps.

Oldsmobile

Two tire carriers marked by much originality of design are shown in Fig. 3. The upper one, fitted to the Oldsmobile, is unusual in that the carrier is made large enough to embrace half of the tire, or tires, for it is a double design, thereby obviating the necessity of any additional support . . . The double cradle is made from a single piece of sheet steel, and is carried on bent tubular brackets extending from the side members of the chassis, to which they are bolted. The tires are held in place by a hinged clamp which bears on the inner surface of the demountable rim and is provided with a lock and key.

One of the tubular brackets acts as a support for the tail lamp, the cable for which is passed along inside the tube to the channel side member.

Howard

Fig. 3 also shows the rigid form of rear carrier fitted to the Howard Six for this year. This is designed to carry the spare by means of the rim only, the tire itself being free. Although there is considerable overhang the design of the brackets suggests that the possibility of vibration taking place is very remote. The outer ends of the brackets are connected by a straight distance bar and also a semi-circular band of steel furnished with a pair of rim clamps at its upper center. Two similar pairs of clamps are fitted to the brackets. It will be observed that each clamp jaw has its own tightening bolt and that it is only necessary to slacken three of these and turn them in to permit

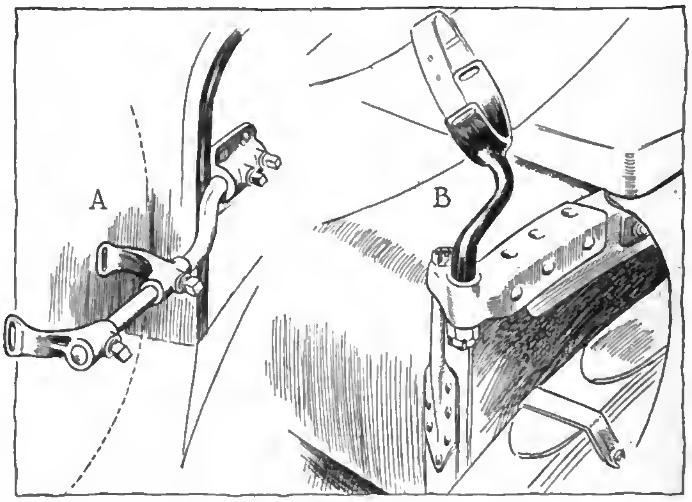

Fig. 5—A, adjustable carrier bracket on Moline coupé; B, tire carrier on Marmon two-seater

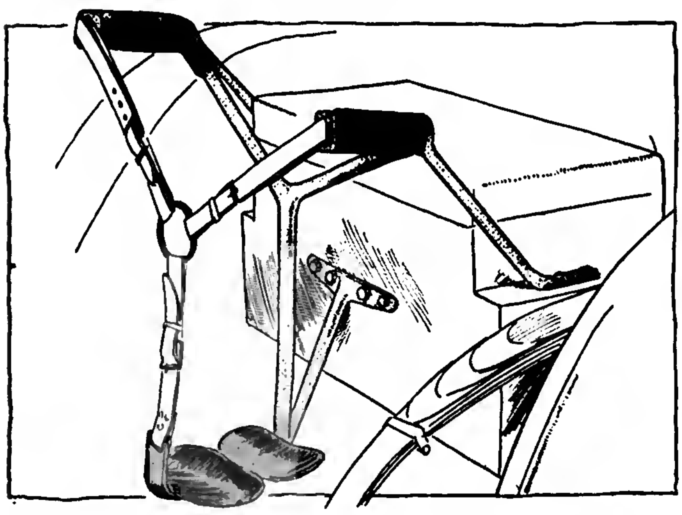

Fig. 4—Spider type of rear carrier on Pullman roadster

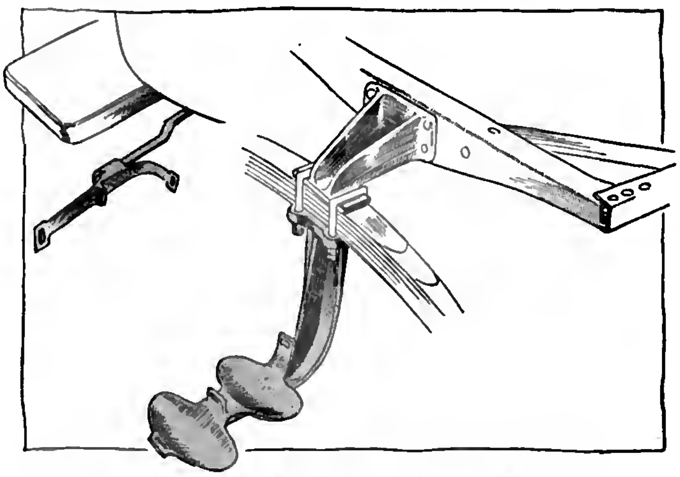

Fig. 6—Havers design of double tire brackets

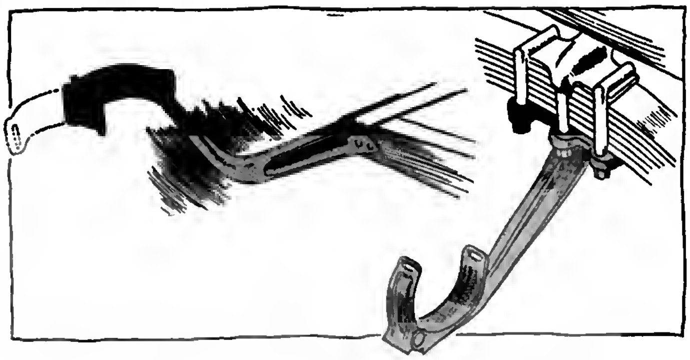

Fig. 7—Rear brackets for spare tires on Cadillac

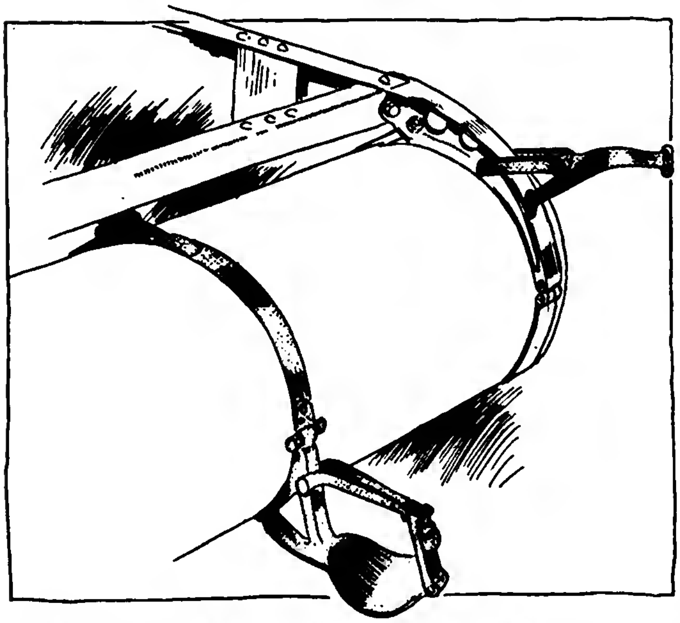

Fig. 8—Method of attaching tire carrier to tank on Edwards-Knight

removal of the rim. From the point of view of appearance, the rather massive form of the brackets is a point in its favor.

Havers

In the Havers design, Fig. 6, advantage is taken of the existing center bracket of the transverse spring, the lower tire carrier support virtually forming a continuation, being bolted thereto by the spring clips. Two side brackets supporting the tire at its horizontal diameter are bolted to the body.

Pullman

An unusual form of double carrier is that on the Pullman roadster, Fig. 4. A forged steel spider is mounted to the rear of the tool box to which it is attached by three arms. Two spoon-shaped receptacles at the base form a bearing for the tire, while the upper arms of the spider are covered with leather to protect the surface of the rubber. The straps are not arranged to surround the rim, but are tightened up against the face, as shown in the illustration.

Marmon

In the Marmon two-seater, B, Fig. 5, short extensions are riveted to the chassis members to form a seating for the carrier brackets which are arranged to hold the tire in the sloped position generally adopted in the case of two-seaters. The same frame extension is also utilized as an anchorage for the suspension of the gasoline tank.

Moline

The carrier fitted to the Moline coupé, A, Fig. 5, is chiefly interesting because of its large range of adjustment and the fact

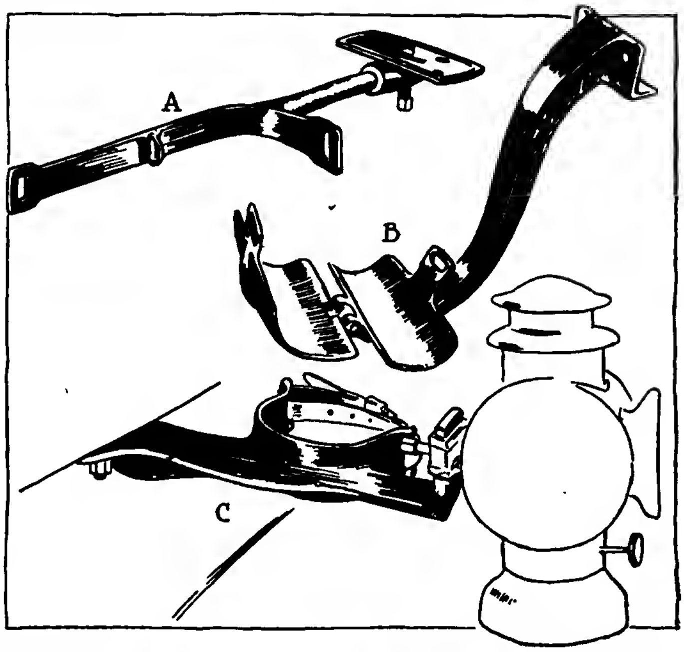

Fig. 9—A and B, tire carriers supplied by the Emil Grossman Co.; C, combined tire and tail lamp bracket on Marathon cars

that it is easily removable. A socket for the reception of the bracket, attached to the side of the body, makes it possible, by turning the cranked rod, to adjust the distance apart of the two brackets. The jaws, also adjustable, permit of their being arranged to accommodate one or two tires.

Cadillac

On the Cadillac touring phaeton a three-bracket type of carrier is fitted, Fig. 7. The center bracket, a malleable casting, is attached to the point of support of the transverse spring, the side brackets being bolted direct to the chassis members. By hinging one-half of the jaws which take the tire this carrier is adaptable for either one or two tires, it being merely necessary to adjust the leather straps.

Edwards

A unique method of attaching the tire carrier is that adopted on the new Edwards-Knight, Fig. 8. Here the center tire support is fitted to the cylindrical gasoline tank by means of a band fastening, the side supports being linked to the phosphor bronze brackets which carry the tank. A means of locking is incorporated in the lower tire fastening, while the side brackets are adapted for leather straps.

Marathon

The Marathon is provided with three tire brackets, attached to the rear of the body, C, Fig. 9. These are all malleable castings. One of the upper side brackets has an extension to take the tail lamp, as shown in the illustration.

Emil Grossman

It is to be wondered at that the accessory dealers are not more active in the preparation of tire carrier designs. The reason is doubtless that the particular conditions to be met in the case of each automobile differ so widely that it becomes difficult to furnish a carrier applicable to all. However, there are a few such devices on the market. One of these, produced by the Emil Grossman Company, possessing a great degree of adaptability, is shown at A and B, Fig. 9. This consists of two strong malleable cast brackets, the center one being intended for direct attachment to the frame, while the side brackets, furnished with a stem for adjustment, fit into sockets screwed to the body. The bracket B has a hinged tire support so as to be adaptable as a single or double carrier.

The Engineers' Forum

Use of Leather for Universal Coupling

Leather Rings Showed No Break or Tear Under a Load of 1,040 Pounds On Olsen Torsion Test Machine

Manganese-Bronze Cylinder Cracked and Broke When Subjected to This Strain on the Same Apparatus

Frank H. Kaiser Tells of Interesting Test
J. Demmler Thinks Horsepower Best Tax Basis
Ferdinand Jehle's Views on Exhaust Gas Analysis

Note—The discussion of the subject of exhaust gas analysis by prominent automobile engineers in The Automobile *is continued from week to week in the Engineers' Forum. Any of our readers interested in this topic are cordially invited to submit their views.*

WEST TORONTO, ONT.—Editor The Automobile:—Knowing that leather will give freely, it was experimented with in connection with a universal coupling to determine if it would give the self-aligning property to the assembled coupling. It was essential that the coupling be self-aligning.

The leather as tested was old two-ply belting, 9.75 inches wide, which was in good condition and more pliable than new leather. Four pieces or strips, each 3 inches by 9 inches, were cut from this belting. Pieces marked No. 1 and No. 2 in the accompanying table were cut crossways and those marked No. 3 and No. 4 lengthways of the belting. Steel plates, 3 inches by 2.25 inches by No. 11 gauge, were riveted to the leather as shown in Fig. 2. This was done to insure perfect gripping in the testing machine.

The table shows the length and width of leather strip test pieces at different loads during the test. It will be noticed that strips No. 3 and No. 4, which were cut lengthways of the belting, were stronger, and after the break the length and width were practically the same as at the start. Each piece broke at the end in the top of testing machine, the leather breaking between the steel plates on a line horizontal to the center rivet.

In the same table is also given the tensile strength in pounds of each leather strip, and the calculated tensile strength in pounds per square inch of cross-section and the tensile strength in pounds per inch width of leather.

The universal coupling consisted of a manganese bronze casting the shape of a hollow cylinder diverging at each end in the form of a flange. The leather was cut ring-shape, and this manganese bronze casting was riveted, at each end, through one of these leather rings at the inner or smaller diameter into a narrow steel ring. This steel ring prevented the rivets from tearing the leather. At the larger diameter or outer edge of the leather ring was riveted in the same way at each end a flange which was a manganese bronze casting. To each flange was keyed a shaft.

It wil be perceived that the hollow cylinder was suspended by leather. The power was transmitted from the shaft at one end to the flange, thence through the leather ring to the cylinder; from the cylinder to the other leather ring, to the flange and then to the other shaft. If at any moment these shafts were out of line, the strains thus set up would be neutralized, so to speak, by means of the leather rings.

A universal coupling thus assembled was tested by gripping the outer end of each shaft in an Olsen torsion test machine. When the load, applied gradually, amounted to a force of 1,040 foot-pounds, the manganese bronze cylinder cracked and broke. The leather rings did not show any break or tear. This force of 1,040 foot-pounds was greatly in excess of the actual torque delivered by the engine to the coupling as assembled in the automobile. The coupling is a success and fulfills its requirements.

The writer wishes to express his thanks for suggestions received from Mr. L. R. Evans, chief engineer, and Mr. A. Fish, mechanical engineer, of the Russell Motor Car Company, West Toronto, Ont.—Frank H. Kaiser, Russell Motor Car Company.

Wants Horsepower as Tax Basis

Grove City, Pa.—Editor The Automobile:—Taxes on automobiles are an injustice against every automobile owner.

Does every wealthy man own an automobile? Certainly not.

Men who buy automobiles and also spend a part of their money for upkeep every year, those are the men which are doing pioneer work in uplifting an industry, these are men who contribute their share for the welfare of the people.

It would be worth while to consider the idea that men who do not spend a cent for automobiling should be taxed for upkeep of roads on which the auto owners are driving along; this would be justice to both parties and boom the automobile industry considerably.

The S. A. E. formula doesn't give any value as to the amount of work required to propel a car along the road.

With a medium-powered car, a driver averages about 20 miles an hour, on level country, and taking into consideration the carrrying capacity of the car, its own weight and the coefficient of friction between the rear wheel and road, it is surprising to note the difference between the horsepower of the motor figured according to the S. A. E. formula and the actual work done at the rear wheel for propulsion of the vehicle. This has reference to any size of car. The result is somewhat different in hilly countries.

But it doesn't matter whether the number of horsepower for a given size of motor figured by the S. A. E. formula is too high or too low for a basis of taxation if a certain amount has to be raised through taxation of automobiles.

Taking another formula into consideration, which also includes the value of the car and reads:

Taxation value = X. S. A. E.

The factor X should have a sliding scale; a car selling for $1,000 the factor should be equal to 1. For all cars selling higher than $1,000 a scale could be worked out so that the factor X would range between 1 and 2, and brought in accordance with the scale, giving the sales price of cars.

For cars selling for less than $1,000 the factor X should be smaller than 1, and could vary between 1 and 0.4.

This formula also would take into consideration second-hand cars, whose value always is in reversed proportion to the age of the model.

Even if the formula of horsepower taxation would put the motor of a second-hand car higher up in the table of taxation, the factor taking into consideration the value of the car, would lower the result expressed in formula:

$$A = S. A. E. X.$$

Where A would indicate a certain value and serve as a basis to figure the amount of taxes which should be paid by the car owner.

In my opinion it is useless to prove that it is unjust to use the S. A. E. formula as a basis for taxation as long as the government wants to raise a certain amount on taxation of automobiles.

As long as only the size of the motor is taken into consideration any other formula would not change the final results, and a formula giving a lower horsepower than the S. A. E. would certainly not reduce the amount of taxes, as the government has only to raise the level of taxation to get the amount which taxation on automobiles should bring.—J. DEMMLER, Chief Engineer Bessemer Motor Truck Company.

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Making Exhaust Gas Analysis

DETROIT, MICH.—Editor THE AUTOMOBILE:—The analysis of the exhaust gases in a motor test is an important part of the test. If the work is done carefully and accurately, it gives us more real information of the fitness of the carbureter to the motor, and of the correctness of carbureter adjustments than any other form of investigation. If the work is not done carefully, the results will be very misleading and sometimes ridiculous. The collecting of the sample demands the greatest of care.

First, the connections must be so made that there can be no leak of air into the sample tube.

Second, the sample tube should be connected as closely as possible to the last cylinder. If it is connected at some distance, and the exhaust pipe becomes red hot, the after-burning will effect the sample. We are only interested in the combustion that occurred in the cylinder.

Third, the sample must be taken over sufficient time so that it really is a true sample.

Fourth, the analysis of the sample must be made with extreme care, and by a person who has had experience along such lines.

To prevent air leaking into the sample, it is best not to suck the gas in with too great a head. It would be best to always keep the height of mercury or water in the sample and displacement tubes the same, then the slight pressure of the exhaust gas will fill the tube—any leak will then be toward the outside.

In every scientific test, of course, gas analyses are always taken. They have, however, a great commercial value as well. It is by far the quickest method of determining the best adjustment of the carbureter. Of course, the carbureter may be adjusted by the aid of a dynamometer, changing the adjustment until the highest load is reached at any one speed. This will then be the best adjustment for power, but it may not be for fuel consumption. After the best power has been reached, the fuel may be cut down still further without reducing the power. If a curve be plotted, using for abscissæ the opening of the fuel valve and for ordinates the power developed at a constant speed, we find that the curve is parallel to the horizontal axis for quite awhile. The best carbureter adjustment for both fuel economy and power can therefore be read from such a curve. Figure 1 shows a sample curve. The same result may be much more rapidly arrived at by changing the adjustment of the carbureter until the analysis of the exhaust gas shows practically no CO and a small percentage of O. The CO_2 will then be between 13 and 14 per cent.—FERDINAND JEHLE, Commercial Engineering Laboratories.

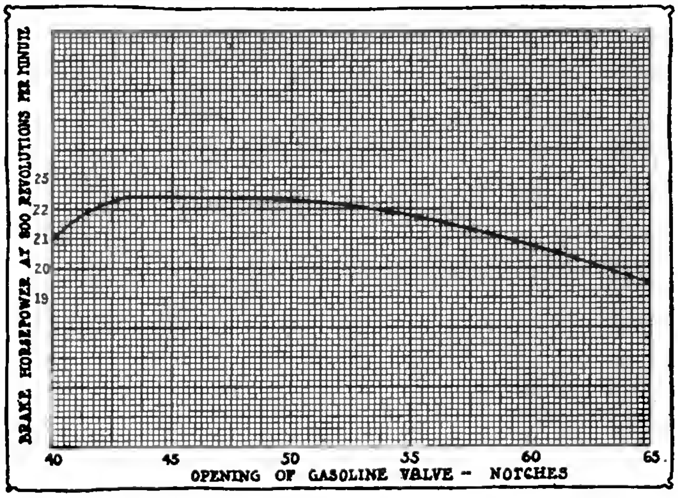


Fig. 1—Sample curve for reading best carbureter adjustment

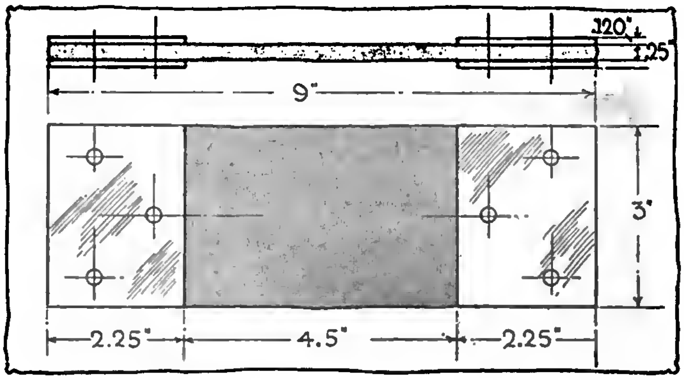


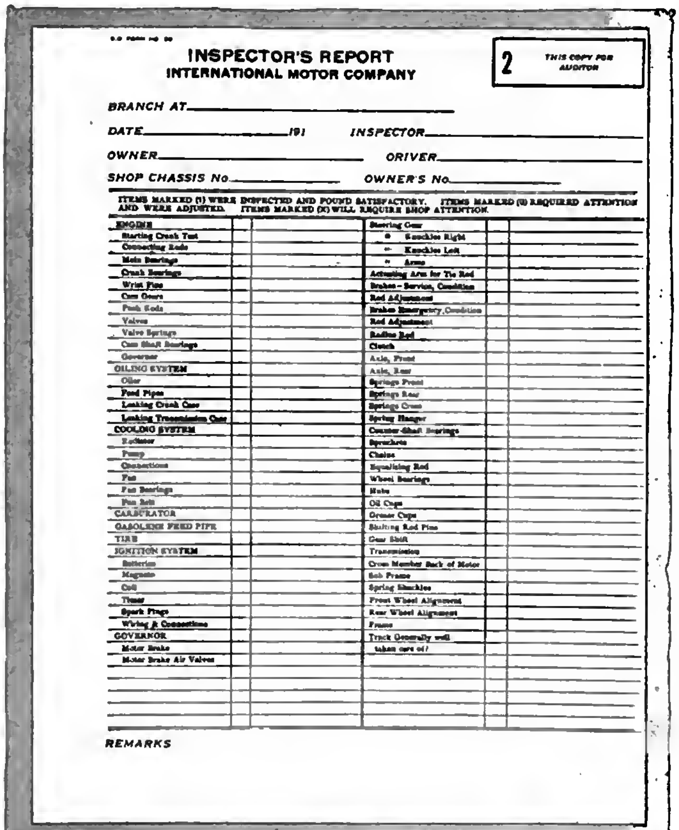
Fig. 2—Dimensions of test pieces used to obtain tensile strength of leather

Table Showing Condition of Test Pieces Up to Breaking Point, and Tensile Strength Obtained

Test Piece	Load in Pounds	0	500	750	1000	1250	1500	1750	2000	2250	2500	After Break	Ultimate Load	Tensile Strength per Sq. In. Cross Section	Tensile Strength per In. Width of Leather
1	Length....	4.6	5.07	5.28	5.4	5.58	....	....	....	....	....	4.92	1435 lbs.	1912 lbs.	478 lbs.
	Width.....	3.0	....	....	....	2.65	....	....	....	....	....	2.7			
2	Length....	4.65	5.28	5.48	5.7	....	....	....	....	....	....	4.88	1200 lbs.	1600 lbs.	400 lbs.
	Width.....	3.0	2.8	2.74	2.64	....	....	....	....	....	....	2.9			
3	Length....	4.55	4.74	....	4.77	4.84	....	4.97	5.06	5.11	5.16	4.6	2500 lbs.	3332 lbs.	833 lbs.
	Width.....	3.0	2.94	....	2.74	2.74	....	2.74	2.74	2.74	2.74	3.0			
4	Length....	4.55	4.82	4.84	4.85	4.92	4.98	5.04	5.11	....	....	4.6	2220 lbs.	2960 lbs.	740 lbs.
	Width.....	3.0	2.96	2.93	2.93	2.93	2.93	2.93	2.93	....	....	3.0			

Truck Inspection

Regular Examination of Freight Automobiles and Detailed Reports to Owners Do the Work



S. O. FORM NO. 90

INSPECTOR'S REPORT
INTERNATIONAL MOTOR COMPANY

2 THIS COPY FOR AUDITOR

BRANCH AT

DATE 191 INSPECTOR

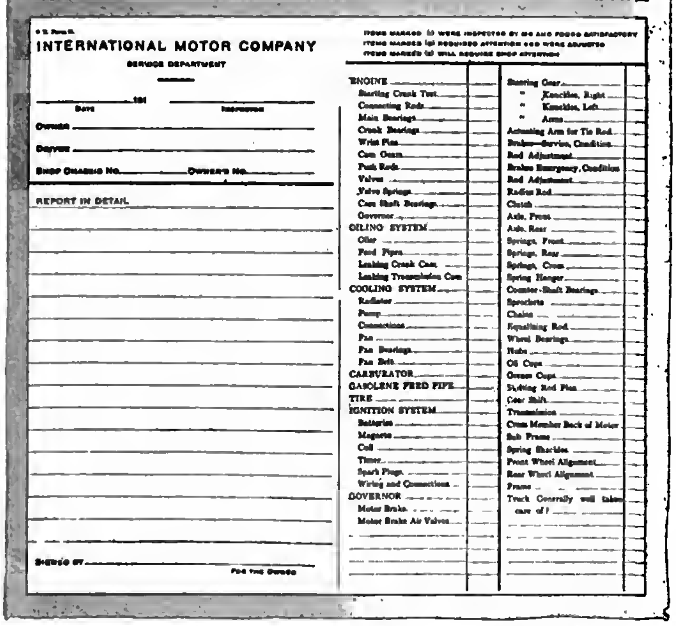
OWNER ORIVER

SHOP CHASSIS No. OWNER'S No.

ITEMS MARKED (1) WERE INSPECTED AND FOUND SATISFACTORY. ITEMS MARKED (0) REQUIRED ATTENTION AND WERE ADJUSTED. ITEMS MARKED (X) WILL REQUIRE SHOP ATTENTION.

ENGINE			Steering Gear		
Starting Crank Test			" Knuckles Right		
Connecting Rods			" Knuckles Left		
Main Bearings			" Arms		
Crank Bearings			Actuating Arm for Tie Rod		
Wrist Pins			Brakes—Service, Condition		
Cam Gears			Rod Adjustment		
Push Rods			Brakes Emergency, Condition		
Valves			Rod Adjustment		
Valve Springs			Radius Rod		
Cam Shaft Bearings			Clutch		
Governor			Axle, Front		
OILING SYSTEM			Axle, Rear		
Oiler			Springs Front		
Feed Pipes			Springs Rear		
Leaking Crank Case			Springs Cross		
Leaking Transmission Case			Spring Hanger		
COOLING SYSTEM			Counter-Shaft Bearings		
Radiator			Sprockets		
Pump			Chains		
Connections			Equalizing Rod		
Fan			Wheel Bearings		
Fan Bearings			Hubs		
Fan Belt			Oil Cups		
CARBURATOR			Grease Cups		
GASOLENE FEED PIPE			Shifting Rod Pins		
TIRE			Gear Shift		
IGNITION SYSTEM			Transmission		
Batteries			Cross Member Back of Motor		
Magneto			Sub Frame		
Coil			Spring Shackles		
Timer			Front Wheel Alignment		
Spark Plugs			Rear Wheel Alignment		
Wiring & Connections			Frame		
GOVERNOR			Truck Generally well taken care of?		
Motor Brake					
Motor Brake Air Valves					

REMARKS



INTERNATIONAL MOTOR COMPANY
SERVICE DEPARTMENT

Date 191 Inspector

Owner

Driver

Shop Chassis No. Owner's No.

REPORT IN DETAIL

Signed by For the Owner

ENGINE		Steering Gear	
Starting Crank Test		" Knuckles, Right	
Connecting Rods		" Knuckles, Left	
Main Bearings		" Arms	
Crank Bearings		Actuating Arm for Tie Rod	
Wrist Pins		Brakes—Service, Condition	
Cam Gears		Rod Adjustment	
Push Rods		Brakes Emergency, Condition	
Valves		Rod Adjustment	
Valve Springs		Radius Rod	
Cam Shaft Bearings		Clutch	
Governor		Axle, Front	
OILING SYSTEM		Axle, Rear	
Oiler		Springs, Front	
Feed Pipes		Springs, Rear	
Leaking Crank Case		Springs, Cross	
Leaking Transmission Case		Spring Hanger	
COOLING SYSTEM		Counter-Shaft Bearings	
Radiator		Sprockets	
Pump		Chains	
Connections		Equalizing Rod	
Fan		Wheel Bearings	
Fan Bearings		Hubs	
Fan Belt		Oil Cups	
CARBURATOR		Grease Cups	
GASOLENE FEED PIPE		Shifting Rod Pins	
TIRE		Gear Shift	
IGNITION SYSTEM		Transmission	
Batteries		Cross Member Back of Motor	
Magneto		Sub Frame	
Coil		Spring Shackles	
Timer		Front Wheel Alignment	
Spark Plugs		Rear Wheel Alignment	
Wiring and Connections		Frame	
GOVERNOR		Truck Generally well taken care of?	
Motor Brake			
Motor Brake Air Valves			

Fig. 1—International Motor Co.'s report which is made out in five copies sent to various officials and departments of the company

Fig. 2—Road report blank used by the inspectors of the same company in the work of inspecting trucks which are out doing work

SYSTEMATIC inspection of freight automobiles by representatives of the maker constitutes a service which goes with the products of most prominent truck makers which are sold in large cities. This inspection service is free to the truck user, that is, it is not paid for from case to case, although it is, of course, included in the selling price of the truck.

The purpose, use and value of systematic truck inspection may be summed up as follows:

1. VALUE TO THE MANUFACTURER.—The maker being kept informed of the weaknesses of his product is put in a position to improve on the parts inferior in design and construction. He may devise means for effectively protecting parts which originally are apt to be damaged or abused. He may, thereby, lessen the cost of upkeep and guarantee work, and render the entire maintenance of the truck less, which makes the product easier to sell.

2. VALUE TO THE OWNER.—The owner's attention is called, by inspectors' reports, to the abuses of his truck by the driver, so that he may hereafter watch out to prevent such practice from being continued. He is thereby made to reduce the upkeep cost of his truck. The consequent diminishing of expenses results in greater business profits.

3. VALUE TO THE TRUCK.—The better care which the truck will get, due to the points brought out in the foregoing paragraphs, results in longer life, lower total cost and better efficiency of the truck and its several elements.

4. MORAL EFFECT ON THE DRIVER.—The man who drives the truck, if he knows that he is being watched, will try to do better so as to hold his job and, if possible, to improve it. The truck will be all the better for the driver's moral rise.

5. MORAL EFFECT ON THE OWNER.—The man who owns the truck, seeing that the maker keeps his interest in view and tries to reduce upkeep for him, will appreciate this work on the part of the manufacturer and, other things being equal, prefer the truck of a company giving good inspection service to one of a maker who does not.

International Uses Two Trucks

In the following a number of truck inspection systems, used by large New York City branches, are described in short and the forms illustrated. The inspection is extended to the trucks, in most cases, periodically, either at fixed intervals or at such periods as the branch sees fit. In inspecting the automobiles, the men doing the work try to catch the truck on the road, thereby taking the driver unawares. The truck is then looked over, the important parts inspected, noises followed up, adjustments made, parts lubricated and so forth. Incidentally the driver is taught how to make minor adjustments and how to take care of the truck as a whole. After this inspection has been completed, the inspector, having returned to the service department, makes out a report of his work and a letter telling the truck owner of the condition, the needs and the troubles of the freight automobile.

The International Motor Co. sends its inspectors to look over every truck in use in the Metropolitan territory, having these inspections once every fortnight, approximately. The inspectors communicate with the truck owners, find out where the truck runs on a certain day, and then each inspector sets out in an automobile to catch the machine on the road. This being done, the inspector looks over the mechanism for loose parts, see whether magneto and carbureter are in good order and what parts are in need of oiling. Minor adjustments, such as that of a brake, the differential and steering gears, are also made by the inspector. He then lets the driver operate the truck and if the man does anything wrong, the inspector instructs him how to do things right. At all this work, the inspector makes notes on the road report blank, Fig. 2. This form is printed black on thin tan cardboard, 8.62 by 8 inches and having space for reporting the name of the owner, the number of truck and motor, date of the inspection and the work done. Each part is separately checked, and depending on its condition, is marked

O. K., in need of shop repair or as having required repair work on the road, which had been done by the inspector. When the cardboard record has been filled out, the driver signs it, after which the inspector returns to the service department. There he dictates the report, Fig. 1, five copies of which are prepared at the same time by the use of carbon sheets. The items appearing on this record are simply duplicating those of Fig. 2, but the report, Fig. 1, is much more adapted for office use. Each of the five copies is printed with black ink, but on thin, almost transparent paper, for various departments, to which the copies are forwarded as follows: White paper, No. 1, to general sales agent of the company at New York; light blue, No. 2, to auditor; light tan paper, No. 3, to agent or branch manager—the report blanks are in use in other cities as well; pink paper, No. 4, to the local service department manager; orange paper, No. 5, to the shop of the service department. A letter is then sent to the owner of the truck informing him of the results of the inspection.

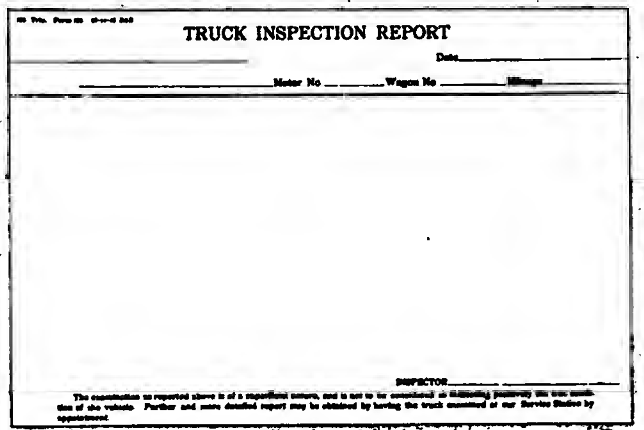
The Packard Motor Car Co.'s inspection service is entirely different from that just described. Packard trucks are inspected once a month during the first year after sale. For this inspection the machines are driven to the Long Island service department of the company and half a day is spent there by an inspector and the driver. After the end of the first year appointments must be made for these inspections. The driver is made to make adjustments and minor repairs under the observation and instruction of the inspector, thereby being familiarized with the mechanism and its requirements. After the half day is over the driver is again put in charge of the truck, the machine having been tested on the road, if necessary. Hereafter the service department makes out a triplicate inspection report, a copy of which goes to the owner, the duplicate to the New York office and the triplicate remains in the Long Island plant. In this way the New York establishment, from which the truck was sold, is kept posted on the history of the truck and enabled to treat the owner in the proper manner if he is again approached.

White Company Inspects Monthly

A different scheme is in use with the White Co. It employs two inspectors who are constantly on the job, traveling over the roads and looking for White trucks, after having been informed by the truck owners where their machines are apt to be at a certain hour of a certain day. Thus, once a month, every White truck in the New York territory is looked over by inspectors according to similar rules as those used by the International and Packard companies. The inspector makes his road notes on a pad of plain paper and transfers them after having returned to the service department to two sheets, Fig. 4. This blank is made in duplicate, being 8.5 and 13.5 inches; the original is printed on blue paper and the copy on yellow; one copy is kept by the inspector and the other in the file of the service department, after Fig. 5 has been filled out. This latter blank is a letter form, 8.5 by 11 inches, and printed with dark red type, the original on white paper and the office copy on orange. The letter form provides space for stating the results of the inspection, the work done by the inspector and suggested repair work. The superintendent of the service department signs the report of the inspector.

The New York representative of the Pierce-Arrow Motor Car Co. sends its inspectors after the trucks as often as it considers it necessary to do so. Repairs are made, the driver is instructed as in other systems, and after the inspection is over the results are compiled on a card of the same size as Fig. 2 and practically the same design. This card enumerates most of the parts of the car, and in spaces provided for the purpose the items are marked: S, A, O or Z; S means that the inspector, having looked over the part, found it in satisfactory condition; A denotes that the part required the attention of the inspector and received it, being in good order when he left the truck; O shows that the part is in need of attention and that the driver promised to take care of the situation, so that the matter is

¶ By the work of inspectors who, at regular intervals, examine the trucks sold by a company, the truck owner is aided and the business of the company is increased. It is necessary that this work be carried out conscientiously and records be exact and complete, to make the idea of free truck inspection a success from every point of view. Poor work is worse than none.



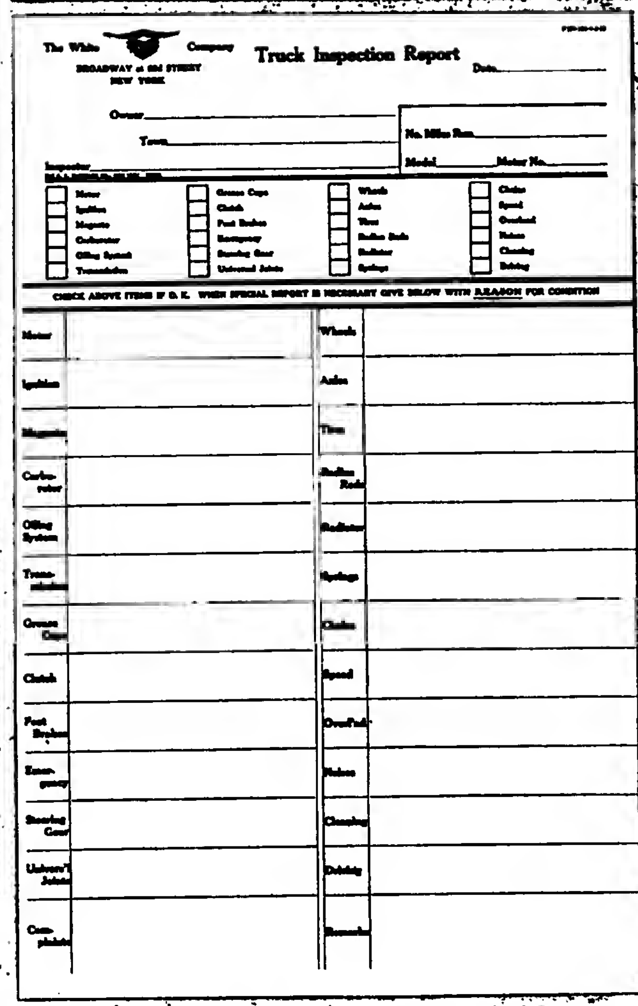


Fig. 3—Truck inspection blank used by the Packard company's inspectors, one copy being kept at the branch, one at the New York office and one being mailed to the truck owner

Fig. 4—White company's report is made out in duplicate by inspectors

in the hands of the owner, while Z is a note to the effect that shop work is necessary to put the part in good condition. Special attention is paid to the tires and their condition, and make, mileage, date of installation and condition are noted in the instance of each of the six tires, there being dual wheels on all Pierce-Arrow trucks. The following abbreviations stand for the various tires: F. R., front right; F. L., front left; R. R. I., rear right inner; R. R. O., rear right outer; R. L. I., rear left inner; R. L. O., rear left outer. After this report has been made out and turned over to the office, the superintendent of the truck service dictates a letter to the owner informing him of the points covered under A, O and Z, and stating just what repair work is needed to put the truck in perfect shape. Of course, the inspector having made notes, if the driver of a truck does not take good care generally or in any special respect this information is also placed at the disposal of the owner. In this way the owner is enabled to eliminate unfit elements among his driving force and to keep the good workers and advance them according to their merits.

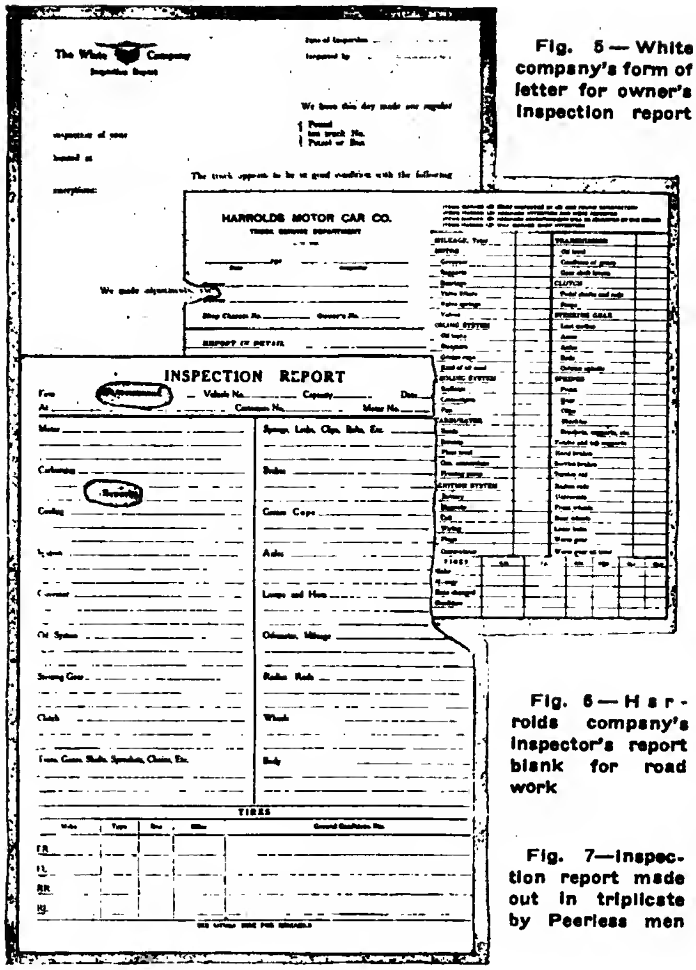


Fig. 5—White company's form of letter for owner's inspection report

Fig. 6—Harrolds company's inspector's report blank for road work

Fig. 7—Inspection report made out in triplicate by Peerless men

The Peerless Motor Car Co. inspects its trucks no less than once a month, and then the work is done on the road. The inspectors overtake the drivers on the road, having learned their route from the truck owners. The inspection work includes an examination of all essential parts, with minor repairs and adjustments being made right on the road by the drivers under the inspector's supervision. After this has been done, the inspector looking over a truck takes the latter and drives it for the next 5 miles so as to become acquainted with the trouble not developing during a stationary examination. The troubles and noises are then eliminated as far as possible, and the inspector makes his notes. After returning to the company's service department he makes out a triplicate report on the blank, Fig. 7. This form is printed black on yellow paper, 8.5 by 11 inches, and the duplicate and triplicate are made by means of carbons. The first copy goes to the owner of the truck, the second to the office of the service department and the third to Cleveland, so as to keep the factory posted on the history of each truck. As in the case of the Harrolds company, special attention is paid to each individual tire, and whatever remarks cannot find space on the front page of the form, under the various headings, are noted on the reverse thus affording ample space for details.

An inspector can make from 100 to 120 inspections per month, so that the cost of each individual examination is relatively small and really trifling when compared with the saving effected by calling attention of the truck owners to detrimental conditions.

Harking Back a Decade

FROM THE AUTOMOBILE of March 7, 1903:

The attendance at the Crystal Palace in comparison to the Grand Palais was probably one-half but, withal, this was a large attendance, considering that the Grand Palais had a paid admission of over 300,000.

Each maker of course is anxious to start first because the leader always has an immense advantage over those who follow him. He has a clear road and a clear atmosphere and can travel all the way at the highest possible speed. The man behind gets the dust, and unless by a very lucky chance—through a short stoppage of the leader for example—he has very little opportunity of passing. The dust is usually so thick that he has to keep prudently in the rear. If he makes a dash, he sees nothing around him. He is in a cloud of dust and only knows that he is near the car by the small stones which tingle his face. He knows, too, that the leader is in the middle of the road. It is of no use to sound the horn, for the man in front can't hear, and he risks his life when he tries to blindly squeeze through between the car and the roadside. No wonder the stoutest heart falters when it comes to fighting an invisible rival in this cloud of dust and stones.

It is generally accepted among contractors that a good horse on fairly good roads has a working capacity for 300 days in the year of 36 ton miles a day, and that in such work he has 5 years of effective service.

Improvements in the carbureters, mufflers and engines have brought about the present flexibility in the operation of gasoline cars, and have almost eliminated the noise which was so dear to the pioneer and so objectionable to the motophobes.

Among the transmission gears on cars exhibited at the New York show, especially those which ran in an oil bath though not belonging to the sliding-gear class, that on the Pope-Robinson cars attracted some attention, but could not be fully investigated on account of pending foreign patents.

The new Fredonia car represents the latest development of the light road car, every detail being of standard make. The wheelbase is 72 inches, the weight is 1,300 pounds, the speed ranges from 4 to 30 miles, the body is finished in black, with gold-leaf stripe and the gear is painted carmine, with black and gold stripe on it.

H. B. Larzere, a San Francisco automobile dealer, takes his prospective purchasers for a 103-mile trip, over the rough roads around San Francisco bay. One of these trips was made with but one stop, the actual running time for the trip being 4 hours 20 minutes, and so successful was the performance of the American car with which the trip was made that an immediate sale was secured.

Communications from The Manufacturer

Tests Conducted by Two Professors Show That Magnetic Speedometers Are Not Affected by Exterior Fields

CHICAGO, ILL.—Herewith are reports of two tests made on Warner and Stewart magnetic speedometers.

One of these tests recently made by Professor Carhart of the University of Michigan is very interesting and I am under the impression that it is of enough human interest to the automobile engineers about the country to merit their attention.

Report I—Pursuant to your request I have procured from stock in Los Angeles one Stewart and one Warner speedometer and have made thorough tests of both instruments relative to their susceptibility to change of readings through the agency of outside magnetic fields, such as that of an electric starting motor in a gasoline machine or the motor of an electric automobile.

The speedometers were driven through their long flexible shaft by attaching to the axle of a two-current generator; the revolutions per minute were measured by means of a sensitive frequency-meter connected to the alternating side of the generator. It was then necessary only to read simultaneously the scale of the speedometer and that of the frequency-meter. The readings of the two were nearly the same and any variation due to magnetism could be readily detected.

Excited Edison Machine Had No Effect

An old Edison bi-polar of .5-kilowatt capacity was employed to furnish an outside stray field. This was chosen because its stray field is greater than that of a machine of more recent make. Readings were taken with the distance between the center of the armature of the Edison at different distances from that of the speedometer up to within 10.5 inches. In no case could I detect any change in the ratio between the readings of the speedometer and the frequency-meter on account of the presence of the excited Edison machine. This statement applies to both Stewart and the Warner instruments.

I am not acquainted with any case in which the speedometer is mounted within 10.5 inches of the pole of a starting motor of an automobile, either gasoline or electric. I also tested the speedometers with a permanent magnet of the horseshoe type. This magnet was capable of holding by means of its armature a weight of a pound or more. The poles were applied directly to the case in various places. Not the slightest effect could be detected in the indications of the speedometers.

The conclusion is inevitable that the magnetic speedometer as made at the present time is not affected by the magnetic field of a starting motor nor by that of a magnet to any extent that can be detected by reading the scale.

The claim that the readings of magnetic speedometers are influenced by the currents or static effects of the ignition system of an automobile is a contingency too remote to deserve serious consideration or experimental disproof.—Henry S. Carhart, Professor Emeritus of Physics, University of Michigan.

Report II—The effect of external magnetic fields upon magnetic speedometers.

1—Horseshoe magnet near the speedometer.

A Stewart instrument with split ring magnet and field ring mounted upon the testing apparatus and operated at known speeds, was exposed to the influence of a permanent horseshoe magnet capable of lifting 4 pounds. This magnet brought as close as the casing of the instrument would permit, produced no appreciable effect upon the readings.

2—An electromagnet capable of lifting 15 pounds on one of its poles brought into like close proximity to the split ring magnetic speedometer on the testing apparatus produced no appreciable effect upon the readings.

A Stewart speedometer with closed ring magnet without field ring similarly exposed to the horseshoe magnet and to the electromagnet showed no appreciable change in its readings.

3—The effect of strong electric current around the speedometer.

A coil of thick wire was placed around the steel case of a speedometer and a heavy current from a storage battery was passed through it. The steel case of the instrument became sufficiently magnetized to lift 1 1-2 pounds. Switching this current off and on, while the speedometer was operated at known speeds on the testing apparatus, produced no appreciable effect upon the readings.

The strength of the magnetic fields passing through the speedometer due to the external magnets and the current employed in these tests greatly exceeded the strength of the fields which would be caused to pass through the speedometer by a generator or a motor mounted on an automobile at the distance from the speedometer at which such generators or motors are found in actual construction.

4—Effect of high-tension current passing through the speedometer.

A Stewart speedometer, Type B, and a Warner instrument were each in turn introduced into the secondary or high-tension circuit of an induction coil giving an intense spark 1 inch long so that the high tension current passed through the instrument while running at known speeds on the testing apparatus. Switching the spark on and off produced no change whatever in the reading of the instrument.

The foregoing test was repeated with the case of an instrument removed, so that the spark passed directly through the magnet and the aluminum cup of the speedometer, but no effect was produced upon the reading.

In these tests the disturbing influences employed greatly exceeded any disturbing influences which could be produced by stray currents or magnetic fields from a motor or a generator mounted on an automobile, even if the circuit of such motor or generator should become directly connected to the chassis or other metal parts of the vehicle.

These experiments indicate therefore, that it is impossible for a magnetic speedometer of these types to be disturbed so as to affect its readings by any influence proceeding from a motor or generator carried on the vehicle for starting or continuously operating it, or for charging a storage battery.—G. M. Wilcox, Armour Institute of Technology.

It will be obvious to you that these tests will probably upset a few stray notions, which were going around to the effect that magnetic spedometers could be affected by currents or stray waves furnished by other forces, such as close proximity to electric starters, magnetos and the like.—Berne Nadall, Stewart-Warner Speedometer Corp.

Danger in Truck Overloading

A car driving at more than a certain speed proves beyond the control of the driver when sudden and positive stopping becomes necessary. The same holds true of the overloaded truck. It should therefore be made the business of State and municipal authorities to forbid overloading of freight automobiles as they forbid travel at more than fixed speeds. This course is the more desirable, as a large percentage of truck owners overload.

Paris now arises at 14 o'clock, France having adopted the 24-hour day after the example of Italy. If America follows the lead, the A. M. and the P. M. are not hereafter to be confounded with a university degree and the postmaster, railway timetables and score cards for 24 hour races will be simplified and the "nick of time" will be promoted from the 11th to the 23d hour.

Special Process Steel Manufacture—An Incorrect Lighting Wire Diagram—Changing the Vacuum Oil Feed—Storage Battery for Ignition—Complains of Carbureter—Value of English Imports—Use of Kerosene in Motor

Difference in Special Process Steel

EDITOR THE AUTOMOBILE:—Will you kindly let me know the difference in Bessemer and Open-Hearth steel, whether they are one and same thing, only different process of manufacture, or whether different formulas?

Akron, O. W. C. MILLER.

—BESSEMER STEEL is made by blowing air through a bath of melted pig iron. The oxygen of the air first burns away the silicon, then the carbon, and before the carbon is entirely burned away, begins to burn the iron. Spiegeleisen or ferro-manganese is then added to deoxidize the metal, and to give it the amount of carbon desired in the finished steel. In the ordinary or "acid" Bessemer process the lining of the converter is a silicious material, which has no effect on phosphorus, and all the phosphorus in the pig iron remains in the steel. In the "basic" or Thomas and Gilchrist process the lining is of magnesian limestone, and limestone additions are made to the bath, so as to keep the slag basic, and the phosphorus enters the slag. By this process ores that were formerly unsuited to the manufacture of steel have been made available.

OPEN-HEARTH STEEL—Any mixture that may be used for making steel in a crucible may also be melted on the open hearth of a Siemens regenerative furnace, and may be desiliconized, and decarbonized by the action of the flame and by additions of iron ore, deoxidized by the addition of spiegeleisen or ferro-manganese, and recarbonized by the same additions, or by pig iron. In the most common form of the process pig iron and scrap steel are melted together on the hearth, and after the manganese has been added to the bath it is tapped into the ladle. In the Talbot process a large bath of melted material is kept in the furnace, melted pig iron, taken from a blast furnace, is added to it, and iron ore is added which contributes its iron to the melted metal while its oxygen decarbonizes the pig iron. When the decarbonization has proceeded far enough, ferro-manganese is added to destroy iron oxide, and a portion of the metal is tapped out, leaving the remainder to receive another charge of pig iron, and thus the process is continued indefinitely. In the Duplex Process melted cast iron is desiliconized in a Bessemer converter, and then run into an open hearth, where the steel making operation is finished.

The open-hearth process, like the Bessemer, may be either acid or basic, according to the character of the lining. The basic process is a dephosphorizing one, and is the one most available, as it can use pig irons either low or high in phosphorus.

Save Gas with One Headlight

Editor THE AUTOMOBILE:—I have recently had some long stretches of touring to do and in order to get to sleeping quarters through a sparsely populated country it has been necessary to do considerable night riding. I have found that I have been able to get along with one headlight and in this way have had my tank last twice as long as with the two lamps lit. At the same time I get a better light than if I had both lights lit dimly.

Westport, N. Y. JOE HUNTINGTON.

Wiring of Lighting System

Editor THE AUTOMOBILE:—Will you please tell me if the diagram for wiring an automobile for side lamps and tail lamps and horn is correct as I wish to wire our car over, the present wiring being inconvenient owing to a change in the location of the battery from rear to front?

Prairie du Chien, Wis. ARTHUR KNOERZER.

—This diagram is incorrect because you would be unable to blow your horn unless the side or tail light was lit. The horn circuit should not run through any of the lamp filaments. It is also improper to place the tail light in series with the horn.

Advantages of Worm Drive

Editor THE AUTOMOBILE:—We have had some discussions as to the drag produced in a worm-drive rear axle over the old gear and pinion and as yet have failed to notice any discussion concerning the subject in the columns of your paper. Kindly advise us as to the advantage of worm-drive over the former gear drive and why it seems to be gaining so much favor, especially with truck manufacturers.

Ashland, O. ASHLAND AUTO GARAGE.

—The advantages of the worm-drive are silence and long life, according to the claim of those who are putting it on the market. The drive is efficient and does not become noisy with wear. Wherever there is considerable reduction between the driving and the driven member a worm is very advantageous because it is not necessary to introduce members of widely different sizes as is the case in the reduction through bevel gears. Material must be carefully selected in a worm drive so that there will be no undue amount of wear. In worm drives the wearing parts are steel against bronze. For the more expensive pleasure cars there is a possibility of its extended intro-

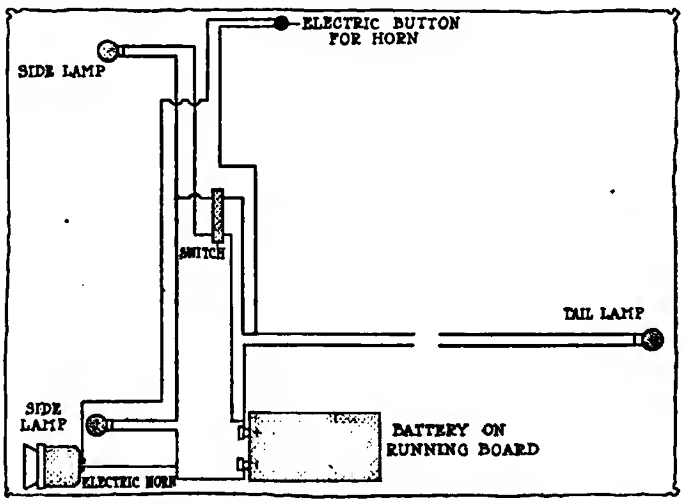


Fig. 1—Incorrect wiring diagram submitted by reader. Horn cannot be blown when lights are not lit

duction into this country because of the silence of its action. It is altogether free from the hum which is often perceptible in bevel gear drive. The makers of bevel gears, however, state that where back lash is eliminated and there is no lost motion throughout the axle the silence of the bevel gear axle is as great as that of the worm-driven device.

Use of Gum Camphor Bad

Editor THE AUTOMOBILE:—Will you kindly advise us if crystalized or gum camphor used in large quantities would have any bad effects on the internal parts of a motor, the above being mixed with gasoline?

The idea is to put more life in the present low grade of fuel, also from what proportion are the best results obtained and what would be the effects of an over dose?

Is there any other solution that you know of that would give better results than the camphor, figuring on same not being too expensive?

Philadelphia, Pa. WILLIAM ELLERSHAW.

—It is generally a bad idea to attempt to doctor a fuel by the addition of some extraneous material. In former years racing cars and motorboats were very prone to use doped gasoline while in contests in the hope of securing better results than from the ordinary fuel. Picric acid was very often used for this purpose, but, owing to the fact that it damaged the cylinder walls, was gradually abandoned until now its use is very rare. Gum camphor has never been used to any extent for this purpose and nothing like definite information can be obtained regarding its successful use in gasoline. Camphor is not readily dissolved and the use of large quantities looks from that standpoint to be bad. As stated, it is safer to use an unmixed fuel.

Hard to Start Cold Motor

Editor THE AUTOMOBILE:—I have a Studebaker Flanders 20 1912 model equipped with their own carbureter, but it starts very poorly in cold weather and I don't think it is as economical as some others. Should I be troubled in this way?

New Haven, Conn. FRED W. STEVENS.

—The carbureter is fitted with a tickler which if pressed should flood the mixing chamber and allow you to start without trouble. If you close the air adjustment slightly you may be able to get an easier start. According to the foreman of the repair department of the Studebaker Corporation in New York City, there are practically no complaints on this carbureter and even in the winter season 15 miles to the gallon is secured regularly. In the summer season on a warm day you will be able to better this and secure in the neighborhood of 18 or 20 miles to the gallon of gasoline.

Changing Vacuum Oil Feed

Editor THE AUTOMOBILE:—I have an E. M. F. with the vacuum system of oiling, which has never worked properly, and I wish to put in an oiling system with a sight feed, and ask suggestions from you.

My idea is to put a double glass adjustable sight feed upon the dash, and use the present 1-gallon oil reservoir on the side of the crankcase.

1—To use a hand pump by the seat to force the oil up to the sight feed, or would you advise taking the pressure from the exhaust pipe, and use a one-way valve on the pipe leading to the reservoir?

2—Would you advise using the present holes at the bottom of the crankcase for the intake of the oil to the crankcase, or would it be better to run the .125-inch pipes to the oil cups on the front and rear main bearings and the overflow running to the bottom of the crankcase for splash?

3—In using the hand pump it would be necessary to have a shut-off cock on the pipe line between the reservoir and feed so as to stop drip when not in use. By using the exhaust for pressure I see several faults. The pressure might get too great, and the carbon from exhaust gases would get into the oil and might clog the feeds as well as fouling the oil. Although it might be convenient, would you deem it necessary to have a pressure gauge from the reservoir in connection with the hand pump system?

4—If the oil leads or pipes to the main bearings be used would not the right side be the better side for the leads to enter the crankcase and would there be danger of the pipes not remaining in place inside at the front and rear bearing cups?

5—Although I have put new bolts in my springs, there is still considerable play. Is there any other way to take this up other than having the spring-eyes bored larger and fitting brass bushings?

6—In grinding valves is a polished or dull face considered the better? Should the valve face be put back absolutely clean and dry or with a little kerosene or oil on it?

7—One year ago I put Firestone demountable rims on my car and 34 by 4-inch tires in place of 32 by 3.5 and found that I now have very little clearance under the fenders. Using 32 by 3.5-inch tires four tires, by shifting around, never lasted more than 2,500 to 3,000 miles, but by using the 4-inch four new non-skid tires ran me over 7,000 miles. I give this to show the value of oversize tires.

New York City, N. Y. HERBERT V. W. CARD.

—The E. M. F. vacuum feed should be successful provided that the valve in the filling hole is tight and the leads to the crankcase are clean. The system which you intend to place upon your car will be very apt to be more troublesome than the vacuum feed unless the work of installing it is very carefully done. It will not be an automatic system, but hence will require attention from time to time. Referring to Fig. 2, which shows the system as it stands now, and as you suggest, the following advice may be readily followed:

1—If you intend to use this system it would be preferable to use the hand pump rather than the pressure from the exhaust pipe. Exhaust pipe pressure is unreliable as you are always exposed to the risk of leaky check valves.

2—It would be better to run the new leads to the oil cups on the front and rear main bearings and allow the overflow to run down into the splash troughs so that you can always be sure that the main bearings will have a sufficient supply of lubricant.

3—The sight feed would have to act in the nature of a gravity feed tank. The hand pump could be used to bring the oil up into this glass tank from which it would feed to the crankcase by gravity through adjustable holes which would permit the flow of oil to be more or less rapid as desired by the driver. If the device for controlling the speed of the oil flow from the glass tank could be inter-connected with the throttle, so that the wider the throttle was opened the more rapidly the oil flowed into the crankcase, the desired result would be obtained, that is, that more oil would be supplied when the engine was laboring than when running under a light load. In this way the system could be made automatic except in so far as it would be neces-

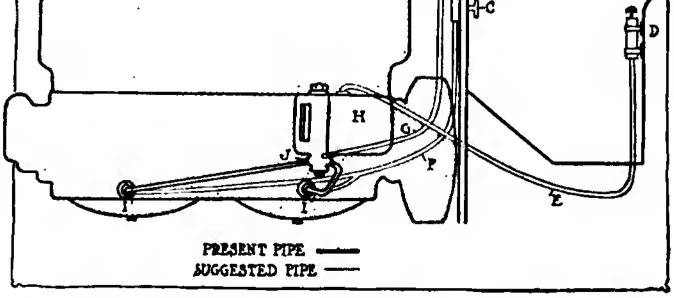


Fig. 2—Suggested oiling system to replace vacuum feed on E.M.F. car. Hand-pump located in reach of driver

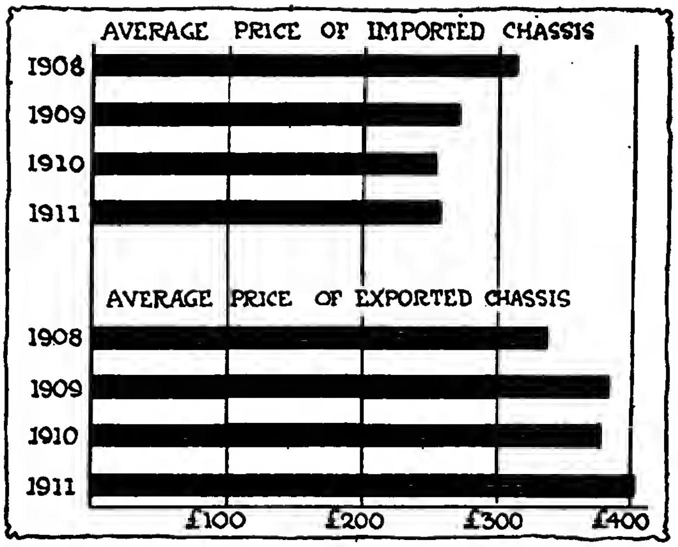


Fig. 3—Chart showing average value of English imports and exports from 1908 to 1911

sary to use the hand pump in bringing the oil from the reservoir to the glass tank on the dash.

4—It would not make any difference what side was used for the entrance of the oil leads to the crankcase. The methods of fastening the leads in place should be so thorough that there will be no danger of not remaining at the bearing cups.

5—The best method is to have the spring eyes bored larger and the brass bushings fitted. The bushings should be secured in place by a set screw so that all wear will be upon the bushing and that they may be removed readily when worn.

6—The face of the ground valve should have a polished appearance and should be absolutely clean except for a quick wipe with an oily cloth to prevent rusting of the newly ground surface.

7—Why not raise your fenders slightly by changing their curvature?

Prefers Four to Six Cylinders

Editor The Automobile:—In regards to the four-cylinder motor, much can be accomplished. The four is lighter than the six if not made too large and weight should be cut down. Some cars are very heavy and use a large per cent. of the motor's power to propel its own weight. The hood on some big sixes is 60 per cent. as long as the body and takes up too much room, leaving a limited space for the latter. A car of high class should be capable of carrying its load from 2 to 70 miles per hour on high gear without noise. A four-cylinder Knight motor 4.5 inch bore, 7 inch stroke as I described in my last letter would develop with steel pistons 120 horsepower and run perfectly smooth and noiselessly. When perfected the body should be made of aluminum with adjustable seats. These would be greatly appreciated on long tours. Light-weight cars would not get mired so often on soft country roads and would be much easier to operate.

Alton, N. H. H. P. Tibbetts.

Valve-In-Head Efficiency

Editor The Automobile:—Will you kindly tell us why a valve in the head motor produces more power than an L-head or T motor of the same bore and stroke?

St. Charles, Mo. St. Charles Garage.

—The reason that the valve-in-the-head motor has advantages over other types is because the combustion space can be more advantageously shaped. If it were possible to make the combustion space a perfect hemisphere the best possible results would be obtained. As it is, however, we are compelled to depart from this form of combustion chamber for practical reasons, among which is the location of the valve. In an L-head motor the designer is compelled to use a port to one side of the combustion space which departs quite radically from the hemispheric form desired, but which, however, renders possible the use of a very simple valve action and avoids the use of long push-rods and parts which tend to become noisy after use. Valve-in-the-head manufacturers who succeed in getting a good valve action which will remain permanently sound and who are able in this manner to take advantage of the nearer approach to the ideal combustion space have secured a very desirable feature from the internal-combustion motor. The T-head motor, of course, has the same problems to face as the L-head. That the power loss is not very serious may be illustrated by the fact that the stock car which won the championship of America during the 1911 racing season was of the T-head type. The use of the valve-in-the-head or other type of motor has been argued pro and con for a number of years and the advantages and disadvantages of both types have been given as outlined above. There are, however, at present many successful manufacturers of both types. This alone will signify that both types have their advantages and disadvantages and that the latter are not serious enough to militate against the successful manufacture and operation of either type.

Using Storage Battery Ignition

Editor The Automobile:—I have a Cadillac 30, 1911, on which I am about to install an electric lighting outfit, consisting of dynamo and storage battery of the 6-volt type. Can I connect the Delco wires to storage battery and discard dry cells?

Will this system work O. K. without harm to the controlling relay?

Perry, N. Y. Delco.

—The storage battery may be used for the ignition system without harm, provided it is of sufficient capacity. You will need an 80 ampere-hour 6-volt battery. What you are doing is simply adding the remaining units of the lighting system. On your car you have merely the Delco ignition. There will be no difficulty with the control, relay or any other parts if you install the remaining units in the same manner that any of the generator battery sets are fitted. It must be remembered that you need a controlling device which will prevent the voltage of the generator from mounting too high at great engine speed and which will prevent the battery from discharging back through the generator when the voltage of the latter becomes less than that of the battery. These systems may be bought complete and installed in many different ways. The most satisfactory manner, however, where the generator is not already fitted to the car is to drive this unit from the pump or magneto shaft of the motor. It can be done by silent chain without a large expense and the resulting installation will be noiseless and permanent.

Sparks Appear in Safety Gap

Editor The Automobile:—Would a poor mixture cause sparks to appear in the safety gap of a magneto, or is there only one cause for it—the secondary current having no outlet?

2—Is it your opinion that the use of a spark-plug air pump is harmful to the motor in any way?

New York City. A Reader.

—1—No, not this alone, although a poor mixture might bring a condition about that would constitute a secondary cause of a spark in the safety gap. The theory of the spark gap is that as long as a circuit is provided through the cables and spark-plugs, the current will not jump the wide gap on the magneto, but if the spark plug circuit be broken, and the engine continues to turn the magneto, generating a high-tension current, it is allowed to escape across the safety spark gap, and thus prevent the burning of the windings. A rich mixture might so carbonize an engine that pre-ignition would result. If this pre-ignition occurred at the time that the spark was about to jump the spark-plug, the increased pressure might constitute such a resistance to the electrical passage that it would jump the safety gap instead. Again, an abnormally rich mixture might cause the motor to overheat to such an extent that the sparking points would become warped, and the gap increased so that the current would find a more ready passage across the magneto spark gap than that of the spark-plug. These conditions would be more likely to obtain in a single-cylinder motor than a multiple-cylinder type, as it is highly improbable that a given mixture would produce the same results in say, four different cylinders with four separate plugs.

2—The types that have come to the attention of THE AUTOMOBILE have not been of such nature as to be conducive of harm to an engine, except the slight wear due to running with one cylinder missing, which, however, is almost negligible.

Wants Starter for Ford

Editor THE AUTOMOBILE:—I own a Ford car, which I stop and start over fifty times daily. I think a self-starter would save its price in time saved over cranking by hand. I wish you would suggest to me the starter I need. The car starts easily, so I had in mind a spring starter as the easiest and cheapest to operate. Do they give satisfaction? Do they easily get out of order? Do they automatically wind themselves after starting the engine?

Needham Heights, Mass. HARLEY E. CRISP.

—A spring starter would give you satisfaction. With a light car such as the Ford they should not get out of order readily. The general operation of these starters is as follows:

A button or lever is operated from the driver's seat. This automatically releases a coil spring which actuates through some mechanical means the crankshaft of the motor. When the cylinder explodes, the operating device is disengaged from the crankshaft. The next few revolutions of the motor rewind the spring and it is then ready for another start. The objectionable feature of the spring starter is not up to the starter itself but the operator. Many people are in the habit of absent-mindedly attempting to crank the motor without first switching on the spark. When this is done with a spring cranking machine it means that in a few moments the spring is unwound and the operator has the irksome task of rewinding it. On your Ford car a spring starter should be a success.

Cars Imported Into England

Editor THE AUTOMOBILE:—Kindly tell me what is the cost of cars imported into England. Are they of the high-priced or low-priced class? I should also like to know if possible the average value of the chassis exported from England. I should particularly like to know how the exported values compare with the imported values for each chassis.

New York City. K. SMITH.

—The chassis of the chart, shown in Fig. 3, will give the average values for the last 4 years in a better way than would figures. It will be noted that the average price of the imported chassis dropped quickly between 1908 and 1910, but that in 1911 it was about the same as 1910. The average value of the exported chassis has been climbing steadily.

Use of Kerosene in Motor

Editor THE AUTOMOBILE:—For the last 3 years I have been giving the subject of kerosene carburetion considerable thought and time studying the conditions under which kerosene operates best. I have developed seven distinct kerosene systems and subjected each to dynamometer tests under various loads and at various compressions, thereby obtaining graphical curves from each system under all conditions. As a result of these tests I have developed the Aultman & Taylor kerosene tractor, which can operate on kerosene quite as well as on gasoline, when once the surfaces of the cylinder walls are given an initial warming, which is done by priming with gasoline, having received quite satisfactory efficiency from the engine in the tests.

I am able to install on engines of good design a system for the use of either kerosene or gasoline simply by throwing a three-way valve one way or the other. I find that an engine must have a scientifically correct manifold in order to distribute the lighter and heavier oils (vaporized and unvaporized kerosene) equally to all cylinders and as a considerable percentage of automobile motor designers today pay little regard to this most necessary virtue it is necessary to take each particular type of motor and so change the design as to take into account these necessary features.

I find that any four-cycle gas engine when properly equipped will operate quite as well on kerosene as when on gasoline. The only trouble whatever is getting the engine warmed up, which difficulty has been surmounted by arranging to start on gasoline and after 1 minute turning on the kerosene. The great trouble heretofore has been due to the fact that kerosene leaves an excess of carbon deposit both in the combustion chamber and under the rings, which causes the rings to stick and forces them harshly against the cylinder walls. This trouble has been entirely avoided by water injection. A test which was conducted in the laboratory of the Aultman & Taylor Machinery Company by the writer, extending a solid week, at various loads, averaging 55 horsepower throughout the week, showed how complete was the combustion and how thorough the scavenging. At no time was it necessary to even clean the spark-plugs, and upon the completion of the test the heads were removed, the pistons taken out, the valves inspected, and there were no signs whatever of any bad effects from the use of kerosene. In fact, the combustion chambers were bright and the spark-plug porcelains were of a brownish white color, showing only the effects of the intense heat.

I predict that within 2 years all stationary engines, heavy-duty tractors and motor trucks will use this cheap 44-degree Beaumé coal oil exclusively, while the pleasure vehicles will use lighter kerosene of about 50-degree Beaumé. Gasoline costs 17 cents wholesale in Mansfield, while 44-degree coal oil costs 8 cents and 50-degree kerosene costs 9 cents. Each contains approximately the same British thermal units per pound, and as a gallon of 44-degree kerosene contains 6.5 pounds, against 5.8 pounds for gasoline, it can be seen that gallon for gallon kerosene contains 6.5 to 5.8 more heat energy. But, owing to the peculiarities of kerosene, an engine is not quite as efficient thermally on kerosene as on gasoline, owing, no doubt, to the fact that small globules of kerosene get into the cylinders without being vaporized and supplied with the necessary oxygen for combustion.

Mansfield, O. E. FIELD WHITE.

—In response to a request from the Editor of this department Mr. White has furnished the curve shown in Fig. 4 which gives the comparative efficiency of kerosene of 44 Beaumé test and of gasoline of 64 test. These were taken to determine the least possible fuel consumption at each load. It will be seen that a very low consumption was obtained by running at about .80 load and throwing the throttle wide open, then reducing the speed with the needle valve to give a very lean mixture. The horsepower was boosted by giving a rich mixture, thus causing the curve to ascend to the maximum horsepower.

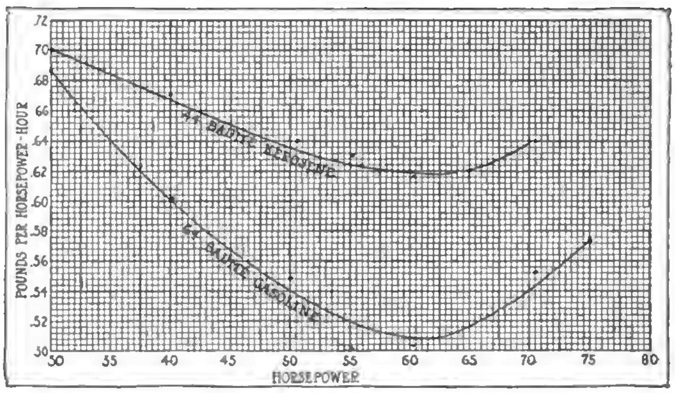


Fig. 4—Comparative consumption per horsepower of kerosene and gasoline in Aultman & Taylor tractor

Showing the way the top folds into the body on the Turcat-Mery torpedo and baggage and spare wheel compartments

Turcat-Mery Torpedo Has Unusual Baggage Facilities

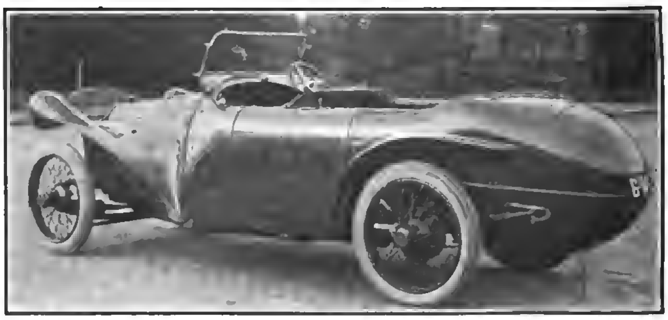
LONDON, ENG.—Many of the problems of luggage carrying have been solved in a torpedo body built by the Turcat-Mery Company on one of its 30-horsepower chassis. As can be seen from the illustrations, the car has really a double width, the side panels being swept out so as to incase the running boards, leaving a locker space all round between the seats and the outer paneling. On the right-hand side of the car there is a particularly big space for personal baggage, for as no entrance has to be provided to the driver's seat from the right, the running board is used for carrying three or four large size grips, which are put in position after removing a side panel. On the opposite side the same amount of space is not available, owing to a door having to be provided here. There is, however, on the running boards a series of cabinets placed between the two doors and having sufficient capacity for all the mechanical spares likely to be required for a long journey.

When the two rear doors are shut, the running boards within them become available for baggage, which is fully protected from the weather. In the egg-shaped tail there is room for a couple of spare wheels carried upright, and, of course, fully protected. To the rear of the wheels, in the extreme end of the tail, there is space for a large number of light articles.

The top lets down into the rear compartment. There is nothing very distinctive in the top itself, but it is hinged in such a way that when lowered it is between the two shells forming the body. The front hoops have a polished beading which completely covers up the space provided for entering the top between the two shells. Although completely out of sight when lowered, the time required to lower this top is no greater than with the ordinary type of external top. In accordance with modern practice, there are no straps for the top, the attachment being made direct to the windscreen. In addition to having great luggage capacity this car has an unusually clean underpan. At the midships section the pan is carried full out to the extremities of the running boards, and not to the frame members, as is usual. At the front end it is run up to join the lower ends of the fenders. Despite its greater width, the car offers considerably less resistance than an ordinary type of touring car with external fittings.

An idea of the external appearance of the car may be gained from the accompanying illustration showing the machine with compartments all closed in readiness for a trip.

The illustration at the top of the page shows the manner in which this novel body construction is adapted for carrying a great many things concealed from view which are generally fitted to the outside of a car in such a way that the effect of the body design is practically destroyed. The upper pictures show the way the top folds into the body while the lower illustrations show the method of carrying baggage and spare wire wheels.



Turcat-Mery torpedo, showing clean-cut lines combined with unusual baggage-carrying capacity

The Clement-Talbot on its world's record attempt, traveling at a speed of over 103 miles per hour on the Brooklands track

How the Clement-Talbot Racer Made Over 103 Miles in an Hour

LONDON, ENG., Feb. 22—The Clement-Talbot car which a week ago established a new world's record on the Brooklands track by traveling 103 miles 1470 yards in 1 hour has since that date been the center of motoring interest because of the phenomenal speed and the small power of the car.

The Clement-Talbot is a four-cylinder car, 101.5 by 140 millimeters bore and stroke. In inches these measurements are 4 by 5.51. This motor has a most enviable power curve, which is practically a straight line from 25 horsepower to 120. It generates 20 horsepower at 500 revolutions per minute, and 120 horsepower at 3,000 revolutions per minute. This is an ideal motor performance in that when the crankshaft speed is made six times as great, the horspower is increased sixfold. It also means that for all intermediate crankshaft speeds the production of horsepower is in direct proportion.

In the current issue of *The Autocar* the valve timing of the motor is given. It shows the intake valve opening 14.5 degrees after dead center and closing 30.5 degrees after bottom dead center, its period of opening being approximately 195 degrees, 360 degrees constituting an entire circle. The exhaust valve opens 46 degrees before bottom dead center and closes 9.5 degrees after top dead center. There is a period of approximately 5 degrees between the closing of the exhaust and the opening of the intake valve. The magneto was so set during the performance as to give a maximum advance of 40 degrees before the top dead center.

Percy Lambert at the wheel of the 25.6-horsepower, record-breaking Clement-Talbot waiting the signal to start

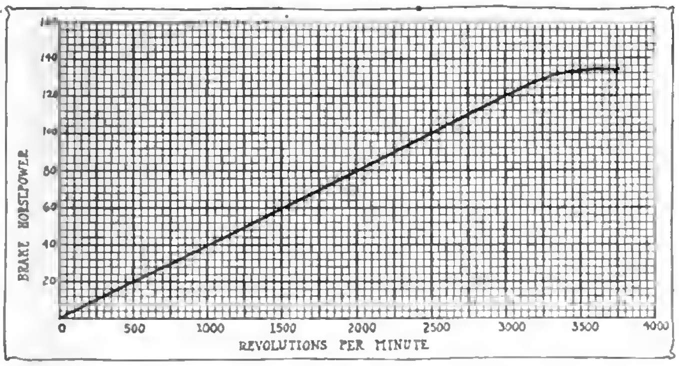
The Clement-Talbot motor was designed by George W. A. Brown, a comparatively unknown internal-combustion engineer. While not identified publicly or conspicuously, he nevertheless has been a close student of motoring and one who has gained much of his information from practical experience with cars on the road. He is looked upon as one of the best authorities on tuning up an automobile in the English industry.

Looking to the future, the next great performance of this character will be 120 miles in the hour. But it is not probable that this will live as long in the memory of the public as the present record. A remarkable feature of the achievement is the small size of the engine. A year ago the best speed for a 4-inch engine was 87.99 for the flying half mile. Interest centered in the way the Talbot car came off the banking each time in its attempt to cover the century in the hour and in the elaborate and successful signaling devices.

Large panels of three-ply wood, about 3 by 3.5 feet, were provided having on one side a red number and a white one on the other. If the car had covered 97 miles an hour in any lap the driver would see a red 7 when next he passed the stand, and if he made 103 he saw a black 3. The red numbers were not needed at all.

There was also a large dial marked out for the run. Every time a lap was covered a hand on the dial was advanced a section so that when the race was over the hand had completed its circuit. Such provisions as these are of great help to the driver in endeavoring to better a world's record.

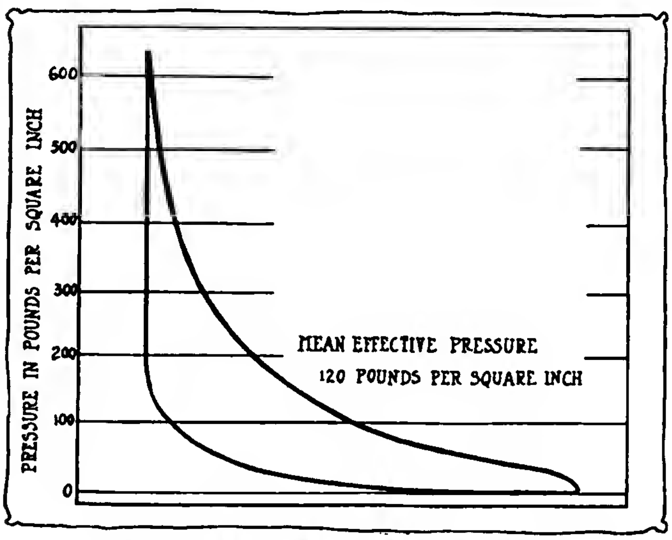
The Clement-Talbot car, of 25.6 horsepower, has an engine capacity of only 4,531 cubic centimeters, is owned by the Earl



Brake horsepower curve of the record-breaking Talbot motor

of Shrewsbury and was driven by Percy Lambert. The car really covered over the distance of 103 miles 1,470 yards, the distance recorded, for the car kept to the outside of the timing line, which at least would mean another 70 yards per lap, so that actually the car attained the wonderful speed of 105 miles an hour, which speaks well of the advance in the design and construction of motor vehicles.

At the start there was an absence of wind, but in its stead there was a dense fog overhanging the track, rendering it impossible for the driver to see more than a quarter of a mile or so in front of him, while he stated that for five laps he could hardly see at all. This fog kept the tires cool, and at the conclusion of the run the tires were measured and it was found that the total reduction of the center rib on the off front tire amounted to 1 millimeter; the near front, 2 millimeters; the off back, 1.1 millimeters, and the near back, 1.4 millimeters. No preliminary run was made, and the first lap was covered at the rate of 87.38 miles per hour from the standing start, which is much slower than the first lap of last week's attempt. However, as the motor warmed to its work and the carbureter began to settle to its labors the speed increased to 103.76 miles per hour for the second lap. The car thus succeeded in establishing class records, and at 50 miles began to put up fresh figures for world's records. The 50 miles were covered in 29:2.5, equal to 103.3 miles per hour, and the 100 miles were covered in 57:49.38. Continuing to travel at this pace for 60 minutes it was found that the actual distance covered in the hour was 103 miles 1,470 yards. Last week, it will be remembered, that it was stated in these columns that the car would cover the 100 miles in about 58 minutes, and it will be seen from the above that that statement is correct within 11 seconds. The car increased in speed as the distance lengthened and at the conclusion seemed to be fit for a further gruelling. The previous figures for the world's record of 100 miles was 1:1:27, compared to 57:49.38.



Indicator diagram of Talbot 25.6 horsepower motor

Benz Wins at San Diego

Carlson Covers 5.9-Mile San Diego-Point Loma Course in 200:9:2—Buick Wins Small Car Race—Two Wrecks

SAN DIEGO, CAL., March 1—(*Special Telegram*)—In the race over the San Diego-Point Loma course today, a Benz, driven by Carlson, finished in 200:9.20 as the winner in the large car class, while the honors in the small car division went to Campbell in a Buick. The course of the road race is 5.9 miles in length and 34 laps were run in both the large and small car division, making the total distance 200.6 miles. In the small car division, Campbell's car was the only one which finished, while in the other division a Stntz, driven by Cooper, finished second.

The thrill of the day came when Jeannette's Benz, in the big car race, was wrecked during the fourth lap as the car threw two tires; the driver and mechanician being injured, but not fatally. A Mercedes driven by Compton was also wrecked due to tire mishap.

In the small car race, Buick (Roberts), Regal (Brown) and Studebaker (Shannon) dropped out in the fourteenth, tenth and second lap, respectively. A Buick for which Nikrent had been scheduled as the driver, did not start. In the large car race, a Buick, driven by Alexander, was flagged third when completing the sixteenth lap. A Stutz (Westburn) dropped out during the twenty-first lap.

Indiana-Pacific Starts July 1

INDIANAPOLIS, IND., March 3—It is expected that the Indiana tour to the Pacific Coast, which will start from this city on July 1 and which will take 17 days until the tourists reach Los Angeles, will be the great touring event of the coming season.

By leaving Indianapolis on July 1 it makes the Sunday stops fall consecutively in Kansas City, Denver, Salt Lake City and San Francisco. This also gives the tour great prominence on the day of leaving, and on July 4 in running from St. Louis to Jefferson City it will be the greatest event of the day.

The route has not as yet been definitely decided. It will take the tourists from Indianapolis to Kansas City via Springfield, Ill., St. Louis and Jefferson City. From Kansas City to Denver there is a choice of two routes, one by way of Omaha, the other straight across. From Denver there is also choice of two routes to Salt Lake City—the Midland trail by way of Colorado Springs and Grand Junction, and the Overland trail, via Cheyenne and Laramie. From Salt Lake City the tour will go to Frisco, thence down the coast to Los Angeles.

On seventeen nights the tourists will camp and arrangements for sleeping, lighting, eating, guarding and sanitation are being made. The sites will be selected by the pilot, who will go ahead of the tour each day and who is well able to select suitable locations. The average mileage will be from 125 to 150 miles per day.

Three passenger cars or less, forming a team, may be entered by any company for $100. The same applies to trucks. A company entering both the pleasure car and truck division will be charged $150. Indiana accessory makers may enter three cars or less for $100, and, if any car of the make entered is already on the list, only $50 will be the fee.

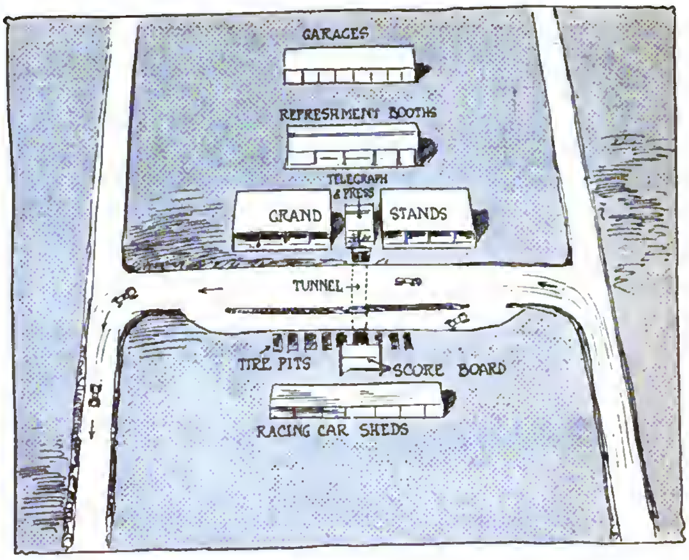
RACINE, WIS., March 5—The automobile department of the J. I. Case Co. is constructing two new racing cars of 450 cubic inches piston displacement, especially for the 500-mile race to be held at Indianapolis, May 30. Two small cars are also in the course of construction as well as a big free-for-all machine of unlimited piston displacement.

Preparing for Grand Prix

Cars Will Race Over a Distance of 57 Miles—Repair Track for Cars Making for the Pits

PARIS, Feb. 22—An unusually attractive scheme has been adopted for the arrangement of the grandstands and the tire pits at the next French Grand Prix race. The two main legs of the course, being almost parallel for nearly a mile at the Amiens end, and only 130 yards apart, will be united by a special cross road with a cement surface and a slight amount of banking. The main roads have a width of 16 feet; the cross road measures 26 feet at each end and 36 feet along the center portion. All the land between the two main roads has been purchased by the Racing Board of the French club; thus it is intended to build a permanent cross road and erect grandstands and offices of an elaborate nature. On the outside of the cross road will be the two main grandstands with the Press stand and telegraph office in a central position between the two. Behind these buildings will be the dining hall and refreshment booth, and further to the rear the private and public garages. On the opposite side of the cross road, and immediately in front of the grandstands, will be the line of tire pits, with the scoreboard behind them and further in the rear a set of boxes in which the cars will be kept under guard after being filled up with the necessary amount of gasoline for the race. In front of the line of pits there will be a special track onto which the cars can pull for repairs, thus leaving the full 36 feet road available for cars going by at speed. The earth dug out of the pits will be carried across the road and dumped on the outside of the cross road, thus forming a safety zone into which any car can run without danger to the public if it should get out of control. It has not been possible to make a very high banking safe for the highest speeds, but it is calculated that cars can take the bends at 50 miles an hour without any danger. The view from the grandstands will be directly onto the pits and the whole of the cross road, and also a clear view 700 yards in length on the two main roads approaching and leaving the grandstands. The grandstands being on the outside of the course can be reached at any time while the race is in progress, and being only 3 miles from Amiens and half a mile from a trolley car terminus, immense crowds can be handled with ease. There will be a tunnel under the cross road opposite the grandstands and a series of foot bridges at various other points will give access to the inside of the circuit while the race is on.

Careful measurement shows that the distance round the course is exactly 19 miles. It is probable that the cars will have to cover thirty rounds, giving a total distance of 570 miles. On the day following the big car race there will be a motorcycle race in the morning and a cycle car and side car race in the afternoon. These machines will use a shortened course with the same cross road, grandstands and tire pits, the distance round being 10.8 miles. The motorcycles will cover twenty rounds, or 217 miles, and the three and four-wheel machines fifteen rounds or 158 miles. The number of entries is limited to seventy for each race; it is expected that the limit will be reached.



Cross-road and grandstand scheme for French Grand Prix

Peugeot and Sunbeam Preparing

PARIS, Feb. 22—Peugeot and Sunbeam having decided to run in the 500-mile race at Indianapolis on Decoration Day, the preparation of the machines is being hurried forward so as to leave nothing to chance. The six-cylinder Sunbeam has been stripped of its Brooklands racing garb and fitted with two seats side by side and a big gasoline tank in the rear. Louis Coatalen, the designer of the car, took the racer to Brooklands this week and had it tried out by Crossmann. Despite unfavorable conditions, the Sunbeam showed a speed of 94 miles an hour. After slight changes it will again be taken to Brooklands track and tried out by Albert Guyot, who is scheduled to drive the car in the American classic. It is the intention of Guyot to leave France with the racing car early in May so as to have sufficient practice on the Indianapolis Speedway before starting in the race.

At the Peugeot racing department the big four-cylinder racers are being modified under the direction of Georges Boillot, the head of the team. At present these cars have a bore and stroke of 110 by 200 millimeters, or 4.3 by 7.8 inches, which gives a cylinder area of slightly more than the 450 cubic inches allowed under the racing rules. It has therefore been decided to cast another set of cylinders with a slightly smaller bore to fit the limit exactly. No other features of the car will be changed. It has been definitely decided that Zuccarelli and Jules Goux shall be in charge of the two Peugeot racers. All three Frenchmen are making their first visit to America.

The driver of a taxicab within the Metropolitan District of London cannot be compelled to drive for more than 6 miles, and if hired by time cannot be made to drive for more than one hour.

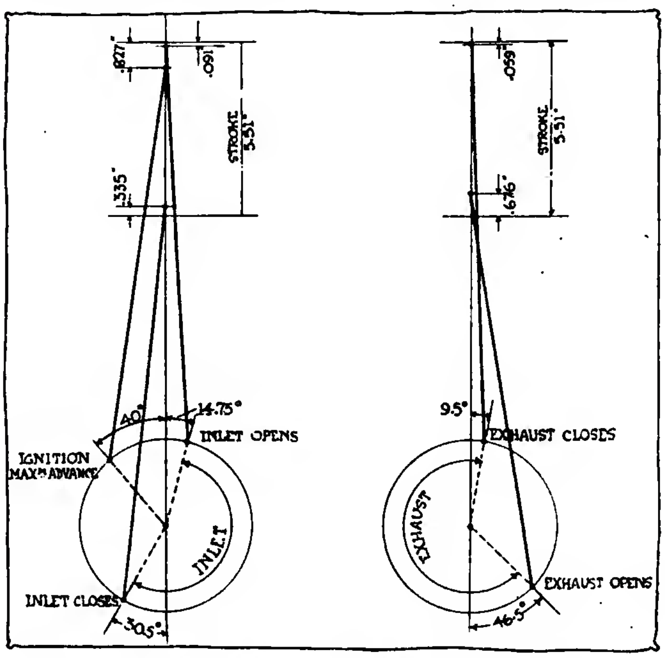


Diagram illustrating operation of inlet and exhaust valves of Talbot

The AUTOMOBILE

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The Emery in Road Races

DOES a well-balanced properly driven high-powered racing automobile destroy road surfaces when driven at speeds of 60 miles an hour or over as is the rule in modern contests?

This question was partly answered by G. Lumet of the Automobile Club of France during the 1912 Grand Prize races over the Dieppe circuit in France, on which occasion an accurate record of the amount of travel done on the circuit during the 2 days of racing was compiled, the speed at which the cars traveled tabulated, and, at the end of the race, a careful examination made of the road conditions on the entire circuit. This examination showed that with a total of 28,267.5 miles traveled by the racing cars, of which mileage over one-half was in excess of 60 miles per hour that the road suffered very little because of the races. Mr. Lemut's report proves conclusively that **on a perfectly smooth road the speed, weight of the car and horsepower have not any destructive effect upon the road surface.**

The report establishes the fact that if a racing car is not well balanced, for example, not sufficient weight over the rear wheels, there will be a destruction of the road surface. Where the surface was broken at points on the Dieppe course where the road is straight and the speed in excess of 75 miles per hour, the breaking up was due to the skidding of the driving wheels caused from insufficient weight for adhesion to the road surface in proportion to the horsepower of the motor. This same fact has been demonstrated time and again in America and those racing drivers that have been most successful in victories have attributed not a little of their success to the careful balancing of their cars so that the car hugs the road irrespective of the speed at which it travels. For racing cars to obtain the best results the weight on the rear wheels must be such that the driving wheels cannot skid at high speed on straight-away stretches. This is necessary not only for the preservation of the roads but also for the preservation of the tires.

Mr. Lumet's report further shows that there are parts of a road-race course in which the road surface is more or less destroyed by the racing cars. One of these places is at the bottom of inclines just where the speed was changed for the up-grade. Variations in speed are shown by these examples to have a destructive effect on the surface, and for road economy not only in racing but in the touring car field there is a necessity for a gradual change of speed when shifting gears.

This report is ample proof of the necessity of car manufacturers giving more attention than ever before to the question of proper balance of the car for road use. There is not an engineer or owner but is familiar with the difference in riding in cars of different makes, some of whch adhere to the road surface better than others. Often it is the faster car that rides the smoother, holds the road surface better, and consequently is more economical on tires and less destructive to the road.

These are days when the question of road-destruction must be given serious consideration. To-day France is agitating an additional tax on motor cars, due to road destruction and at the same time she is cutting down her taxes on unimproved lands. This would appear to be a most unbusiness-like action, but the government feels such is imperative. Much of the road destruction by the automobile is directly due to the methods of French driving, namely, high speeds with poorly balanced cars, and not infrequently cars in which the weight over the rear wheels is not sufficient to prevent skidding, and consequent road and tire destruction.

Agitations are becoming more general in America for increasing the annual tax on the automobile in order to pay for roads. The manufacturer can to a considerable extent avoid this if he will give due consideration to the question of not only proportioning the weight properly over the front and rear wheels, but also if he will do his part to discourage the unnecessary speedy acceleration which has been pushed to the front so much in selling arguments during the last 2 or 3 years.

This report is one more argument for the construction of roads intended for motor traffic, instead of roads built specifically for neither horse or motor use. Roads built for motor cars will endure with rational driving so far as acceleration, speeding and braking are concerned. It is only when extreme carelessness in these matters, coupled with poorly-balanced cars, are combined that disaster follows to the modern road. It is going to be well-nigh impossible to maintain any type of road in good condition with mixed horse and motor traffic. It is the combination of the two that produces the injury.

The Principles of Scientific Management

There Must Be a Complete Mental Revolution on Part of Workman and Employer —All Labor Troubles Due to Division of Surplus

From an address delivered by Frederick W. Taylor, before the Canadian Club, Toronto, Ont.

WHAT is scientific management? It is not any efficiency device for increasing output; it is not a bonus system; it is not a cost system; is not motion study or time study; it is not unloading a lot of blanks at the goods entrance and saying, "There is your system, go ahead and use it." Most people think of it as one of these things. Scientific management cannot and does not exist until there has been a complete mental revolution on the part of the workmen and the employer, and until this great and complete mental revolution has taken place, scientific management does not exist.

Part of the cost of manufacturing is the cost of material. Another part is the cost of production of the article, and a third is the overhead expense. The difference between the sum of these three and the selling price is the surplus. All labor troubles are due to the division of this surplus. The workmen desire as much as they can get in the form of wages, etc., and the owners as much as they can get in the form of dividends. Under scientific management they have ceased combat over the division of this surplus. The result has been a surplus so large that both contenders get more than they ever received before. The workmen get at least 33 per cent. more wages, and the company gets larger profits. This is one result of the mental revolution.

The Four Principles

The delusion is almost universal among workmen that the division of the surplus in the past has been entirely wrong; that the working men are not getting their proper share of the general profits of capital and labor. Although in some cases it is true, their feelings have been rashly augmented by the labor leaders, newspapers and the public. In an article on Division of Capital, in the *Atlantic Monthly* of June last, Norman Faig showed their conviction to be wrong. All that the working man can ask for is that the profits that accrue to capitalists should come to the people of the United States. They themselves could not demand all this profit. If it should be divided in the manner suggested there would be 13 cents per day per man as dividend. It shows conclusively that the hope of the workman does not lie in the division of capital. It lies rather in an increase of output.

The speaker outlines the older type of management where, for example, 500 to 1,000 men in perhaps twenty different trades have acquired their knowledge, not by books, but by observation and by traditional word of mouth. This is just the condition that obtained in the Middle Ages, and still largely obtains. Yet, in spite of lack of progress his trade is the workman's greatest asset. To achieve the best results one realizes that he must get the initiative of his workmen, but one's realization of soldiering forces him to the conclusion that to render this initiative the workman must receive a larger remuneration than his competitors. The employer who has the pluck to do this, and to continue doing it, will find that his men will respond to such good treatment. This is the highest type of management under the old system, yet it cannot compete with scientific management, for under the latter there is no spontaneity on the part of the workman, but continuous effort. This, because of the new and unheard-of burdens which the management assumes.

The first of these principles is the gathering-in of the great mass of traditional knowledge held by the workmen; recording it and reducing it to laws, rules and mathematical formulas. These deductions become of immense assistance in increasing the output. Rule-of-thumb knowledge is replaced by science.

Secondly, it becomes the management's duty to study carefully every man in the plant, his capacities, possibilities and limitations; and to train each to the highest class of work for which he is shown to be fitted—progressive selection and progressive study.

Thirdly, the science and the scientifically trained man are brought together. This is difficult. It can be accomplished only by binding the workman to work by science. This, however, does not cause appreciable trouble. Nine-tenths of the trouble experienced comes from forcing the management and owners to assume *their* burdens.

And, fourthly, a great mass of work formerly done by the workmen is now partly taken over by the management, until the whole is more equally divided. On the management's side there is generally one man for every three workmen.

These principles are deduced from years of study and work under scientific management. The system is no longer something which might be found beneficial if tried—it has been well tried —and pays.

A careful study and series of observations in a plant where 400 to 600 shovellers were employed resulted in a reduction in the cost of handling iron ore from 8 cents per ton to less than 4 cents, after paying the workmen employed 60 per cent. higher wages, establishing a labor office, employing teachers to instruct the men how to scientifically handle a shovel, and timekeepers, etc., to record performances.

Investigation showed that the loads upon shovels under old methods varied from 3.5 to 38 pounds. Placed on a scientific basis, a load of about 21 pounds to the shovel, proper motions, simple and untiring, the work was now being done by 140 men. Furthermore, investigation into their private affairs showed the workmen to be living better lives, in every way, than before.

The Power of Scientific Management

Illustrations were also given in the operation of machinery. The speaker claimed that not one in fifty of the machines in the factories of America are speeded accurately. The majority of them are 200 to 400 per cent. out, and from two and one-half to nine times as much work could be done by them if they were properly adjusted. In the work of the high-class mechanic science is so great a factor that he cannot gain the proper knowledge of himself.

I know of one case in machine manipulation where mathematicians were confronted with a problem involving twelve unknowns, and struggled with it for 18 years. Now the problem is solved in 20 seconds on a slide rule taking care of the twelve variables.

"If you are willing to pay the price in time and hard work, things that have through the ages been termed impossibilities can eventually be solved and put to use for the good of man."

Waltham-Keene Decision

Judge Ray Draws Line Between Contract and Dealer's Sale License

By George Cooper Dean

THE decision of Judge Ray, sitting in the United States District Court for the Southern District of New York, in the case of the Waltham Watch Co. vs. Charles A. Keene has created something of a sensation among prominent members of the patent bar, apparently more by reason of what the judge says than by reason of what was decided in the case.

Most of the facts were stipulated by the parties and are set forth in the opinion. The Waltham Watch Co. sold watch movements conditionally with a right to recover the goods in case of a breach of conditions, the principal condition involving the fixing of the retail sale price to users. Keene bought movements from outside jobbers or dealers and resold at cut prices. The Waltham Watch Co. instead of seeking to recover the goods, as provided for by the contract, sued Keene for infringement of some patents covering only the frame and spring barrel of their watch movements.

The conditional sale contract of the Waltham Watch Co. was in the form of a notice inserted in the package in which each movement was packed. The form is as follows:

WALTHAM CONTRACT NOTICE.

16 size Waltham movement No. ——, bearing the trademark RIVERSIDE. 19 jewels, essential parts of which are protected by United States Letters Patent, is sold subject to the following conditions, which every buyer thereof by accepting this movement agrees with the undersigned company to keep and perform, viz.: (1) Jobbers may sell this movement to established retail watch dealers, except those designated by this company, and to no other persons, and only at the price and discount authorized by this company. (The term "retail watch dealers" shall include all watch dealers other than those recognized as jobbers by this company); (2) Jobbers must in every instance deliver this contract notice with the movement; (3) Retail dealers may dispose of this movement by sale only, and only to buyers for use and not for resale and must not advertise nor sell this movement for less than $25.00. A breach of any of these conditions shall revest in the company the title to this movement and upon tendering the price paid therefor to the holder thereof the company may retake possession of the same.

These conditions will be enforced by the company.

WALTHAM WATCH COMPANY,
Waltham, Mass.

The invoice had annexed or printed to it the following:

CONDITIONS OF SALE.

(Bill to Jobbers)

Each Waltham movement and Waltham watch in this bill is sold subject to the following conditions and to those in the Waltham contract notice issued with the movement or watch, which conditions every buyer thereof by accepting said movement or watch agrees with the undersigned company to keep and perform, viz.: (1) Jobbers may sell said movements or watches to established retail watch dealers, except those designated by said company, and to no other persons, and only at prices and discounts authorized by said company; (2) Must bill said movements or watches only on billheads approved by said company and bearing the condition of sale; (3) Must not bill said movements or watches with any other goods; (4) Must not exchange said movements or watches for any other goods whatsoever; (5) The Waltham contract notice must be delivered with the movement or watch in every instance.

These conditions govern the sale of the following movements: VANGUARD, 18 size and 16 size; CRESCENT ST., 18 size and 16 size; No. 845; APPLETON, TRACY & CO. PREMIER; RIVERSIDE MAXIMUS, 16 size, 12 size and 0 size; RIVERSIDE, 16 size, 12 size and 0 size; No. 645; ROYAL, 16 size and 12 size; all Colonial Series watches.

(6) A breach of any of said conditions shall revest in the company the title to all movements of the grades named and all Colonial Series watches in the possession of the violator and of any one who shall have induced or knowingly participated in such breach; and upon tendering the price paid by the holder of such movements or watches the company may retake possession of the same.

(7) Jobbers must immediately send to the company's selling agents a duplicate of every bill of the above named movements and watches which they issue.

The undersigned will enforce these conditions.

WALTHAM WATCH COMPANY,
Waltham, Mass.

This conditional sale contract with right to retake goods is noticeably different from the conditional patent licenses commonly used for controlling conditions of resale by the Victor talking machine, Edison phonograph and Klaxon companies.

Judge Ray held that the case was analogous to the "Bath Tub" case recently decided by the Supreme Court rather than like the Dick vs. Henry (Mimeograph case) recently decided by the same court. These cases, decided in October and November 1912, were urged before Judges Lacombe, Cox and Ward on an appeal in this circuit decided as recently as January 13, 1913. As I pointed out when acting as attorney for the complainants, this latter case was a straight infringement suit under the Lovell-McConnell Manufacturing Co.'s Klaxon patent licenses, which provide that breach of a condition is infringement of the patents. The defendant, International Automobile League of Buffalo, had bought Klaxons under conditional licenses and sold them to members of the league at cut price, and being enjoined by the court from infringement of the patents by cutting prices, they advertised that being compelled to sell at full price they would hereafter give their profits to a charity to be named by the purchaser. Judge Lacombe, for the Court of Appeals, held that even this evasion of the Klaxon patent license was an evasion of the injunction against infringement, and ordered that the injunction be enlarged so as to specifically prohibit the league's charity scheme. Now, barely a month afterwards, Judge Ray seems to say that all attempts to fix resale prices under whatever guise are illegal under the Sherman act. This apparent conflict between Judge Ray's opinion and the Court of Appeals' decision in this circuit presents considerable difficulties to lawyers attempting to reconcile the two.

Another feature of the decision is that while Judge Ray devotes some twenty-two pages to discussion of this branch of the law, he gives only a paragraph, without mentioning even by name, various important cases, such as Circuit Court of Appeals decisions in Victor Talking Machine Co. vs. Fair, 123 Fed. 424; National Phonograph Co. vs. Schlegel, 128 Fed. 733; The Fair vs. Dover Manufacturing Co., 166 Fed. 117; also District Court decisions in Edison Phonograph Co. vs. Kaufman, 105 Fed. 960; Edison Phonograph Co. vs. Pike, 116 Fed. 863, and others.

When asked my opinion, I responded that relying on the decision of the Court of Appeals and his memory of the discussion of the hearing before Judges Lacombe, Cox and Noyes on his appeal in the International Automobile League suit, he would feel no diffidence whatever about bringing a patent infringement suit and a motion for preliminary injunction against any dealer violating Klaxon patent licenses in this jurisdiction.

The decision in this Waltham watch case, of course, does not apply outside of the Southern District of New York, and does not control other jurisdictions in which the Circuit Courts of Appeal have most emphatically sustained price fixing by patent license conditions.

Klaxon Suits Progress Slowly

In the suit against Manhattan Electrical Supply Co. there is a preliminary injunction now in force which, it is understood, is satisfactory to both parties, so that up to the present time this suit has not been pushed.

The three suits against the American Ever Ready Co. have not been pushed because the Ever Ready horn has already been enjoined by preliminary injunction of the District Court affirmed by the Court of Appeals.

The seven suits against New York dealers, New York Auto Supply Co., Zeisler, Crane & Wagner Auto Supply Co., Thirty-Five Per Cent. Auto Supply Co., National Auto Supply Co., American Auto Supply Co. and Charles E. Miller, are against sellers of the Newtone horn, and the Lovell-McConnell Manufacturing Co. having no desire to unnecessarily burden dealers are permitting these suits to await decision of the Brooklyn suit against the Automobile Supply Manufacturing Co., in which final hearing is expected in the latter part of March.

The three suits against automobile companies, Garland, Jackson and Haynes, who have offered the Sparton horn of the Sparks-Withington Co., have not yet reached the taking of testimony even under the new rules, the defendants' answers not being due until some time in March.

New Law for Texas

Favorable Report Made on Bill Providing for the Registration of Cars

Fees Based on Horsepower

AUSTIN, TEX., March 1—The judiciary committee of the Senate has reported favorably on a bill for the registration of motor vehicles and regulating their use. According to the bill, license numbers will be issued by the secretary of state without cost, the registration fee being graduated as follows: 20 horsepower and under, $8; over 20 horsepower at the rate of 40 cents per horsepower. If a motor vehicle shall have been licensed for 5 separate years the annual registration fee thereafter shall be one-half of this amount. Motor bicycles will be registered at $3 each. The bill provides for number plates of a different color in successive years. Persons, firms, associations or companies manufacturing or dealing in motor vehicles may instead of registering each vehicle manufactured or handled by them make a verified application for a distinctive number for use on all the vehicles owned or controlled by them. The new bill contains the usual provision for brakes and lights. The front lights shall be visible 500 feet in advance and the rear lamps must illumine the number plate making it visible 50 feet. The law as framed calls for careful and prudent driving at a rate of speed not to endanger the property of another or the life of any person, and fixes the legal limit in the country at 25 miles an hour. It permits the exclusion of commercial vehicles from parks, and also invests local authorities with the right to regulate the speed within their domains, which speeds shall not be less than 10 miles an hour in any case. Chauffeurs must take out licenses.

Illinois Towns May Have More Power

SPRINGFIELD, ILL., March 5—If House Bill No. 77, which is now before a committee of the Legislature, becomes a law, every city, village or incorporate town in the state will be given the power to regulate the size of tires used on commercial vehicles and also the annual license fee. In a word, the bill gives permission "To direct, license and control all wagons and other vehicles conveying loads within the city or village, or any particular class of such wagons and other vehicles, and prescribe the width of the tire of same, the license fee, which when collected is to be kept as a separate fund and used only for the cost and expense of street or alley improvement or repair. Provision is made for a fine not in excess of $200 and imprisonment not in excess of 6 months for one offense."

Idaho Legislature Busy

BOISE, IDAHO, March 3—The solons of Idaho are just now wrestling with two bills providing for the regulation of the use of motor vehicles. The first bill, known as the Booth bill, was introduced early in the month of February. It was held up in committee when a second, known as the Koelsch bill, was announced.

The bill introduced by Booth provides for a registration fee of $1. This looks simple and easy, but there is a proviso, to wit: That when any bonds are issued and sold by the county commissioners for the purpose of building roads in the county, then the license fee shall be $1 for each horsepower of any motor vehicle. The money collected in this way is to go into a "bond interest fund" to be used to pay the interest on the road bonds. The other details of the bill are patterned after the uniform law.

The Koelsch bill is more comprehensive and covers three distinct features. It provides for a state highway commission of three members; use of convict labor on the highways, and the registration of motor vehicles. In this bill the user of a motor vehicle is taxed a graduated scale. Under 30 horsepower, $15; 31 to 40 horsepower, inclusive, $20; 41 to 50 horsepower, inclusive, $25; over 50 horsepower, $40. Dealers are taxed $35 and $1 for each additional plate issued. The money is to go into the road fund and the car owner is exempt from any personal property tax on his car. The state highway commissioners are given power to expend this money on the roads anywhere in the state. It is estimated that at the present time this bill would afford a fund of about $75,000. There are about 4,000 motor vehicles in Idaho at this time.

Pennsylvania to Tax Trucks Heavily

HARRISBURG, PA., March 3—A bill to take the place of the present automobile laws of Pennsylvania was introduced into the Senate at the session of the legislature last week. The bill has the support of the Motor Federation of Pennsylvania. It changes or affects the present law as follows:

Dealer's registration fee is raised from $5 to $10. Fee for solid tire vehicles (motor trucks) regulated by combined weight of vehicle and load as follows: Less than 4,000 pounds, $10; from 4,000 to 5,00 pounds, $15; from 5,000 to 10,000 pounds, $20; from 10,000 to 15,000 pounds, $25; from 15,000 to 20,000 pounds, $30.

No vehicles, including load, shall exceed 86 inches in width nor shall weight with load be more than 10 tons.

Ohio Drivers Always Liable

COLUMBUS, O., March 3—Automobile owners and drivers in Ohio are up in arms over a bill pending in the Ohio General Assembly which seeks to do away with the contributory negligence feature of the personal liability law of the state. The bill provides that any one injured in any way can collect damage for such injury, even if he is negligent. While the law does not apply to the driving of automobiles any more than any other line of endeavor, still, it is looked upon with some considerable askance by automobile drivers, An effort will be made to defeat the proposed law.

Minnesota to Get New Law

MINNEAPOLIS, MINN., March 3—Modifications of the present Minnesota automobile and road law, passed 2 years ago, have been approved by the Minnesota State Automobile Association, and a bill has been introduced in the legislature to make the changes. The bill was discussed at the annual meeting of the directors of the association during show week. In effect the changes are as follows:

Creation of a state automobile commission of three members appointed by the governor to take charge of the licensing of motor vehicles and the examination of chauffeurs, now vested in the secretary of state and the state board of examination; diversion of all receipts from licenses and fines for violation of the law into state road and bridge fund; registration fee of $3 for 3 years for automobiles, instead of $1.50; $10 registration for manufacturers and dealers and $1 for each additional car, except where in private use or for hire; misdemeanor for owner selling car to fail to report sale to the commission; charge of $1 for remainder of year when person selling a car applies to retain the number for another car; trial judge may recommend revocation or suspension of license of driver on conviction for violation of law; licensed physician arrested for speed in answering emergency call must be allowed to proceed on giving car number and showing driver's license; creating salary of $1,800 a year for secretary and allowing $5 a day and traveling expenses for examiners of chauffeurs, who may be appointed in localities to represent the commission, making it a misdemeanor for anyone to drive a car while intoxicated; making it unlawful to leave car standing with engine running and to cut out the muffler. The clause exempting non-residents and the paragraph prohibiting local speed ordinances are allowed to stand. The clause requiring all occupants of a car in an accident to return and give names and addresses changed to exempt other occupants than the driver and owner.

Steering Gear Design Is Conservative

Trend Favors the Worm-and-Gear Types, Although Screw-and-Nut Constructions Are Numerous

STEERING gears, like other stable automobile parts, this year continue practically the same in design and general construction as heretofore, although here and there refinements of details such as the placing of grease cups in more accessible locations and the further facilitating of adjustment features have received attention.

The worm and full gear types are in the lead in point of numbers, the easy adjustment which the full wheel makes possible being the principle advantage claimed for this type. In accord with the general aim to make all parts of the modern automobile as silent in operation as possible, steering gear makers have brought out types in which the spark and throttle levers are held in position on the quadrant by friction instead of ratchet devices. Though a small noise factor in itself, nevertheless the slight click which the ratchet makes is deemed objectionable, and the manufacturers are therefore prepared to eliminate it, in most cases supplying optionally either friction or ratchet controlled levers.

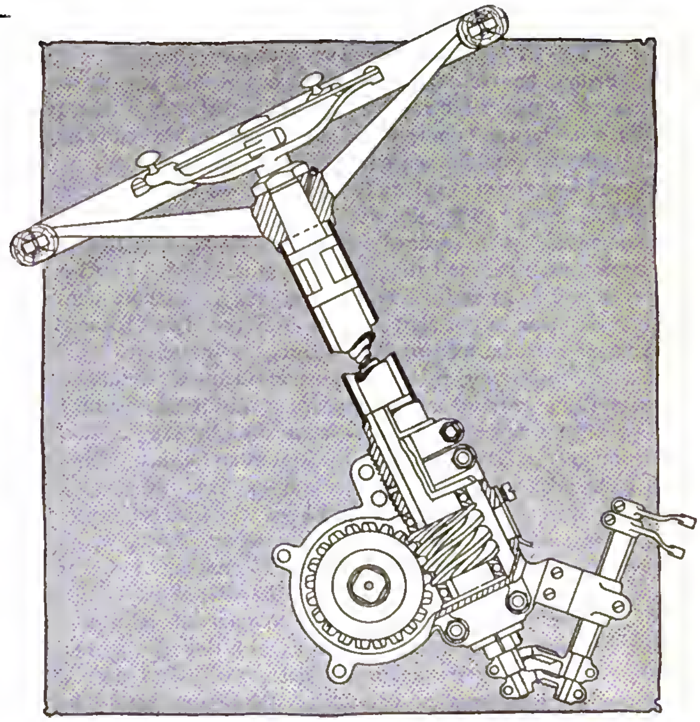


Fig. 1—Gemmer model K of the worm-and-gear type

Gemmer

The Gemmer Manufacturing Company, Detroit, produces at present four models of pleasure car steering gears and three types for commercials. The model K is seen in Fig. 1. This is a typical Gemmer type and illustrates the full worm and gear construction embodied in all of the steering mechanisms of this make. The worm is carried on annular ball thrust bearings, one above it and one below. The worm wheel is mounted on a squared shaft, permitting of the shifting of the wheel a quarter turn, thus bringing a new set of teeth into play when another set has become worn. To facilitate the lubrication of the wearing parts, grease cups and grease openings have been made very accessible. Above the worm, for instance, an opening has been provided in the housing and fitted with a spring cover, making it very easy to lubricate the gearing. To prevent rattle a spring bushing has been placed around the shaft just below the point where the spider joins the tube. This serves to steady the shaft within its housing. For light cars a new model in the Gemmer line is the type S which also has the worm and full wheel construction.

The housings of all the Gemmer types are of malleable iron with a minimum wall thickness of .1875 inch, while shafts are one-piece steel forgings. Ball arms are also forged and from high carbon steel. Jacket tubes are made of seamless brass tubing ranging from 1.5 to 2 inches in diameter and finished in brass, nickel or black enamel. The main column tubes are seamless steel of various dimensions to meet the requirements of the different sized gears. The control tubes are also of seamless steel, bronze bushed at the ends to prevent rattle and provided with a series of grooves, properly placed and reamed to avoid whipping due to vibration. The Gemmer concern furnishes four forms of controls, viz., spring lever, ratchet and two styles of friction controls, all of which are standard and interchangeable. A dozen types of spiders are also included in the line.

Warner-Toledo

Steering gears produced by the Warner Manufacturing Company, Toledo, are in six types for various sizes of cars, the heavier ones being adaptable to trucks up to 2 tons. The Warner design embodies the worm and full gear construction, the latter being mounted below the worm in the usual way. Type 5-A for cars of about 40 horsepower is shown in Fig. 3. It is for right-hand steer and the slope of the column is adjustable to any desired angle. Ball thrust bearings are fitted above and below the worm. Both worm wheel and worm are constructed of forged steel, hardened and ground and the mounting of the former makes it possible to change the meshing teeth for adjustment purposes. The Warner gear is, in fact, thoroughly adjustable in every way. The ball arm is conventional and is mounted on the end of the worm wheel shaft which is squared to receive it. A bolt tightens the split end of the arm around the shaft. The arm is furnished in 6, 7.5 or 9-inch length to meet the requirements. Spark and throttle rod gears are furnished either as bevels or spurs and arranged for accelerator. The column diameters range from 1.38 inch to 2 inches in diameter, while the steering wheels which are corrugated around the inner edge come either 16 or 18 inches in diameter. The spark and throttle levers may be had either with ratchet or friction control. The finish of the column and spider is also optional in that it may be either nickel, brass or black enamel. Grease cups are accessibly located.

In the Warner construction the worm gear is integral with its shaft which is eccentrically mounted in a sleeve so that wear may be easily taken up. The housing for the gearing is of malleable iron and at its top there is an adjusting nut which takes up any lost motion.

Muncie

Also of the worm and full gear type are the steering gears marketed by the Muncie Gear Works, Muncie, Ind., one style of which—model S-34 for right-hand steering—is depicted in Fig.

2. The concern makes six styles of its steering mechanisms, three for left and three for right drive and all constructed along the same lines, the features in general not differing materially from the dictates of present practice. The worm has a triple thread while the gear is provided with 20 teeth, .5-inch pitch. A ball thrust bearing is mounted above the worm and another below it. The worm wheel shaft is integral with the wheel and carries the ball arm at its squared end. The gear housing is of malleable iron and at its top there is an adjusting nut which provides for the taking up of end play.

Grease cups are accessibly located on the upper side of the housing and at the top. The spark and throttle rod gears located below the housing are beveled, while friction control of the levers on the quadrant is favored. The Muncie types include styles for use with cars having fixed spark, model S23A being provided with throttle lever only. The spark lever may be supplied with this type, however, at a slight extra cost. Steering wheels are of plain mahogany and range from 16 inches to 18 inches in diameter.

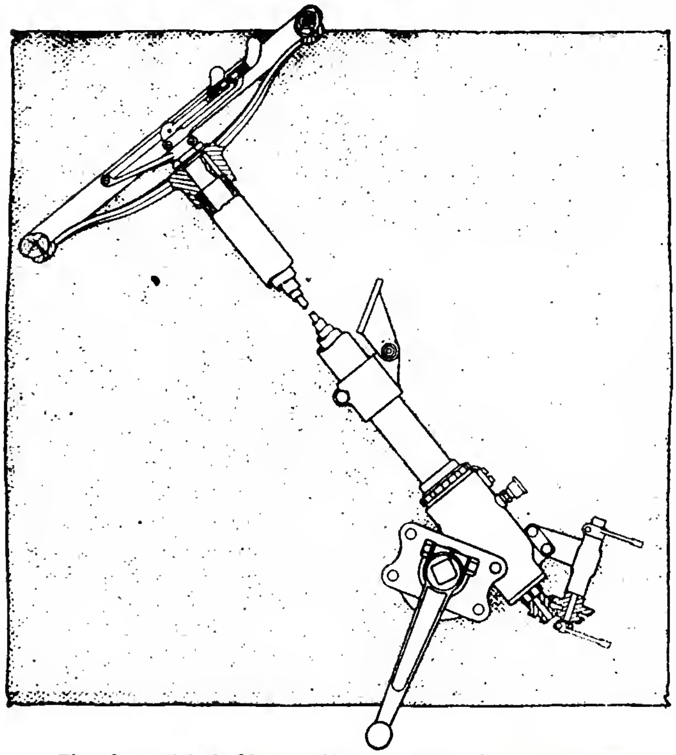


Fig. 2—Model S 34 Muncie gear for right-hand drive

Warner-Muncie

The Warner Gear Company, Muncie, Ind., makes a very complete line of steering gears for pleasure cars, taxicabs and commercial vehicles. These are all of the worm and full gear type with adjustable angle column. One type is shown in Fig. 4, which is typical of the styles made for pleasure cars. A sectional view showing the details of the worm and gear construction and mounting is also given. A ball thrust bearing is mounted above and below the worm, while take up for end play is provided in the usual way, by means of a nut at the top of the housing. Grease cups on housing take care of the lubrication of the contact parts. The type shown in the figure is model 12E and is designed for cars of from 35 to 45 horsepower. The shaft carrying the worm wheel is integral with the latter in this type, but the Warner concern also makes types in which wheel and shaft are separate. In this case the gear fits to a squared shaft end.

Several types of hand wheels are furnished with the Warner gears. The rim of the spider may be made continuous with the spokes and rabbitted into the wood, the top and bottom laminations being glued together thus concealing the metal. Or the ends of the spokes may be fitted into grooves in the wood rim or screwed to it. These gears may also be had with throttle lever only for fixed spark cars. All types are furnished in either black enamel, nickel or brass finish as desired. The commercial car styles retain the design characteristics of the pleasure car types, but they are, of course, made heavier for the heavier duty service.

Ross

The Ross Gear and Tool Company, Lafayette, Ind., manufactures steering gears for commercial cars only. These are made in five styles for vehicles ranging from 5 tons to 500 pounds capacity. The type shown in Fig. 5 is the heaviest of the line and is model BF for 3 to 5-ton propositions. All of the Ross steering gears have the same features of construction. The steering wheel hub is tapered and keyed to the steering

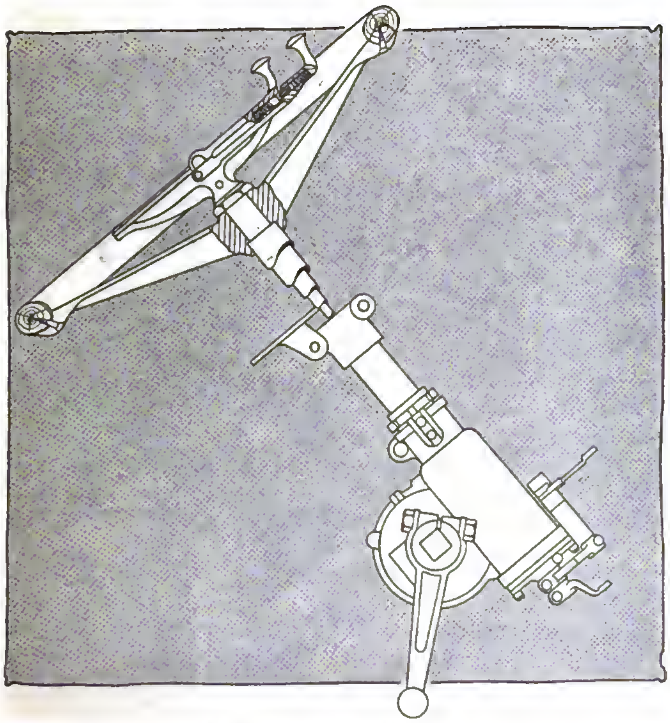


Fig. 3—Warner Mfg. Co.'s style 5-A for 40-hp cars

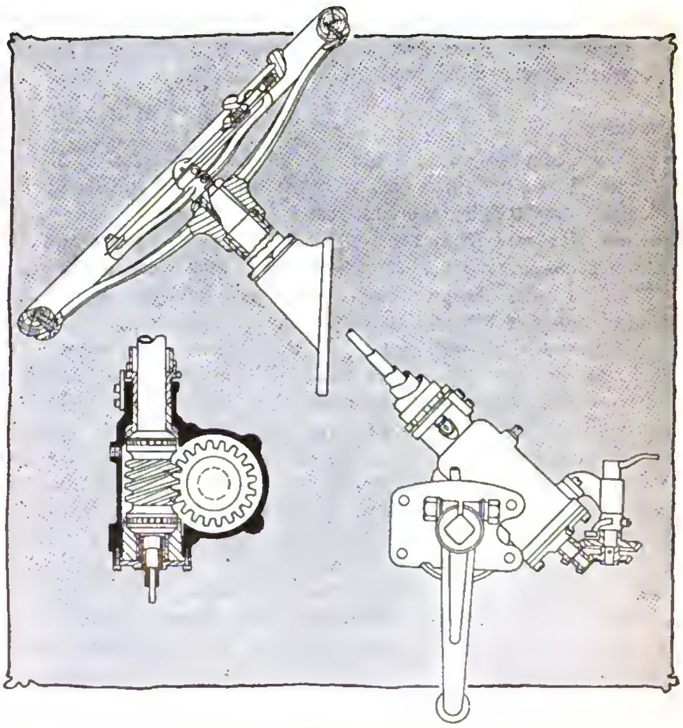


Fig. 4—General construction of a Warner Gear Co. type

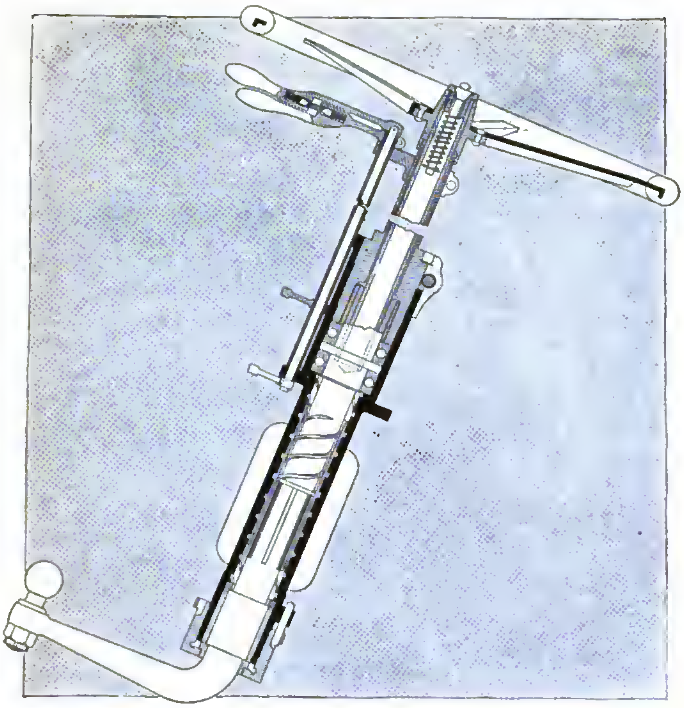


Fig. 5—Ross type BF steering gear for heavy trucks

tube, the lower end of which is integral with a steel screw. This screw operates a sleeve of phosphor bronze which surrounds it and which is threaded to receive the screw. The outer surface of this sleeve is provided with spirals, the pitch of which is very long as compared with that of the screw threads. A malleable housing surrounds the sleeve, in turn, and its inner surface is spirally grooved to receive the spiral projections of the sleeve. Thus when the steering wheel is turned, it turns the screw and gives up and down motion to the sleeve, and in order to so move, it must turn, due to the spirals on its exterior mating with the spiral grooves in the housing. This rotary motion is transferred to the ball arm which extends half way up into the housing. The upper end of this arm is splined, the splines fitting into slots in the inner surface of the sleeve, thus allowing the sleeve to move up and down and at the same time turn the extended end of the ball arm. A feature of the Ross gears is the oiling plug on the nut holding the wheel down on the taper.

Lavigne

These steering gears, made by the Lavigne Gear Company, Racine, Wis., are in styles to meet the requirements of the pleasure car and commercial vehicle. They are in four sizes, suitable for cars from 1,800 to 4,500 pounds in weight and for commercials of from 1,000 pounds to 6 tons capacity.

The Lavigne design comprises a push-and-pull mechanism having a double leverage arrangement for operating the steering connections. The ball arm is moved backward or forward by the operation of two slides which are guided by the housing. These slides are threaded right and left on their inner surface, the spiral thread grooves meshing with the threads of a worm which is integral with the steering rod to which the steering wheel is attached. The lower end of each sliding block is slotted to receive a trunnion block which carries a trunnion. These trunnions are parts of a rocker arm, one being on each end of the rocker arm. The latter attaches to the shaft which carries the ball arm connecting to the steering rods. When the sliding blocks are moved up or down by the screw action of the worm which, in turn, is being operated by the steering wheel, the rocker arm is turned due to its trunnion connections with the sliding blocks. This rocker turns the shaft and the ball arm. The construction eliminates the use of ball thrust bearings, since the thrust is taken by the trunnions. The wear of the sliding blocks or head against the housing is taken up automatically by two shoes which are pressed out against the sliding contact surface by springs.

Jacox

This is the trade name of the steering mechanisms made by the Jackson, Church, Wilcox Company, Saginaw, Mich., which products are designed for both pleasure cars and trucks. The principle involved is that of a double threaded screw and two half-nuts. The screw is attached to the steering rod which runs up through the column and is turned by the steering wheel. The half-nuts surround the screw and slide up and down within the gear housing when the screw is operated. The lower ends of these half-nuts bear on rollers at each end of a rocker or yoke which is mounted on the horizontal shaft. This shaft carries the ball arm. In operation the screw serves to back one half-nut off while the other is screwed in the opposite direction, due to the double thread. This motion of the nuts twists the yoke and its shaft and also the ball arm.

The Jacox screw is made of a solid bar of high carbon steel, casehardened to make the proper bearing surface between it and the two half-nuts which are bronze castings. To the lower end of each of these half-nuts is pinned a hardened steel thrust block across which the yoke rollers travel.

Boyer

The Boyer steering gear, designed and invented during 1910 by Joseph Boyer, president of the Burroughs Adding Machine Company is now being placed upon the market by the Boyer-Miller Company, Detroit, which has been organized for the purpose. In the Boyer gear, shown as a whole and in section in Fig. 6, an integral steel double screw is used which has full contact with two separate bronze nuts. The steering action is taken from the center of these nuts by a trunnion collar and is transferred to the steering reach rod by the ball arm suspended on roller bearings at its rocker shaft and ball bearings between steering arm yoke and trunnion fins. The end thrust is taken by two ball thrust bearings located at the end of the steering rod below the screw. The bronze nuts, which travel up and down in opposite directions in order to move the ball arm in either direction, are solid, yet they are entirely adjustable by loosening the trunnion collar bolt and turning one nut. This steering gear is being made in several sizes to meet all requirements of frame construction, weight, size and kind of steering wheel.

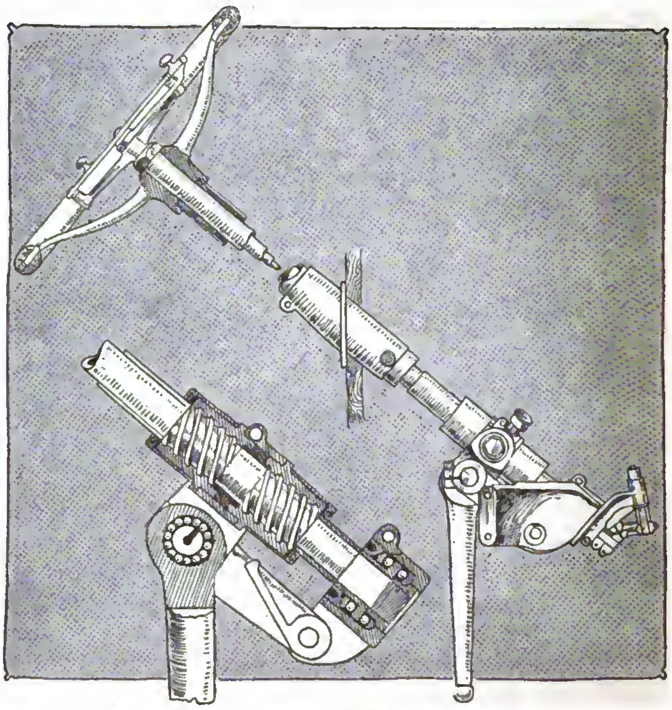


Fig. 6—New Boyer gear of the screw-and-nut design

Side view of the Maxim tricar equipped with light delivery body

A Three-Wheeled Vehicle

Maxim Tricar Adapted for Both Business and Pleasure—Two-Cylinder Motor

THERE has been more or less activity among automobile engineers during the past few years in the way of three-wheeled vehicles designed for both pleasure and commercial use. The tricar has always been an alluring proposition and the makers of these vehicles point out that the foremost of the world's designers and builders of motor cars have begun with a three-wheeled vehicle, and only cast aside three-wheel construction because of its limitations in the matter of speed.

An acquisition to the three-wheeled fold is the Maxim Tricar built by the Maxim Tricar Manufacturing Corporation, of New York City. This vehicle, which is designed for both business and pleasure is the joint construction of Maxim Karminski, an automobile engineer who has had much experience on the continent, in France, Germany, Italy as well as in England, and Charles Peters. The type of car is well known in Europe, but not as much so in America.

The Maxim machine is equipped with a unit power plant, so that the substitution of a new equipment is the work of but a moment.

The motor is of the double-cylinder vertical type, and develops about 8 horsepower. The unit type power plant is suspended above the front wheel and the drive is through a single roller chain to a larger sprocket secured on the front wheel. The construction is a simple affair, practically the entire machine being built over the front wheel. That is to say, the motor and transmission are thus placed.

It has been the practice of some followers of the three-wheeled design to place their single driving wheel in the rear, but the Maxim makers place theirs in front, a reversal of the common practice.

The motor cylinders are cast singly, side by side, and are secured to an aluiminum crankcase which is cast in two vertical sections having integral with its side-plates which form the bed or support. The motor is secured to a bedplate above, and cast as a solid piece with the mudguard. This acts as the support for the motor, steering device and the shock-absorber at the same time. The cylinders have integral ribs. Automatic inlet valves of large diameter are used, though the exhaust valves are mechanically operated. The bore of the cylinders is 3.25 inches and the stroke is 4.5 inches. The pistons, like the cylinders, are cast of gray iron and have three compression rings placed above the wristpin, while there is a fourth holding the pin. The crankshaft, which is 1.5 inches in diameter, is a built-up member. The transmission is a simple two-speed planetary affair, controlled from the operator's seat, and as but a slight movement of the wrist is necessary to engage either speed, to stop the car is a very easy matter. This transmission is carried on the left side of the motor case, being controlled from the steering rod or guide from which is a horizontal steel tube 1.5 inches in diameter. The operator holds a grip which describes a horizontal plane. The drive of this transmission to the front wheel is through a roller chain.

To eliminate road shocks, this chain is fitted with a small sprocket idler and this is provided with a spring attachment easily adjusted so that, as the car jounces over a rough piece of road, the tendency of the chain to jounce or wobble out of position is overcome.

The axle of the front wheel is fitted onto these springs, and the worst kind of road cobblestone, etc., does not affect the smooth running of the car.

One of the most commendable features of this machine is that it is interchangeable. The motor, transmission and driving clement being mounted over the front wheel, the entire propelling assembly is a unit. The withdrawal of the locking bolt connecting this unit with the chassis, is all that is required to take out the damaged unit, and replace same with another one. The frame of this Maxim is made of heavy gauge tubular steel 1.5 inches in diameter, and the construction is of the so-called bridge type. It is, however, the intention of the builders to turn out these cars with a channel steel frame same as used by other automobile manufacturers.

The springs used are semi-elliptic in form, being built of five leaves 1.5 inches wide, and 32 and 29 inches long respectively. These springs are provided with a shackle, which allows plenty of play without disalignment. The wheels are wood, artillery type clincher rims being used, the tires being 28 by 2.5 inches in size. Ball bearings are used in the front and rear members. The hubs are made of steel and the spokes are of hickory.

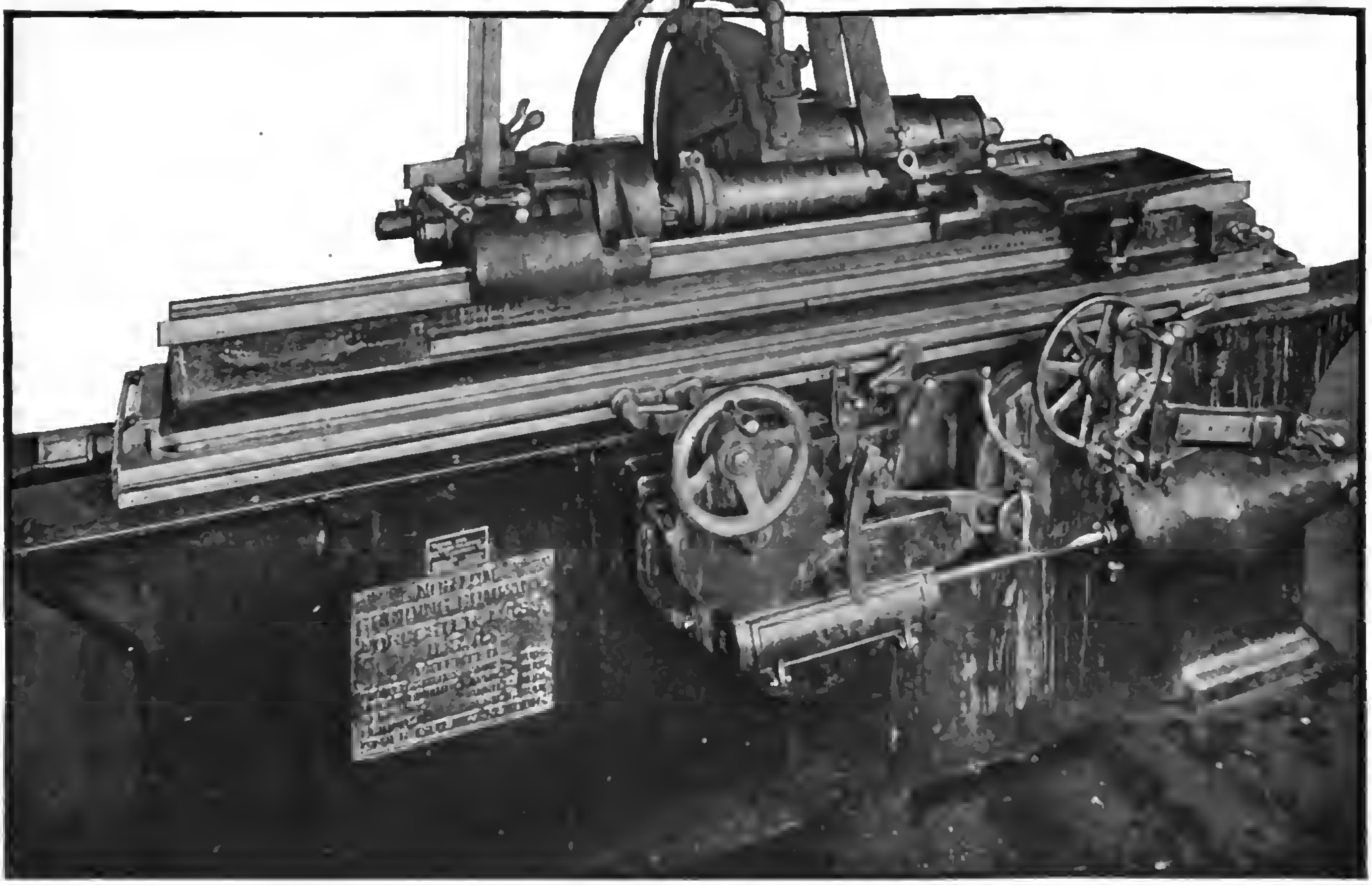
There are two brakes on the rear wheel drums, the drums being steel 10 inches in diameter, with a 2-inch face. These brakes are of the internal expanding type similar to those used on other cars, and are actuated through a single pedal on the right hand side of the floor board, besides a lever used for emergency cases.

Ignition is by the Bosch high-tension system, the magneto being secured to the motor base and driven from the crankshaft.

There are two types of bodies used for delivery purposes, one of the box type with space area of 23 cubic feet and the other is on the Ford commercial body type, covering the driver's seat. The capacity is about 600 pounds.

Power plant of the Maxim machine, showing motor mounting

Factory Miscellany



One of the twenty grinding machines used in the factory of the F. B. Stearns Co., Cleveland, O., on the outside surface of the Knight sleeves

IN the Knight sliding sleeve motor the sleeves must be accurately ground. In the manufacture of this motor there is a great area to be ground and for that reason the grinding machines used in the factories which make these motors are of special interest. The above illustration shows one of the machines used for this purpose in the Stearns company which specializes in Knight cars. Twenty machines of this type are used in the Knight factory and it takes three operations for each sleeve. It requires but one operator to take care of the machine. The operation is similar to other grinding jobs in most respects. The emery wheel turns toward the work while the latter turns in the opposite direction away from the wheel. Above the wheel a pipe keeps a constant supply of cool water flowing on the metal keeping the surface clean and cool.

POWER Plant Efficiency—One of the aims of automobile designers has been to increase the efficiency of the power plant, that is, to secure a maximum of power on a minimum fuel consumption and with a minimum of wear. The marked advance in the price of gasoline in the last year has made this efficiency a more important factor than ever. One of the steps is the use of the long-stroke motors.

Chatham Planning Factory—The Chatham Auto-Wheel Company, Chatham, Ont., is planning the erection of an auto-wheel plant, the estimated cost of which is $40,000.

Wilcox-McKim Builds—The Wilcox-McKim Company, Saginaw, Mich., has been organized to manufacture automobile accessories. Plans for a factory have been completed.

Hudson's Second Addition—The Hudson Motor Car Company, Detroit, Mich., will start work at once on a second addition to its plant, which will result in the doubling of its facilities.

Working Day and Night—The Warner Manufacturing Company, maker of automobile parts, is employing 750 men and the factory is working day and night in an endeavor to keep abreast of orders.

Rubber Company in Maissonneuve—The Plymouth Rubber Company hopes to locate a factory in Maissonneuve, Ont. It has written to the council asking for the best terms, and it looks as if the negotiations would end successfully.

Hendrie Tire's New Factory—The W. C. Hendrie Rubber Company, Denver, Col., has just purchased 6 acres of land in Torrence, Cal., and has closed contracts for a $100,000 automobile tire factory, to be erected on the site this year.

Establishes Rolling Mill—The Standard Aluminum Company, Two Rivers, Wis., is planning to establish a large rolling mill in connection with its present foundries and stamping works. A large combination stamping and drawing press has recently been installed.

National Gauge Builds Plant—To accommodate the rapid expansion of business of the National Gauge and Register Company, La Cross, Wis., a new factory is to be erected. Eighty-five men are employed. The new plant will have 20,000 square feet of floor space.

Alliance Purchases Land—The Alliance Motor Car Company, Alliance, O., has purchased land in that city upon which it will erect a two-story brick block factory, 52 feet by 160 feet. This plant will cost between $16,000 and $20,000 and will be begun prior to April 1 and completed within 60 days thereafter.

Mather Spring Increases Capacity—The Mather Spring Company, Toledo, O., will double its plant capacity.

Plant in Cuyahoga Falls—A concern is being organized at Cuyahoga Falls, O., to erect a factory for the manufacture of automobile lamp reflectors. W. A. Wyatt is one of the promotors of the concern.

Beloit Works Enlarged—The Stewart-Warner Speedometer Corporation, of Chicago, Ill., is planning to enlarge its works in Beloit, Wis., in the addition of a couple of wings, to be added in the early part of spring.

Plant Turned Over to Trustees—R. H. Cook, doing business as the Cook Body Company, Flint, Mich., has turned the affairs of the company over to C. O. Hetchler, as trustee. Mr. Hetchler will effect a settlement with the creditors.

Go By Name of Fuller—On account of the recent change in name of the Michigan Automobile Co., Ltd., to Fuller & Sons Mfg. Co., it has been decided by the company to hereafter call all the products of the new company by the name of Fuller.

Truck Plant for Salt Lake—If plans are carried out there is every promise that Salt Lake City, Utah, will have in the near future an automobile truck factory that will mean an investment of $1,000,000 or more. It is said that the plant would eventually employ 3,000 workmen.

Starter Company Formed—The Krank-Less Starter & Manufacturing Company, Cleveland, O., advises that it has been organized to manufacture the Krank-Less starter, speeder and gasoline saver. No factory will be built at present, but the company contemplates building later in the year.

Clark Manufacturing Brass Gauge—The Clark Motor Car Company, Louisville, Ky., has begun the manufacture of a patented brass gauge for use in handling liquids, especially oil and gasoline. The company plans the enlargement of its facilities to take care of the new business if it develops favorably.

Body Company Builds—Automobile bodies are to be manufactured by the Capitol Body Company, which has just been organized in Indianapolis, Ind., and incorporated with an authorized capitalization of $10,000. A factory is to be established immediately and about 2,500 bodies will be manufactured annually.

Atlas Forge Company's Plant—According to Manager S. H. Carpenter, of the Atlas Drop Forge Company, Lansing, Mich., the company will double its capacity this spring by the erection of a fireproof steel plant twice the size of the one being used. While the plans have not been completed, it is said the new building will be modern in every respect.

Quick Work In Rebuilding—On February 8 the Double Fabric Tire Company, Auburn, Ind., suffered the loss of its factory by fire. By February 15 the vulcanizing kettles and metal cores were dug out, cutting tables were made, large quantities of material and equipment were wired for, and by the 17th practically a full force was working in the new factory.

Painesville Starts Automobile Factory—The Vulcan Manufacturing Company, a new Painesville, O., concern, is to enter the automobile manufacturing business. A plant which had been idle has been purchased and is to be remodeled for best use of the company. One hundred and fifty men are expected to be employed there before July 1 and 1,000 automobiles are to be turned out during the present year.

State Electric Will Build—A company, to be known as the State Electric, Ltd., has been formed with Montreal, Que., and Toronto, Ont., capital to manufacture electric commercial vehicles at Walkerville, Ont., and plans are being prepared for a factory to cover more than 40,000 square feet. The directors of the new company are H. Timmins, N. A. Timmins, W. S. Hutchinson, C. E. Archibold and S. Carsley.

Plant at Xenia—An organization for the purpose of increasing the capital stock of the Baldner Automobile Manufacturing Company, Xenia, O., from $5,000 to $150,000 has just been effected. The selling stock of the company will be increased to $48,000. It is the purpose to establish an automobile manufacturing plant at Xenia to manufacture a car of the roadster type after a model made by Jacob Baldner. A commercial car will be built.

Swinehart Expanding—Contracts have been let by the Swinehart Tire & Rubber Company, Akron, O., for the construction of new buildings. One addition, 100 feet by 70 feet, and three stories high, will be added to its main plant. Other buildings, including a laboratory, 30 feet by 60 feet, have been erected. In the main building will be installed new rubber machinery capable of tripling the company's present output. A new 1,200-horsepower Corliss engine, with additional boilers, is now being installed.

Shows, Conventions, Etc.

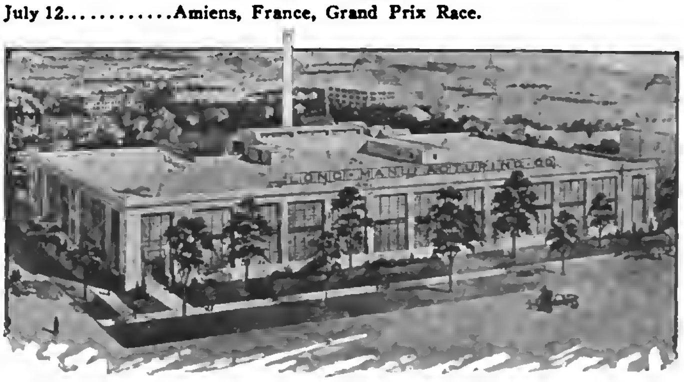
March............Indianapolis, Ind., Spring Automobile Show. State Fair Grounds, Indianapolis Automobile Trade Association.
March............Nashville, Tenn., Annual Show, Nashville Automobile Dealers' Association.
March 1-8........Pittsburgh, Pa., Annual Automobile Show.
March 3-8........Bridgeport, Conn., Show, Park City Rink, B. B. Steiber.
March 3-8........Denver, Col., Annual Show, Municipal Auditorium.
March 3-8........Springfield, Mass., Automobile Show, New Auditorium Building, United Amusement Company.
March 3-18.......Des Moines, Ia., Annual Show, Pleasure Car Section, Coliseum, Dealers' Association.
March 5-8........Tiffin, O., Annual Show, Tiffin *Daily Advertiser.*
March 5-8........Louisville, Ky., Annual Show, Dealers' Association.
March 5-8........London, Ont., Annual Show, Drill Hall, Louis Blumenstein.
March 8-15.......Boston, Mass., Annual Automobile Show.
March 8-15.......Columbus, O., Annual Show, Billy Sunday Tabernacle, Automobile Club and Traders' Association.
March 10-15......Columbus, O., Opening Week, Columbus Automobile Trades Association.
March 11-15......Buffalo, N. Y., Commercial Vehicle Show, Auditorium, Automobile Dealers' Association.
March 12-15......Ogdensburg, N. Y., Automobile Show, Louis Blumenstein, Manager.
March 17-22......Norfolk, Va., Annual Show, Armory Building, Norfolk Automobile Trade Association, Inc.
March 19-26......Boston, Mass., Annual Truck Show.
March 20-24......New Orleans, La., Annual Show, N. O. A. D. A.
March 24-29......Indianapolis, Ind., Annual Automobile Show.
April 1-6........San Francisco, Cal., Motor Truck Show, Coliseum Hall, *Motor Field.*
April 5-19.......Pittsburgh, Pa., Annual Show, East Liberty Market House, Dealers' Association.

Race Meets, Runs, Hill Climbs, Etc.

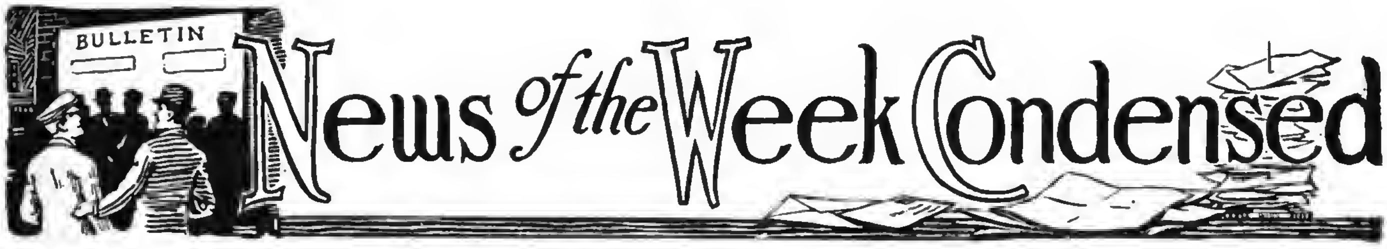
May 5-8..........Washington, D. C., Motor Truck Reliability Run, *Washington Post.*
May 30...........Indianapolis, Ind., 500-Mile Race, Speedway.
July 1...........Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Association to the Pacific Coast.
July 1-16........Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.
July 8-16........Winnipeg, Man., Midsummer exhibition, A. C. Emmett, Manager.
July 27-28.......Tacoma, Wash., Tacoma Road Races.
Nov. 24..........Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 26..........Savannah, Ga., Grand Prize Race, Automobile Club of America.

Foreign

March............France, Sealed Bonnet, 3000-Mile Run.
March 31.........Montevideo, Uruguay, International Competition of Agricultural Motor Vehicles.
April............Barcelona, Spain, International Exhibition.
May..............St. Petersburg, Russia, International Automobile Exposition, building of Michael Maneze, Imperial Automobile Club of Russia.
July 12..........Amiens, France, Grand Prix Race.



Factory of the Long Mfg. Co., Detroit, Mich., where motor hoods are made




General view of the Brooklyn automobile show held in the Twenty-Third Regiment Armory last week

PRESIDENT WILSON Invited—President Woodrow Wilson is to be extended a special and cordial invitation to attend the Grand Prize and Vanderbilt Cup automobile races on the Chatham County course in November. It is possible that a special committee from the Savannah Automobile Club, Savannah, Ga., promoters of the races, will deliver the invitation to him in person in Washington, D. C.

Utica's Show Busy—The annual automobile show is being held this week in Utica, N. Y. The exhibition is being held at the Amory building.

Manager of New Branch.—E. C. Cox has been appointed manager of the Findeisen & Kropf Mfg. Co.'s Eastern sales and service branch, New York City.

Elmira's Third Annual Show—The third annual automobile show held under the auspices of the Elmira Automobile Club proved successful. Twenty dealers displayed their cars.

Large Registration in Ohio—According to the announcement of state registrar of automobiles J. A. Shearer, 37,000 automobiles were registered in Ohio since January 1. This figure was reached February 23.

McCulla with Packard—W. R. McCulla has accepted a position with the Packard Motor Car Co., Detroit, Mich., as assistant research engineer. The Packard company has secured his services for experimental work.

Opens New Franklin Building—R. C. Hamlin, Franklin dealer in Los Angeles, Cal., has completed and opened up his new building. The structure is a story and a half in height with a frontage of 87 feet and is 105 feet in depth.

Age Limit Reduced—A bill has been introduced in the Connecticut legislature reducing the age limit necessary for the operator to obtain a license from 18 to 16 years. The bill is set for a hearing shortly along with other proposed measures.

Import and Export Figures—Automobiles show an interesting record in our trade, the value of the import of automobiles and parts thereof having fallen from $5,000,000 in 1906 to a little over $2,000,000 in 1912, while the exports increased from $1,000,000 in 192 to $28,000,000 in 1912.

Bennett Succeeds MacDonald—J. H. MacDonald, for 18 years executive head of the Connecticut highway department, states that he has decided to relinquish his post in favor of C. J. Bennett of Hartford, appointed recently highway commissioner, with dispute.

Civic Garage Proposed—A civic garage in which to house automobiles while owners are transacting business in the congested districts of Rochester, N. Y., is being advocated. A small fee would be charged each owner who desires to take advantage of the garage. The garage would be maintained by the city.

World's Visible Cotton Supply—Secretary Hester of Louisiana recently made a statement of the world's visible supply of cotton, showing the total visible to be 5,636,955 against 5,667,841 last week, 6,001,350 last year and 4,795,889 year before last. Of this the total of American cotton is 4,135,955 against 4,222,841 last week and 4,841,350 last year.

New Britain Wants Apparatus—New Britain, Conn., is anxious to improve fire and police service by the installation of motor equipment. In the budget for the new year the police department asks for a motor patrol and ambulance at a cost of $5,000. The fire department wants two motor fire trucks to cost $12,000 and a car for the chief to cost $1,500.

Wisconsin Association's Second Convention—The Wisconson County Highway Commissioners Association, Madison, Wis., recently held its second annual convention. It lasted 4 days and brought out a splendid discussion of ways and means, as well as achievements in permanent highway construction in that state during the time that the state-aid law has been in effect. A law was passed making the annual appropriation by the state, after 1913, $850,000.

New Agencies Established During the Week

PLEASURE CARS

Place	Car	Agent
Aberdeen, Wash.	KisselKar	M. M. Stewart.
Barre, Vt.	KisselKar	Barre KisselKar Co.
Bartlesville, Okla.	Moon	Cherokee Motor Car Co.
Booneville, Mo.	KisselKar	Johnson & Stevens.
Boston, Mass.	Nyberg	Clyde H. Smyth.
Boston, Mass.	Palmer Singer	H. A. Clapp.
Bremerton, Wash.	KisselKar	W. J. Benbenick.
Bridgeport, Conn.	KisselKar	Boulevard Garage.
Canton, O.	Marmon	Wise-Green Motor Car Co.
Chehalis, Wash.	KisselKar	Twin City Auto Co.
Chicago, Ill.	McFarlan	Jos. B. Deibler Motor Car Co.
Chico, Cal.	KisselKar	W. W. Head.
Cle Elum, Wash.	KisselKar	B. N. House.
Columbus, O.	Detroiter	Batdorf & Stampfle.
Columbus, O.	Locomobile	Engle & Vincent Co.
Columbus, O.	Patterson	Batdorf & Stampfle.
Colusa, Cal.	KisselKar	Geyer & Boroski.
Cottage Grove, Ore.	KisselKar	Newmith Auto Co.
Craig, Iowa	Moon	Craig Auto Co.
Crow's Landing, Cal.	KisselKar	B. E. Munson.
Davenport, Iowa	KisselKar	Kneuppel & Ott.
Dayton, O.	Reo	Miami Valley Auto Co.
Elko, Nevada	KisselKar	Elko Auto Co.
Forest Grove, Ore.	KisselKar	J. J. Wirtz.
Fort Worth, Texas	KisselKar	Chandler & Hightower.
Fostoria, O.	Oakland	Nestlerode Bros.
Glen Cove, L. I., N. Y.	KisselKar	Ed. J. Deasy.
Grenport, L. I., N. Y.	KisselKar	Hedge's Garage.
Hackensack, N. J.	KisselKar	Hackensack Auto Service.
Harrisburg, Ill.	Moon	Chas. V. Parker.
Hillsboro, O.	Hudson	Currie Motor Car Co.
Hillsboro, O.	R. C. H.	Currie Motor Car Co.
Joplin, Mo.	Moon	Joplin Supply Co.
Kenosha, Wis.	McFarlan	Russell Bros.
Kent, Wash.	KisselKar	McGhee Auto Co.
Kenton, O.	Lambert	Littleton & Critchfield.
Lebanon, Ore.	KisselKar	W. J. Booth.
Lexington, Ky.	KisselKar	O. R. Hukle & Co.
Lexington, Ky.	McFarlan	O. R. Crutcher.
Lima, O.	Little	Rudy & Salierup.
Lima, O.	Mitchell	Shappell & Carson.
Lima, O.	Studebaker	E. H. Hawisher.
Lindsay, Ont.	Ford	Madison Williams & Son.
Los Angeles	McFarlan	Louis F. Benton Co.
Louisville, Ky.	Little	Reimers Motor Car Co.
Macon, Mo.	Moon	Macon Garage Co.
Madison, Wis.	McFarlan	Green Bay Motor Car Co.
Marion, O.	Stevens-Duryea	C. C. Stoltz.
Mediapolis, Iowa	Moon	Fleenor's Garage.
Middletown, Conn.	McFarlan	S. M. Foote.
Mitchell, S. D.	McFarlan	Mitchell Auto & Supply Co.
Montclair, N. J.	Moon	Montclair Garage & Machine Co.
Monroe, Ore.	KisselKar	A. Wilhelm & Sons.
Monterey, Mexico	KisselKar	J. F. Austin.
Montreal, Canada	McFarlan	N. A. Racine.
Montreal, Que.	Nyberg	De Vaux Motor Car Co.
Moosejaw, Sask.	KisselKar	Saskatchewan Garage.
Mt. Vernon, Wash.	KisselKar	Ernest Peterson.
Mt. View, Cal.	KisselKar	W. A. Platt.
New Berg, Ore.	KisselKar	S. A. Mills.
New Orleans, La.	McFarlan	Swartz & Co.
New York City	Vulcan	Sidney B. Bowman Automobile Company.
Niles, Cal.	KisselKar	E. F. Rose.
North Yakima, Wash.	KisselKar	Yakima Auto & Supply Co.
Oakland, Ore.	KisselKar	E. E. Leas.
Old Town, Me.	McFarlan	C. B. Swan.
Owen Sound, Ont.	KisselKar	Hugo A. Gutenkunst.
Paso Robels, Cal.	KisselKar	E. T. Neal.
Paterson, N. J.	KisselKar	Taximeter Auto Co.
Phoenix, B. C.	KisselKar	Morrin-Thompson Co.
Placerville, Cal.	KisselKar	F. H. Davis.
Pleasanton, Cal.	KisselKar	J. S. Gill.
Portland, Ore.	McFarlan	Gerlinger Motor Car Co.
Reno, Nevada	KisselKar	Western Auto Supply Co.
Rochester, N. Y.	McFarlan	Carthage Motor Car Co.
Roseberg, Ore.	KisselKar	John Gray.
Rosenburg, Texas	Moon	Rosenburg Auto Co.
Salem, Ore.	KisselKar	C. L. Rose Co.
San Mateo, Cal.	KisselKar	Wisnom-Bonner Hardware Co.
Santa Cruz, Cal.	KisselKar	T. W. Thomson.
Schaller, Iowa	Moon	E. F. F. Hasseler.
St. Helena, Ore.	KisselKar	McCoy & Veazie.
St. Louis, Mo.	McFarlan	Coller-Reitz Motor Car Co.
Stockholm, Sweden	KisselKar	C. R. Miller.
Taylor, Tex.	Moon	Prewitt Auto Co.
Tiffin, O.	Detroiter	Fred Fetzer.
Tiffin, O.	Mitchell	R. T. & E. E. Outhwaite.
Tiffin, O.	Overland	J. G. Miller.
Tiffin, O.	Rambler	Bellevue Garage.
Toronto, Ont.	Humber	Stepney Motor Wheel of Canada, Ltd.
Toronto, Ont.	Stutz	Maxwell Stoddard Ontario Co.
Turlock, Cal.	KisselKar	Brooks Auto Co.
Ukiah, Cal.	KisselKar	F. O. Taylor.
White Salmon, Wash.	KisselKar	G. A. Thomas.
Winters, Cal.	KisselKar	F. M. Wyatt.
Willimina, Ore.	KisselKar	C. R. Canfield

COMMERCIAL VEHICLES

Place	Car	Agent
Canton, O.	Gramm	Wise-Green Motor Car Co.

ELECTRIC VEHICLES

Place	Car	Agent
Canton, O.	Standard	Wise-Green Motor Car Co.
Louisville, Ky.	Baker	Yager Motor Car Co.
Louisville, Ky.	Chicago	Kentucky Auto Co.
Louisville, Ky.	Grinnell	Rommel Motor Car Co.
Louisville, Ky.	Waverley	A. E. Reid.

Wilson Midland Sales Manager—C. G. Wilson was recently appointed general sales manager of the Midland Motor Car Co., East Moline, Ill.

Murphy Resigns from Splitdorf—G. H. Murphy has severed his connections with the Splitdorf Electrical Co., New York City, as assistant treasurer.

Pittsburgh Show On—The Pittsburgh Auto Show Association is holding an automobile show this week at the Exposition Building, Pittsburgh, Pa.

Mackaye with Keeton—H. D. W. Mackaye has received the appointment of special factory representative of the Keeton Motor Co., of Detroit, Mich.

Ambler Wants Fire Apparatus—The Old York Road Fire Co., Ambler, Pa., has appointed a committee to purchase a new fire fighting automobile, at a cost of $10,000.

Livingston Goodrich-Diamond Manager—G. E. Livingston has been appointed manager of the Columbus, O., branch of the Goodrich-Diamond Co. to succeed C. W. Walker.

Republic's Indianapolis Factory Branch—The Republic Rubber Co., Youngstown, O., has established a factory sales branch in Indianapolis, Ind., with E. A. Stone as manager.

New Shock Absorber Manufactured—A new industry will shortly be started in Waynesboro, Pa., for the manufacture of the Landis shock absorber. F. F. Landis is the inventor of the new device.

Bus Line in Chile—A concession to operate motor buses has been granted by the Chilean government to Carlos Eastman, who will equip and conduct several lines between Santiago and its suburbs.

Smith on Western Trip—Paul Smith, recently appointed sales manager of the Lozier Motor Company, Detroit, Mich., recently left that city on a month's journey through the Central and far West.

Stearns Returns from Vacation—F. B. Stearns, president of the F. B. Stearns Co., Cleveland, O., manufacturer of Stearns-Knight cars, returned recently from his midwinter vacation in Florida and Cuba.

Taxicab Rates Cut—Competition in taxicab service in Wilmington, Del., has resulted in cutting of rates, the Brandford Automobile Co. announcing a minimum of $0.50 per mile, with $0.25 for each additional person.

Mayer Carburetor Appoints Distributor—The Mayer Carburetor Co., Buffalo, N. Y., has appointed the Maydwell Company, Los Angeles, San Francisco, Cal., and Seattle, Wash., distributor of its product on the Pacific coast.

Breaking heavy wiregrass sod at the Richmond, Va., state fair with a Parker motor plow

Johnson Ford Manager—Fred Johnson has been appointed manager of the sales branch of the Ford Motor Company at Omaha, Neb.

Goodhart Advertising Manager—H. H. Goodhart has been appointed advertising manager of the Lippard-Stewart Motor Car Company, Buffalo, N. Y.

New Kerosene Carbureter—The Air Friction Carbureter Co., of Dayton, O., has placed on the market a carbureter designed for use with kerosene oil as fuel.

Dowse Promoted—R. P. Dowse has been appointed general sales representative in the Central District for the Goodyear Tire & Rubber Co., Akron, O. His headquarters will be in Detroit, Mich.

New Manager for Velie—C. R. Gardner has been made manager of the automobile department of the John Deere Plow Co., Omaha, Neb., and will have charge of the Velie in the Omaha territory.

Miller's New Quarters—G. C. Miller, automobile dealer, is preparing to move into his new home at Main and Northampton streets. After removal, the concern, of which Mr. Miller now is manager, will be known as the Kane-Cadillac Motor Company.

Wolf with Henderson—The Henderson Motor Car Co., Indianapolis, Ind., announces the appointment of O. R. Wolf as factory representative and territory manager for the Central States District. His headquarters will be in Chicago, Ill.

Bay State Lamp Bill Killed—Despite a campaign in favor of it, the Massachusetts tail light bill introduced by Representative Greenwood, was defeated by the House of Representatives recently. The bill made it unlawful for an automobile to be so equipped that the rear light could be extinguished from the driver's seat.

Havana Good Second-Hand Market—Within the last few months there has been an enormous increase in the volume of the export business in the used car market in Havana, Cuba. The popularity of American made cars is not appreciated by those who are ignorant of the remarkable frequency of shipments of used cars in that part of the world. The Latin-American countries are not slow to take advantage of improved facilities, especially when these facilities can be secured at a discount.

Wireless Now From Automobile—A new portable type of complete wireless telegraph station has been recently exhibited to the Government officials in Washington, D. C. The outfit, which includes two telescopic towers, is carried on a large automobile truck. It has living quarters for twelve men. The two towers can be raised to an altitude of 200 feet by the same motor which propels the automobile truck. At night illumination is supplied by a small electric plant operated by the truck motor. The signal officers of the army are studying the wireless auto-truck, and in the event it stands the tests several may be purchased for the army.

Automobile Incorporations of the Week

AUTOMOBILES AND PARTS

Altoona, Pa.—Central Motor Car Co.; capital, $10,000. Incorporators: C. C. Baker, Albert C. Akers, G. M. Smith.

Boston, Mass.—W. C. Bates Co.; capital, $10,000; to do a general automobile business. Incorporators: William C. Bates, G. A. Kearsley, W. J. Munday.

Brooklyn, N. Y.—Ackerman & Baird, Inc.; capital, $10,000; to manufacture engines, motors, etc. Incorporators: Raymond P. Ackerman, Andrew D. Baird, Andrew D. Baird.

Camden, N. J.—Par-Keel Wheel Co.; capital, $100,000; to manufacture, buy and sell, and deal in automobiles. Incorporators: Frank S. Muzzey, F. Stanley Saurman, Frank A. Kuntz.

Chicago, Ill.—Rayfield Motor Sales Co. of Illinois; capital, $41,000; to deal in automobiles and accessories. Incorporators: R. C. Wheeler, C. L. Cobb, C. Barnes.

Lockport, N. Y.—Amper Electric Co. Incorporated; capital, $25,000; to deal in autos, auto locks, and switches. Incorporators: Theodore D. Robinson, Ernest W. Jones, Charles L. Nichols.

Milwaukee, Wis.—Creek Motor Sales Co.; capital, $25,000. Incorporators: R. A. Creek, Nora M. Creek, Willett M. Spooner.

Mt. Vernon, N. Y.—Motor Truck Mfg. Corp.; capital, $150,000. Incorporators: Arthur J. Albert, Henry Hilchenbach and Louis Bertsch.

Providence, R. I.—Lister, Smith & Walsh Co.; capital, $50,000; to do a general automobile business. Incorporators: James J. Lister, Herman R. Smith, Wilbur R. Walsh.

Providence, R. I.—Savoie Tire Co.; capital, $10,000; to deal in automobile and other tires. Incorporators: Joseph Savoie, Edward C. Clines, Harry D. Reed.

Ravenna, O.—Ravenna Motor-Truck Co.; capital, $200,000. Incorporators: W. F. Traves, A. H. Knuth, H. Schwartz.

Rochester, N. Y.—Carthage Auto Co., Inc.; capital, $5,000. Incorporators: Frederick A. Kuhnert, Arthur W. Alderman and Chas. L. Pierce.

Saratoga Springs, N. Y.—Ross Ketchum Co., Inc.; capital, $18,400; to deal in automobiles, motorcycles, bicycles, motor boats and motor vehicles. Incorporators: J. Arthur, P. Ketchum, Norman B. Ross, James W. Northrup.

Thomasville, N. C.—Thomasville Motor Co.; capital, $5,000. Incorporators: T. J. Finch, B. F. McCuister and Z. V. Crutchfield.

Trenton, N. J.—Taxi Service Co.; capital, $25,000; to do a general automobile business. Incorporators: H. W. Snook, F. J. Butter, C. H. Naylor.

Wilmerding, Pa.—Valley Rapid Motor Co.; capital, $5,000. Incorporators: John Genre, Dominick Genre, H. F. W. Rentzel.

Worcester, Mass.—Overland Winton Sales Co.; capital, $10,000; to do a general automobile business. Incorporators: H. T. Pierpont, Geo. F. Daller, J. Clarke, Jr.

GARAGES AND ACCESSORIES

Amesbury, Mass.—Walker, Wells Co., Inc.; capital, $25,000; to manufacture automobile bodies. Incorporators: H. P. Wells, James H. Walker, H. Miller.

Bangor, Me.—Penobscot Garage Co.; capital, $10,000. Incorporators: Charles H. Shorey, Amos J. Shorey, G. D. Shorey.

Boston, Mass.—Arco Rubber Co.; capital, $15,000; to deal in rubber goods, tires, etc. Incorporators: L. D. Apsley, H. G. Cressinger, F. E. Black.

Boston, Mass.—Peabody Square Garage Co.; capital, $5,000. Incorporators: John T. Duke, J. J. O'Keefe, M. A. Duke.

Brooklyn, N. Y.—Peerless Radiator & Auto Lamp Works, Inc.; capital, $5,000; to deal in auto lamps, parts, supplies, etc. Incorporators: Max Stadlen, Luis Schapiro, Bernard Wolfensohn.

Brooklyn, N. Y.—Cumberland Garage, Inc.; capital, $25,000; to deal in automobiles, etc. Incorporators: A. Wilmarth, W. L. Gray, M. F. Wilmarth.

Brooklyn, N. Y.—National Auto-Radiator & Lamp Works, Inc.; capital, $10,000. Incorporators: Jacob Samas, Julius Pasternack, Milton J. Gordon.

Camden, N. J.—American Silencer Co.; capital, $50,000; to manufacture devices for silencing automobiles. Incorporators: F. R. Mansell, Geo. H. B. Martin, S. C. Seymour.

Charlestown, W. Va.—Kanawha Garage Co.; capital, $5,000; to conduct a garage for the hire of automobiles and other vehicles to the public. Incorporators: H. M. Bertolett, George Morrow, W. E. Waybright, J. H. Ford and Leroy Allebach.

Chicago, Ill.—Chicago Original Auto Polo Co.; capital, $6,000; to operate places of amusement, and also deal in automobiles. Incorporators: Jos. R. Dcahl, Frederick W. Moore, Marie C. Subr.

Cleveland, O.—National Garage Co.; capital, $20,000. Incorporators: R. D. Morgan, E. G. Nally.

Columbus, O.—New Columbus Auto Co.; capital, $30,000; to do a general repair business. Incorporators: Jesse J. Brown, Lillian Brown, Wm. E. McGannon, Chas. E. Dennis, Edson B. Dennis.

Cleveland, O.—Eaco Auto-Lock Sales Co.; capital, $5,000. Incorporators: W. G. Wells, Ralph W. Fellows, Charles Pugh, M. P. Carrig, Stewart Hart.

East Orange, N. J.—Norwood Garage, Inc.; capital, $10,000. Incorporators: Walter C. Jacobs, Dwight R. Davies, Louis Boehme.

Far Rockaway, N. Y.—Far Rockaway Motor Vehicle & Cab Owners Association, Inc.; capital, $500. Incorporators: James Harris, Edward J. C. Kelly, Harry Traver.

Hartford, Conn.—Hartford Auto Pump & Supply Co.; capital, $50,000. Incorporators: Henry F. Schwarb, Edward E. Tryon, Thos. Lockwood.

Indianapolis, Ind.—Motor Starting Mfg. Co.; capital, $40,000; to manufacture a motor starting device. Incorporators: W. J. Sylvester, Samuel Brundage, H. J. Herff.

Indianapolis, Ind.—T. M. S. Mfg. Co.; capital, $25,000; to manufacture a combination front fork and shock absorber. Incorporators: F. M. Strong, W. J. Gemmill, L. W. Mellette.

Newark, N. J.—Puncture Cure Sales Co.; capital, $50,000; to deal in devices for repairing tires. Incorporators: Frances B. Stewart, Howard F. Kirk, Chas. H. Stewart.

New York, N. Y.—Star Taxi Cab Co., Inc.; capital, $2,500. Incorporators: H. T. Silverman, Nathan Waxman, James B. Vaughey.

New York, N. Y.—Forty-seventh Street Taxi Cab Co., Inc.; capital, $500. Incorporators: Thos. G. Corvan, James E. Corvan, Jerome P. Corvan.

New York, N. Y.—Auto Center Inc.; capital, $25,000; to do a general garage business. Incorporators: E. W. Forrest, C. H. Fuller, B. C. Thomas.

New York City, N. Y.—Tioma Oil & Grease Co.; capital, $50,000; to deal in greases, lubricating oils, etc. Incorporators: E. J. Forham, F. B. Knowlton, J. J. Harper.

New York, N. Y.—No-Shock Wheel Co.; capital, $400,000; to deal in automobile wheels. Incorporators: J. W. Ebbs, R. H. Waddell, A. A. Kelly.

Philadelphia, Pa.—Franco-American Safety Tire Co., of Philadelphia; capital, $100,000; to deal in automobile tires. Incorporators: Emile LeFevre, Eugene Wolf, Armand Gallard.

Richmond, Ind.—Sedgwick Mfg. Co.; capital, $10,000; to manufacture the Sedgwick lifting jack for motor cars. Incorporators: James H. Judson, Richard Sedgwick, J. R. Sedgwick.

Rochester, N. Y.—Zimbrich Taxicab Co., Inc.; capital, $3,000. Incorporators: Fred Simmons, Alexander G. Wall, Herman J. Zimbrich.

Rochester, N. Y.—Stein Auto Supply Co., Inc.; capital, $3,000. Incorporators: Andrew E. Stein, Harry E. Pramer, Louise M. Stein.

Rockaway Beach, N. Y.—Seaside Garage Inc.; capital, $5,000. Incorporators: Patrick H. Morrison, Anthony Hauser, Jennie Morrison and Louise Schilling.

Savona, N. Y.—Kirkham Aeroplane & Motor Co., Inc.; capital, $100,000. Incorporators: Edwin H. Skinner, Chas. B. Kirkhs, Stanley I. Vaughn.

Yonkers, N. Y.—Broadway Auto Supply Co., Inc.; capital, $5,000. Incorporators: Frederick J. Snyder, Pauline A. Snyder, Bernard E. Reardon.

CHANGES OF CAPITAL AND NAME

Dayton, O.—Air-Friction Carbureter Company; capital increased from $20,000 to $30,000.

Toledo, O.—Rapp Mfg. Co.; change of name to Toledo Spark Plug Mfg. Co.

Looking north in Grand Hall; in the foreground is seen the arrangement of the passenger car exhibits flanked by 25-foot Bermuda palms. The turret-shaped sign posts may also be seen. In the background is a huge painting of the entrance to the Palace of Nebuchadnezzar

The Boston Show

Most Elaborate Exhibition Ever Held in New England

By J. Edward Schipper

BOSTON, MASS, March 8—On Saturday, March 8, the doors of Mechanics' Hall were thrown open on the biggest and most elaborate automobile show that has ever been held in New England. Over the 105,000 square feet of floor surface were distributed more than 400 passenger cars and 1,116 useful automobile articles, the products of 232 accessory manufacturers. Last year's show, which exceeded every previous exhibition, had a total of 242 pleasure cars and chassis on exhibition. This year there are over 50 per cent. more cars than last year.

Chicago had a total of ninety-nine pleasure car exhibitors. New York had eighty-eight. Boston has 103 different makes on the floor. Chicago had 205 accessory exhibitors, twenty-seven less than Boston. New York had 340 accessory manufacturers who showed their products at the Palace or Garden. This is 118 more than Boston.

The Boston show, which used to be considered the big accessory exhibition of the year, no longer holds sway in this particular. New York, with its multitude of small accessory plants scattered about the metropolitan district, exceeds it in this respect. As for a pleasure car show, however, the status is different. Boston exceeds both New York and Chicago in the number of exhibits. In total exhibits New York ranks first with 467, Boston second with 345 and Chicago third with 304.

Boston is the big dealers' show of the year. They come from all New England and the southern border of Canada to close agencies, to make arrangements for the approaching season and to confer with the Boston office which, in most instances, is the central distributing point for this section. The dealers' territory covered by the Boston show runs as far south as Bridgeport, north to the Canadian border and west to Pittsfield. Practically every dealer in this territory is represented at the show by one or more members

Show Facts

¶*More than 400 passenger cars are distributed over floorspace of Grand Hall and Exhibition Hall*

¶*Every inch of the 105,000 square feet of floorspace available has been taken up by cars or accessories*

¶*Boston has 345 exhibitors and ranks second, New York having had 467 and Chicago 304 at this year's shows*

¶*The decorations were done by renowned scenic painters and decorators at a cost of $45,000*

South end of Grand Hall, showing the magnificent painting of the Hanging Gardens of Babylon. These gardens were constructed by the Babylonian king to please his Medean bride and to satisfy her yearnings for the tropical splendor of her native land

of his selling organization. Advantage is taken of the time to hold conferences and the hotels in back-bay Boston are thronged with visiting members of the automobile and allied trades.

Mechanics' Hall does not lend itself readily to decorative effects but this year the committee has outdone itself. At a cost of $45,000 the interior of the historic building has been transformed into a huge garden. Grand Hall, the main section of the building, forms the center of the decorative scheme. The motive of this section represents the hanging gardens of Babylon.

The Babylonian king in order to satisfy the yearnings of his bride, a Medean princess, for the luxuriant gardens of her youth transformed the barren wastes about the palace into a scene of tropic splendor. The main floor scene represents one of these gardens. An array of Bermuda palm trees 25 feet in height borders the center space while from the terraces of the hanging gardens illuminated waterfalls give a striking effect. At each end of the hall is a huge scenic painting. At the north end is the entrance to the palace. Nebuchadnezzar's tribute to his Medean bride, painted by Walter Burrage. In the center of this garden is an electric cascade which gives an intensely realistic effect to the work. The remainder of the building has been decorated on the scene of the gardens 100 years ago. Colonial pillars from which hang festoons of garlands and electric

The exhibits were labeled by a series of turret-shaped posts containing an illuminated semi-opaque glass sign. Swinging beneath the sign is a fern cluster which adds greatly to the decorative effect of the hall. The numerous sign posts of this nature diffusing a soft white glow gave a well-illuminated and rich appearance to the hall, forming a splendid setting for the cars

lights. The idea of separating the exhibitors throughout these spaces by the white picket fences, so common in colonial times, is in tasteful keeping with the general outdoor scheme.

More than 30,000 people saw the show on opening night. The total attendance at the show last year was 227,108. At the 1911 show it was 146,343. It is probable that last year's figures will be exceeded. Last year every car on the floor of the hall was sold at the exhibition. According to figures compiled by the management of the show 1,498 cars were sold as a direct result of the 1912 display.

Chester I. Campbell, manager of the show, has sent out over 3,000 letters to dealers inviting them to attend the show. It is stated that practically every dealer in the territory will respond. With very few exceptions these dealers bring prospects with them. Many have been invited to the show by the dealers themselves. The business predictions throughout the show are extremely optimistic.

The growth of the Boston shows, of which this is the eleventh, is of great interest and the following table shows the increase in attendance since the first was held in 1902:

Shows	Attendance
First, 1902	17,350
Second, 1903	30,000
Third, 1905	47,000
Fourth, 1906	51,000
Fifth, 1907	56,260
Sixth, 1908	69,371
Seventh, 1909	91,007
Eighth, 1910	107,000
Ninth, 1911	146,343
Tenth, 1912	227,108

General view of Grand Hall which illustrates the garden-like atmosphere created by the Bermuda palms. One of the most novel features is the waterfalls which rippled from the terraces to the pools on the main floor. Glass foundations make these fountains beautiful

The possibilities of New England as an automobile field are vast. With its large prosperous population, the pleasure car finds a ready sale throughout the entire territory. The roads in most of the states, where the natural difficulties due to mountainous country are not too great, are excellent.

There are at present 94,334 automobiles registered in the six states of New England. With its enormous population and with the number of large cities that are included in this section of the union, this does not represent half of what there will be eventually. Within the next 2 years the dealers will find that New England will purchase thousands of cars. The prosperity of the country and its accessibility will render it remarkably responsive to the vigorous campaign that the dealers of this section of the country are only beginning to wage. Massachusetts, including as it does Boston and other large centers, has the largest registration in New England. The others follow in the order named:

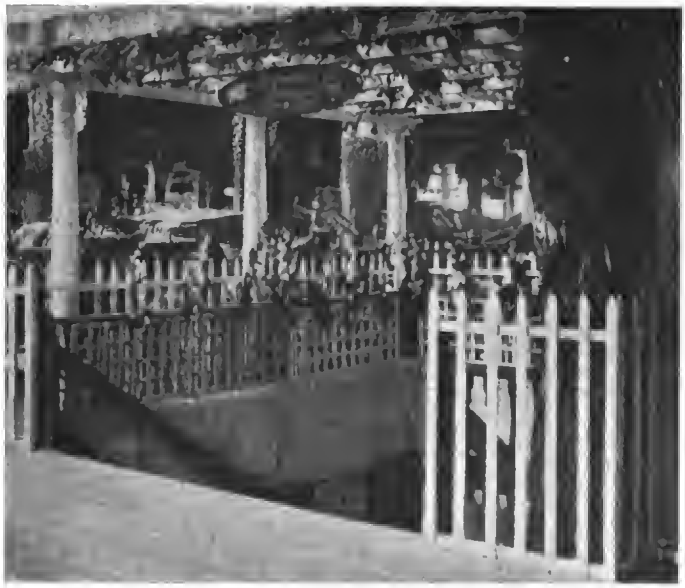
State	Registrations
Massachusetts	51,229
Connecticut	17,950
Maine	7,743
Rhode Island	7,565
New Hampshire	5,764
Vermont	4,183
Total	94,334

With its enormous population, New England can stand three times this number of cars. Connecticut, in spite of its magnificent touring country and fine roads, has less than seven cars to every 1,000 of its population. Massachusetts with its large number of people of the wage-earning class has over seventeen cars to every 1,000 people.

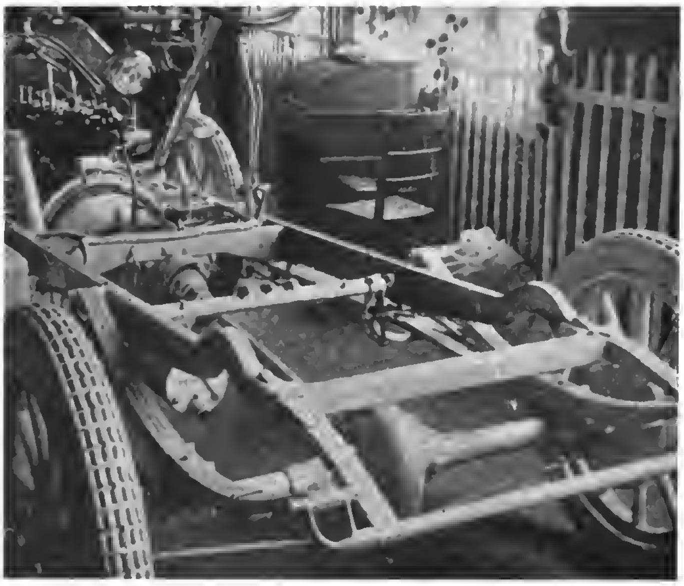
Exhibition Hall is arranged to represent the garden of a century ago. White picket fences serve to separate the different exhibits while old-fashioned hollyhocks, honey flowers and blue-bells cling to the fences. An out-door effect created by vine-clad arbors which practically cover the center aisle. The exhibits are grouped beneath the arbors and along the white picket fences which go to make up the effect of a garden

The field of the electric car in this vicinity is large. Boston, with its traffic difficulties, almost requires electric cars if women are to drive them through the streets. The impossibility of stalling in traffic, the ease of control and the accessibility and number of suitable charging stations renders them particularly desirable. The possibility of attending the theater in an electric, leaving the car parked in a suitable place and then, after the play is over, getting into the electric and going home, appeals to a large class of buyers who could afford to have electrics as well as gasoline cars.

The accessory show in Boston is most complete although the many devices seen displayed on the balconies and in the basement were in the main familiar to those who have studied the situation this year, there were many new and useful implements with which the automobilists have been heretofore unacquainted. The Boston Show in spite of the fact that the number of accessories exhibited may not be as great as that in New York, is still looked upon as the big accessory show of the year. Throughout New England many prosperous plants are devoted entirely to the manufacture of inexpensive tools and equipment for the use of automobilists. These they show in Boston knowing that it is the one exhibition



Stair leading to basement from main floor of exhibition hall



Moyer car with novel spring suspension which attracts attention

which reaches both the dealer and consumer at the same time.

The big accessory houses of New England always have space at the Boston Show and it is rare that some of these concerns have not some new device of interest to the automobile user or to the garageman.

A fact which is worthy of attention is that a large number of accessories designed for specific low-priced cars were exhibited. Tire removers, lighting outfits, gasoline gauges for Ford, Metz and other small cars could be seen at the tables of all the jobbers' exhibits and in many instances these special accessories are shown at the booth of manufacturers.

Exhibits of interest to a garageman are also numerous. In the basement there are a number of gasoline tanks and oil storage devices showing methods of handling the volatile fuel and other liquids in a cleanly and economical manner. There are large air compressors for garages to be seen and a carbon remover by means of which the carbon is burned from the cylinder by the use of a carbon-consuming gas.

Motorists' clothing is shown in the rooms just off the balcony around the main hall. It may be remarked that the exhibitors in this line did not follow the lead of the other exhibitors in making their exhibition seasonable. The fact that spring will be soon with us and that automobilists are now preparing for warmer weather was not noticed. This is evidenced by the fact that on every hand are to be seen fur coats and heavy gloves.

The bodies seen at the show are generally of the touring type, the closed cars being confined to the electrics and in a very few cases to the higher-priced gasoline car. The Locomobile company has a noteworthy exhibit in this line, a handsome town car finished in beautiful upholstery with silver mountings being shown.

Many roadsters of racy lines are to be seen evidencing the fact that this style of car is gaining in popularity. Fiat, Pathfinder, Stutz and others have distinct models shown which attracted much attention on opening night. These roadsters are of semi-racing design fitted in some cases with no windshield end in others with an elliptical shield clamped to the steering column. The tires are carried on the rear deck or on brackets in the rear of the car. The carrying of tires on the side has been practically eliminated in cars of the race-about type.

One car new to the shows on the big circuit this year is the Moyer. This car is unique owing to its peculiar spring suspension. The illustration on this page shows it clearly. The rear spring is what may be called a separated three-quarter elliptic. It is composed of a half-elliptic spring suspended between two oscillating cross bars which extend across the chassis, and a quarter-elliptic spring which forms the rear member and which is attached at one end to the chassis frame and at the other end to the rear cross bar.

Out of the 103 makes of passenger cars exhibited there are not more than seven makes of electric. There are twenty-five large makers of electrical vehicles in this country and it is strange that more have not taken advantage of the Boston Show to exhibit their wares to the New England market. As has been stated the electric is popular in this part of the country and a big market is found for this type of vehicle. Those shown are of coupé design in most instances and make ideal cars for theater or shopping use or wherever ladies are driving through traffic. The electric exhibits at the Boston Show attract considerable attention and the salesmen have been kept busy answering inquiries ever since the doors were opened.

As at New York and Chicago the principal inquiry made by visitors to the booth of those exhibiting passenger cars relates to the cranking and lighting equipment. The design and construction of the car itself is taken for granted and the attention of the attending purchaser is focused largely on general appearance and equipment. Cars selling above $1,000 are with few exceptions equipped as well as the much higher-priced makes, the only difference being in the luxuriousness of the upholstery and finish. As far as starters are concerned the electric predominates even in the lower-priced makes. Some of the higher-priced cars, however, are fitting an acetylene priming device in addition to the electric starter.

It is too early in the show to predict accurately its value from a business standpoint. It is the consensus of opinion, however, among dealers that the show is more seasonable from a selling standpoint than either that held at New York or Chicago. Touring cars bodies are far in the majority and it was stated by several that where purchases were made 95 per cent. would be of this type. With the approach of warmer weather the desire of owning an automobile becomes stronger and the enthusiasm created by the show is all that is needed to lead to many a purchase. Last year every car on the floor of Mechanics' Hall was sold before the doors closed, and with the ever-growing attendance it has been but natural that those exhibiting expect good results from a business standpoint.

While the show is going on at Mechanics' Hall an Importers' Automobile Salon is being held at Copley-Plaza Hotel, at Copley Square, Boston. The exhibitors are the Benz, Metallurgique, Lancia, Isotta-Fraschini, De Dion, Bouton, Minerva, Mercedes. These are all selling more than one chassis. Benz and Lancia each having two while Mercedes has nine different models, one of which is a Knight. Isotta-Fraschini has five. This ball-room exhibition is being attended by many prominent Bostonians.

Twenty Racing Cars Entered in French Grand Prix

PARIS, FRANCE, March 5—All entries are now closed for the French Grand Prix race at Amiens on July 12. The list comprises twenty cars, of which two were entered at the last moment on payment of double fees. These eleventh-hour entrants were a six-cylinder Excelsior, which will probably be driven by Arthur Duray, and a Th. Schneider to be handled by Rene Thomas, who was a member of the Peugeot team last year. It was expected until the last moment that the Fiat would enter a team of cars for this race. The German firms, Mercedes, Opel, and Benz also boycotted the contest and although the Belgian and English agents of the Mercedes company made every effort to put a team of cars in the race the factory persistently refused to give their consent. Although the number of entries is small, this fuel consumption race will not be lacking in interest, for a very fast short course has been selected in the suburbs of Amiens, and the Racing Board of the French Club has made such arrangements that the event will be more spectacular than any previous race held in France. The entry list, with the names of the drivers so far as they are known, is as follows:

1	Sunbeam, Victor Rigal	11	Itala, ——
2	Sunbeam, Gustave Caillois	12	Itala, ——
3	Sunbeam, W. Lee Guinness	13	Itala, ——
4	Sunbeam, Darius Resta	14	Opel, Joerns
5	Peugeot, Georges Boillot	15	Th. Schneider, Champoiseau
6	Peugeot, Jules Goux	16	Th. Schneider, Gabriel
7	Peugeot, Paul Zuccarelli	17	Th. Schneider, Rene Thomas
8	Delage, Bablot	18	Th. Schneider, ——
9	Delage, Albert Guyot	19	Excelsior, Christiaens
10	Mathias, Mathiss	20	Excelsior, Arthur Duray

The French light-car race will be held at Boulogne, Sunday, September 21, and is for cars of 183-inch piston displacement, the maximum weight being 1,984 pounds. The circuit is 32.3 miles and the distance is 452 miles, or fourteen laps.

Hudson Wins as Ice Racer

STOCKHOLM, SWEDEN, March 6—America scored its first motor car victory in Sweden during the annual winter ice racing classic. The first prize for the kilometer race was captured by a beautiful 1913 Hudson car. The distance of 1 kilometer from a standing start was covered by the fleet automobile in 40 seconds. The rate of speed was a mile in approximately 65 seconds.

An American car won second position at the finish, the Cadillac finishing the kilometer in 45.4 seconds.

Quakers Prepare 30-Day Run

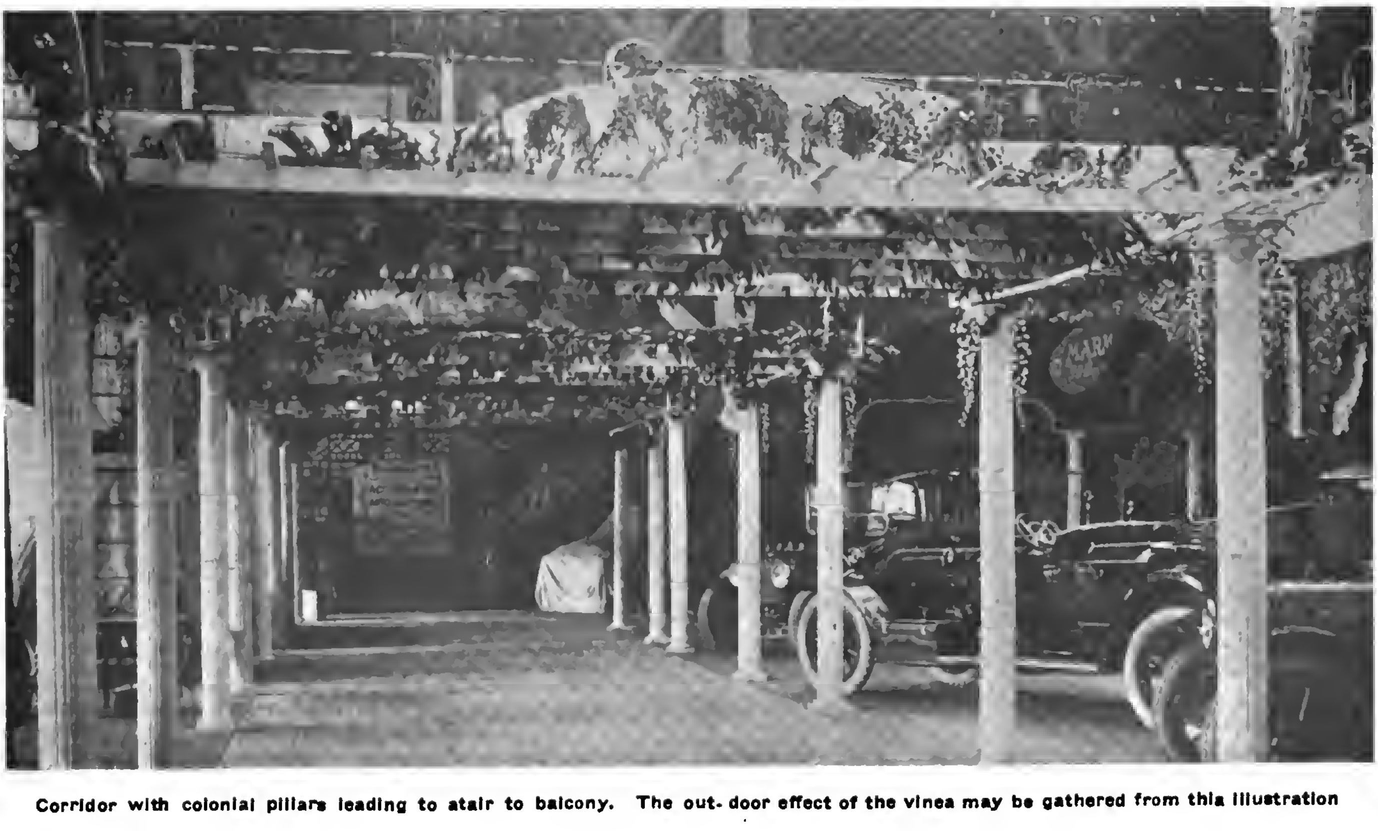
PHILADELPHIA, PA., March 10—The touring information department of the Automobile Club of Philadelphia 2 days ago started a Multiplex car on a 30-day, sealed-bonnet run. The car will travel from Philadelphia to Harrisburg and back, making 210 miles every day and the seal on the bonnet will be broken once in every 1,000 miles so as to permit of tightening up the dynamo and fan belts.

Smada Car for May 30 Race

INDIANAPOLIS, IND., March 10—With twelve formal entries to date the entry list for the 500-mile race at the Indianapolis Motor Speedway, May 30, looks very promising. The latest entry is by F. L. Adams of this city who will drive a specially built car known as the Smada. The car will have a four-cylinder motor, with the cylinders 3.5 by 5 and a piston displacement of 384.8 cubic inches.

Raymond Heads Badger Contests

MILWAUKEE, WIS., March 10—William H. Raymond, president of the Wisconsin State Automobile Association during 1912, has been designated as Wisconsin representative on the contest board of the association, thereby supervising all sanctioned contests to be conducted in Wisconsin during 1913. Mr. Raymond is treasurer of the Milwaukee Automobile Club.



Corridor with colonial pillars leading to stair to balcony. The out-door effect of the vines may be gathered from this illustration

Akron Strike Conditions Becoming Normal

Leaders of the I. W. W. Still Struggling To Keep the Remnants of Their Organization Together

Tire Plant Officials State That Fully 75 Per Cent. of the Strikers Are Back at Work

AKRON, O., March 10—Local and imported I. W. W. leaders are still struggling to keep the remnants of their organization together in connection with the rubber strike in this city. However, hundreds of strikers who have been marching under the I. W. W. flag a week ago have broken away and are now back at work. The strike leaders claim 5000 followers, but their strength is about 1000, as shown by their parade last Saturday, and of these 1000 in line 300 were imported and another 300 had never seen the inside of a rubber factory.

At the Goodrich, Goodyear, Firestone and other local plants the head officials state that hundreds of men have returned to work and that conditions are fast becoming normal. Goodyear has announced that night shifts will start at once. In general the manufacturers claim that of the 25,000 factory help, fully 75 per cent. are back at work. There are hundreds of others who are apparently afraid of being attacked if they return to their jobs.

Strikers Are Still Violent

Three hundred reserves are here from all over the country and are known as the Strong Arm Squad. For nearly a month the I. W. W. leaders have been preaching violence. They have said that "other countries have been overthrown and that the United States must be overthrown." They have carried red flags through the streets and have defied the police. They have prepared a new scale and have sent it to the manufacturers. The demands made by the strikers have been characterized as absurd.

Since the strike commenced the first real violence occurred Friday night when the strikers, 500 in number, gathered at the Goodrich plant and defied the police to move them on.

Saturday noon it was announced that the leaders would "put on the San Diego work." A parade started for the Goodrich plant. Police and deputies under Sheriff Fergusson charged the strikers after they had refused to move on. A fierce fight followed. Clubs and rocks were used by the strikers and the police had to resort to their clubs. After the charge was over it was found that many had been injured. One man was taken to the hospital. The police made many arrests.

Sunday afternoon the I. W. W. strikers and the strong-arm squad held a meeting. They denounced the police and said they would continue to defy the law. Orders were issued to march down on the Goodrich again. The police and deputy sheriffs made preparations to meet any emergency that might arise.

In the meantime the Senatorial Probe committee is yet at work. A midnight session was held Saturday after an all day session. The senate committee expects to complete its investigation this week. Up to the present time F. A. Seiberling, president of the Goodyear Tire & Rubber Company, and H. S. Firestone, president of the Firestone Tire & Rubber Company, are among the manufacturers who have been before the senate probe committee. A dozen or more of the strikers and a few of the I. W. W. leaders have also testified before the state committee. Among the leaders was George H. Speed, chief organizer of the I. W. W. Mr. Speed closed his testimony before the state committee with these words: "There is but one bargain that the I. W. W. will make with the employing class—Complete surrender of all control of industry to the organized workers. In short, the I. W. W. advocates the use of militant direct action tactics to the full extent of our power to make good."

This defiant statement was like the dropping of a bomb in the senate probe room. Members of the committee openly commented on it. Mr. Speed told the state committee that the factories belong to the strikers and that they would take them.

So far but one witness has testified before the committee that has in any way had a tendency to show that the I. W. W. strikers have any grounds for grievance. That witness was a girl who was before the committee Saturday night. She testified that one day she received 32 cents for 10 hours on piece work. It was also shown that she was sickly and had often been in the hospital at the plant. Another girl testified that her average pay for 2 weeks was $23. One of the I. W. W. leaders who has been before the state committee and testified that conditions are bad in the factories has since denounced the I. W. W. and has withdrawn from the order.

H. S. Firestone, president of the Firestone Tire & Rubber Company, was before the committee all day Saturday. He testified that the average monthly earnings of his employees, outside of the superintendents, department foremen and assistants on salary, for the month of January was $66.65. He placed the average monthly earnings at $64.95.

Mr. Firestone said that while he was at all times ready to meet with his employees that he would never meet with any committee from the I. W. W. He told the senate committee that he had what he considered to be the best rubber plant in the country. He invited the state committee "to come and see for yourselves." Other manufacturers told the committee the same thing. The committee will make a tour of investigation some day this week.

Members of the Grand Army have become so incensed at seeing the red flag carried through the streets by the I. W. W. men that the former commander of Puckley Post, R. F. Palmer, has made this announcement: "I am authorized to announce that the services of 200 members of the local G. A. R. are at the service of the sheriff to assist in putting down this riot of Red Revolutionists in Akron. Let us have peace first. We can settle our differences afterward."

Following are the demands made by the strikers at Akron:

1st. That all employees now on strike shall be reinstated in their old positions and not be considered as new employees.
2nd. That the union workday shall be one of eight hours, six days in the week.
3rd. That all workers shall be paid double time for overtime.
4th. That all male and female employees shall be paid not less than 22½ cents an hour.
5th. That all male inspectors shall be paid not less than 55 cents an hour.
6th. That all female inspectors shall be paid not less than 30 cents an hour.
7th. That all inspectors shall be experienced men and women.
8th. That all tiremen, machine men and finishers shall be paid not less than 55 cents an hour.
9th. That all apprentices in the pit shall be paid not less than 30 cents an hour.
10th. That all men curing tires shall be paid not less than 60 cents an hour.
11th. That all truckers trucking tires or cores shall be paid not less than 60 cents an hour.
12th. That all tire buffers, cementers, treaders or wrappers shall be paid not less than 55 cents an hour.
13th. That all tube builders, ply cutters, or tread cutters shall be paid not less than 50 cents an hour.
14th. That all stock carriers shall be paid not less than 45 cents an hour.
15th. That all calender men shall be paid not less than 50 cents an hour.
16th. That all wind-up men shall be paid not less than 55 cents an hour.
17th. That all mill men shall be paid not less than 50 cents an hour.
18th. That all wind-up men shall be paid not less than 55 cents an hour.
19th. That all mill men shall be paid not less than 50 cents an hour.
20th. That all feed men shall be paid not less than 45 cents an hour.
21st. That all wind-up helpers shall be paid not less than 42½ cents an hour.
22nd. That all extra helpers on calenders shall be paid not less than 42½ cents an hour.
23rd. That all tire men shall be paid not less than 25 cents an hour to start.
24th. That experienced tire men shall be paid not less than 55 cents an hour.
25th. That electricians shall be paid not less than 40 cents an hour.
26th. That all first class electricians' helpers shall be paid not less than 30 cents an hour.
27th. That all second class electricians' helpers shall be paid not less than 25 cents an hour.
28th. That all electricians' apprentices shall be paid not less than 20 cents an hour.
29th. That all oilers and motor tenders shall be paid not less than 27½ cents an hour, and that electricians shall have double pay for Sunday and holiday work.
29th. Steam fitters, pipe fitters shall be paid 45 cents an hour.
30th. Steam fitters' helpers shall be paid 35 cents an hour.
31st. All straight wrappers, cross wrappers, pulling and blowing on tubes and cutting tubes shall be paid 50 cents per hour.
32nd. Bag rollers and pulling tubes shall be paid 40 cents an hour.
33rd. All first-class machinists shall receive 60 cents an hour.
34th. All erectors and bench hands shall receive 50 cents an hour.
35th. All handy men shall receive 40 cents an hour.
36th. Machinists and helpers shall receive double time for Sundays and holidays.
37th. All men employed making beads shall receive 50 cents an hour.
38th. All foremen shall receive not less than 50 cents an hour.
39th. All motorcycle tire builders, whether hand or machine men or finishers, shall receive the same as automobile tire men—55 cents an hour.

All girls working in rubber factories at flat rates and no piecework shall receive not less than $14 per week.

If working on a piecework basis they shall receive a 25 per cent. increase over the standard piece in their respective departments in January, 1912.

Any and all departments not represented in the foregoing scale, either male or female employees—shall receive an increase of 25 per cent. over standard price for piecework in January, 1912.

When the company is in any way at fault for employees not putting out required amount of work per hour, they shall receive the usual price per hour as when running full capacity.

All day work labor shall be rated at not less than 30 cents.

Wages Are Higher Each Year

In an open letter to the public Mr. Frank A. Seiberling, president of the Goodyear Tire & Rubber Company, has said: "Every year since we have been in business the average wage paid our people has been higher than that of the preceding year and 1913 will be no exception. Our record for fair treatment in the past is a guarantee for the future. Akron's industries have already been sufficiently crippled and its people have suffered enough distress to satisfy any one with a sober judgment that nothing of value can possibly be gained by a continuance of existing conditions. Let us all get to work again, and the time will show that most of our troubles have been imaginary and that those that are real will be fairly adjusted in the ordinary course. Perhaps one feature of value has come out of it all; namely, the pricking of the bubble of fictitious values on the stocks of the various corporations. Speculators have carried the value of Goodyear common stock to a basis of $465 per share. It is now around $350, while its intrinsic valne is approximately $125. Let this good work go on, and we will not have as much false reasoning when the fictitious basis of value has been properly exploded."

Mr. Seiberling was before the state committee an entire day. He reviewed the history of his plant and urged the committee not only to come and see for themselves but to have their expert accountant look over the books of the company. He denied the insinuations and charges by the strikers that his employees were poorly paid, that the sanitary conditions were bad, that his employees were unfairly treated and that a blacklist was in vogue at his plant.

In his testimony before the state probers Mr. Seiberling said: "I don't think there ever was a company started in Akron that has made such a record as that of the Goodyear company. We started with practically nothing and we have built up a great business. We have not one drop of water in our security out. We did a $25,000,000 business last year and it took $17,000,000 capital to handle the business."

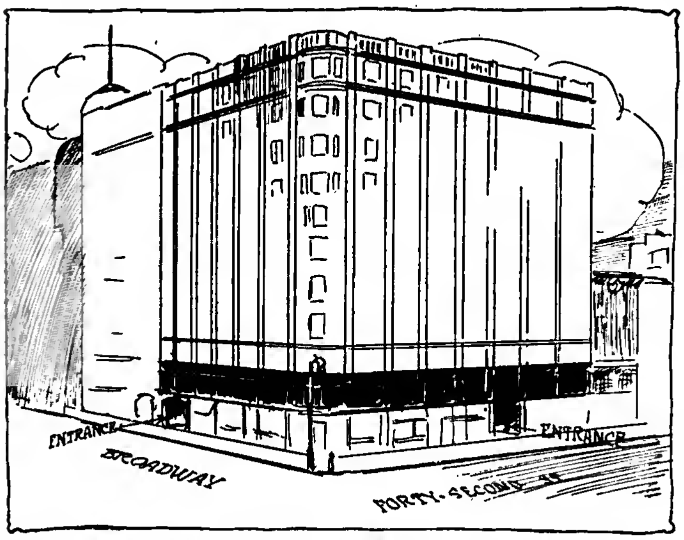
Mr. Seiberling, as did also Mr. Firestone, denied emphatically that there is a combine on among the rubber men of Akron to maintain prices. Mr. Seiberling told how his company has spent $20,000 in installing a water system at his plant and that a hospital was built on top of one of the buildings at an expense of $6,000. Dining rooms have also been installed. He also told of the establishment of a welfare department at his plant where 6000 people are employed at the high point.

"We have in the United States," said Mr. Seiberling, "approximately ninety concerns engaged in all kinds of rubber business, with a capitalization of approximately $300,000,000, doing a volume of business approximating $250,000,000. We have in Akron a capitalization approximating $110,000,000, doing a business of $90,000,000, divided among seven concerns."

Form New York Automobile Center

New York City, March 10—The Antomobile Center, Inc., has been formed in order to give New York a permanent accessory exhibition at a locality where it is bound to attract the attention of a large number of people interested in automobiles. The second floor of the Longacre Building, Broadway, Forty-second street and Times Square, has been selected for this purpose. The floor has a floorspace of more than 10,000 square feet, with 103 feet frontage on Broadway and 115 feet on Forty-second street. The floor is divided into a number of spaces by the nature of its construction, the ceiling being supported on columns.

Due to its location at a corner where about 750,000 people pass during a day, the Automobile Center affords a bright outlook. The spaces will be rented to various accessory makers from week to week, and even now, 2 weeks in advance of the opening of the place, 65 per cent. of the space has been disposed of. The place will be open daily from 8 a. m. to 12 p. m., being accessible and attractive to the majority of passengers arriving on the New York Central, Pennsylvania and Long Island railroads, to say nothing of people on Broadway. Another scheme is a service for assisting cars having accidents within 30 miles of the city.



The entire second floor of the Longacre building at Forty-second street and Broadway is to be occupied by the proposed automobile center

Washington Roads Convention a Success

Delegates from Various Good Roads, Civic, Motoring and Other Organizations Were In Attendance

National Construction of Roads Was the One Thought—Senators and Congressmen-Elect Give Addresses

WASHINGTON, D. C., March 7—The 2-day convention called for federal aid in good roads construction at Hotel Raleigh, in this city, came to a most successful conclusion this evening. Delegates from various good roads, civic, motoring and other organizations were in attendance from forty-two states in the union. Many senators and congressmen-elect were present, and a portion of 1 day entirely given over to their addresses on the subject of national road construction.

This convention will be recorded as one of the most successful in the history of the national road-construction movement in that it was attended by delegates who are working tooth-and-nail on some good roads movement in their own locality. Some of them are presidents of local highway organizations for cross-state or other inter-territorial highways; several are representatives of civic clubs and chambers of commerce that are actually building roads. This was a convention of business road men who came inspired with a single purpose, namely, securing national construction of roads. Because of this every session was well attended. Thursday's sessions began promptly at 10 o'clock and ended at midnight. Today's sessions were equally businesslike.

The legal aspect of national road construction received much attention and it was settled to the satisfaction of all that the building of national highways and the maintenance of them by the Federal Government does not in any way interfere with the constitution, but rather that power is given in the constitution for the construction and maintenance of such highways. Lawyers, senators and congressmen were equally agreed on this.

The first essential in securing national road construction is the proper presentation of the question before Congress. At present the only avenue of presentation is through the standing committee of the Department of Agriculture. That there should be a standing committee on national road construction and maintenance was accepted by all, and the first step in securing such a committee was taken by the committee on resolutions, which drafted the following, which was adopted:

"Whereas, Federal aid for good roads has become of such national interest and importance, and whereas the second national aid for good roads convention feels that this subject should be resolved by Congress with the greatest care, therefore, be it resolved, that Congress be respectfully requested to create a standing committee on national roads."

Further resolutions adopted were: "That we recommend our federal government to build and maintain an inter-state system of highways connecting the capitals of the various states and with the national capital." And be it further resolved: "That we advocate the creation wherever they do not now exist of effective state departments of highways in the various states, and that a copy of this resolution be forwarded to the governor of each state."

One of the most important aspects of the convention was the various reports from presidents of more than a dozen of the highway associations which have been organized during the last year for the improvement of state, territorial and inter-territorial highways. Among these organizations represented were: National Trails Ocean-to-Ocean Road, Quebec-Miami International Road, Lakes-to-Gulf Road, Meridian Road, Pacific Highway, Southern Transcontinental Highway, Santa Fé Trail, Memphis-to-Bristol Highway, Cross Arkansas Highway, Omaha-Denver Good Roads Association, Platte Valley Transcontinental Road, Iowa River-to-River Road, Crest of the Blue Ridge Highway and Park-to-Park Road.

Weed Infringement Suits

Whittaker Chain Tread Co. and E-Z-On Chain Tire Protector Co. Are Defendants

Complainant Recently Obtained Preliminary Injunctions Under Parsons Patent No. 723,299 on Chain Grips

BOSTON, MASS., March 10—The Weed Chain Tire Grip Company has recently obtained preliminary injunctions under Parsons patent No. 723,299 on chain grips against the Whittaker Chain Tread Company. in Boston and against the E-Z-On Chain Tire Protector Company in Chicago.

The papers in the Whittaker suit show that the Whittaker company has for some time been making and selling the Whittaker, Besdam, Empire and other chain grips. The Weed Chain Tire Grip Company brought suit some time ago against the E. J. Willis company in New York, a distributor of the Whittaker company's grips. The defense of this suit was assumed by the Whittaker company and its officers, Stillwell G. Whittaker and Clinton E. Hobbs. The Willis suit was brought to a final hearing in the summer of 1911 and a decree for permanent injunction and accounting issued by Judge Lacombe in September, 1911. In the early part of 1912 the decree was made final by the fixing of the amount of profits, damages and costs recoverable by the Weed Chain Tire Grip Company by reason of the infringement by the Willis company. An appeal was taken by the Willis company, but has not been actively pushed and is still pending in the Court of Appeals. Having made various endeavors to persuade the Whittaker company and its officers to appear openly in the Willis suit and to get the Willis appeal to an early hearing, the Weed Chain Tire Grip Company finally commenced a new suit against the Whittaker Chain Tread Company, Whittaker and Hobbs in Boston and moved for a preliminary injunction. The motion was argued before the Honorable Frederic E. Dodge on February 27, and early in March Judge Dodge handed down his opinion reviewing the numerous cases in which the Parsons patent had been sustained and held to be entitled to a broad scope, found the Whittaker company's grips to be within the Parsons patent, and directed the issuance of a preliminary injunction.

Mohawk Buys Stein Tire Plant

AKRON, O., March 10—The Mohawk Rubber Company has been organized at Akron, O., and has bought the Stein Double Cushion Tire Company plant and machinery. The new company is organized with a capitalization of $350,000; $250,000 common stock and $100,000 7 per cent. cumulative preferred stock, redeemable at 110 with accrued interest after January 1, 1916. The new company has been organized without any water in the stock. The plant is located in east Akron, near the factory of the Goodyear Tire & Rubber Company. It consists of a 3-acre tract of land, a brick factory in good condition, with switching facilities, and free water rights, having a capacity of between seventy-five and one hundred tires per day. The Stein company has discontinued and liquidated its business.

Grabowsky Creditors Get 20 Per Cent.

DETROIT, MICH., March 10—The Security Trust Co., trustee in bankruptcy for the Grabowsky Power Wagon Co., is now returning to creditors of the defunct Grabowsky concern a dividend of 20 per cent., providing they have filed valid claims. An additional dividend of about 15 per cent. will be distributed to wind up the remaining assets when such action is ordered by the Federal court.

The Grabowsky concern was adjudicated a bankrupt in November last by Judge Tuttle in the Federal Court, and at the time of the appointment of the Security Trust Co. as trustee, the liabilities totaled about $400,000. The plant was later sold to the Edward G. Budd Mfg. Co., maker of automobile bodies, for the sum of $110,000, while the Seitz Automobile and Transmission Co., Wyandotte, Mich., purchased the physical assets, including machinery, patents, cars and parts for $55,000. These sums, together with the small amount realized from outstanding accounts, are the basis of the present dividend distribution.

DETROIT, MICH., March 8—At a special meeting of the stockholders of the Lozier Motor Co., to be held on March 19, the capital stock of the company will be increased from $3,000,000 to $5,000,000, according to a statement issued by President H. M. Jewett, who gives as a reason for the increase the necessity for extending the manufacturing facilities, the large sales of the light six having over-taxed the present plant.

The Lozier concern's present capitalization consists of $2,500,000 in common stock and $500,000 in 7 per cent. preferred. The contemplated increase is $1,000,000 common and $1,000,000 preferred. It is stated that the greater portion of the issue will be taken by the directors of the company.

COLUMBUS, O., March 10—According to the report of appraisers Julius F. Stone, J. F. Hatcher and Paul T. Norton, named by the court to appraise the assets of the Columbus Buggy

Automobile Securities Quotations

A general decline all along the line of automobile and kindred stocks marked developments this week. There was hardly a security quoted in New York that did not drop from 1-2 to 5 points, with the exceptions of Firestone, the common stock of which rose 2 points and the preferred 3; and of Chalmers common, which dropped 20 points during the week. The Akron situation being well nigh normal once more lent strength to the various rubber and tire manufacturing securities, although these dropped generally and slightly, with the exception of the Firestone issues.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	150	170
Ajax-Grieb Rubber Co., pfd	..	..	95	99
Aluminum Castings, pfd	..	..	98	101
American Locomotive Co., com	36	37	35½	36
American Locomotive Co., pfd	106	107	104	106
Chalmers Motor Company, com	..	..	115	125
Chalmers Motor Company, pfd	..	..	98	102
Consolilated Rubber Tire Co., com	12	20	19	22
Consolidated Rubber Tire Co., pfd	30	40	..	83
Firestone Tire & Rubber Co., com	200	205	292	300
Firestone Tire & Rubber Co., pfd	108	110	105	107
Garford Company, preferred	..	..	98	100
General Motors Company, com	32	33	30	32
General Motors Company, pfd	77	78	75	77
B. F. Goodrich Company, com	..	..	39½	40½
B. F. Goodrich Company, pfd	..	..	98	100½
Goodyear Tire & Rubber Company, com	338	342	385	390
Goodyear Tire & Rubber Company, pfd	108	110	102	103
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	5	10
International Motor Co., pfd	..	..	35	45
Lozier Motor Company	..	..	..	25
Miller Rubber Company	..	..	185	195
Packard Motor Company	104	107	..	103
Peerless Motor Company	..	..	120	125
Pope Manufacturing Co., com	40	42	22	25
Pope Manufacturing Co., pfd	74	76	63	68
Reo Motor Truck Company	8	10	11½	12½
Reo Motor Car Company	23	25	20½	21¼
Rubber Goods Mfg. Co., pfd	100	105	104	106
Studebaker Company, com	..	..	27¼	29
Studebaker Company, pfd	..	..	86½	90
Swinehart Tire Company	..	..	95	102
U. S. Motor Company, com	..	..	..	8
U. S. Motor Company, 2d pfd	..	..	..	33
U. S. Motor Company, 1st pfd	..	..	..	65
U. S. Rubber Co., com	48	48½	60	60½
U. S. Rubber Co., 1st pfd	110	110½	104⅞	105⅞
White Company, preferred	..	..	103	108
Willys-Overland Company, com	..	..	62	67
Willys-Overland Company, pfd	..	..	92	98
Fisk Rubber Co., com	..	..	..	..
Fisk Rubber Co., pfd	..	..	100	103

Company, of Columbus, O., now in the hands of Receiver McLaren, if the concern continues to operate under efficient management and is not thrown into forced sale, the corporation is solvent. The figures showed the assets to be valued at $892,935.53 which is only about half of the valuation given for the assets at the time of the receivership, January 18.

In arriving at the valuation the gasoline cars were appraised at but 50 cents on the dollar because of the inevitable difficulty in disposing of the completed product.

PONTIAC, MICH., March 10—At a recent meeting of the directors of the General Motors Truck Co., Pontiac, Mich., the capital stock was increased by $250,000 all of which is owned by the General Motors Co., of which the Pontiac concern is a subsidiary. Prior to this time the Truck company was simply a selling company but it now takes complete charge of its manufacturing. It is the successor to the Rapid Motor Vehicle Co., another General Motors subsidiary which has been discontinued.

The General Motors Truck Co. was formerly capitalized at $10,000, all of the stock being owned by the parent concern.

WASHINGTON, D. C., March 8—The Prest-O-Lite Company has filed a suit in the District Supreme Court for an injunction to prevent the alleged infringement of its trademark by the National Electrical Supply Company. It is alleged that the defendant has attempted to refill the interchangeable cylinders of the plaintiff when they have been offered for exchange. The claim is made by the Prest-O-Lite Company that the good will of its business and trademark are worth $7,000,000.

Market Changes of the Week

Few changes took place in last week's markets. Tin proved to be the most important, experiencing a drop of $1.85 per 100 pounds. But more interest was shown in tin in the domestic market yesterday both in nearby and future positions. Lead dropped to $4.20 per 100 pounds, a loss of $.10. Electrolytic copper dropped $.00 1-8 per pound. Antimony slumped to $.07 5-8 a loss of $.00 5-8. Both Bessemer and open-hearth steels remained constant at $29.00 per ton. Cottonseed oil fluctuated throughout the week, its highest mark being $6.38 per barrel, and its lowest $6.37, a loss of $.01. Domestic scrap rubber remained in a very steady position. Collections are still reported to be unusually light and stocks continue small. Dealers report a moderate movement into consuming channels at home and abroad. No new features developed in the export branch of the market for refined petroleum yesterday. The prices of Kansas and Pennsylvania petroleums, per barrel, were $.88 and $2.50 respectively.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, per lb..	.08¼	.07¾	.07¾	.07¾	.07¾	.07⅝	— .00⅝
Beams & Channels, per 100 lbs.....	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Copper, Elec., lb.	.14⅞	.14⅞	.14⅞	.14⅞	.14⅞	.14¾	— .00⅛
Copper, Lake, lb..	.14⅞	.14⅞	.14⅞	.14⅞	.14⅞	.14⅞	....
Cottonseed Oil, bbl.	6.38	6.38	6.38	6.38	6.40	6.37	— .01
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil, Menhaden, Brown...	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 gals.........	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime..	.90	.90	.90	.90	.90	.90	....
Lead, 100 lb.....	4.30	4.35	4.20	4.35	4.20	4.20	— .10
Linseed Oil......	.47	.47	.47	.47	.47	.47	....
Open-Hearth Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Petroleum, bbl., Kansas crude..	.88	.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa., crude......	2.50	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	....
Silk, raw Italy..	......	4.30	....	....	4.30	4.35	+ .05
Silk, raw Japan....	....	3.72½	....	....	3.72½	3.75	+ .02½
Sulphuric Acid, 60 Beaumé.....	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb......	48.35	47.75	47.25	47.25	46.50	46.50	—1.85
Tire Scrap.......	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	....

N. A. A. M. in Conclave

Decides Not To Have Separate Building at Panama-Pacific Exhibition—Trade People Apathetic

Recommends Abandonment of Truck Shows Week Following Passenger Car Show in New York and Chicago

NEW YORK CITY, March 7—At a meeting of the National Association of Automobile Manufacturers, March 5, it was announced that the proposal of having a separate building at the Panama-Pacific Exhibition to house the automobile exhibits has been dropped, owing to the inadequate response of the trade. Instead it was decided to accept the offer, on the part of the exhibition authorities, of 60,000 square feet in the transportation building. The feeling was general that this space would be found insufficient, bnt having regard to the attitude of the trade no other course could be taken.

The proposed consolidation of the N. A. A. M. was also touched upon, and a committee meeting will be held March 19, presumably to make final arrangements for the union. The incorporation of the new organization will probably take place before the end of the month. It will be styled the Automobile Chamber of Commerce, and the present officers of both existing bodies retained.

The ocean-to-ocean stone highway, to which a great deal of attention is being devoted at present, was considered by the good roads committee, which reported its approval.

Charles Thaddeus Terry, counsel for the N. A. A. M., was authorized to take action to protect the interests of the industry where adversely affected by the pending legislation in this state and Massachusetts.

It was unanimously recommended by the members present that commercial vehicle shows at New York and Chicago, which have been held on the week following the passenger car shows, be not held in 1914, such action being due to poor attendance during the recent shows and not doing the anticipated volume of business. This action, however, is not final, but in the form of a recommendation to the executive committee. The matter will next go before the consideration of the commercial vehicle committee which will meet in the course of a few weeks and hand its recommendations to the executive committee which may act on the matter at its meeting April 2. It is imperative that the subject be settled in the course of a few weeks.

January Exports Were $2,668,013

WASHINGTON, D. C., March 11—(*Special Telegram*)—The exports of automobiles and parts from the United States for January, 1913, are as follows: Total, $2,668,013; increase over January, 1912, of $240,122. The total for the 7 months ending January, 1913 is $14,761,139, being an increase over same period 1 year before of $2,890,946. In January last, eighty-seven commercial cars having a value of $182,271 and 2,070 passenger cars totaling in value $2,051,806 were exported from this country. Engines and tires not included in "parts of."

Imports were as follows: During January, 1913, automobiles and parts of the total value of $212,377 were bought from foreign countries, making a decrease of $11,965. For the 7 months ending January last, the decrease was $174,884.

DETROIT, MICH., March 10—The Studebaker Corp. of America announces the appointment of E. R. Benson as vice-president, which position he will fill in addition to retaining the sales managership. This move enables Mr. Benson to sign any legal papers incident to his sales work.

Many Car Sales At Boston Exhibition

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Denver Dealers Enthused Over Advertising Value of Show—40,000 Saw Des Moines Show

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Attendance and Sales Gratifying at Louisville, Pittsburgh and St. Louis—S. A. E. Studies Rims

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BOSTON, MASS, March 11—(*Special Telegram*)—The indications for 1913, judging by the business of the Boston show, will be much better than the preceding year according to the men who have been identified with the Boston show. They base this on the general increased interest in the show this year. To test the matter some of the leaders and leading dealers did not put in any chassis this year in order that the crowds that hang about them might not interfere with prospective customers. These dealers say that it was a good move, for their spaces were crowded as usual, but by a lot of people who were real buyers and to whom a chassis display was not a novelty.

Then there were a great many more dealers from New England at the show. Manager Chester I. Campbell said that last year a little more than 3,000 men identified with the industry were registered. With the show but 2 days old this number had been increased by nearly 300, and many outside dealers do not register until the middle of the week to stay to the finish, so many more are coming.

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Denver Show Good Advertising

DENVER, COLO., March 7—Denver dealers in automobiles and accessories are unanimous in declaring the outlook highly favorable for a heavy trade in their line this coming season, and their prediction is strengthened by the business indications developing at the twelfth annual automobile show now in progress at the Auditorium. The event will last one more day, and it promises to prove profitable to all participating.

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DES MOINES, IA., March 8—Forty thousand people saw the fourth annual show of the Des Moines Automobile Association, which closed at the Coliseum tonight. Sixty different makes of cars were shown with a total of 200 models. A consensus of opinion among the dealers was that not less than 20,000 cars would be sold in the state this season.

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BRIDGEPORT, CONN., March 10—The largest automobile show in the history of Bridgeport came to a close Saturday night at the Park City Rink. During the entire week the building was filled with automobile owners, prospective buyers and sightseers and the paid admissions numbered 7,500.

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ST. LOUIS, MO., March 11—The Eighth Annual St. Louis Spring Automobile Show which was held in this city the week of February 24, was one of the most successful from a business standpoint ever held indoors in this city.

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PITTSBURGH, PA., March 10—The third annual automobile and truck show held by the Pittsburgh Automobile Association in Exposition Hall was entirely the most successful exhibit of its kind ever seen in Pittsburgh. The attendance the first day was about 15,000, which was a gain of nearly 80 per cent.

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LOUISVILLE, KY., March 8—After having held attention since Wednesday evening, in the First Regiment Armory, which covers 54,000 square feet of floor space, what is believed to be the best business show ever held south of the Ohio River closed tonight. Many car sales were reported and attendance was good.

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Rims Occupy S. A. E. at Cleveland

CLEVELAND, O., March 12—*Special Telegram*—Following the regular March meeting of the Council of Society of Automobile Engineers, which was held at the Chamber of Commerce here this morning, at which meeting, in addition to the regular routine business, it was decided to appoint a fuel committee to co-operate with the recently-formed similar committee of the National Association of Automobile Manufacturers, the hearing before the pneumatic rim standardization division of the society was opened.

About thirty-five engineers and representatives of the rim makers were in attendance, while, in addition to the members of the council, the Rim Committee, consisting of Henry Souther, chairman; G. G. Behn, Hudson Motor Car Co.; T. W. Guthrie, Standard Welding Co.; F. H. Moyer, Firestone Tire and Rubber Co.; W. C. State, Goodyear Tire & Rubber Co.; C. B. Whittlesey, Hartford Rubber Works; C. B. Williams, Mott Wheel Works, were present. J. G. Vincent, Packard, and H. L. Barton, General Motors, were unable to attend.

There have been a number of letters of protest received by the society as to its appointing interested men on its committee, but it was shown to be desirable to have these experts so that their testimony might be used to the committee's advantage. The number of rim makers on the committee, however, is in the minority.

To facilitate the work of uniformly recording the testimony of the various makers, the committee prepared previous to the meeting a list of the points considered vital to the investigation, and the witnesses were examined along these lines. The committee has recognized the work of the Clincher Rim Association as applied to the one-piece type. It was made clear that while standardization was sought progress would not be checked, in that anything fixed by the division would be done so, with the idea of later changing the standards providing such changes were made.

The investigation was opened by the taking of testimony of representatives showing quick detachable rims as distinguished from the demountable types. There were four samples of strictly detachable rims. Each representative was questioned as to the weight of his type, whether it could be sold in competition, how it withstood service, method of operation, number of loose parts, its adaptability to wire wheels, whether the standard dimensions of the Clincher Tire Association had been adhered to and whether it could be manufactured by any mill without special machinery. Other special questions were put in order to bring out as far as possible every feature of every type exhibited.

At the morning session three rim representatives were quizzed, these being W. L. Burgess, Firestone; O. W. Mott, Mott Wheel Works, and E. R. Hall, Goodyear. It is probable that the inquiry will extend over several days.

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Proposes Regulation of Tire Width

NEW YORK CITY, March 10.—George McAneny, president of the Borough of Manhattan, had an ordinance introduced today in the City of New York, which is intended to regulate the width of vehicle tires and the loads carried thereon as well as the body width of vehicles. Objection has been raised to the excessive width of some automobile truck bodies because they practically limit the right of way to one direction along certain narrow streets. The ordinance proposes a standard maximum body width of 6 feet 6 inches and to tax all additional widths as follows: 6 feet 6 inches to 7 feet, $5.00 per inch additional; 7 feet to 7 feet 6 inches, $10.00 for each inch in excess of standard; 7 feet 6 inches to 8 feet, $15.00 per inch in excess of standard; 8 feet to 8 feet 6 inches, $20.00 per inch in excess of standard, and 8 feet 6 inches to 9 feet 6 inches, $25.00 per inch in excess of standard. The regulations covering permissible weight on a wheel arranges for annual licenses ranging between $1.00 and $1,000 per year, according to excess load per vehicle. Where loads are greater than 10,000 per wheel the additional tax is $500 for each 1,000 pounds increase per wheel or fraction thereon.

Parcels Post Needs 100 More Automobiles

Trucks of Various Makes with Complete Equipment Ordered To Be Bought by Postmaster-General

Hupp's Company to Be Tribune Motor Co.—Crop Report Favorable—Western Insurance Underwriters Organize

WASHINGTON, D. C., March 6—One of the last official acts of Postmaster-General Frank H. Hitchcock, before he was succeeded by Albert Burleson, was to sign the recommendations made by the committee of award for the awarding of contracts for furnishing 100 motor vehicles for the parcels post service, as they may be ordered during the fiscal year ending June 30, 1913. These vehicles will be distributed throughout the country. The contracts were awarded as follows:

The White Co., New York, five White cars, 1,500 pounds, $2,000 each; Stewart Motor Corp., Buffalo, ten Stewarts, model F, 1,500 pounds, $1,440 each; Kissel Motor Car Co., Washington, ten Kissel Kars, 1,500 pounds, $1,350 each; Durant-Dort Carriage Co., Flint, Mich., ten model C, 1,600 pounds, $1,225 each; Louis J. Bergdoll Motor Co., Philadelphia, ten Bergdoll 30 delivery cars, 1,500 pounds, $1,240 each; Atterbury Motor Car Co., Buffalo, ten model A, 1,500 pounds, $1,323 each; the Willys-Overland Co., Toledo, ten model 69 delivery special, 900 pounds. $1,000 each; Studebaker Corp. of America, Detroit, five model 20 delivery wagons, 750 to 1,000 pounds, $755; Prest-O-Lite tank, $25 extra; C. B. B. Motor Car Co., Washington, ten Modern model B, 1,000 pounds, $1,270 each; Waverley Co., Indianapolis, five machines, 1,000 pounds, $1,739 each; Kentucky Wagon Mfg. Co., Louisville, five model 10 Urban, 1,000 pounds, $1,793 each; Ward Motor Vehicle Co., New York, five commercial type EA, 1,000 pounds, $1,975 each; Baker Motor Vehicle Co., Cleveland, five model H, 1,000 pounds, $2,000 each.

Each car is to be equipped with the usual accessories, including windshields, lamps, horns, storm curtains, tools, etc.

To Sell Matheson Plant

WILKES-BARRE, PA., March 10—William C. Shepherd, receiver of the Matheson Automobile Co., has been directed to sell at public auction the right, title and interest, etc., of the company on April 21, at 10 a. m. The property will be offered for sale in separate parcels, most of which is subjected to mortgages. It includes real estate, buildings and equipments on which there is a first mortgage of $200,000 of which there are outstanding $183,200 bonds carrying interest amounting to $4,268.56. There is a second mortgage of $105,000 of which there are outstanding bonds $68,500 together with interest. The total of mortgage bonds with interest on April 21, 1913, will amount to $257,222.11. Bids must be accompanied by a certified check or 10 per cent. of the total amount.

Nearly 200 Inquiries on Thomas Sale

BUFFALO, N. Y., March 12—(*Special Telegram*)—The entire plant of the E. R. Thomas Motor Car Co. is to be sold at public auction beginning Monday morning, March 17 at the plant on Niagara street. There are 5,843 catalogue lots in this sale and it will require about 6 full days to complete the auction. J. E. Conant & Co., auctioneers, of Lowell, Mass., will conduct the sale. As a result of advertising about ten inquiries have been received from Europe while those from the United States and Canada total 180 in 30 days. Articles to be sold include modern high-speed automatic and other machine tools with machinery and mechanical equipment. The Thomas sale will be one of the biggest auctions ever conducted in North America.

Hupp's Firm Is Tribune Motor Co.

DETROIT, MICH., March 10—It has developed that L. G. Hupp, formerly of the R-C-H Corp., and his associates cannot make use of the name Monarch Motor Car Co. for the new automobile concern which they have launched recently. Two applications for this title were filed at Lansing at about the same time, that of Mr. Hupp being superseded by a few hours by an application fathered by A. J. Bloom, F. J. Priest and E. L. Wallace, who have incorporated with a capital of $30,000 to manufacture motor cars. Consequently, Mr. Hupp had to decide on another name for his company, and he selected that of Tribune Motor Co. A low-priced car is to be manufactured in a factory on Scotten avenue. Mr. Hupp will head the company, while H. C. Limbach is to be chief engineer.

WASHINGTON, D. C., March 11—(*Special Telegram*)—The governmental crop report of March 1 shows percentages of wheat, corn, oats and barley on farms on March 1, 1913, to be considerably in excess of amounts on farms on March 1, 1912, with present conditions in the West, Northwest and Southwest as to all these crops unusually favorable, the crops on farms being greatly in excess last year.

INDIANAPOLIS, IND., March 10—A company to hold the patents of Thomas J. Lindsay has been organized in this city under the name of the Lindsay Automobile Parts Company, which has been incorporated with an authorized capitalization of $250,000. Mr. Lindsay is the inventor of many devices and automobile parts, including the Lindsay roller bearing axle. The company will hold these patents and control the licenses granted other companies for manufacturing purposes.

The officers and directors are: Mahlon E. Bash, president; Joseph T. Head, vice-president and Matt W. Lowder, secretary-treasurer. Mr. Bash and Mr. Lowder are officers in the Lowder Manufacturing Company, manufacturers of automatic timing devices.

Stromberg, Accessory Pioneer, Dies

CHICAGO, March 10—Alfred Stromberg, former president of the Stromberg Motor Devices Co., died Saturday noon at his home in this city of apoplexy. He had been ill 3 weeks. He was born near Stockholm, Sweden, March 9, 1861, and lived to be 1 day less than 52 years old. He learned the telephone business in Sweden, coming to Chicago in 1883, where he identified himself with the Chicago Telephone Co.

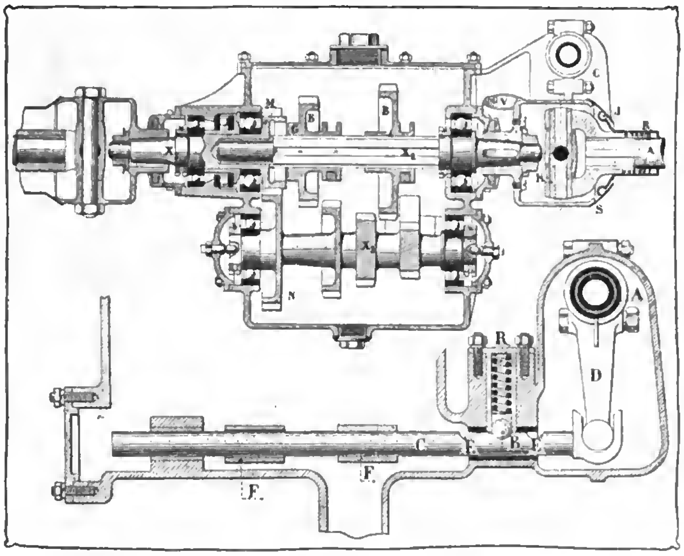
BATTLE CREEK, MICH., March 8—The annual meeting of the stockholders of the Castle Lamp Company, the factory of which is at Battle Creek, Mich., was held in Toledo on February 28, and practically all the stockholders were represented.

The directors elected by the stockholders were: E. A. Williams, Jr., Walter Stewart, Royal R. Scott, Rathbun Fuller and C. B. Mertz. These met afterwards and elected E. A. Williams, Jr., president; Walter Stewart, vice-president and treasurer and Royal R. Scott, chairman of the Board and secretary.

Western Underwriters Organize

CHICAGO, March 11—Lower rates of insurance on new models and higher rates on second-hand cars will result from the formation of the Western Automobile Underwiters' Association in this city recently and an alliance with the Automobile Underwriters Conference, the parent body, to be effected soon. With the new organization established as a subsidiary body to the conference, the Eastern schedule of rates will be adopted.

The schedule of rates now in force in Chicago and the Middle West do not differentiate between the new and the second-hand machine. For example, the owner of a 1913 model, listed at $3000, who wishes to insure against fire and theft for $2,500, must pay a rate of 2.5 per cent. or an annual premium of $62.50. The owner of a second-hand car, put on the market 2 years ago and selling then for $3,000, wishing to insure for $2,500, pays a rate of 3 per cent. on $1,500, 40 per cent. being deducted from the desired amount of insurance for depreciation, or a yearly premium of $45.



Figs. 6 and 7—Change-gear system in Sizaire-Naudin car

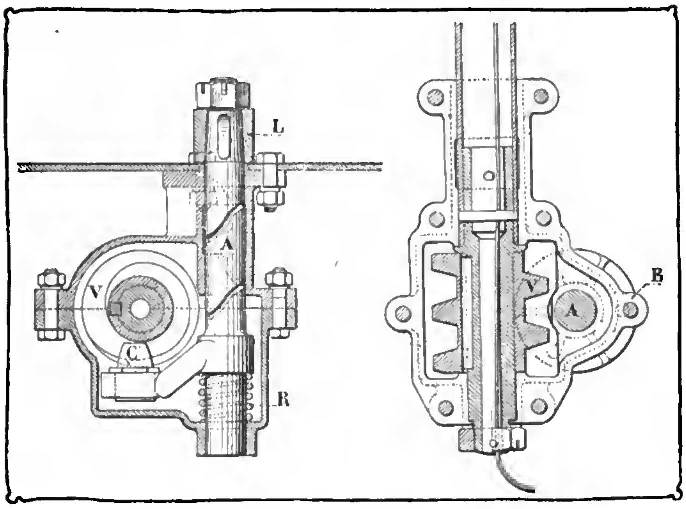


Fig. 8—Self-adjusting steering gear for small car

part G and push back the front part of the sheath. Then the adjustment nut can be reached with a spanner. If the cone is to be dismounted, the front end of the short shaft connecting the universals is allowed to drop, and then the spring-adjustment nut, the ball-bearing abutment B and the spring can be removed, whereafter the cone can be withdrawn.

Fig. 5 gives a view of the clutch mechanism and a part of the motor in a 25-horsepower Rochet-Schneider car.

The construction of the clutch proper, as shown, also applies to the 12-horsepower model of the same make, in which, however, the universal joint is omitted, as the motor, the clutch and change-gear box are supported on a single aluminum casing, differing from ordinary unit construction in this that the casing is open at the top between the motor and the gear box cover, so as to leave the clutch as accessible as if the parts were separatély mounted.

The clutch-operating parts in the 25-horsepower model are all inclosed, and the cone is of the inversed type with special provisions for preventing oil from straying onto the cone facing. To this end, the flywheel is made in two parts, the female cone being formed as a separate annular lip, and the annular space *h* between this lip and the flywheel rim receives all oil which may be thrown out centrifugally from the central parts. The latter are oiled from the bore H which constitutes an oil reserve in the end of the crankshaft. Every time the clutch is released, the clutch shaft which is aligned and supported in the bore H, acts as a piston, driving a small amount of oil back through its own hollow center. The oil supply is renewed at the filler *j*.

The rest of the unique construction relating to the conservation of the clutch control mechanism may be understood from the drawing, in which Q is the primary shaft supported in ball-bearing N, L the clutch pedal shaft mounted in the gearbox, M the clutch brake, O the universal joint surrounded by a bell-shaped casing secured to the primary shaft at the rear and by a felt-lined joint P to the hub of the sheet-steel cone. K is the end-thrust ball-bearing of the clutch spring, and *l* that of the clutch pedal movement which is received through a sleeve mounted upon the primary shaft and abutting against an intermediate piece sliding in a slot in the shaft and in turn bearing against the universal. There is, by this construction, no break in the continuity of mechanism from the clutch cone to the gearbox and no chance for dust to enter or oil to escape—all of which relates to the reduction of maintenance cost.

The motor comprises a four-cylinder (110 bore by 140 stroke) block casting with very long bearings in which the oiling is safeguarded by a very powerful pump D, which filter E, driven from a spur gear mounted directly upon the crankshaft at one side of its middle bearing.—From *Omnia*, February 22, and *La Vie Automobile*, February 22.

FEATURES of 10-12 Horsepower Car.—In addition to the clutch of the small Sizari-Naudin car mentioned in the preceding note, the change-gear and the steering-gear in the same model are also interesting. The gearbox is shown in Fig. 6 and the control and locking system in Fig. 7. The three front speeds and the reverse are controlled by two shifting forks which extend horizontally from the left side of the gearbox. The lever for operating them is of the type which is worked transversely. By placing the intermediate shaft X, below the primary shaft X_1 and the secondary shaft X_2 and keeping only the intermediate shaft submerged in oil, the level of the latter is kept far below the level of the sliding gears and the stuffing-boxes through which oil is likely to exude, with the result that the gathering of dust and oily grime is largely avoided.

All journals are ball-bearing, and the primary shaft has an abutment and an end-thrust ball-bearing between the two radial bearings, relieving the latter of those stresses which cause most wear. The control of the shifting-forks is completely inclosed in a small casing C attached at the front left of the gearbox. The locking device is inclosed in a separate portion, V, of this casing and can be inspected by removing two nuts from the cover of this portion.

Each of the two sliding gears is controlled by one of the forks FF, and each of these is mounted upon both of the selector-rods, which lie side by side, but is of course secured only to one of them, while the other in each case acts as a guide rod, passing through the boss of that fork which it does not control with an easy sliding-fit. Each of the rods can be engaged by the arm D, Fig. 7, which is fixed upon the shaft A of the operating-lever. Three notches E correspond to the three possible positions of each selector-rod, and a steel ball B is pressed into each notch by a strong spring R according to the position to be secured. A definite lever movement is required for dislodging the ball.

Steering of the Sizaire-Naudin car is especially hedged with precautions against wear and play, embodying devices for taking up all play automatically. A worm gear V with very coarse thread is secured upon the steering port, but does not engage a screw or sector. A conical finger C is secured to an arm mounted upon the shaft A of the steering-arm L and extends into the thread of the worm. Rotation of the latter naturally causes the finger C to move up or down and a corresponding movement of the steering-arm.

The shaft A is constantly pushed by the spring R, so that the tendency of the finger is always to seek the bottom of the thread. It is noticed that this spring action is at right angles to the steering effort and remains unaffected by shocks upon the front wheels.—From *La Vie Automobile*, February 22.

Packard Service System Simple and Sure

Boston Branch Uses, Besides Time and Labor Records, Scheme of Checking All Accessories

SERVICE department systems are used because of their manifold advantages. Firstly, they enable the manager of the department to ascertain the exact cost of every repair job and to charge the customer no more than necessary for first-class work, without taking a chance of conducting the department at a loss to the company. Secondly, they minimize waste or loss of labor and material, thus directly reducing the two principal cost items. Thirdly, they make it possible to keep exact records of accessories, parts and equipment of automobiles brought into the department to be repaired, and to avoid completely or almost so the loss of such articles, which, if it occurs, means a loss to the company of just as much money as the article cost.

In the long run, a record system has the additional advantages of permitting the establishment of standards of repair cost and of determining exactly the comparative efficiencies and consequent values of the various workers. All this information may be obtained in a very easy manner, that is, by the use of a small number of forms filled out to record every essential operation done in the department. In the course of time this system may be more and more simplified, until it takes almost no work yet helps to keep efficiency at the top notch all the time.

As an example of an excellent scheme the service system of the Boston, Mass., branch of the Packard Motor Car Company, described below, is simple and has a number of strong points. One is the small number of forms used; another, that shop workers are hardly troubled at all with the record system, but that this work is done entirely by the office forces of the several departments; furthermore, there is provision for recording every essential detail, so that records form a good basis for correct minimum charges to the customer. These points hold good for all Packard service systems, the method being the same in all cases and the only difference lying in variation of details as carried out in the various plants.

The forms illustrated and described below are only the main five blanks. Outside of these, the Packard system includes the well-known time-clock card and a requisition form as well as a card-file form for the stock room. These, however, having been shown repeatedly with explanations of their use, in THE AUTOMOBILE, are not taken up in the following description. The forms

Form 21

PACKARD MOTOR CAR COMPANY OF BOSTON. Alvan T. Fuller, Prop.

Terms:
Cash ....
Charge:
No. ....

Make .... *Model* .... *Motor No.* .... *Date* *191*

Owner ....

Address ....

The following work is to be done:

When promised		Date from paint room			
Date from repair room		" " trimming room			
" " body "		" " finishing room			
" " testing "		" O. K'd			

The instructions hereon are correct.

Signed .... Per ....

Above order was received by .... Order Clerk.

Work Completed .... Inspected by ....

Delivered .... To ....
Signature

Fig. 1—Blank of job card used by Boston service department of the Packard Motor Car Co.

BODY EQUIPMENT

OWNER	STOCK	DATE REC'D
ADDRESS		DATE DELIV'D
JOB NO.	BODY NO.	LOCKER NO.
		TYPE

WITH BODY	IN	OUT
Rear fenders		
" fender brackets		
Tonneau floor boards		
Folding seats		
Robe rail		
Door handles		
Door lever		
Gasolene tank		
Front cushion		
Rear "		
Dome light		
" " bulb		
Speaking tube		
Enunciator		
Foot rest		
Hat holder		
Door hooks		
Fore doors		
Paint body		
Monograms		
Top		
Envelop		
Top straps front		
" " rear		
Storm front		
Top supports		
" bow separators		
Tail lamp brackets		
Rumble seat		
IN LOCKER		
Tonneau mat		
Front floor boards		
Enclosed body keys		
Toilet cases		
" bottles		
" mirror		
" pad and pencil		
" match case		
" ash tray		
" card case		
" watch		
Silk window curtains		
Umbrella cups		
Enclosed body bolts		
Dress guards		
Seat covers		
Front outside side curtains		
Flower vase and holder		
BATTERY		

MISCELLANEOUS	IN	OUT

Reproduction of form in five-sixth of full size

Fig. 2—Body equipment part checking card

here shown and described, with an explanation of their purpose and use, are:

1. The job card or order card.
2. The name and number tag.
3. The equipment checking blank.
4. The claim tag.
5. The body equipment blank.

Taking these forms up in the order of their numbers, the first to consider is:

1. The Job Card or Order Card—This form is 7 by 12 inches, and is made out in the main office as soon as a car is brought in by its owner to be inspected or repaired. The form comes in pads of consecutive triplicate blanks, a yellow original, a white carbon duplicate and a third copy on thin tan cardboard. When the customer brings his car in, the order taken by the superintendent of the department is typewritten on the form, Fig. 1, noting, on the top of the page form, the model car and motor number of the machine, the date on which it is brought in, the name and address of the owner and the terms at which the work ordered is to be carried out. Then, the details of the work ordered are entered on the blank and when the latter is filled out completely in so far as the customer's wishes are concerned, the yellow copy remains in the superintendent's office, the white copy is sent to the coach department and the tan cardboard copy is attached to the car. It is carried in an envelope designed specially for this purpose, which is fastened to the steering wheel.

2. The Name and Number Tag—Whatever transactions are carried out in the service department and which refer to a certain car, are recorded on blanks on which the job number and the name of the car owner appear. To insure this, the tag, Fig. 3, is filled out. As a matter of fact, about fifty or seventy-five such tags are made out, by means of a tag-printing machine, as soon as the motor car is received in the service department. A number of these tags are used for labeling the accessories which are taken off the car—which phase of the work is described further below—while the rest are put in the aforementioned envelope and carried on the car.

3. The Equipment Checking Blank—Before the car is sent out of the shop, however, all accessories which are removable are taken off, recorded and numbered by means of tags, after which they are locked together in a special bin by themselves. This work is done most carefully and every part and accessory, whether part of the regular Packard equipment or not, is noted on the form, Fig. 4. This blank is 8.25 by 20 inches in size and printed black, being ruled red and blue. It is made out in duplicate with a carbon which is given to the owner as a receipt for the equipment. When the car comes out of the shop again, the clerks specially employed for this purpose go over it and check every single item on the record. If a part or accessory which was there when received is missing or damaged, the

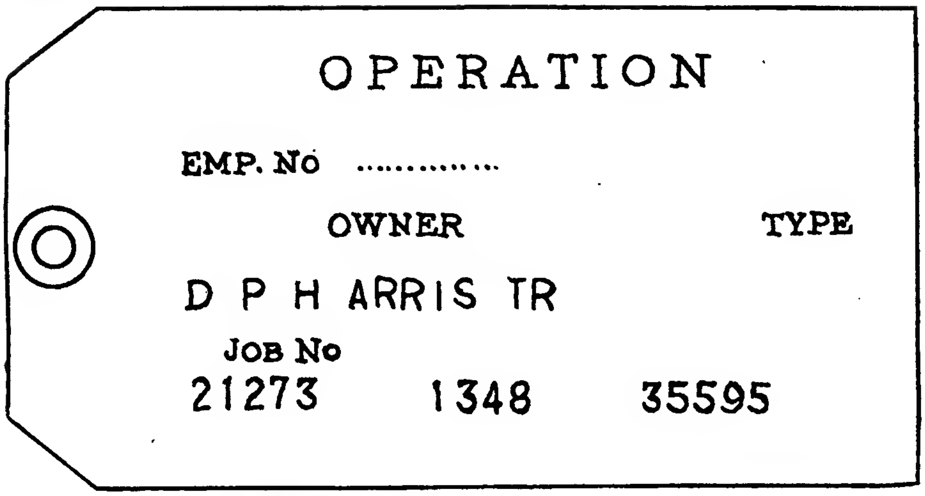


Fig. 3—Tag used for labeling accessories and noting parts needed

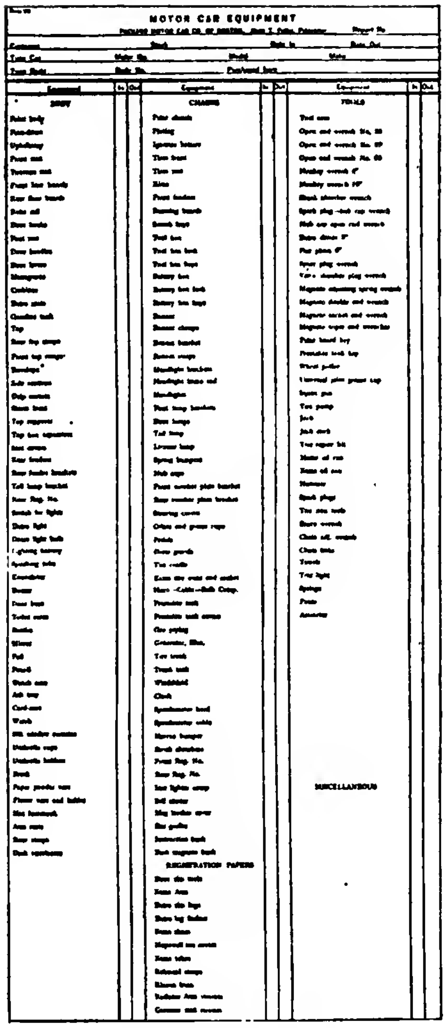


Fig. 4—Accessories record

Packard company makes good for the loss incurred. While here only the front side of this blank is shown, it should be stated that the reverse is also printed, so as to permit recording the accessories and parts of top, body, lamps, horn, batteries, tires and whatever miscellaneous, special accessories are carried on the car.

4. **The Claim Tag**—This form, Fig. 5, is an original blank, especially introduced by the Packard company for the recording of accessories which are brought in by the owner of a car later than the car itself, but which he wants put on the car in connection with the work done in the shop. This form is 3 by 7.5 inches in size and printed on tan cardboard of the shape seen in the illustration. The lower portion of the blank forms a coupon which is torn off after the form is filled out and is given to the owner as a receipt for the accessory brought in. The claim tags are consecutively numbered.

5. **The Body Equipment Blank**—This form, Fig. 2, is 8.5 by 11.5 inches in size and is used, when repair work is done on the body or if the latter is painted, so that it must be taken down and all its parts be disassembled and stored by themselves. If this is needful, exact recording becomes necessary, as in the case of accessories, and the form used in this case serves exactly the same purpose, in its special field, as form, Fig. 4, for checking accessory and equipment of the car. A record is made of the parts which remain on the body and of those which are taken off it and placed in a locker to be reinstated and checked after the body is ready to leave the department.

Following is the method adopted for handling the forms by the clerical force.

1a. **Use of Job Card**—The blanks of this form, like all other forms, are stored in the stationary department, except for a relatively small number of pads stocked in the office of the superintendent of the service department. The blanks are filled out by an office clerk, and attached to the cars while a copy goes to the coach department, as already stated. The copy affixed to the car stays there, and after the repair work has been completed and every item checked by the workers who carried out the operations the shop foreman or a clerk of his enters the cost of labor and material used on the back of the card. The coach department copy remains with the foreman of that department and after the work is completed there it is returned to the main office. If the coach department has no work to do on the car, the copy is sent for by the superintendent's office, when the car is ready to be turned over to its owner.

2a. **Use of Identification Tag**—The tags are prepared in the main office and after part of them have been used by the accessory checking clerks, the remainder are placed in the same envelope with the job card. The workman operating on the car is not troubled with any detail work, but when requiring a part makes a note on a tag, the detail work of making out a requisition being taken care of by a clerk used to do this work. The stock records are of course also worked by clerks.

3a. **Use of Equipment Blank**—This blank is filled out simultaneously with the dismounting and tagging of the accessories, and by the same people. When the repairs are complete, the same clerks mount them on the car again and check them.

4a. **Use of Claim Tag**—All blank claim tags are stocked, with other blank printed matter, in the stationery department. When accessories are brought in and registered on them, this is done by the clerks checking off the accessories and parts.

5a. **Use of Body Equipment Form**—The majority of these forms is kept in the stationery room, but a number of them are held in the body shop and when it becomes necessary to overhaul a body a workman and a clerk of this department go to work on it, the one taking down whatever parts may be disassembled and the other recording them and putting them in a suitable storage place. When the work on the body is finished, the parts are put back in place and the form after having been checked is turned over to the superintendent's office.

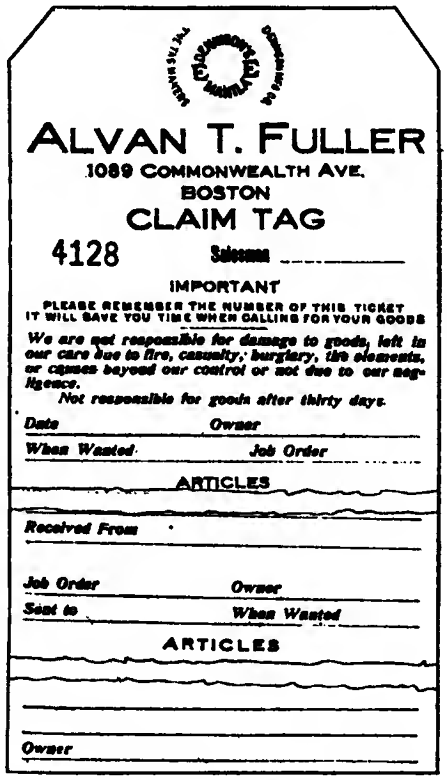


Fig. 5—Packard claim t

The Engineers' Forum

Carbureter Manufacturers on Carburetion

Makers of the Zenith, New-Miller, Newcomb, S. U. and Solex Give Their Views

Ideas on the Subject Differ Widely But All Agree That There Are Many Factors To Be Considered

¶*N. R. Heftly Finds That Results Depend on Practically Every Part of the Car—L. H. Colvin Lays Stress on Machining—Holtzer-Cabot Co. Features Control—G. W. Skiner Gives Test Results*

AT the present time interest in the problems of fuel economy and carburetion is so widespread that THE AUTOMOBILE decided that it is time for the automobile public to hear from the carbureter manufacturers as well as from the engineers who have been giving expression to their views on this subject in The Engineers' Forum. Accordingly letters were sent to most of the leading carbureter makers in this country as well as to some in England and France. Some of the replies have arrived and are printed herewith.

The ideas of the carbureter manufacturers should be of great value in studying this fuel problem, especially as practically all of the makers are conducting research work and making experiments with a view to bringing about improvements in design and a consequent increase in carbureter efficiency.

Results Depend on Many Factors

DETROIT, MICH.—The subject of increasing the mileage per gallon of gasoline is really very large and should include not only our experience on our own carbureter, but also some remarks of a general character, as, indeed, the mileage obtained, not out of a carbureter, but out of a car, depends on everything from the shape of your body to the type of your tires and the condition of the road, including all the intermediate parts, such as carbureter and motor, ignition, transmission, brakes, bearings, and the skill and individuality of the driver. We have also failed to mention the muffler, which is very important.

We have always refrained from stating the guaranteed mileage per gallon with our carbureter. Our only claim is that, other conditions being equal, we will give either increased mileage or an increased pick up, or a higher speed, or a combination of all these advantages.

There are, however, several points which have lately come to my attention, and which might be interesting. The design of the air passages from the carbureter to the intake valve is very often not made in accordance with the old principle that the less there is of an intake manifold, the better it will be. Emile Mors used to say of the intake manifold: "It is a necessary evil," but that was 5 years ago, and the foreign tendency is now to do away with as much of it as possible. There lies one of the great advantages of the pressure feed tank or of the tank in the dash. This shortening of the intake brings to a minimum the chances for condensation at the same time as it renders the carbureter more responsive to sudden opening of the throttle. The design of the valve pocket also has a great deal to do with the condensation, and there is more gasoline lost through the supplying of an over-rich mixture to overcome the condensation at low speed than one would imagine.

Then the driver should exercise proper judgment in driving and remember that every foot and pound of power wasted costs a few cents. When a bicycle rider approaches an obstruction he will slow down as soon as he sees the obstruction; the careless driver will keep on with his foot on the accelerator pedal until he comes near to it, and then applies the brake:—Cost, gasoline and rubber.

It must also be remembered that sudden acceleration as well as sudden braking is very wasteful.

These remarks do not apply to our carbureter any more than to any other carbureter. While we do not pretend that ours cannot be improved, we merely mean to say that the discrepancies in the results obtained from a standard carbureter show conclusively that the greatest work to be done towards economy is within the province of the motor designer and of the individual driver.—N. R. HEFTLY, The Zenith Carbureter Co.

Machining Is an Important Feature

INDIANAPOLIS, IND.—When the layman can realize that gasoline will find its way through almost microscopical crevices and that at no great distance in the future the price will be almost prohibitive, then, and not till then, will he appreciate some of the well-known facts that apply to the carbureter as well as any other part of his car.

There has never been a machine put on the market for producing and machining metal that will turn the work out automatically at a high rate of speed and hold all dimensions to a plus or minus of a half thousandth or less.

To make a carbureter that will be machined so that it is gasoline-tight, the dimensions must of necessity be held closer than the well-known term steam-tight.

Now, to illustrate: Notice the sectional cut-off of the New-Miller model A, shown in the illustration. The throttle, or butterfly valve, T, when closed is perfectly flat. You can realize the care necessary in machining this disk to bring it to correct dimensions and the care for making the under-cut in body. The exact dimension for the nozzle J over the needle is just three-tenths of a thousandth—no more, no less.

A clearance of one-thousandth on either side of the gas needle by actual test on a block will develop 2 to 6 horsepower.

Now, to secure economy in driving there are several things all must do and know.

FIRST—Gas mixture will burn at a certain speed. When the motor travels faster than the burning of the gas you have either reached your limit or you must lessen the quantity of gasoline, so that it will burn faster than the motor is traveling.

SECOND—The getaway, if quick, must be rich as the motor is not up to speed and can handle or burn the quantity.

THIRD—The intermediate speed or the average driving speed is the same as the "getaway" speed, as to throttle opening.

RESULT: If the driver insists upon a quick getaway with a rich mixture, immediately he is traveling at the average driving speed of 15 to 20 miles per hour he is wasting gas—not burned—of from three to four thousandths past his needle, or, in other words, from 2 to 6 horsepower of unconsumed gases.

The adjusting of our carbureter is most satisfactorily done by closing off the gas until the motor spits and then giving it one and one-half turns, or a lift of the needle equal to about three-thousandths. This is for proportions between speeds. Then in driving we always use the steering-post control. We cut the gas down until motor spits, reverse control and give one or two notches.

This control has command of all speeds and is on the gas only. The air is positive, is set, and mechanically operated. The driver has nothing to watch—he simple listens to the purr of the motor and can cut the quantity of gasoline fifty times a day as easily as opening and closing the throttle. There are no wearing parts —simply a clearance and as the parts controlling do not touch they remain perfect for years, accurately metering out a saving charge to the layman or the expert.

Where a person buys a carbureter that has been made by placing the joints to a surface grinder, by stamping a disk out of sheet metal for a throttle and leaning it against the wall of the body for a closed throttle, it is just as reasonable to expect a sieve to hold water as that carbureter to hold gas; and it is well to remember that the machining of the instrument, outside of design, makes for a very large percentage of the economy.—L. H. COLVIN, New-Miller Carbureter Co.

Controlling from the Steering Column

NEW YORK CITY.—To secure the greatest mileage per gallon of gasoline will frequently mean making sacrifices in other respects, such as running the motor very hot, thus increasing lubrication difficulties, and cutting down the maximum power, or heating the mixture, which will probably reduce the power and may interfere with the smooth running of the motor on account of the quicker burning of the charges.

The most practical way to economize fuel that we have tried is to place the lever controlling the load-carrying mixture in a convenient location, say, on the steering column, so that the proportion of fuel can readily be kept at the lowest possible limit for any given driving condition. This works out well with our system of fuel control which serves to uniformly increase or decrease the fuel proportion throughout the entire motor range. instead of the effect being concentrated at some particular throttle setting as is frequently the case.—THE HOLTZER-CABOT ELECTRIC CO.

Testing by Analysis of Exhaust Gas

NEW YORK CITY.—It is important in taking exhaust gas analysis that the samples of gas be taken under all circumstances. Owing to the peculiarities of the carbureter the combustion will be most complete in some particular set of circumstances. For instance, on a test of a certain small automobile it was found that it was possible to secure on the average about 22 miles to the gallon of gasoline on a level road running on high gear at an average speed of 18 miles per hour. Although it would seem that this mileage was very fair, it was found that the exhaust products were too rich in uncombined carLon in the form of CO. The same car was tested on Fort George Hill, New York City, and was able to attain 18 miles an hour on low gear up the steep gradient. The gasoline combustion was at the rate of 9 miles to the gallon, but the combustion was perfect. There was no free CO in the exhaust and the percentage of CO_2 was at a maximum. In order that a fair test for average performance be made it is necessary that both level and hilly country should be tried. Samples of gas should be taken with the motor running idly, with the car driving the motor as when descending a hill, with the car accelerating and when running up hill, besides taking ordinary flat roads at medium speeds.

It would also seem to be essential that in comparing the results obtained in testing, the conditions under which the tests were made should be taken into consideration.

When the motor is driven by the car in descending a hill there is a marked tendency on the part of the carbureter in many instances to flood and to furnish an exceedingly rich mixture. This will be noted in the exhaust by the presence of a large percentage of CO as compared to that found in the exhaust under ordinary circumstances.—LOUIS VAN RENSELLAER.

Results of Some Bench Tests

LONDON, ENG.—It may interest you to know of the bench tests made by our BX carbureter. It has a 1.75-inch bore and was fitted to an engine 3.54 by 3.94, rated at 40 brake horsepower at 3,600 revolutions per minute, this being a standard engine manufactured by a well-known automobile firm in this country.

We find that from cars fitted with 3.15-inch bore engines we have obtained as much as 32 miles per gallon of gasoline.

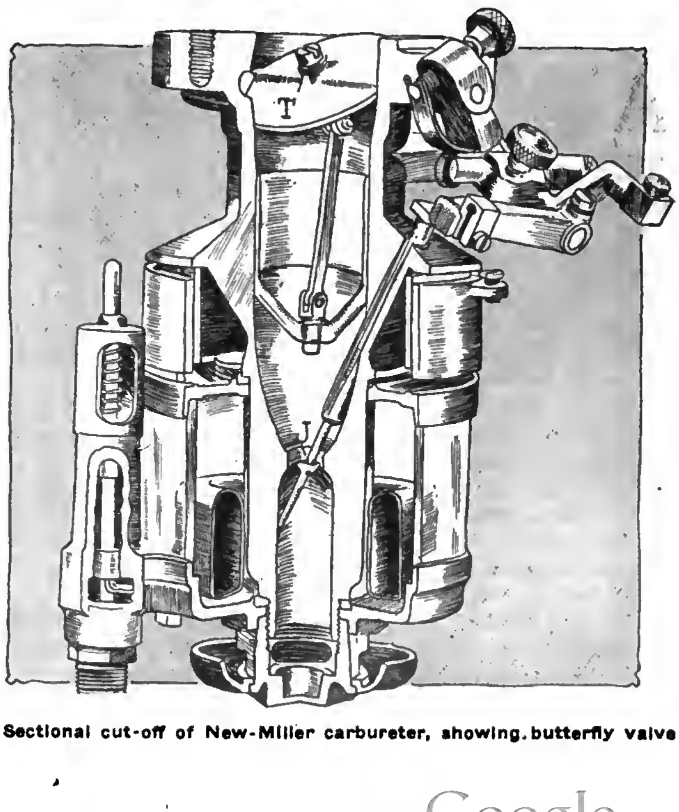
From a Chenard-Walcker car fitted with a 3.15 by 5.91 engine fully loaded with four passengers and being driven at an average of 25 miles per hour, 28 miles per gallon of gasoline has been obtained over give-and-take roads.

Standard 3.54-inch cars, which are used to a large degree in this country, weighing unladen from 30 hundredweight to 2 tons, will average 18 miles per gallon. Generally speaking, on passenger cars you can depend on getting 30 to 35 ton-miles per gallon. —G. W. SKINER, The S. U. Co., Ltd.

Trying Two Carbureters on Same Car

PARIS, FRANCE.—We find it difficult to give very precise data on the fuel consumption obtained with our apparatus. In fact, this varies within relatively wide limits according to the condition of the road, the nature of the carriage body, the manner of driving and the climatic conditions.

The only method which really means something consists in trying two different carbureters in the same vehicle under absolutely identical conditions, and it is only in this manner that the difference in consumption between two devices can be ascertained.—GOUDARD & MENNESSON.



Sectional cut-off of New-Miller carbureter, showing butterfly valve

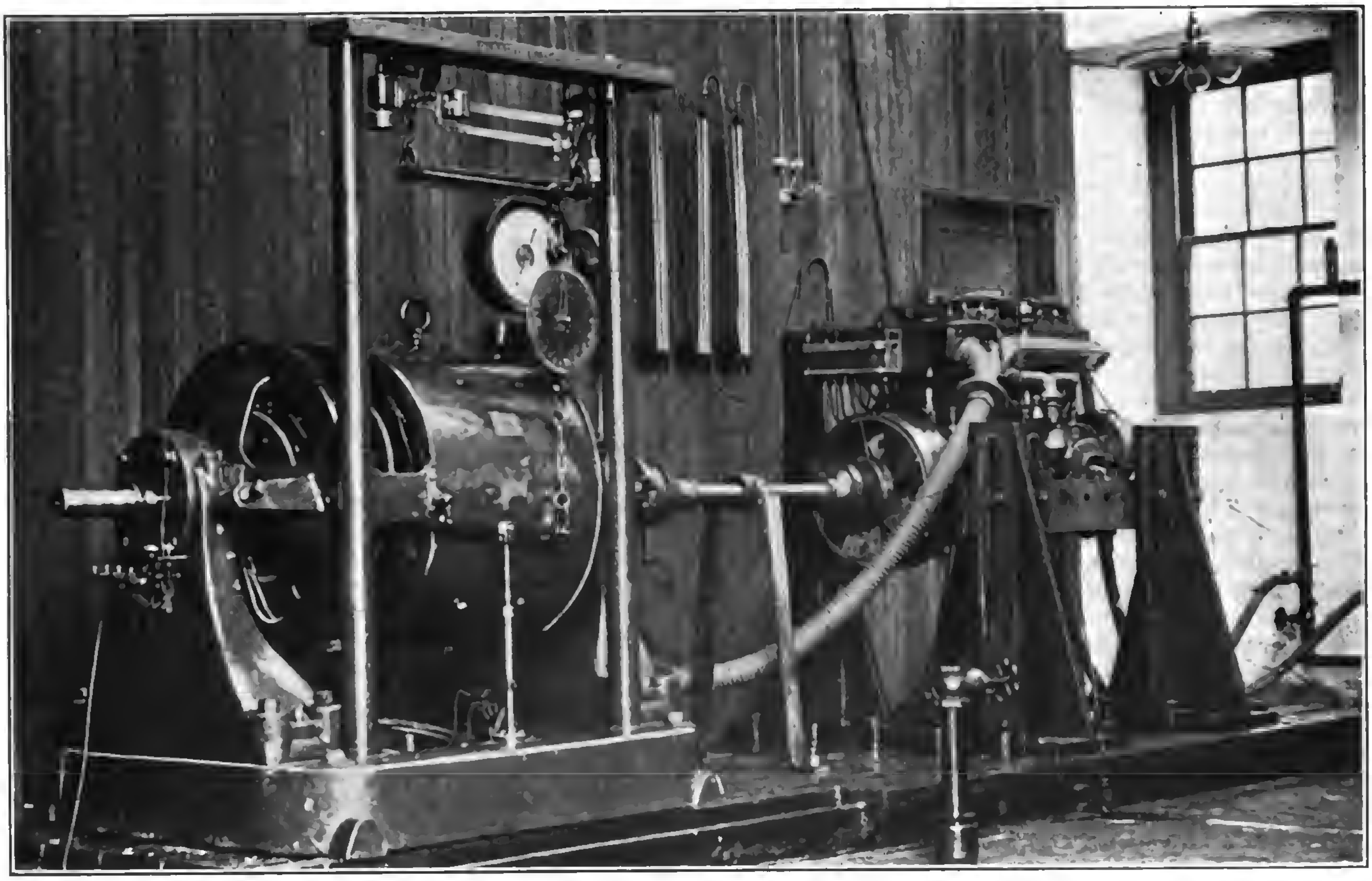


Fig. 1—Diehl electric absorption dynamometer connected to American motor at the Schoen-Jackson plant, Media, Pa.

Motor Testing Plants

Carbureter Manufacturers Alive to Necessity of Having Complete Apparatus for Accurate Testing Purposes

By J. Edward Schipper

A CORRECTLY designed carbureter can save its price in one season. It is a question of dollars and cents and as such strikes the automobilist in his tenderest spot—the pocketbook. It is the question that the carbureter manufacturers are trying to answer through data secured by the use of accurate testing plants.

Three main facts are determined by the use of carbureter testing apparatus. These are, the horsepower at any rotative speed of the motor, the fuel consumption per horsepower hour and the correct adjustment of the carbureter to attain the maximum efficiency at any given revolutions per minute. Besides these the weight and temperature of the cooling water before and after passing through the jackets is determined by sub-apparatus, the oil consumed is measured, the condition of the carbureter under conditions of speed variation can be found besides other important facts that go to make up a fund of data which is of the utmost importance in future design of the carbureter.

The presentation of them in curves is the most convenient manner of offering them and it also automatically guards against error because the nature of the curve is such that it must be fair and regular. It is therefore plotted so with due regard to the points secured from the readings given by the apparatus.

The layout shown in Fig. 1 is the installation designed by P. P. Dean, of the Diehl Manufacturing Company, at the Schoen-Jackson plant at Media, Pa. This laboratory in which the Feps carbureters are tested may be taken as an example to show the process of making these tests.

The apparatus consists of three principal parts; namely: the dynamometer, fuel weighing device and control mechanism. Besides these there are the necessary tachometers, pressure meters, thermometers and clocks to take the readings of speed, pressure, temperature and time which are necessary to secure complete data of the action of the motor and the carbureter. They are laid out about the room to suit the convenience of the operator, but should be in such positions that they are accessible with a minimum amount of effort on the part of whoever manipulates the plant. Taking the Schoen-Jackson layout as typical of a modern installation a brief description may be valuable: Imagine a rectangular room approximately 20 feet in length and 35 feet in width, partitioned off from the end of a long oblong-shaped frame structure devoted to the manufacture of carbureters. The partition forms the dividing wall between the remainder of the factory and the testing laboratory. It is one of the 35-foot walls of the room. The wall opposite the partition is pierced by a large window which furnishes an abundant supply of daylight through its eastern exposure. This light is supplemented by two windows in the north wall and numerous skylights.

Along the west wall, formed by the partition, is the dynamometer and motor supports. This is shown in Fig. 1. Behind the motor may be seen the door which connects the testing plant to the rest of the factory. The north wall supports the water measuring and fuel measuring apparatus and along the east wall is arranged the control mechanism which is portable, however. The motor to be tested is brought in through a large double door which pierces the east wall at its juncture to the south wall. The space along the south wall is left free to bring in an entire car if desired. Overhead there is a traveler which is used for lifting the motor from the chassis and placing it in the testing frame. At the Schoen-Jackson place the dynamometer frame and the motor frame are both supported by one massive cast-iron T-slotted base plate, weighing 8,000 pounds, stiffened on the under side by a number of parallel vertical ribs, cast in a concrete foundation anchored on bed rock, running longitudinally the length of the plate. The plate is stiff and free from diaphragmatic vibration. This plate is shown in Fig. 1, with the dynamometer and motor in place.

The dynamometer used on the Feps carbureters is of the direct-current Diehl electric absorption type. It consists of a steel frame fitted with commutating poles. The revolving armature is proportionately small in diameter to allow of high rotary speeds with comparatively small peripheral velocity. The steel frame is carried on two ball-bearing pedestals, one of which may be clearly seen at the near end of the dynamometer shown in Fig. 1. The pedestals are in turn carried on a heavy independent base plate. The ball bearings in this particular pedestal are of Hess-Bright manufacture and are practically frictionless, offering a negligible resistance to movement of the frame.

The armature shaft is extended and tapered to take a Spicer universal joint between it and the engine. A shield, carried by two stanchions, is placed around the Spicer universal shaft between the motor and the dynamometer to protect operators in case of fracture. The entire magnetic field frame rests in a ball-bearing cradle which offers no resistance to its free rotary movement.

Referring once more to Fig. 1, it will be seen that the motor drives the armature of the dynamometer by the universal shaft, or if desired, the engine may be driven by the dynamometer, when acting as a motor, through the same shaft. The motor can be started by means of an outside current which is allowed to flow through the windings converting the dynamometer into a motor. Owing to the magnetic drag between the fields and the armature, the entire field frame, swinging on the ball bearings, tends to rotate in the same direction as the armature, hence the torque. The torque varies with the magnetic drag. The magnetic drag is a direct result of varying currents in the field and armature, which currents may be controlled directly by the operator. The operator, therefore, has direct control of the torque and hence of the horsepower absorbed. Owing to the method of electrical connection the strength of the field current controls the load, therefore, the operator in controlling the torque need only manipulate the resistance in the field circuit. This is done at the master control table to be explained later.

Since the pull exerted by the armature is through a radius it will have to be reduced to horsepower by a formula in which cognizance is taken of this leverage. Matters can be simplified to a great degree if the radius is made 1.315 feet from the center of the shaft because the horsepower formula then becames:

$$\text{Horsepower} = \frac{\text{Pull in pounds} \times \text{revolutions per minute}}{4{,}000}$$

From this formula a chart is made up showing the horsepower delivered by the motor at any given number of revolutions per minute. This chart is shown in Fig. 4. It is placed upon a board on the master control table, shown in Fig. 2. The radial lines represent revolutions per minute, fifty apart, starting with 50 on the left line.

In order that the readings may be exact, it will be noted in Fig. 1 that there are two scales. First, a spring scale which gives the rough readings and then the double beam suspension scales which are set for finer readings down to tenths of a pound. The insertion of the spring scale in the line aids greatly in the rapid shifting of the weights on the beam scales to the correct points and therefore helps in taking quick successive readings from the beam scales. It is

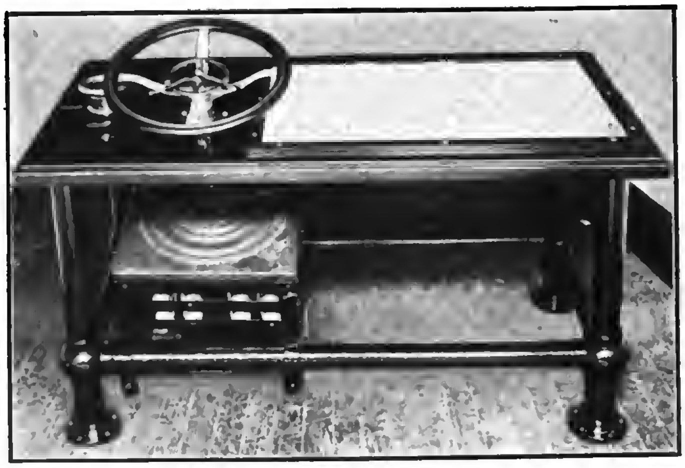


Fig. 2—Master control table, showing the steering wheel rheostat control which regulates the strength of the field circuit and the small wheel which controls the outside current

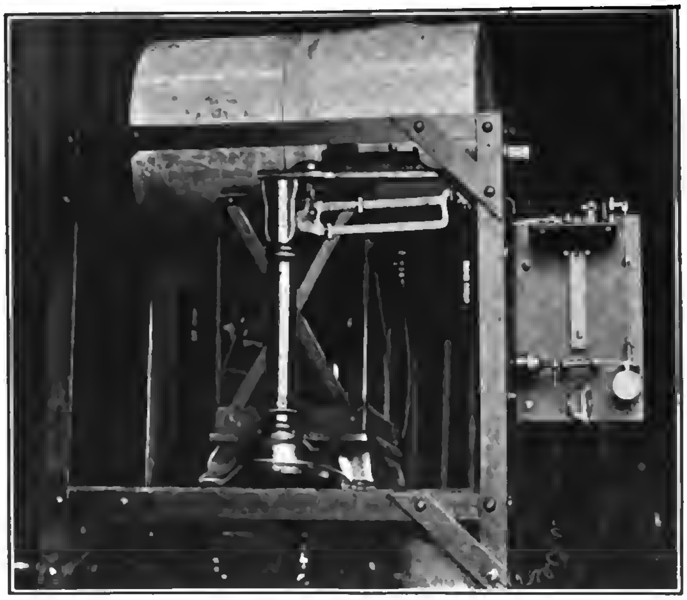


Fig. 3—Fuel measuring device with 50-gallon gasoline tank, telegraphic relay, stop watch and scales to register the time required to consume one pound of fuel and the number of revolutions

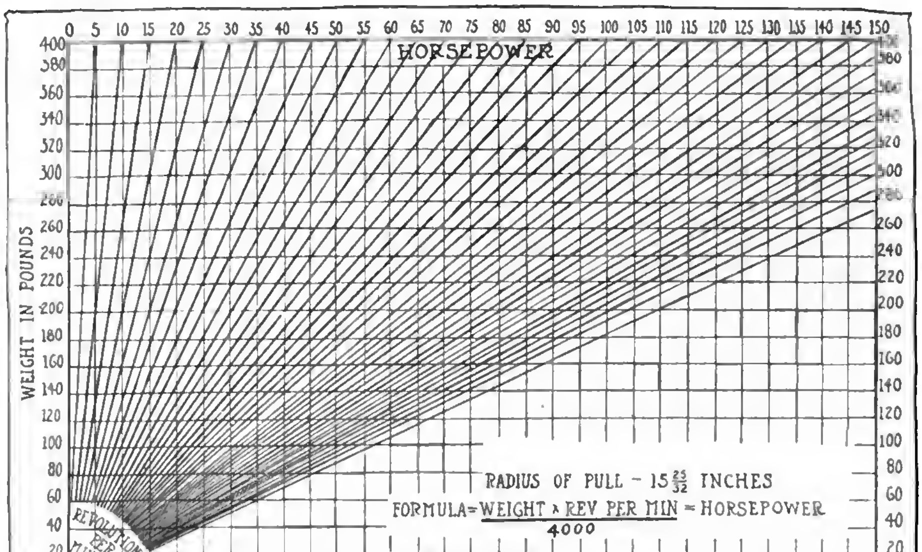


Fig. 4—Conversion chart for changing the pounds pull on the dynamometer to terms of horsepower. The radial lines represent revolutions per minute and start with 50 on the left and run at intervals of 50 up to 2,200 revolutions per minute

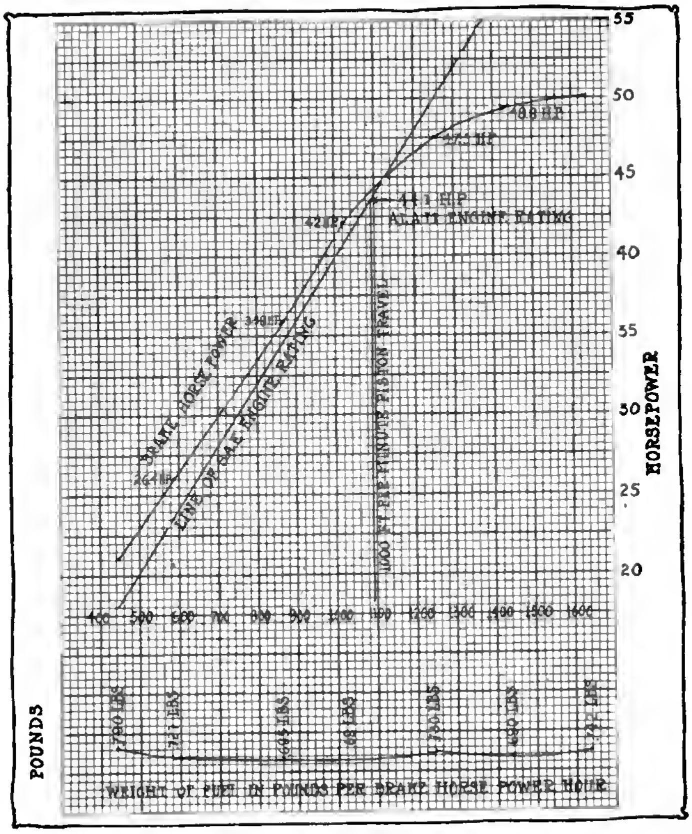


Fig. 5—Horsepower and fuel curve of 44 horsepower motor, Fepa carbureter

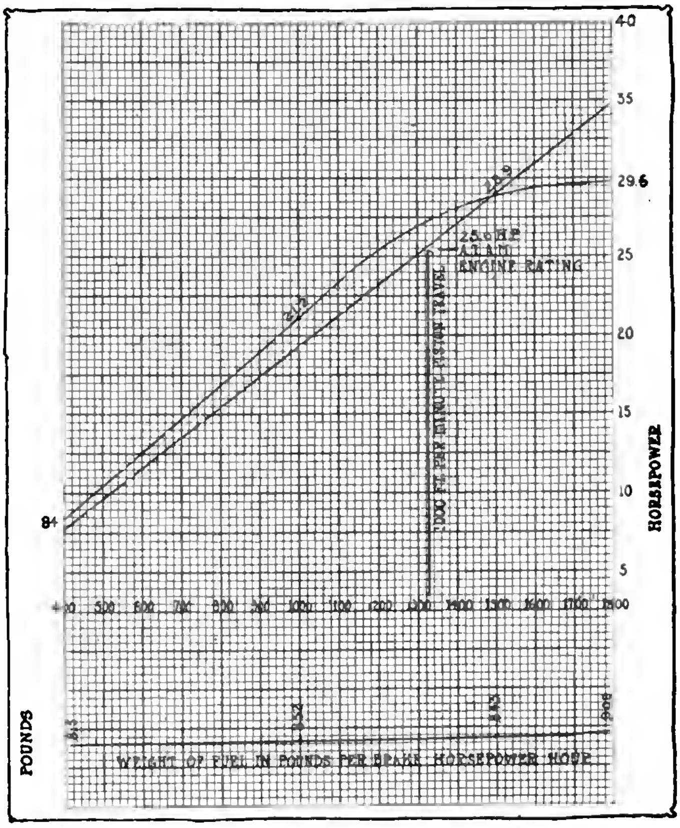


Fig. 6—Horsepower and fuel curve of 25 horsepower motor, Fepa carbureter

these readings which are depended on rather than on any readings taken from the spring scale.

One more reading must be taken from the dynamometer besides the pull in pounds exerted by the frame; this is the speed of rotation. In the Diehl installation at the Schoen-Jackson plant there are two tachometers for this purpose. One can be seen in Fig. 1 just behind the spring scale. It is of the mechanical type driven from the motor shaft. It is actuated by weights which spread apart in the manner of a centrifugal governor. The other, an electric tachometer, whose magneto is driven by the shaft at the extremity which projects from the pedestal to the left of Fig. 1. The flexible cable leading to the instrument may be seen dropping down from the shaft. This instrument may be brought to the master control table, Fig. 2, and be directly under the eye of the operator while his assistant stands at the machine and watches the dial of the other tachometer while manipulating the scales.

With the apparatus described thus far we are in a position to make the tests which result in the horsepower curve plotted on a basis of revolutions per minute.

Seated at the master control table, Fig. 2, we have before us a steering wheel similar in all respects to that upon the steering column of a car. The spark and throttle levers are in their customary positions and take care of the usual functions in the usual manner. The wheel, however, instead of governing direction manipulates the field rheostat shown beneath the table in Fig. 2. Just to the left of the steering wheel is a small wheel which corresponds exactly to the switch of an electric cranking motor except that in this case it controls current which comes over the wires from a central station instead of from a storage battery. Turning this wheel, the dynamometer for the moment becomes a huge starting motor. The ignition is switched on, the spark advanced, the throttle opened and the motor is off under its own power. The uses of the dynamometer as a starting motor are now at an end and the switch is turned to a point marked load, which throws the load resistance into circuit. This leaves the engine running under its own power and driving the dynamometer.

The chief operator remains at the control table, while at the dynamometer stands his assistant with his eye on the tachometer and the spring scale. The bar scale is for the time being hooked in place and cannot move. Suppose it is intended to take the first reading at 800 revolutions per minute. The throttle is opened until the desired speed is attained. From this point on, as the throttle is opened, the load is increased by turning the master control wheel, which increases the field resistance through the rheostat seen in Fig. 2. Finally the motor is running at the desired revolutions per minute with the throttle wide open. In other words, the motor is developing its utmost torque at the given number of revolutions per minute.

When the electric tachometer at the elbow of the operator at the master control table registers exactly 800 revolutions per minute with the throttle wide open he signals his assistant at the dynamometer, who immediately checks the speed on the mechanical tachometer and places the beam scales in position to take measurements. At the instant that the chief operator signals, the reading on the scale is taken and noted on a blank form opposite the cross heading 800 revolutions per minute. Two or three readings are taken at this speed to secure accurate results. From the conversion chart, Fig. 4, the horsepower is readily obtainable directly from the readings. After a set of these figures have been obtained they can be arranged in curvilinear form, as shown in the upper section of Figs. 5 and 6, which show sample curves taken on two motors at the Schoen-Jackson plant.

To measure the fuel a very ingenious device, designed at the Schoen-Jackson plant, is used. The 50-gallon gasoline tank is so arranged that the exact time through which 1 pound of fuel is consumed, together with the exact number of revolutions during that time, is measured with extreme exactness. The device is shown in Fig. 3.

The fuel-measuring mechanism consists of the tank, a beam scale, telegraph relay, transmitter, split-second watch and a Veeder revolution counter. The latter is magnetically thrown in and out of gear while the stop-watch is connected mechanically to the telegraph transmitter.

When the engine is operating under any given load the sliding poise on the scale beam, which is graduated to read in tenths of a pound, is set so that it almost floats, but remains in the upper position. As soon as the engine has consumed enough fuel to cause the beam to fall due to the reduced weight of fuel in the tank, the poise is set to 1 pound less and the beam again rises. As the beam dropped it hit the transmitter contact of the relay, which automatically started the stop-watch and threw the gears of the Veeder revolution counter into mesh with the dynamometer shaft. As soon as a pound of fuel has been consumed the beam again drops and through the relay instantly disengages the gears of the Veeder revolution counter and stops the watch, thus accurately registering the time required for the consumption of 1 pound of fuel and the number of revolutions during that time. This test can, of course, be carried on while the horsepower test is in progress and by combining the two the fuel consumption per horsepower-hour is determined. It is entirely possible for the assistant to be carrying out the fuel test while the operator carries on the horsepower test since the gauges for the horsepower test are in plain sight and the spring scale readings may be taken instead of the more delicate beam-scale readings. Since the results are to be plotted along a curve small errors are automatically compensated for by the required fairness of the curve.

The method of laying out the fuel consumption-horsepower curve is comparatively simple. The revolutions per minute can be taken on the tachometer during the time that the test is under way and the reading here checked back on the revolution counter. They should be the same if the motor has run steadily during that period. The pounds of fuel per hour can be figured from the reading on the stop-watch. This supplies sufficient data for the determination of the pounds of fuel per horse-power-hour.

By the use of thermometers and pressure gauges the temperature and pressure of the exhaust gas can be obtained. The pipe is so arranged that the action of a motor with and without a muffler can be duplicated. A by-pass is also placed in the line of the exhaust pipe so the products of combustion and the contents of the exhaust pipe may be noted at any time. Three vacuum gauges are used to determine the vacuum in the exhaust manifold and carbureter.

For use in determining the amount of water used in cooling there is an arrangement by means of which the temperature of the water entering the jacket can be measured as well as that of the water leaving the jacket. The velocity of the water flow is measured by pitot tubes, and knowing the time and velocity it is readily possible to calculate the flow in pounds per horse-power-hour or in any other units desired.

From the foregoing description it may be seen that there is practically nothing which may not be determined as regards the motor with the testing apparatus as outlined. Various road conditions may be simulated on account of the dynamometer's ability to act as a motor and drive the gasoline engine. For instance, the motor may be allowed to drive the dynamometer under a heavy load, as in climbing a hill, and then the dynamometer may be switched over suddenly to drive the motor as would be the case in going over the brow of the hill when the action of the force of gravity on the car would cause it to revolve the motor rapidly. Other parallels with road conditions may also be simulated by the operator.

With the successful testing of the motor and carbureter well in hand it is but natural that another step forward should be made. This has been done recently by the Diehl Manufacturing Co., which has brought out an entire chassis testing outfit of the type shown in Fig. 7. It is designed by P. P. Dean, their engineer. With this plant the operator may sit in the driver's seat, walk around the chassis or remain at the master control table and test every part of the chassis except the springs. The action of the gearset and rear axle and the different gear reductions may be ascertained. In using the chassis testing dynamometer set, the rear axle is rigidly fixed to a pair of cradles and provided with a pair of chain-sprockets in place of the ordinary wheels.

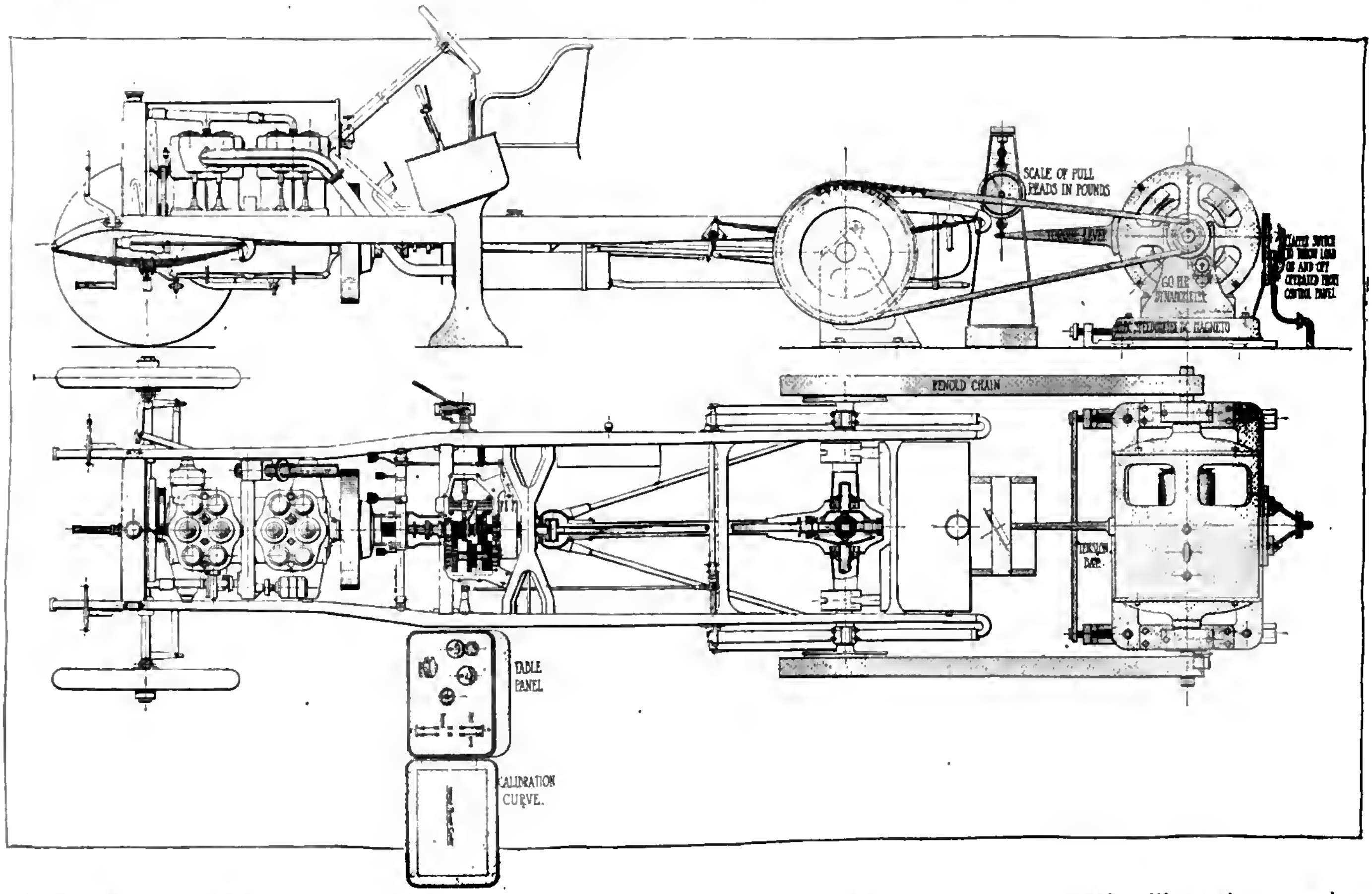


Fig. 7—Dean chassis testing dynamometer, by means of which many of the tests made on the road can be made with greater convenience in the laboratory

Frameless Glass Windows for Automobiles

By George J. Mercer

Body Designer

THE use of frameless glass windows on closed bodies is growing rapidly in favor. At the last Importers' Salon, held in New York, at the Astor Hotel, Jan. 2nd to 11th, there were twenty-two bodies having frameless glass while sixteen had windows with wooden frames.

There are, however, two very noticeable drawbacks connected with the newer method. One of these is the increased liability of breaking the glass, and the other is the letting in of water when it rains or when the car is washed. The letting in of water is not due to a mistake or fault, but is the accompaniment of one of the methods used in operating the glass.

Fig. 1, A, a cross section through the body of a limousine, shows the door pillar with the glass suspended by the lift strap. This window is of the frameless glass type and as illustrated the glass travels in a straight groove extending from top to bottom of the pillar, being supported at all times by the strap. The metal channel in which the lower edge of the glass rests and to which the strap is attached, is continuous across the whole width of the glass between the pillars. This channel always remains below the top of the bar and out of sight. The necessary clearance, however, to enable the glass to pass by the back face of the bar without touching, is sufficient to enable the water to enter. Where this method is employed, provision is made at the bottom of the door and body for drainage, and if the construction of the body is practically all metal no great inconvenience is experienced.

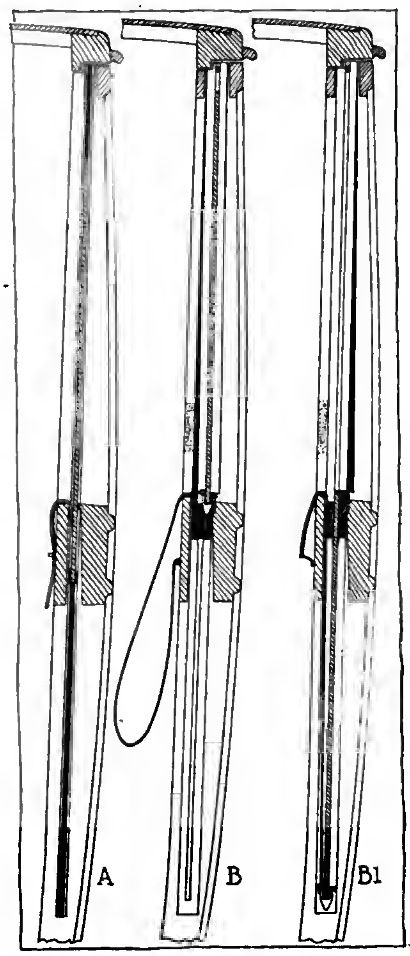


Fig. 1—Sections showing two methods of fitting

In some of the best bodies made this method is used with apparently satisfactory results. The two strong features in its favor are the safety with which the glass can be operated without breaking, and the opportunity that it presents of utilizing a mechanically operated lifting device. The disadvantage of this method is that it permits the entrance of water in the glass pockets with a consequent deteriorating effect on the wood framing of the body.

B and B1, Fig. 1, illustrate another method of operating the frameless glass window. Two positions are shown and the section of the body illustrated is the same as at A. These two illustrations show a method employed to overcome the tendency of the glass breaking when raised and lowered, and at the same time keep out the water. B shows the glass raised and the entrance of water effectively barred, while B1 shows the glass dropped to its lowest position in the pocket.

Fig. 2, an enlarged view of the door bar at B, Fig. 1, better illustrates the glass in raised position. The wood channel in which the glass moves up and down, is not one continuous piece, but is parted and is put in the pillar in two pieces. The lower half is stationary in the pillar and the top and terminates at A. The upper half of the channel is fastened with one wood screw at the top, in the center. With this screw as the pivot point the lower end of the channel moves in the arc of the circle from C to D and carries the glass with it. This channel terminates at the lower end at BB. A cross section showing the dimensions of the channel is given at E1. At the rear of the glass the channel has a downward extension so as to support the glass when the pull comes on the strap.

Across the lower edge of the glass is the metal channel K. The glass rests in this channel, being first protected by a rubber channel that fits over the glass and in turn fits into the metal groove. This metal channel K is very strong, so as not to bend when the strap is drawn tight. At the front the metal terminates in a lip or hook that slips over the fence iron on the door bar, thereby forming a watertight contact that prevents any leakage of water into the body. On the inner side the channel is flat and to the center are fastened lugs that provide attachment for the lifting strap.

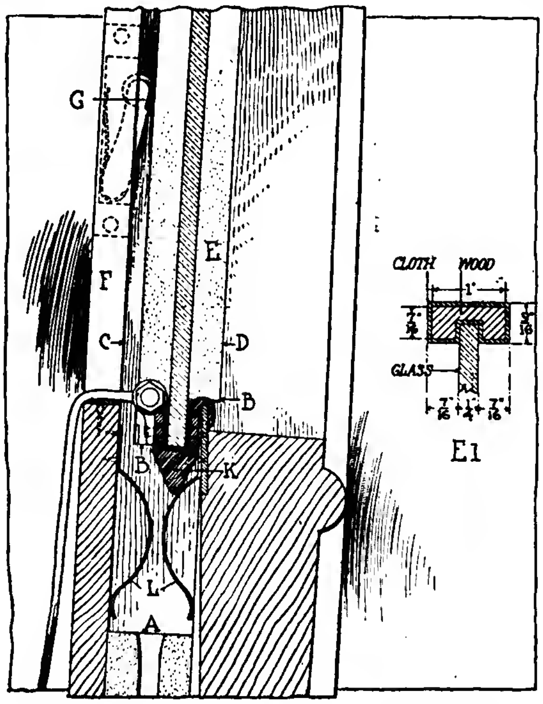


Fig. 2—Watertight method of supporting window

The position of the glass as illustrated is with the opening closed, when the glass is supported by the metal lip of the bottom channel hooking over the fence iron. In order to facilitate an easy movement forward of the channel containing the glass, a strong spring G, fitted with a roller at the end, is pocketed in the side of the groove and presses constantly against the channel.

When it is desired to lower the glass, it is first lifted slightly by the strap and then lowered, the two springs LL guiding it into the groove of the lower channel that commences at A. When in its lowered position the top of the glass is even with the top of the fence iron and the springs LL perform the duty of holding the glass rigid and prevent rattling.

Mirrors For Dangerous Street Corners

Insure Safety

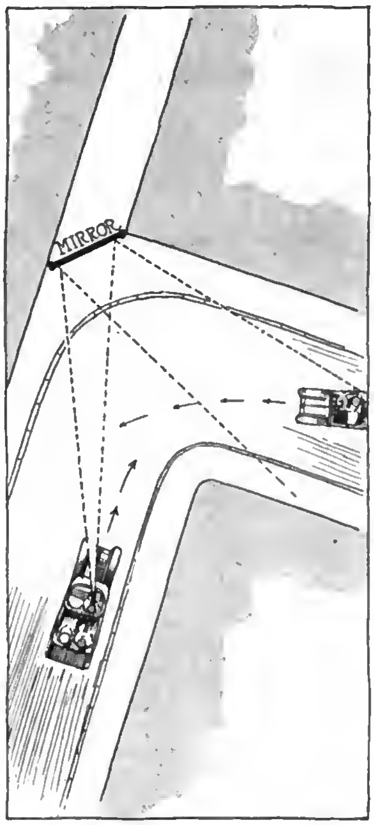
ALL motorists are familiar with that feeling of uneasiness which is experienced when driving toward a blind corner. There is always present the danger of some careless road user looming out of the hidden approach too late to avoid a collision. In this connection the extensive use of rear view mirrors on automobiles must often have suggested to drivers the possibility of using a larger fixed reflector at the dangerous street corners, to show the approaching vehicle. But, strangely enough very little has been done in the way of actual experiment with such a device. The success, however, attending the adoption of these mirrors in the few places where trials have been made renders the available information of great interest to road users.

Some years ago the Touring Club of France placed mirrors of this type at dangerous turns on the Corniche road at Menton and Ventimiglia with satisfactory results. And at a few towns in England similar success has followed the use of these devices.

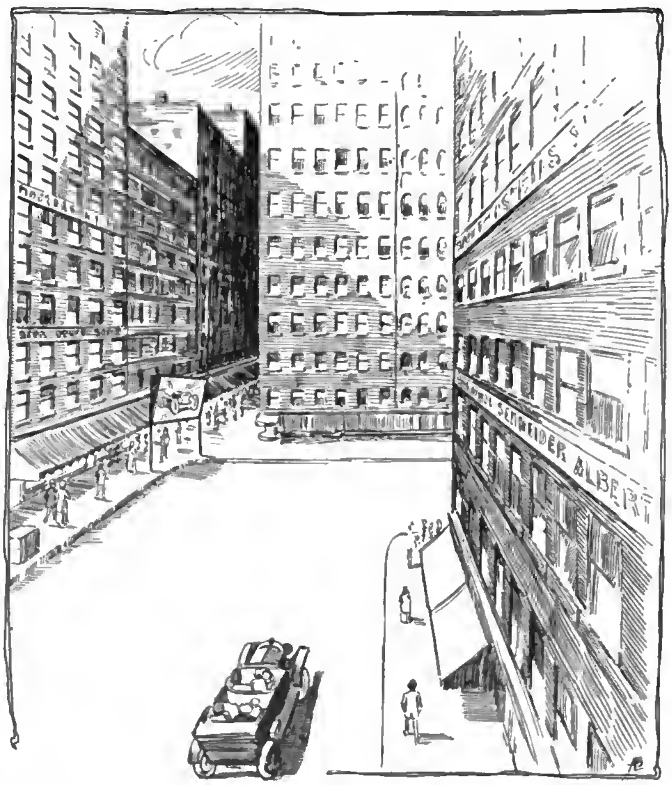
In Folkestone, England, at a street crossing where previously accidents were of frequent occurrence, the roads at that point carrying quick traffic, a mirror 2 feet square has been in use since June, 1910. With reference to it, A. E. Nichols, borough engineer and surveyor of that town says: "Since the mirror has been fixed I have not heard of anything approaching an accident, and as a motorist myself have personally experienced its value. I do not find that the damp, mist, rain or frost has any ill-effects on the mirror, which is occasionally cleaned by a passing lamplighter when cleaning his lamps. Nor do I think apparatus of this description unduly encourages high speed at turnings. I do suggest, however, that these street mirrors would be of much greater value if they were very slightly convex, in order that a very much greater area could be observed than is possible with a flat mirror."

The reflector in question is mounted at a suitable angle on an upright of 1.5 inch gas pipe, driven into the ground.

With regard to the important point of including a greater or lesser amount of reflected area it is of interest to note that at a similarly dangerous street corner in Malmesbury, another English town, a larger flat mirror, measuring 8 feet by 5 feet is at present in suc-



Plan of turning, showing radius of view included in mirror as car approaches the point of danger



Method of mounting safety mirror at city street corner, showing approaching car, hidden from view by the building

Practical Results

cessful use. This is mounted on two vertical pillars on the sidewalk, the long side being placed horizontally, leaving sufficient headway for pedestrians. The large size brings up the question of unsightliness and also the possibility of objection on the part of the occupants of adjacent houses, and suggests the desirability of experiment with smaller convex surfaces.

In fitting mirrors of this description, the deteriorating effects of the weather make it necessary to take into account several constructional considerations. The most important of these is that of the silvering. Ordinary mirror silvering, to meet interior conditions is not sufficiently heavy to prevent oxidization. The thin protective paint backing as generally applied is also inadequate for exterior requirements. This coating must be thicker and so mixed that extreme variations of heat do not tend to cause cracking of the surface and consequent peeling or exposure of the silvering.

The thickness of glass used is also a point of considerable importance although only partly connected with the weather conditions. All glass is porous to some extent and therefore the thicker it is in mirrors the less trouble will be experienced in causing oxidization of the reflecting surface. But while thick plate glass is an advantage in this respect it has the great drawback of causing a double image when used as a street corner reflector. This is due to the refraction of the glass. Refraction is always present, but its effect is negligible when the entering ray is not removed far from the normal, as for instance, when an observer looks at his own reflection. In this case the entering ray is at 90 degrees. In the particular mirrors in question, however, the angle of incidence, or relation of the sight line to the mirror surface is in the neighborhood of 45 degrees, and the refraction then becomes a serious objection, causing a confused image. If the glass is thin this drawback is lessened, but the liability of breakage through accident or wilful damage is increased and therefore some suitable mean thickness should be adopted.

This question of street corner reflectors is well worthy the serious consideration of city authorities.

Cleaning Out the Crankcase—Using Drip Gasoline—The Differential Gear—Overheating Causes Power Loss—Allowing for Clearance—Gas Turbines—Concave Piston Motor—On Adjustments—Ignition System on the 1910 Mitchell

Removing Oil from Crankcase

EDITOR THE AUTOMOBILE:—I have seen several directions, at different times, to remove the oil from the crankcase of the motor and to flush the latter out with kerosene. I have a car which, according to my instruction book, uses a splash system of oil. I am very much of an amateur when it comes to doing any work around the motor and I would therefore appreciate specific directions, with illustrations if possible, telling how to remove this oil and how to get the kerosene to the correct spot.

New Bedford, Mass. SUBSCRIBER.

—You will note on the bottom of your crankcase a series of petcocks and a drain plug, as shown in Fig. 1. Open the petcocks and remove the drain plug. This will not only permit the oil to flow from the splash troughs, but will also remove that which is contained in the oil reservoir. After all the oil is out, pour 2 quarts of kerosene in the breather pipe or oil filler hole, as shown in Fig. 2. Run the motor for about 30 seconds—no longer—then open the petcocks and the drain plug again and let the kerosene flow out. After this has drained thoroughly replace with new fresh oil.

Use of Drip Gasoline

Editor THE AUTOMOBILE:—Do you think it a safe and sane plan to use drip gasoline (caught direct from a well) in a 30-horsepower motor without any refining? I know a number of people who use it and claim it more powerful and quicker than refined gasoline, although it smokes and causes more carbon. I can get plenty of it for almost nothing, and have been thinking of buying some refined gasoline with good gravity, then using half refined and half drip. I think by mixing it it will be safer and better fuel than using the drip gasoline alone, but would like to have the opinion of someone with more experience than myself before trying it.

Metz, W. Va. L. C. S.

—Drip gasoline taken directly from the well cannot harm your motor. If your carbureter can handle it there is no reason why you should not take advantage of the low price at which you can secure it. Before using the drip gasoline, or any other gasoline, as a matter of fact, it is necessary to strain it through chamois skin or through two or three layers of exceedingly fine wire gauze mesh. It would not be wise to mix refined gasoline with the heavier fuel; the result of this would be that even if it did arrive in its mixed state at the nozzle of the carbureter the gasoline constituent would be evaporated while the less volatile part of the mixture would remain in globular form.

When using the heavier fuel you will find that a different carbureter adjustment is necessary. From 50 to 100 per cent. more air is required than with the higher grades of refined gasoline. The reason for this is that owing to the difficulties of evaporation it is necessary to pass more air over the surface of the unevaporated gasoline than would be the case where the more volatile products were used.

Action of Differential Gear

Editor THE AUTOMOBILE:—Would you kindly tell me if the engine power of an automobile is distributed equally to the two rear wheels in taking a turn or corner or if the most power is transmitted to the outside wheel? Also if running at 15 miles an hour on the straight and without changing your throttle lever you go around a corner, if the speedometer will go above 15 miles an hour with the same amount of gas?

Clermont, N. Y. R. R. SAULPAUGH.

—In turning a corner more power is exerted by the outside rear wheel. When the front wheels are turned by the steering gear in order to make the car turn a corner they force the car to swing about the inside rear wheel as a pivot. This wheel therefore exerts very little power. The narrower the circle in which the car is turned the more stationary the inside wheels and hence the less power exerted by this wheel. The action of the differential is such that the power is transmitted to the wheel which opposes the least resistance to its motion.

The action of the speedometer is altogether dependent on the peripheral speed of the wheel to which it is geared. When turning a corner if the wheel to which the speedometer is geared is the outside wheel it will show a greater mileage per hour than it would were it the inside wheel. In other words, the odometer shows the number of miles traveled by the wheel to which it is geared. If the car were traveling around a circular track the outside wheels would travel a greater distance than the inside wheels, and hence if the speedometer were geared to the outside wheels it would show a greater mileage than when geared to the inside wheel. As the number of left and right turns made in a day are very nearly equal, and since most of the running is done along straight roads, the report of the odometer at the end of the day is generally accurate.

Cooling Water Boiled Suddenly

Editor THE AUTOMOBILE:—Recently on a trip to Peoria, a distance of 12 miles, my engine ran well. On the return trip, however, when about half way home, the motor lost power rather suddenly and the water boiled violently. At first I thought the carbureter was flooding, but examination showed that it was not flooding. The carbureter adjustments are the same as they have been for nearly 3 years. There was no popping or back firing into the carbureter or exhaust manifolds. After arriving home I removed the valves and proceeded to grind them, even though they did not seem to need it. I looked for carbon deposits, but found not enough to cause much trouble. I very seldom use hard water in the radiator, and I have a habit of draining it often. The carbureter is a Schebler. The ignition, Remy type "S" and the motor a Regal.

Now, what, in your opinion, caused this boiling of the water and the loss of power, for the motor would not pull on high gear on a level road?

Spring Bay, Ill. WILLIAM L. ZELLER.

—There is only one thing that could cause the cooling water to boil suddenly in the radiator in this manner and that is the failure of the water to circulate. This could be due to but two causes. First, breakage of the water pump, and, second, to the clogging of the cooling system by some foreign matter.

The second is the probable cause and may be cured by pouring a pail of boiling water and soda through the radiator and then flushing this out with two or more pails of hot water. If the tendency to clog be very marked and the deposit stubborn, the motor may be run for a few moments with the soda water in the system if so desired. The proportion of soda to water should be about a double handful to each pail of water.

Should the pump drive, or the pump itself be damaged, it is a matter of replacing the damaged parts. It would also be wise to look at the spark and throttle linkage to see if either of these could possibly have become disarranged.

Design of Diesel Motor

Editor THE AUTOMOBILE:—Can you tell me where I can secure a book on the theory and design of the Diesel motor? Also where I can get the data published by the S. A. E. in loose-leaf?

Watertown, S. D. W. H. McCULLOUGH.

—The best place to secure data regarding the theory, design and construction of the Diesel motor would be from the Diesel Engine Co., Busch-Sulzer Bros., 30 Church street, New York City. The literature furnished by this company goes deeply into the principles of the Diesel motor and its manufacture.

2—The loose-leaf data given out by the S. A. E. can be secured by addressing Coker Clarkson, care of the Society of Automobile Engineers, 1786 Broadway, New York City.

Wants to Use Bell Signal

Editor THE AUTOMOBILE:—I disposed of my automobile last fall, and I thought I would quit, but as spring approaches I feel the fever coming on again and suppose nothing will do but get one. On my former automobiles I found the bulb horn very unreliable. Would you kindly inform me is there any regulation, rules, ordinances or laws, city or state, forbidding the use of bells on automobiles, such as used by the city fire department or ambulances?

Mt. Vernon, N. Y. A. D. EVERTSEN.

—The law of New York on warning signals states that each car shall be provided with an adequate horn, bell or other signal. There is nothing which would prevent you from using a bell if you so desire. It would be inadvisable, however, to equip yourself with a bell identical with that used by the ambulances or fire department of your city, as you would find yourself in trouble with the local authorities.

Correct Allowance for Clearance

Editor THE AUTOMOBILE:—The cylinders of my Stoddard-Dayton have worn so as to allow pistons to slap. Cylinders now measure 4.742 and I have ordered pistons measuring 4.752. Would it be better to have cylinders bored at a machine shop or could a satisfactory job be done by grinding down with emery using the old piston as a grinding tool. What is the proper clearance to allow for expansion between piston and cylinder walls?

Holyoke, Mass. CYLINDER.

—The correct clearance at the top of the piston is .004 inch and at the bottom or skirt of the piston .002 inch would be correct. The clearance between the top and bottom of the piston is decreased .0005 at each of the rings. This gives a sort of stepped taper which has been found to correctly take up all slaps and leave a good, quiet-running motor.

It would not be wise to attempt to use the old piston as a grinding tool in reboring the cylinder. This should be done at a machine shop which has the correct equipment for doing this work.

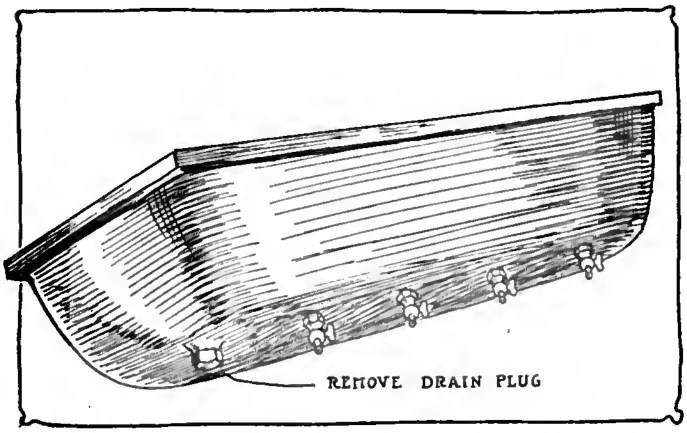


Fig. 1—Petcocks on the bottom of the crankcase should be opened and the drain plug removed to clean out the old oil

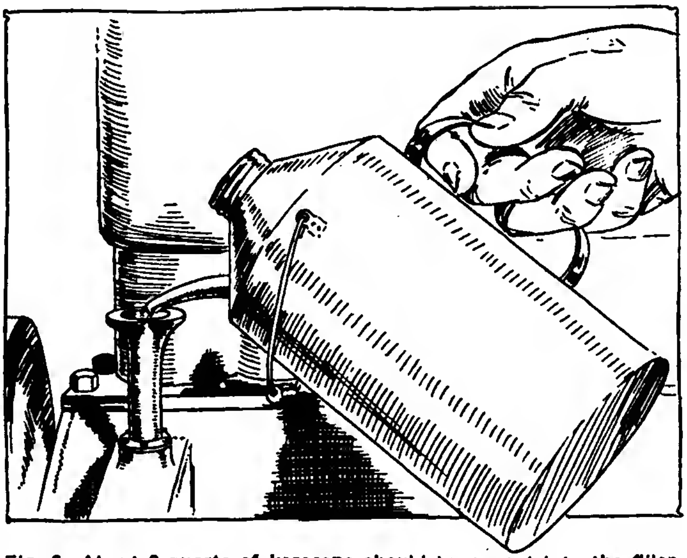


Fig. 2—About 2 quarts of kerosene should be poured into the filler hole after the old oil has been removed

Vulcanizer for Garage Purposes

Editor THE AUTOMOBILE:—I am about to purchase a vulcanizing plant and not having any experience in that line, I would like to have you tell me what make of plant would you advise me to buy.

Is there any special objection to the Haywood system? What kind of stock is best for use with the Haywood system? Is retreading practical with any style of vulcanizer?

Natick, Mass. L. E. DAVIS.

—The Haywood system is excellent for garage purposes. It is made by the Haywood Tire & Equipment Co., of Indianapolis, Ind. Besides this concern there are several others which make excellent systems for garage use. Among these may be mentioned the following:

Auto Tire Vulcanizing Co., Lowell, Mass.
Biggs Boiler Works Co., Akron, O.
Burge Machine Works, Chicago, Ill.
Diamond Mfg. Co., Des Moines, Ia.
Milwaukee Auto Specialty Co., Milwaukee, Wis.
Schafer Company, Waupun, Wis.
Westinghouse Electric and Mfg. Co., Pittsburgh, Pa.
Williams Foundry and Machine Co., Akron, O.

Gas Turbines In Existence

Editor THE AUTOMOBILE:—Do you know of anyone who has experimented on a turbine operated by gasoline, and, if so, what advance has been made?

Cumberland, Md. J. H. DANTZIC.

—Gas turbines have been experimented upon for a number of years; as far back as 1648 there have been traces of investigation of this type of motor. One of the earliest of which we have knowledge is the gas turbine designed by Barber, who patented his device in England in 1791. His patent number was

1833 that year. After that nothing more was done for 50 years, until 1850 W. F. Fernihaugh took out a patent No. 1,328 on a mixed steam and gas turbine. Following this came Burdin's hot air turbine, which was proposed by him in 1847 and actually built in 1853. The first of what may be called the more modern types of gas turbine was made by M. W. Boulton in 1864. He was the first to realize that the high velocity of the jet of gases issuing from the nozzle offered a practical difficulty and proposed to remedy this by use of successive induced jets of increasing volume and consequently lower velocity. There have been a number of works upon the gas turbine, one the latest being by Henry Harrison Suplee, J. B. Lippincott Co., 1910. There are many turbines which are suitable for either steam or gas. Among these may be mentioned Bucholz, of which an account appeared in *Electrical Review,* January 8, 1904, and the Patschke turbine, which has had extensive use in Germany. The French firm of Armengaud & Lemale have gas turbines up to 300 horsepower which are actually in use at the present time. Another turbine which has been brought forward within the last 3 years is that of M. Karavodine, of Paris. The reason that gas turbines have not become more popular and brought into general use is that the efficiency obtained with them has been very low.

Desires Motor Encyclopedia

Editor The Automobile:—Is there any encyclopedia or text published on modern automobile engineering and design? What is desired is something quite complete and useful to the automobile engineer, setting forth the best practice together with a good list of formulæ and plenty of diagrams and results of tests.

Bozeman, Mont. Arthur C. Ford.

—There is an encyclopedia of automobile engineering published by the American School of Correspondence, Chicago, Ill.

Theory of Concave Piston Motor

Editor The Automobile:—Kindly advise whether in your opinion one of the results obtained from an L-head engine of the general design shown in Fig. 3 as compared with the ordinary domed cylinder type will be a stratification of the burned gas above the piston with the fresh charge unmixed with it or partially mixed above it.

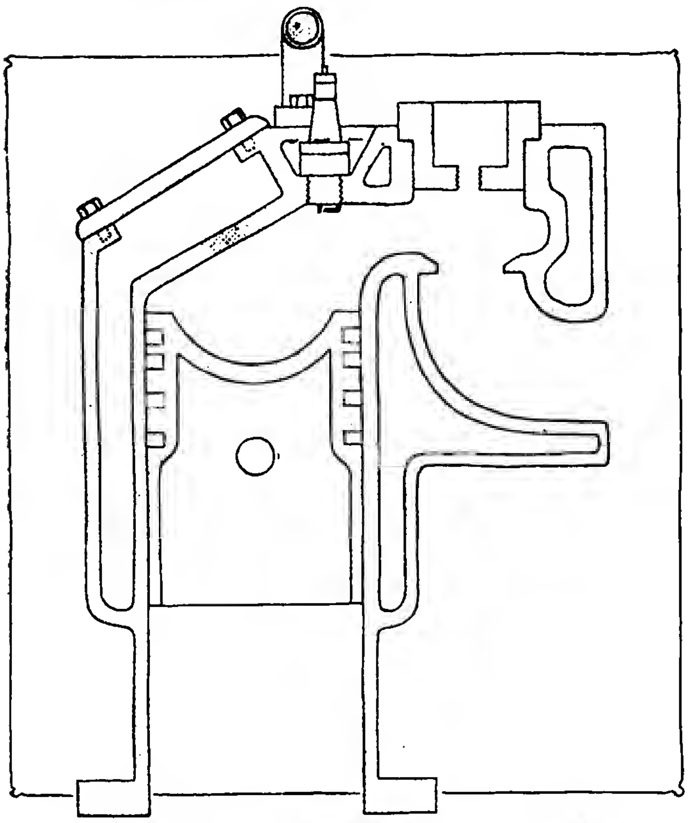


Fig. 3—Novel L-head motor design embodying a concave piston

2—Would such a stratification result in more rapid combustion, higher initial and mean effective pressure?

3—Would the central location of the spark-plug tend to produce the increased power resulting from the use of a two-spark system in T-head engines?

4—Would the burned gases on the piston tend to cushion the more violent explosion?

5—Is not the claimed increased power of Knight and V and H engines due to similar stratification rather than to cleaner scavenging, it being, of course, assumed that the engines compared have the same displacement and compression and are identical as to gas passages, size and lift of valves.

Port Henry, N. Y. F. E. Bachman.

—1—Such a stratification would probably result owing to the fact that there would be a pocket formed in the bottom of the piston bowl.

2—It is impossible to state that such a stratification would result in any better combustive efficiency. It is absolutely impossible to get any definite data of this nature through drawings or for the motor itself without the aid of indicator or manograph cards.

3—The central location of the spark-plug would doubtless be the most advantageous for the shape of combustion chamber which you have in your motor. It would not give the rapidity of combustion that would be secured by two sparks.

4—The burnt gases on the piston would not act as a cushion because the pressure in any part of the combustion chamber is the same at any instant. Besides this, no cushioning effect, which would virtually amount to slower combustion and expansion, is necessary.

5—The basis of advantages claimed for Knight and valve-in-head motors has never been laid to stratification. The reason for this is that nobody has ever proved definitely that stratifition existed within the cylinder.

Some Pertinent Adjustment Queries

Editor The Automobile:—1—Would it be advisable in order to stop compression leaks to use white lead on the threads of the petcocks, gaskets, etc? If not, what would you advise?

2—How can I stop a slight leak through the petcock, due to its not closing tightly?

3—I have read your answer on eliminating noise caused by tapping of loose valves in your magazine of October 17, 1912, but should like to know if after the engine is heated up there is still a space between the valve stem and tappet, would it be advisable to further tighten the valve?

4—Do you think it shall be necessary to retime the valves on a car which has been run only 3,500 miles? It is a Cadillac 1912.

5—In the directions for readjusting the carbureter there is one given to "adjust screw E until the motor attains a speed of 280 to 300 revolutions per minute." How can this speed be determined by an inexperienced person?

6—Do you think a tap would be caused by worn cam-followers, as you suggested, in an engine run as little as this?

Oakland, N. J. Waldemar Büsing.

—1—It is better to use shellac than white lead on the threads of the cylinder petcocks, gaskets, etc. Shellac will withstand the effects of heat better than white lead and does not offer as much resistance to removing the parts.

2—The leak in the petcock can be stopped by grinding in the valve or, since they are so cheap, by simply fitting a new one. If you desire to grind it in you can put a little valve grinding compound between the petcock valve and its seat and work the handle back and forth in the same manner as you would do in grinding a poppet valve. This will make a tight fit between the valve and its seat.

3—If there is still a space between the valve stem and the tappet after the motor is heated up it would be wise to close this gap by turning the adjustment nut. The clearance between the tappet and stem when the motor is cold should be .003 inch.

4—It should not be necessary to retime the valves on a car which has run 3,500 miles. You might check the timing by noting the marks on the flywheel and seeing if they agree with the action of the valve. For instance, where the flywheel is marked E.O. 1 it means the exhaust valve on cylinder one is just starting to open when the mark at E.O. 1 is just opposite the indicator.

5—It is impossible for an inexperienced person to accurately estimate the revolutions per minute of a motor. Three hundred revolutions per minute, however, would be just about the point at which the motor appears to be running rapidly but not racing. This may give you a vague idea of the speed. With the spark in medium position 300 revolutions per minute would probably be obtained when the throttle was opened a little less than one-quarter way, assuming the gears to be in neutral.

6—A tap may be caused by a worn cam follower in any motor, although it is not likely to be the case with a car run such a short time.

From Hattiesburg to Chicago

Editor THE AUTOMOBILE:—Can you furnish map showing route taken by Glidden Tour? I want to go from Hattiesburg to Chicago in my car and would like advice as to the best way to go.

Hattiesburg, Miss. H. S. LILIUS.

—It will be necessary for you to take whatever roads you can find from Hattiesburg to Newton, which is a few miles north of you. From Newton to Jackson leading through Brandon. Once at Jackson you are in a position to take the regular Blue Book routes north as compiled from the 1910 Glidden Tour, which passed through that city. Your course will lie through Canton, Lexington, Greenwood, Memphis, Middleton, Tuscumbia, Nashville, Bowling Green, Cave City, Louisville, Indianapolis, Lafayette, Chicago. These routes will be found in Volumes 3 and 4 of the Blue Book.

Ignition on 1910 Mitchell Car

Editor THE AUTOMOBILE:—Would you please explain the ignition system used on 1910 model T Mitchell? My car has a Splitdorf magneto. I gave my car an overhauling, ground the valves and had it all apart and since I put it together it does not seem to have the same compression it had before I sent the magneto to the repair shop and had it tested and fixed up, but I cannot get any ignition. Why?

Some time ago I started to take my car out and after running about 10 feet out of the garage my transmission subshaft broke. I had a new one made and then I went about 15 miles, and not running over 15 miles per hour, and my subshaft broke for the second time. The car was not handled rough, making all changes in gear as they should be; each break looked as though the shaft was twisted off. I have not had car out since my last break.

Pittsburgh, Pa. GEORGE E. KESTNER.

—The system on this car consists of a low-tension magneto with a tube transformer. The diagram of the wiring system is given in Fig. 4. The system will be readily understood from the diagram and but one precaution need be observed, that is, that both poles of the battery must be brought to the transformer. The battery should not be grounded under any circumstances. The current for ignition is generated by the low-tension magneto and is then led up through the transformer, where its voltage is increased to such an extent that it readily jumps the 1-32-inch gap between the spark-plug electrodes. It may be that the reason you did not get a spark is that you have grounded the battery current.

It is natural that immediately after the valves have been ground that the compression will be lower than usual. This condition will disappear after running a short time. The reason for this is the fact that the piston rings do not get a running fit for some time after they are removed.

It is impossible to state why the gearset shaft broke unless it was improperly lined up or unless it had a bend in it. It might be possible that the bearing surface for the layshaft is too small or that the bearings are too far apart to furnish adequate support.

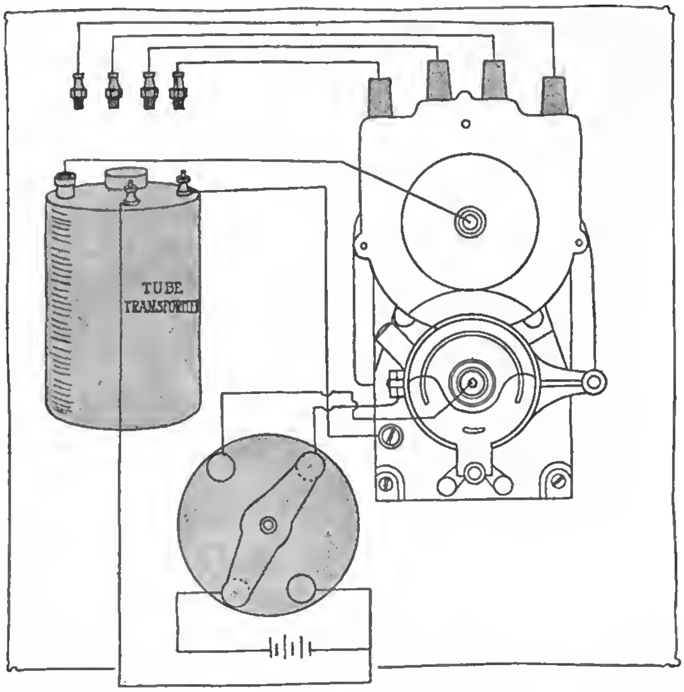


Fig. 4—Diagram of 1910 Mitchell ignition wiring system

Editor THE AUTOMOBILE:—Apropos of the recent controversy regarding whether automobile shows pay or not, it strikes me that there being such a question is in itself a circumstance which would indicate that something is fundamentally wrong with the big shows. A report of the 1912 Paris salon—which, if I am not mistaken, appeared in THE AUTOMOBILE—stated that after paying for the cost of the show, a surplus was left which was distributed among the exhibitors.

While the number of show visitors at New York and Chicago was a large one, it has been stated that some 40 per cent. of the people that went to see these exhibitions had complimentary tickets. The question then arises, was it necessary to give these people gratis tickets, or would they have paid admission to see the shows?

In my mind, the answer is: No, they would not have paid. For the majority of these people are not necessarily interested in automobiles for the immediate future, though they are possible buyers for some time hence. Yet, in a city like New York or Chicago, which every evening has scores of entertainments for the man who is seeking them, an exhibition to which people are expected to come and to pay for their tickets, must be made as attractive as any other entertainment. People want to enjoy themselves, not to be educated. Soloist singers of the cabaret style and adequate dinner and tea facilities should be there.

Furthermore, if fewer complimentary tickets had been distributed and that with utmost care, the paid tickets selling at $1 should have made the show a commercial success. If only well-to-do people would come to the shows, all of them would be there. And these are all that are looked for.

New York City. D. VON BERN.

Simplex Car Has Force Feed

Editor THE AUTOMOBILE:—Will you please tell me if the Simplex company of New York are going to put out a new car for 1914 with steel pistons and force feed lubrication? If they are can you give me the specifications?

Alton, N. H. H. P. TIBBETTS.

—The Simplex for 1914 will no doubt use the force feed lubricating system as is the case this year. The possibility of its using steel pistons is very remote. There is no intention of doing so at present.

The Automobile

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Silk Stockings on Trucks

IT is not surprising that the members of the National Association of Automobile Manufacturers at their regular meeting last week should vote practically unanimously for a recommendation that the commercial vehicle shows at New York and Chicago be discontinued, ostensibly on account of the expense to the manufacturer in conducting them, failure to make the anticipated sales, because of poor attendance and sundry other reasons.

You do not dress a football hero up in court costume when he is going into one of the severest battles of the year on the gridiron, neither does the business man go to his office in evening dress to transact the business affairs of the day. The commercial vehicle shows up to the present have been carried on in the dress and setting of the passenger car shows. The walls of glass and mirrors to add attractiveness to the polished lines of the passenger car have been used when the coal-dumping truck, the lumber truck, the brewery truck and the emergency repair wagon, have filled the exhibit spaces on the following week.

These vehicles designed for business have been taken out of their proper setting. They have been transported from what should be an atmosphere permeated with everything that is most businesslike in the transportation field, and deposited in what would be the same environment as a person wishes to enter when buying a spring hat or Easter gloves.

Even in the conduct of shows for motor trucks recognition must be had of those universal feelings and influences in life. Shakespeare wrote: "How many things by season seasoned are!" What could be more true? Apply this to the present style of motor truck shows, and it must be admitted that it would be more rational to demonstrate these vehicles of labor on the boulevards of Central or Jackson parks than to hedge them in with mirrors and church windows in an exposition building.

The fact that the present type of show has proven a failure, as the manufacturers admit by their action, is no reason that they should come to the conclusion that commercial vehicle shows are all failures. Far from it. Such a course is precipitant. Such decisions will be changed by the passage of time. There is need to-day for commercial vehicle shows, but they must be held at the proper time, in the proper place, and in the proper manner.

The week following the passenger car shows is not the proper time for a commercial vehicle exposition. It does not meet with the conveniences of many business houses. It comes too close at the end of their fiscal year, it being a well understood business fact that few concerns make large investments, such as motor truck equipment calls for, nearing the end of a fiscal year or immediately upon the opening of another year's business.

A better season for the show is in the early spring or early fall. These are the periods of greatest purchasing by the largest industrial houses.

A combination exposition and demonstration is needed. It is not sufficiently convincing to display commercial vehicles with dumping bodies passively on a carpeted floor. They should be out actually operating in a zone of business activity where every warp and woof of interest would prove an additional force in the selling arguments.

Such a program is not impossible. During a show extending over one week certain hours of each afternoon could be devoted exclusively to such demonstration work. These demonstrations could be in actual progress in some outlying section of the city. In either New York or Chicago it is possible to secure such demonstration grounds within short distances of the exposition centers. Long Island City affords excellent room in the East; and in Chicago the Lake front would more than meet every requirement.

But the outside demonstration must go further. All trucks have not dumping bodies, and only a small percentage of the buyers are looking for such a design. Other afternoons can be given over to some forms of city demonstration, or inter-urban work. These outside demonstrations should also be outlined to bring forth the time-saving aspects of the truck. Time-saving loading apparatus and unloading apparatus should form a part of such demonstration. These assume the forms of endless conveyors, traveling buckets, cranes, chutes, etc., and there is no reason why the adaptation of these for loading and unloading means should not be dwelt upon. There is no end to the rational ramifications for good of a combined commercial vehicle exposition and demonstration in at least three, or perhaps five, of our biggest American cities.

Is Barometer of Value in Motor Tests?

Following Introductory Paper by Herbert Chase on Fischer Motor, Ferdinand Jehle Put This Hypothetical Question up to Detroit Section of S. A. E.

Abbreviated report of Section meeting held at Detroit last Friday.

DETROIT, MICH., March 7—A representative gathering of automobile experts was present at last night's meeting of the Detroit Section of the Society of Automobile Engineers, which was the first to be held since December, the national shows having occupied the attention of the members during January and February.

The session was particularly interesting because of the presentation of the report of the test by the Automobile Club of America of the Martin Fischer slide valve motor by Herbert Chase, the club's laboratory engineer. A paper in explanation of this non-poppet type, which is being introduced in this country by L. B. Brown and George Ratcliffe under the name of the Magic motor, was read at the last meeting of the section, its unique crescent valve slides being the principal distinguishing feature, and Mr. Chase's report answered many of the questions which were left open from lack of data at that time.

Mr. Chase's report did not seek to compare the motor with other existing types of engines in any way, nor to offer any comment as to the results obtained. It was merely a presentation of the facts as obtained in the club's laboratory and to which the club was willing to give its official signature. The report was supplemented by lantern slides showing some of the special apparatus used for the test and the arrangement of the various apparatus, as well as curves plotted from the data obtained and manograph cards of both working and pump strokes. There was no special discussion of the results set forth in the report.

The second paper of the evening was read by Ferdinand Jehle of the Commercial Engineering Laboratories, this city. Mr. Jehle's subject was: "Are Barometric, Temperature and Humidity Readings of Any Value in Comparative Motor Tests?" Mr. Jehle did not attempt to answer the question but merely wished to set the facts before the engineers so as to bring out a discussion of the subject, and possibly, to cause some careful and scientific investigation to be made along this line in the near future. He took the stand that the ordinary variations in the temperature, barometer and relative humidity readings do not appreciably affect the practical comparative tests of motors, although there may be very slight differences due to them.

When one motor does not show up as well as another in test, these atmospheric conditions are blamed for the poor showing, thus offering a loophole. Calculations were offered to show that even with the most extreme differences in atmospheric conditions, coupled with the maximum effects which they could cause, no such differences should be taken into consideration.

Mr. Jehle stated that the only way in which we can arrive at definite conclusions on this subject is to run special tests with this particular end in view. "Some of us have cold rooms in which motor tests can be run," he said. "In these we could control the temperature and possibly the humidity. The pressure of the entering air might be controlled by a small blower. Such tests would be of real value. They would show better what differences atmospheric changes bring about than any calculation."

The general trend of the discussion which followed was toward the views held by Mr. Jehle, barometric changes due to altitude and humidity variations being taken up, principally in their effects upon carburetion. Frank H. Trego, research engineer of the Packard company stated that he was about to start a 500-hour test and that he would be glad to get any suggestions from the members present as to what determinations or observations in addition to those ordinarily included in a test of this kind which would be of value. He sketched some curves made from data taken on a recent 351-hour test of a Packard motor running continuously at 1,200 revolutions per minute with wide open throttle. Through one range of about 40 hours during this particular run, the weight of air per cubic foot diminished while the torque remained constant. This was offered as a proof that even with a varying humidity, the engine running was constant.

The question of difference in atmospheric conditions during the daytime and at night was taken up as to its influence, if any, on motor running.

Museum of Safety League Grows

NEW YORK CITY, March 10—More than 175,000 school children of New York City are now wearing the green and red button of the Safety League and a thousand or two more become members of the League every school day. A children's safety crusade has been carried on in New York since last December by the American Museum of Safety with the hearty cooperation of the Board of Education. Its object is street safety for children and the basis of the campaign is daily class-room talks to school children by lecturers from the Museum of Safety, both public and parochial schools being included. These talks are followed by the distribution of pamphlets containing "safety fairy tales," which the children are encouraged to take home and discuss with their parents. Lectures are illustrated by models which enable the speaker to point out graphically the dangers to be encountered in public streets and how to avoid them. To be a full-fledged member of the Safety League all a girl or boy has to do is to put into practice the safety rules and wear the safety button. These badges have the design of a green railroad lantern on red ground, thus carrying out the color scheme of the safety movement—red for danger and green for safety. In many instances children have made the stories contained in the pamphlets the basis of school essays and compositions. Some of the fundamental rules for the children run as follows:

NEVER fail to look both ways for automobiles, trucks and trolley cars before crossing a street. Keep eyes to the left until the middle of the street is reached, then eyes to the right until the curb is reached.

NEVER play any kind of a game in street where automobiles and heavy trucks are constantly passing or in streets where trolley cars are operating.

NEVER hitch on behind a trolley car, automobile or motor truck as you may lose your footing and be thrown under the wheels.

NEVER run pushmobile races in the streets. Pushmobile is hard to stop and may run right in the way of an automobile, heavy truck or trolley car coming in the opposite direction.

NEVER step from behind a trolley car without hesitating and looking as another car may be coming from the other direction.

NEVER take chances.

ALWAYS safety.

Caution and self-control are at the root of the lesson taught; to teach children to take care of themselves and through the children to reach the adults. It is training the children of today to be the prepared workers of tomorrow.

1914 Packard's New "48"

Has Left Drive, Control Centralized on The Steering Column and Combination Electric Lighting and Starting

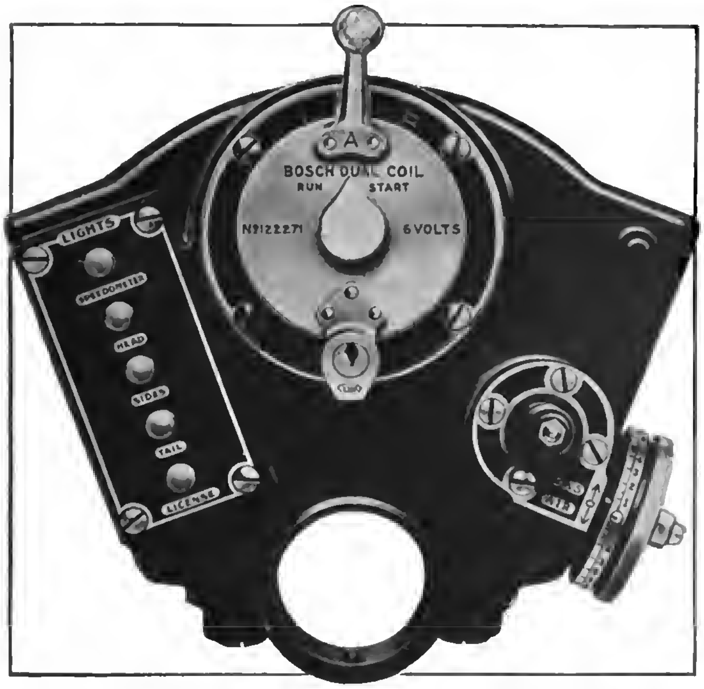


Fig. 1—A unique feature of Packard design which is incorporated in the new 48 is the centralizing control board which is placed on the steering column. The ignition switch is at the front and the light switches, each of which is labeled, are at the left, while the carbureter adjustment is at the right of the board

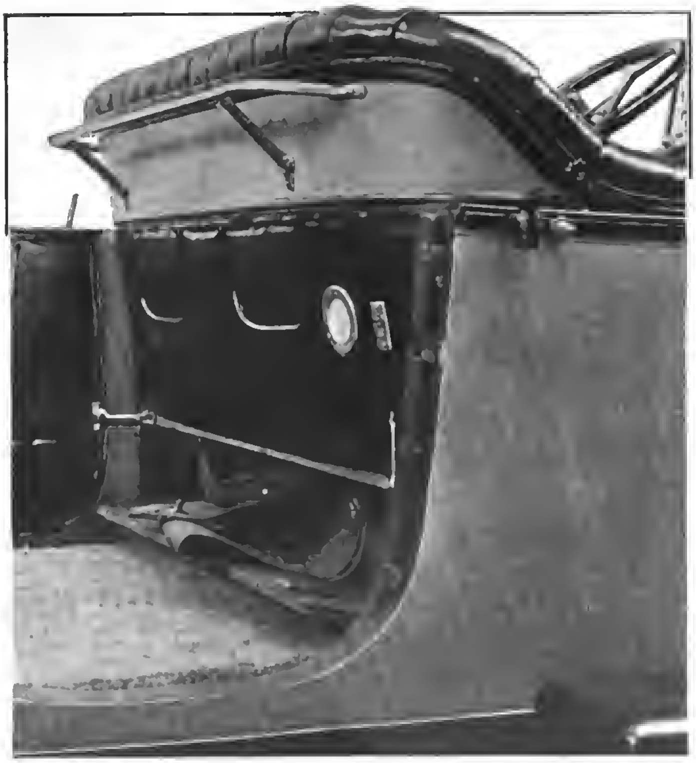


Fig. 2—Rear compartment of the new Packard 48 touring car, showing detailed view of the tonneau and the ample storage space which is provided for side curtains and other impediments. The tonneau is roomy and comfortable and all appointments are finely finished

DETROIT, MICH., March 8—In accordance with its present policy to develop and announce one model of chassis at a time, offering it to the market when ready, as stated in H. B. Joy's recent report of the directors, the Packard Motor Car Co. has just announced another model—the 1914 model 48, six-cylinder type. This new scheme of bringing only one chassis through the factory at a time arises from the fact that the former method of carrying two chassis through the engineering department of two sizes at the same time to be turned over to the manufacturing department together in order to have them ready for the market at the same time, both thus going along together through the shop, has proved unsatisfactory for many reasons, causing delayed deliveries and restricted output.

Summing up the features of the new larger six; it combines the salient features of the 1913 model 48, except that it has left drive, centralized control on the steering column and electric cranking and lighting in combination. These features make the new 48 consistent in design with the smaller six, model 38, which was put before the public last fall.

Control on Steering Column Continued

This control board, Fig. 1 which appeared for the first time last fall as a part of the then new 38, has the ignition switch located at the front and at the left are the various light switches, labeled so as to be readily seen. There are five of these buttons, making it possible to switch on any or all sets of lamps without shifting the driving position. At the right is the carbureter adjustment for varying the ratio of gasoline to air. The box is finished in black enamel, and since its inception has been favorably received by Packard owners.

The first of these new 48's appeared at the New York show. While the same as the model 48's which are now coming through the factory, the car seen at Madison Square Garden was a special job made up to show the public how the car would appear when placed upon the market.

The first demonstrators will be shipped from the factory this week.

In the motor, the only changes over the 1913 model 48 are those brought about by the shifting of the drive to the left side and the centralizing of the control below the steering wheel. The T-head construction with cylinders cast in pairs is retained. Carbureter, magneto and hydraulic governor are placed on the left side, making this now the business side of the power plant. The Delco motor-generator and water pump are placed on the right, the former at the rear, close to the rear support and the latter forward. The timing gears and pump and magneto shaft gears are helically cut and inclosed.

The front end of the motor is hung from an arched cross member of I-beam section, whereas the two rear supports are integral with the upper half of the crankcase, in fact, the careful observer is unable to discover any departures whatever from accepted Packard motor design.

The motor has a bore of 4.5 and a stroke of 5.5 inches, the horsepower by the S. A. E. rating being 48, which gives the model its name. The Packard engineers state that the actual brake horsepower at the same piston speed as that used as a basis for the S. A. E. formula (1,000 feet per minute) is 62 with the muffler on. The maximum is said to be 82 which is at a piston speed of 1,576 feet a minute, or 1,720 revolutions per minute.

The cylinders and pistons are ground and interchangeable, each of the pistons being fitted with two rings. These parts are all lapped together after assembling. The crankshaft has four main bearings supported conventionally by large caps bolting to the upper half of the crankcase. Its diameter is 2 1-4 inches. The valves are of nickel steel.

The electric cranking and lighting combination is too well known and has been commented upon too often in these columns to be taken up in detail here. It is manufactured for the Packard motor by the Dayton Engineering Laboratories Co., and when used for cranking drives through gearing which meshes with teeth cut in the periphery of the flywheel. The unit is normally a generator, being operated by the engine to generate power for the lights and for charging the storage battery which is a part of the equipment. When temporarily a motor for turning the crankshaft, the storage battery returns some of this electric energy to the unit. This battery also assists the generator in supplying the lights when the demand is greater than the amount being generated due to the low running speed of the engine.

To operate the cranking apparatus, it is only necessary to engage the driving gear with the flywheel teeth after the current has been switched on. To assist the cranking mechanism in extremely cold weather, an acetylene primer is included in the regular equipment. The small tank at the right forward side of the running board supplies the acetylene for this purpose.

The current for the ignition system is furnished by a Bosch dual system employing magneto and a storage battery, both of which are entirely distinct from the Delco cranking and lighting system.

Special Carbureter and Governor

The special Packard carbureter operating in connection with a hydraulic governor is retained, though now placed on the left side. The essential feature of this governor is a diaphragm against one side of which the pressure of the water system is directed. The other side connects with the carbureter throttle. The outward bulge of this diaphragm is in proportion to the pressure of the water on the other side, which pressure is, in turn, in proportion to the engine speed. Through its connecting to the throttle, the bulging acts to shut off the fuel somewhat, thus aiding in uniformly governing the engine speed. The advantages claimed for this governor, which is integral with the carbureter on the 48, are that it prevents stalling the motor in crowded traffic, avoids racing the motor when the clutch is disengaged and affords uniformity of road speeds without requiring skillful use of the accelerator pedal. The carbureter combines float feed with a large cylindrical mixing chamber directly above the aspirating nozzle and automatic mixture regulation for all speeds. The auxiliary air inlet is automatically regulated by a spring-controlled poppet valve, the adjustment of the spring tension of which is accomplished from the control board, Fig. 1. From the control board the primary air intake may also be shut off to facilitate the obtaining of rich mixtures for cold weather starting. The air entering the carbureter is heated by a scoop passing around the exhaust manifold, while the mixing chamber is hot-water jacketed.

Motor lubrication is of the same form as used on the 38. The main system feeds oil directly to the crankshaft, connecting-rods, wrist-pins and motor-gear bearings by pressure from an eccentrically-driven pump. The system also lubricates the intermediate camshaft bearings by spray from the lower connecting-rod bearings. The cylinder walls are lubricated by this spray for light running, but when the motor is under heavy load, an auxiliary system, governed directly and automatically by the throttle, feeds oil directly to the cylinder walls. The crankshaft is drilled to provide an oil passageway. All of the surplus oil eventually finds its way into a reservoir at the bottom of the crankcase, from which point it is re-circulated after being strained. The bottom of the crankcase slopes both ways to form the reservoir, and sediment pockets provided with drain plugs are placed in front and at the rear of the strainer. The normal

Fig. 3—Fore end of the touring model, showing left drive

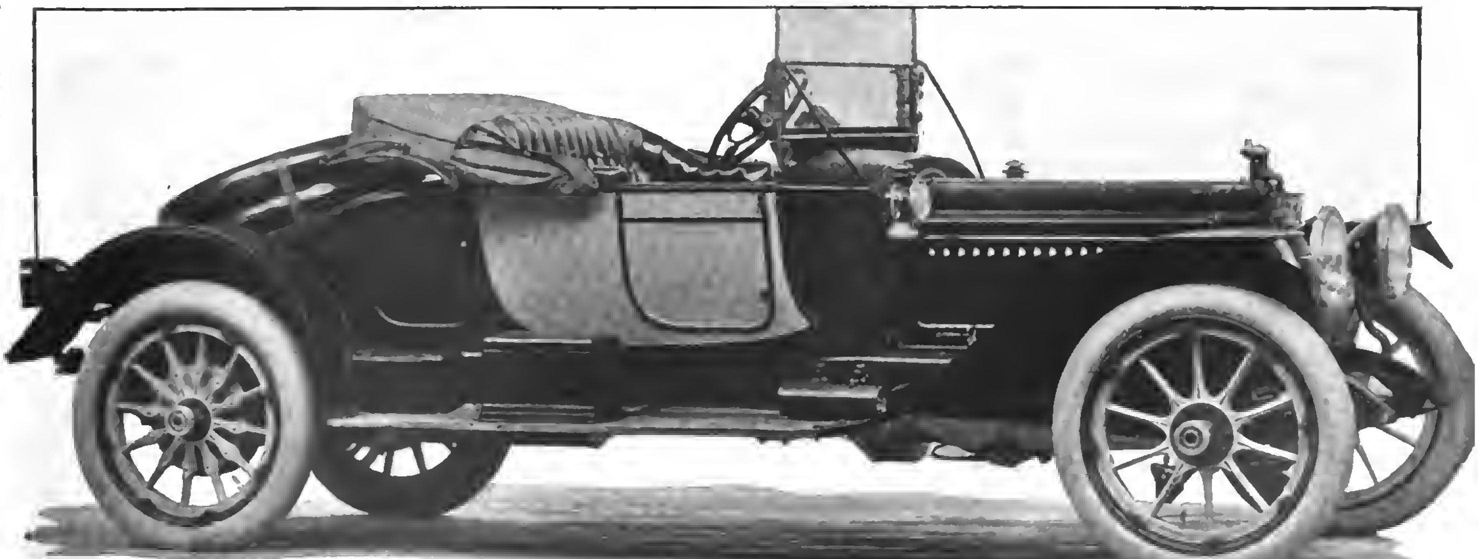


Fig. 4—Packard 48 runabout with body built along phaeton lines—an innovation for the 1913 season

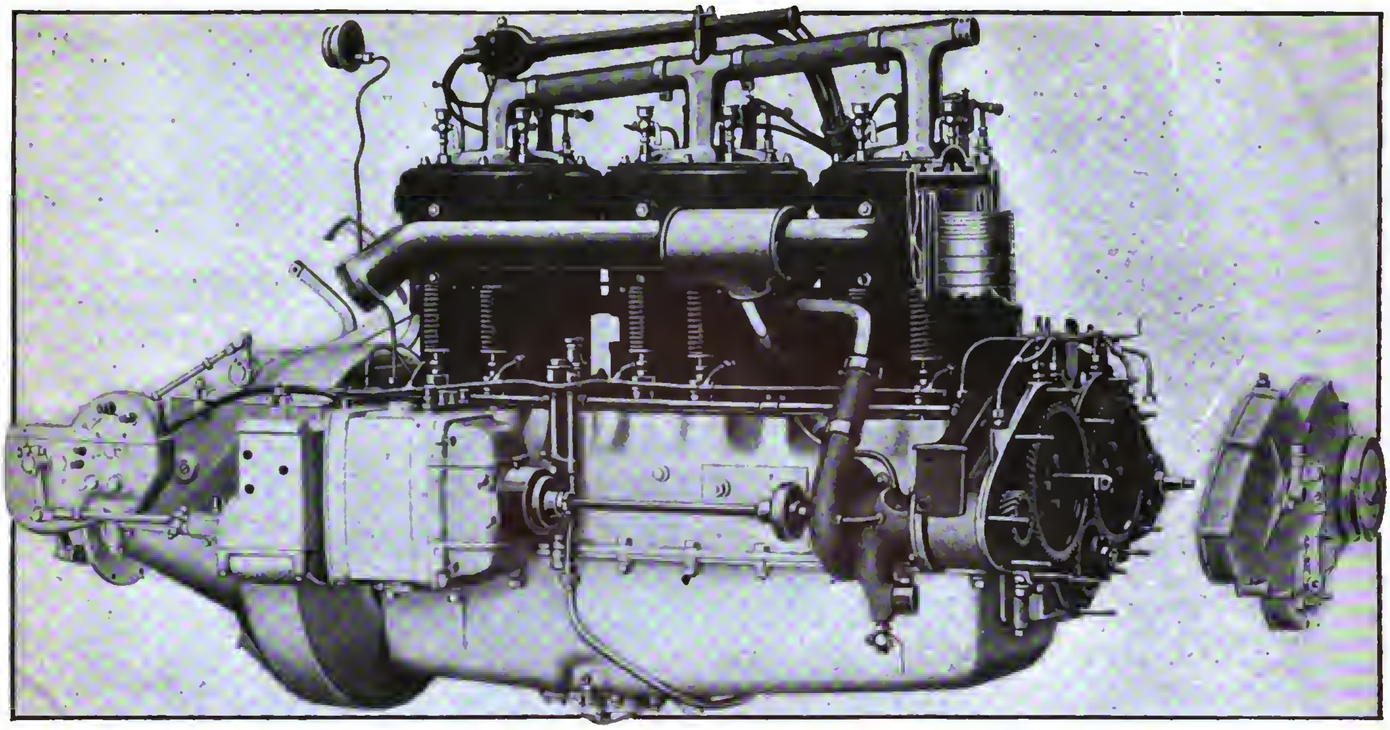


Fig. 5—Showing the new Packard motor with the front cover removed, displaying timing gears

oil capacity is 1 gallon and the oil level is indicated within a gauge glass on the left side.

The dry-plate clutch is used and designed for gradual engagement. The casing plates are faced with friction material, and the shaft plates have plain ground metal faces. An integrally cast rearward extension of the upper half of the crankcase supports the rear clutch shaft, clutch shifter and clutch pedal bearings. This extension also completely houses the clutch in a manner shown in the chassis illustration. To aid in gear shifting, a clutch brake is fitted to the clutch pedal.

Looking at the chassis as a whole, it is seen that the Packard design of two main units remains unaltered. The forward unit comprises the motor and clutch, and the rear one takes in the gearset, differential and final axle drive. The transmission unit reveals no new features. The gearset bolts directly to the differential housing through a flange. The housing for speed change gears, bevel gears and differential are of aluminum, internally ribbed for strength and rigidity. Throughout the transmission, annular ball bearings are used. The rear axle tubes are of large diameter and heavy gauge, pressed into and riveted within flange collars bolted to the housing. The hubs are ribbed from steel forgings, and the hub flanges are of heavy gauge pressed steel.

There are four brakes, the service being continuous external contracting bands operated by the right pedal. The emergency brakes expand internally. The internal brakes are inclosed and are protected by the drum disks. They are provided with bayonet locks against rattle.

The steering is by worm and nut, the worm and worm shaft being forged integrally with the flange joint. The nut has trunnion disks which operate the yoke. The latter is forged integrally with its shaft, the end of which is squared to receive a heavy ball arm. The steering connecting-rod is so arranged that the car may be turned around in a circle 45 feet in diameter.

The Packard 48 is furnished in three forms—touring, phaeton and runabout. The wheelbase of the touring and phaeton types is 139 inches, while that of the runabout is 121 1-2 inches.

Several new body types have been added to the former wide range of styles in open and closed designs. The phaeton-runabout is a distinctly new style of body which has been added to the open line. It is a rakish body designed to fit the phaeton chassis, thus giving the advantage of the longer wheelbase.

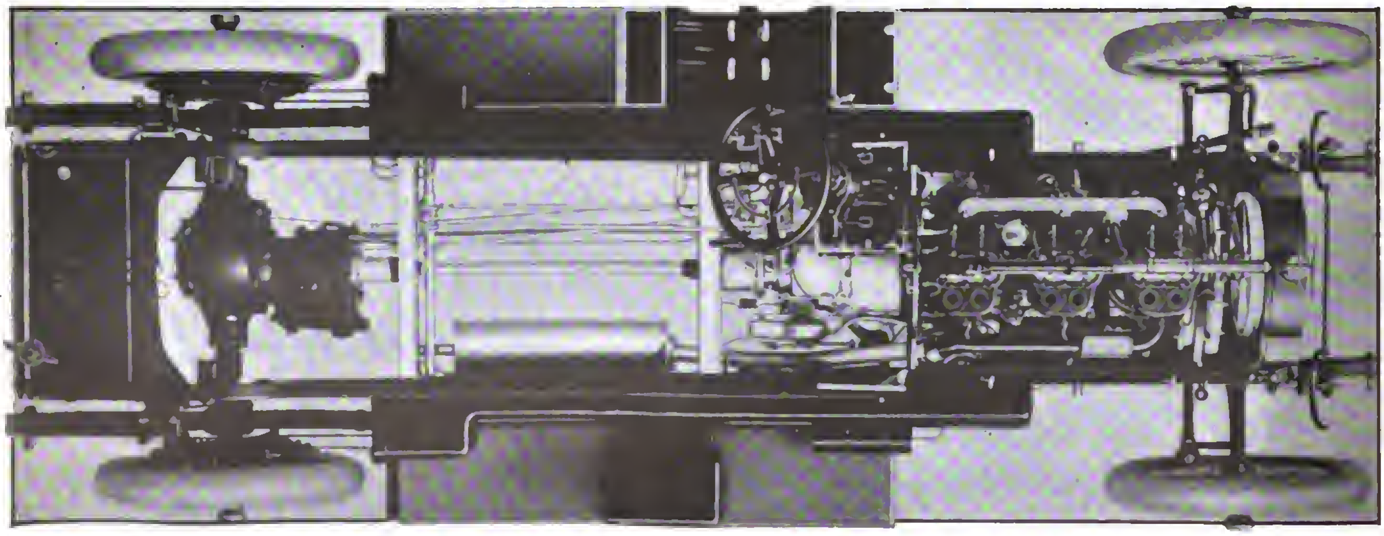


Fig. 6—Plan view of the new Packard 48 chassis, showing mounting of drive and torque members

Jules Goux in the Peugeot which he is to drive at Indianapolis, Ind., in the 500-mile race

Foreign Drivers Preparing for the 500-Mile Race

PARIS, March 1—Before starting in the French 15-day reliability trial today on a Pierron car, Albert Guyot did a little practising on the six-cylinder Sunbeam entered for the Indianapolis 500-mile race. Guyot declares himself delighted with the car and believes that his rivals will have to possess an unusual turn of speed to keep ahead of the English record-breaker. The car has now been returned to the factory for slight modifications. Since it established its records at Brooklands it has been made several miles an hour faster. Among the new features is a radiator for cooling the lubricating oil. The Sunbeam car has six cylinders in pairs of 3.54 by 6.29 inches bore and stroke, giving a cylinder area of 380.8 cubic inches. The valves are on one side with their stems inclined so as to obtain a more efficient form of combustion chamber. The motor has a force-feed water circulating system, high-tension Bosch magneto and Claudel carbureter. The lubrication is under high pressure to the main bearings and through the hollow shaft to the connecting-rod ends. A large quantity of oil is in circulation and arrangements are provided for cooling it while in circulation. Up to the present this car has always been equipped with Sankey steel detachable wheels. It is probable that the same will be used at Indianapolis, with Palmer cord tires.

Albert Guyot, who has been selected to drive the Sunbeam, is a Frenchman of 32 years of age whose first important victory was the winning of the light car Grand Prix at Dieppe, in 1908, on a Delage single-cylinder model. A spectator of Bleriot's flight across the English Channel, Guyot took to flying in 1909 and on August of that year secured his license on a Bleriot monoplane.

To come within the Indianapolis rules, the cylinder bore of the Peugeot racers has been decreased from 110 to 108 millimeters. As their stroke is 200 millimeters, the cylinder area will be very close to the 450 cubic inches allowed under the rules. With the exception of the fitting of the smaller-bore cylinders the cars have undergone very little change. They have overhead valves directly operated by a patented type of camshaft and pushrods placed over the center line and some distance away from the cylinder heads. The cars are fitted with Bosch magneto and Claudel carbureter and have lubrication under very high pressure to all parts. The oil is cooled by deep ribs on the base chamber. A three-point suspended sub-frame carries the motor and gearbox, the final drive being by propeller shaft without the use of radius rods or torque tubes. The cars will be fitted in the race with Rudge-Whitworth wire wheels; the tires have not yet been chosen. At present the gear ratio is 2 to 1. This will doubtless be retained, changes being made on the wheels to get the exact ratio necessary for the track. Jules Goux and Paul Zuccarelli will be in charge of the Peugeot pair.

The six-cylinder Sunbeam to be driven by Albert Guyot in the 500-mile race at Indianapolis, Ind.

Many Fittings for Cars and for Drivers

Novelties Seen at the Boston Show—Devices Which Have Not Been Described Previously, and Which Are of Value to Owner, Manufacturer, Garageman and Repairman

Part 1

MANY new accessories have appeared for the first time at the big shows held in New York, Chicago and Boston this year. A number of these have been covered in past issues of THE AUTOMOBILE which dealt with the novelties shown at New York and Chicago. At the Boston show a number of the New England manufacturers displayed accessories which are new to the automobilists.

It is purposed to take up the accessories which seem to have an unusual merit as factors in increasing the comfort or reducing the expense in running an automobile. Most of these accessories appeal to the car owner although there are others which are interesting to the garage keeper. Among the latter are portable tire inflators and jacks which lift the entire end of the car in one stroke.

The following descriptions give a brief outline of the principles involved in each accessory as well as outlining its purpose. It will be noted that the attention of the accessory makers are not confined to one particular line of endeavor nor to the cheaper type of car. Tires, ignition and lighting devices, primers, speedometers, etc., of improved design will be found mentioned in these columns. While many of these have been brought out by new concerns there are several devices which are the outgrowth of similar accessories placed on the market some time ago. Ease of manipulation of tools and legibility in gauges and measuring devices has been made a subject of study by accessory manufacturers.

F. & S. Ball Bearings are characterized by a new retainer. The shape of this retainer and its construction are shown in Fig. 1. It allows the very small space between the balls so that a maximum number of these may be carried in addition to the fact that they are guided perfectly and that there is no possibility of inter-ball contact. A solid-cage construction is used and its form is such that no parts can get between the balls and wedge them in case the cage breaks. The makers claim that, should the cage break, the work of the bearing will not be disturbed. They are imported by the J. S. Bretz Co., New York City.

Tyrian tires and inner tubes made by the Tyer Rubber Company, Andover, Mass., are manufactured by a concern which has been in the rubber goods business for over 50 years. Casing are made in plain or non-skid tread. The non-skid tread consists of two rows of T-shaped depressions in the tread. These depressions are positioned so that the stems of the T's point toward the hub, one row on the outside of the tire, the other on the side next to the body and a smooth tread strip remaining between them. This style of non-skid carries with it the argument of having sharp edges of rubber to offer resistance to skidding to either side as well as to a circumferential slip. Tyrian casings are built up of Para rubber and Sea Island cotton.

The Expanson tire of the Expansion Spring Rim & Tire Company, Boston, Mass., has an outer shoe similar to the standard pneumatic casing, but instead of using an inner tube filled with air employs what is termed an expansion core supported in conjunction with a crescent-shaped retainer which holds the core outward against the tread portion of the casing. The core is made up of alternate sections of rubber and a non-compressible material. It normally fills not more than one-half of the internal space in the casing, the space occupied being that closest to the tread. In operation the flexible core, in combination with the spring retainer, is looked upon to absorb the jar and it is claimed to distribute this jar around a considerable portion of the wheel periphery.

Bethlehem Five-Point Spark-Plug—The five points of the plug are arranged with one in the center which forms one electrode and the other four distributed in a hollow square about the central point and forming the other electrode. The object of the plug is to prevent carbonization, the use of two of the points at one time allowing the carbon to be burnt out of the other points during that time. Increasing the temperature of an electric conductor also increases its resistance. When two of these points become hot the spark will jump across the coolest gap. The body of the plug is made of Bethlehem steel insulated with German porcelain. A feature of the plug is the distance that the points extend below the body. The plugs are made by Victor G. Goulding, Holyoke, Mass.

Dunn-Ray Lighter—Utilizing a new principle for igniting acetylene lights from the seat, the Dunn-Ray lighter is particularly convenient. Every other device of this type requires a jump or make-and-break spark. This device consists merely of a platinum wire passing through the gap between branches and an electric battery. The wire be-

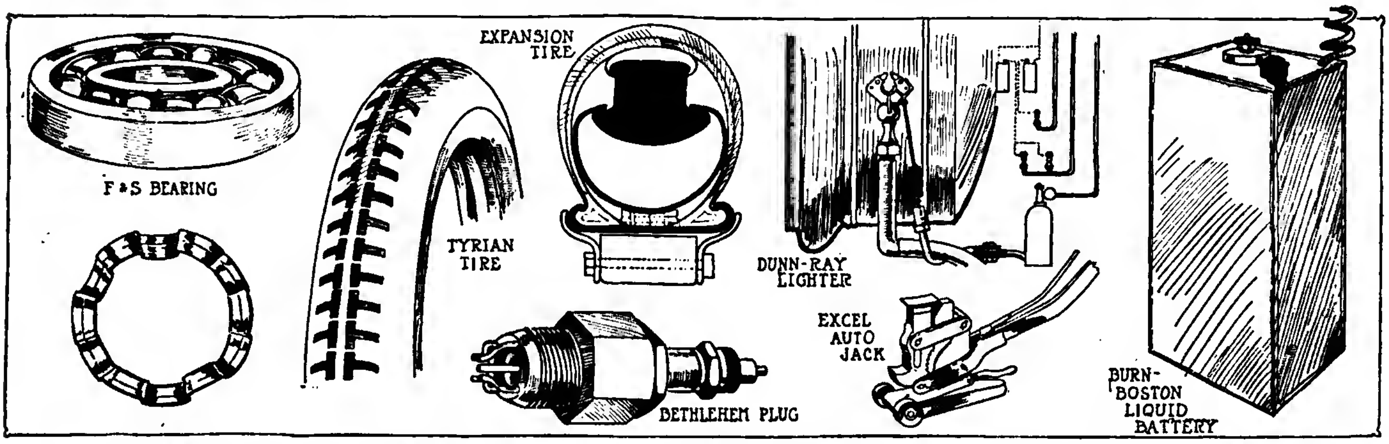


Fig. 1—F and S bearing with new retainer. Tyrian T-tread. Expansion tire. Bethlehem high point plug. Dunn-Ray electric gas lighter. Excel Jack. Burns-Boston liquid battery

comes incandescent in about 2 seconds after the switch is thrown on and lights the gas by means of this incandescence. By the aid of the device which is equipped with a controller on the dash the lights may be turned higher or lower from the seat. It is made by the Dunn-Ray Co., Boston, Mass.

The Excel motor jack, built by the Excel Jack Mfg. Co., Boston, Mass., is of the long-handle style, and designed to be used by the operator standing up. In other words, the jack can be positioned under either the front or rear axle and operated without the operator having to assume an impossible position. To facilitate this the pedestal, or stand, is mounted on two wheels at its forward end, these wheels enabling the jack to be readily pushed into any position under the axle. The jack is operated by an up-and-down movement of the handle.

Burns-Boston Battery is a liquid cell using a special form of salt solution electrolyte. The design of the battery is such that rapid circulation is allowed to permit of excessive overload and of obtaining an even distribution of wear through all parts of the current-producing material. The zinc sheet is insulated from the electrolyte and cannot be acted upon by it, except for a pinhole vent. The cell is tightly sealed, thereby doing away with all sources of leakage. The liquid employed in the electrolyte gives forth no noxious gases and is non-freezing. These cells are made by the Burns-Boston Battery and Mfg. Works, Boston, Mass.

Bair Auto Top Holders have been adopted as standard equipment on nineteen important makes of automobiles for the 1913 season. They hold the top tightly in place, keeping the bows separate and tightly in place by a strap and spring. The bows fit into separate notches arranged in a line on the top holder and when clamped in place cannot move. Bair bow hinges are adjustable and can be arranged to bring the top to the desired shape. This is effected by setscrews under each flap. They are made by the Auto Specialties Mfg. Co., Chicago, Ill.

Crankless Gasoline Primer supplies an evaporized mixture of gasoline to a point in the inlet manifold close to the cylinders in order that the motor will respond promptly to the electric starter and reduce the current consumption and wear on the starting device. Besides this its object is to make starting more certain. The crankless primer consists of the valve casing containing two valves. The casing is mounted on the inside of the dash. Projecting on the inside of the dash is a valve stem made of selected Tobin bronze on which is mounted a lock-nut and nickel-plated foot button. Should the starter not operate quickly, the foot button is pressed, allowing a mixture of gasoline and air to be forced into the manifold. As shown in the illustration, Fig. 2, the gasoline is taken from the feed pipe between the carbureter and the tank. The two valves draw in the gasoline and air and a pressure on the button forces the mixture into the manifold. This device is made by the Cox Brass Mfg. Co., Boston, Mass.

The Ingersoll-Sargeant Drill Company, Boston, Mass., has a various line of air compressors for garage use, some of these being air-cooled and others water-cooled. Some types are stationary and others mounted on three-wheel trucks, on which are also mounted the electric motor for operating the compressor. The motors used in these air compressors are for 110 and 220-volt circuits. They are also made for three-phase, 60-cycle, 110, 220 and 440-volt circuits. The company also furnishes them for single-phase alternating circuits of 110 and 220 volts. These compressors are made with various cylinder sizes, namely 2.5 by 3 inches, 3.5 by 4 inches, 4.5 by 5 inches, and 1 by 1.25 inches. What is known as the Imperial tire pump, is a combined air-cooled single cylinder pump with an electric motor on a three-wheeled truck, has 1 by 1.25-inch cylinder. It operates at 1,700 revolutions per minute, and is claimed to inflate a 35 by 4-inch tire up to 70 pounds pressure in 3 minutes. The Imperial 12 is also a combined pump and motor mounted on a truck. The single cylinder air-cooled motor measures 2.5 by 3 inches bore and stroke. It operates at 450 to 700 revolutions per minute.

Blazer Horn is an exhaust horn for Ford cars and is one of the most simple devices of its kind ever produced. It can be attached by slipping the pipe holding the horn over the end of the Ford exhaust pipe and by connecting with a pedal. It consists of two whistles which are blown by the exhaust gases diverted by a flap valve operated by a bell crank leather and held in place by a coil spring. As the horn is tilted down it is impossible for it to become clogged, the dirt being shaken out by the vibration of the car. It is made by the Motor Specialties Co., Cambridge, Mass.

The Cataract diagonal block tire for motor trucks differs from other block tires by virtue of the diagonal positioning of the blocks on the rim. The blocks are of such size that upward of a dozen are used to extend around the wheel. They are made in either single or double rows, according to the width required. The blocks are flanged on both sides and have steel trellised bases moulded into the rubber and extending to the extreme edge of the side flanges which secure the blocks in position. The blocks are flanged on both sides in order to fit snugly into the row of steel rims and are also fastened by cross-sectional steel strips with three bolts inserted through the strip and wheel, and tightened by nuts on the inside, this being done to avoid any possibility of creeping and stretching. The diagonal construction is used to eliminate vibration, as with it there are three blocks at a time in contact with the road, and at all other times two blocks carry the weight, in this way making rolling smooth. In case of damage a block is removed as in the various types of block tires now on the market. These tires are made by the Cataract Rubber Co., Buffalo, N. Y.

Standard Speedometer—A new Standard centrifugal speedometer which has made its first appearance at the Boston show indicates the speed by large figures shown at the top of the dial. The slogan adopted by the company in selling this speedometer is "A Figure for Every Mile." The total mileage is shown below the speed dial and below this is the trip mileage. There are two sets to the instrument, first a selective set by which the mileage may be set at any desired point, and second, a zero set by which the mileage is set back to zero. These speedometers are made by the Standard Thermometer Company, Boston, Mass.

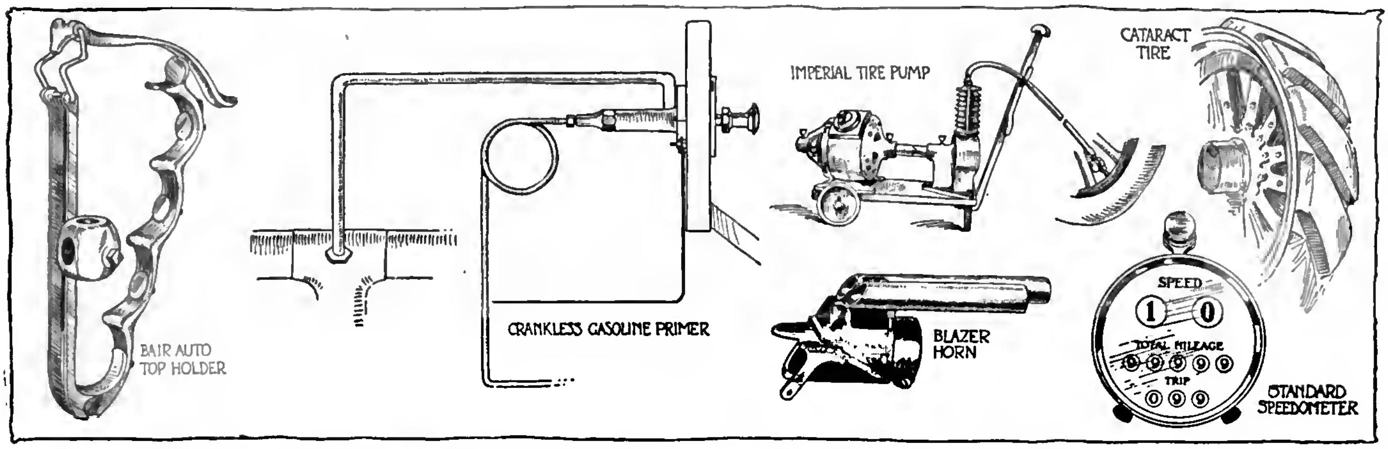


Fig. 2—Bair top holder for top bows. Crankless primer for gasoline. Ingersoll Imperial tire pump. Blazer horn for Ford cars. Cataract diagonal block tire. New Standard speedometer without indicator


Boring machine used in the factory of the Haynes Automobile Co., Kokomo, Ind. It requires only one man to operate it

THE machine shown in the above illustration can do two things. It can bore the cylinders accurately to size and it can face them off. It takes but one man to operate both processes. Time is saved with this machine because it is only necessary to set up the job once for both operations, instead of making two separate settings. The illustration shows the cylinders in place ready to be worked upon. As may be noted, there are two blocks of cylinders in the machine at one time, so that the time spent upon the work is cut down to its furthest degree. This machine is used in the shop of the Haynes Automobile Company at Kokomo, Ind.

CANADIAN Industry's Growth—Since the first automobile show was held in Toronto, Ont., 8 years ago, automobile factories have been started in seventeen Ontario towns and cities. There are large manufactories in Brantford, Orilia, Brockville, Oshawa, Windsor, St. Catherines, Berlin, Amherstburg, Petrolia, London, Ottawa, Bowmanville, Ingersoll, Guelph, Galt, Walkerville and Kingston. Toronto and West Toronto have several large plants making automobile engines, batteries and other parts.

High Point's Addition—An addition is being erected to the plant of the High Point Motor Co., High, Point, Tenn.

Feilbach Buys Site—The Feilbach Motor Co., Milwaukee, Wis., has purchased a site of 5¼ acres upon which a new plant will be erected.

Erect Automobile Painting Plant—Ground has been broken by J. W. Schnabel for the erection of a plant for painting automobiles in Greensburg, Pa.

Morgan & Wright Builds—The Morgan & Wright Co., Detroit, Mich., has commenced work on a five-story addition to its plant. It will be 94 feet by 250 feet and will cost $100,000.

Baldner Contemplates Automobile Plant—The Baldner Automobile Mfg. Co., Xenia, O., recently organized, contemplates the erection of an automobile plant at that point.

Aluminum Goods Company Enlarges—The Aluminum Goods Co., which has plants in Manitowoc and Two Rivers, Wis., will enlarge both this summer. An addition, 100 feet by 20 feet, will be made at Two Rivers.

Dealers Visit Ford Plant—A. H. Smith, manager of the factory sales branch of the Ford Motor Co., Indianapolis, Ind., was recently host for a party of 150 Ford dealers, bankers and newspapermen on a trip to the factory at Detroit, Mich.

Peerless Building Plans Completed—Plans for a five-story brick, concrete and steel truck factory to be constructed in Cleveland, O., for the Peerless Motor Car Co., that city, have been completed. The plant will cost $250,000.

Vulcan Plant Started—The Vulcan Mfg. Co., which recently purchased property in Painesville, O., has perfected an organization and will start the manufacture of automobiles. The plant is expected to be finished by July 1 and will employ 150 men.

Standard Adds—The Standard Aluminum Co., of Two Rivers, Wis., will add a large rolling mill this year. An addition, 160 feet by 40 feet, will be erected at once to house the rolling mill equipment. The concern will become a large importer of French aluminum in the raw.

Gray & Davis Building—The Gray & Davis Co., Boston, Mass., has awarded a contract for a factory building to be erected on the Charles River near Cambridge. The contract calls for a five-story reinforced concrete building. The work will be pushed in order to reach completion by July 1.

Factory Office Removed—The factory office of the Pope Mfg. Co., Hartford, Conn., has been removed to the quarters in the west wing formerly occupied by the post office department as a sub-station of the local post office. The space vacated by the factory office will be given up to the factory use.

Republic's Factory Club—The Republic Rubber Co., Youngstown, O., has decided to build a clubhouse for its factory employees, which will be 60 feet by 130 feet in size and made of brick and three stories high. The new clubhouse will be partially under the control of the 1,500 employees of the plant.

Wisconsin Aluminum Builds—The Wisconsin Aluminum Foundry Co., of Manitowoc, Wis., a producer of aluminum castings for the automobile trade, has decided to remain in Manitowac, the Citizens' Assn. having come forward with a site for the new plant, which will be 200 feet by 75 feet in size, of steel and brick construction.

Dayton Engineering Purchases Factory—The Dayton Engineering Laboratories Co., Dayton, O., has purchased a site and factory building of the Pinneo & Daniels Co., wheel manufacturers, and will maintain a plant on the site in addition to its present one. This company manufactures the Delco self-starting and ignition systems for automobiles.

Mitchell-Lewis Plant Busy—The plant of the Mitchell-Lewis Motor Co. at Racine, Wis., is now operating on a 24-hour schedule, three shifts of men being employed 8 hours a day each. The company some weeks ago started a 20-hour schedule, soon afterward increased this to 22 hours, and now to a full day. Nearly 2,100 men are employed.

Continues Manufacturing Atlas Parts—The Auto Parts and Repair Co., Springfield, O., has leased a portion of the Atlas Motor Car Co.'s factory at that city and will have a full stock of parts of Atlas cars and will repair both Atlas cars and other makes of cars. The company may eventually continue the manufacturing of commercial cars of this type.

Prizes for Republic Employees—In order to insure a greater interest in its product, and to stimulate suggestions for the improvements on machinery and in methods of manufacture, the Republic Rubber Company, Youngstown, O., yearly awards a list of cash prizes. The awards covering the past season were recently made.

Automobile Wheel Factory Coming—A factory for steel automobile wheels will be established in Kansas City, Mo., during the spring by J. N. Carnahan, of Washington, D. C., representing a subsidiary corporation of the Bernsten Steel Wheel Company, Pittsburgh, Pa. An assembling plant is to be opened in April for the manufacture of wheels and automobiles..

Company Moving to Nashville—Nashville, Tenn., has secured an automobile factory, which will be built at a cost of $200,000 and which will offer employment for 500 men. The new company is the Automobile Manufacturing & Engineering Co., Detroit, Mich., which has been manufacturing the Evans commercial car. The new plant will be of steel and concrete sections, so that the facilities can be readily increased with the growth of the business. The first section will be 60 feet by 200 feet.

Aluminum Castings Wants Site—The Aluminum Castings Co., with headquarters at Cleveland, O., and its principal western foundries at Manitowoc, Wis., is looking for a new location, claiming unfavorable labor and transportation conditions. It is likely that Racine, Wis., will be selected as the site of the new works. The Manitowoc plant is running at a greatly reduced production due to the inability to obtain sufficient labor. This concern manufactures crank-cases and other aluminum castings for many of the large automobile factories of the country.

National Adds to Factory—Another addition has been made necessary at the National Motor Vehicle Co.'s buildings at Indianapolis, Ind. The newest addition is a modern brick and cement building, adding 20,000 feet of floor space and three floors. On the first floor will be a general expansion of machine shops. On the second floor will be an enlargement of the painting department. The top floor will be an enlargement of the trimming and upholstering departments and has been especially arranged so as to afford exceptional good light and ventilation.

The Automobile Calendar

Shows, Conventions, Etc.

March............Indianapolis, Ind., Spring Automobile Show, State Fair Grounds, Indianapolis Automobile Trade Association.
March............Nashville, Tenn., Annual Show, Nashville Automobile Dealers' Association.
March 8-15........Boston, Mass., Annual Automobile Show.
March 8-15........Columbus, O., Annual Show, Billy Sunday Tabernacle, Automobile Club and Traders' Association.
March 10-15.......Columbus, O., Opening Week, Columbus Automobile Trades Association.
March 11-15.......Buffalo, N. Y., Commercial Vehicle Show, Auditorium, Automobile Dealers' Association.
March 12-15.......Ogdensburg, N. Y., Automobile Show, Louis Blumenstein, Manager.
March 17-22.......Norfolk, Va., Annual Show, Armory Building, Norfolk Automobile Trade Association, Inc.
March 19-22...... Springfield, Ill., Annual Show, Springfield Commercial Association, W. L. Chapin, Mgr.
March 19-26.......Boston, Mass., Annual Truck Show.
March 20-24.......New Orleans, La., Annual Show, N. O. A. D. A.
March 24-29.......Indianapolis, Ind., Annual Automobile Show.
Mar. 27-April 3....Quincy, Ill., Mississippi Valley Automobile Show, H. F. Hofer, Director.
March 31-April 5...Manchester, N. H., Automobile Show, Dealers' Association, J. H. Graham, Manager.
April 1-6...........San Francisco, Cal., Motor Truck Show, Coliseum Hall, *Motor Field.*
April 5-19.........Pittsburgh, Pa., Annual Show, East Liberty Market House, Dealers' Association.

Race Meets, Runs, Hill Climbs, Etc.

May 30...........Indianapolis, Ind., 500-Mile Race, Speedway.
July 1.............Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Association to the Pacific Coast.
July 1-16..........Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.
July 8-16..........Winnipeg, Man., Midsummer exhibition, A. C. Emmett, Manager.
July 27-28.........Tacoma, Wash., Tacoma Road Races.
Nov. 24...........Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 26...........Savannah, Ga., Grand Prize Race, Automobile Club of America.

Foreign

March............France, Sealed Bonnet, 3000-Mile Run.
March 31.........Montevideo, Uruguay, International Competition of Agricultural Motor Vehicles.
April.............Barcelona, Spain, International Exhibition.
May..............St. Petersburg, Russia, International Automobile Exposition, building of Michael Maneze, Imperial Automobile Club of Russia.
July 12...........Amiens, France, Grand Prix Race.

Showing a recent addition which allows 20,000 feet of floor space to the National Motor Vehicle Co., Indianapolis, Ind.

Daily scene in front of the Studebaker Corporation's plant 1 in Detroit, Mich. Every Detroit juvenile hopes to grow up to be a tester

AUTOMOBILES in Australia—There are about 135 automobiles in use in the Newcastle district, Australia, about 75 per cent. of which are runabouts, usually of 20 to 30 horsepower and four cylinders, selling at $1,000 to $1,200. Touring cars sell for $1,800 to $2,500, but the market for high-priced cars is very limited and is practically confined to European makes. Medium and low-priced cars are meeting with a good sale, and about 50 per cent. of this grade of cars in use are American. As the climate is semitropical the extra air pipe, besides the water-cooling device, is in general use.

Ogdensburg Holding Show—Ogdensburg, N. Y., is holding its annual automobile show this week.

Beyer Resigns—E. C. Beyer, manager of the Mitchell Motor Co., Kansas City, Mo., has resigned.

Bregstein Opens Supply House—C. Bregstein recently opened a supply house in New York City.

Inspector General Now—H. G. Harper has been appointed inspector general of the Studebaker Corporation's automobile division, Detroit, Mich.

Venice Purchases Pope Truck—The city of Venice, Cal., has purchased a 3-ton Pope-Hartford motor truck which will be used for the collection of garbage.

Baldwin with Stewart-Warner—R. H. Baldwin has accepted a position as assistant to E. W. McGookin, of the Stewart-Warner Speedometer Corporation, in Detroit, Mich.

Workman President—The Fargo Automobile Retail Dealers' Association, Fargo, N. D., has elected W. H. Workman president of the association for the ensuing year.

Jewell Sales Manager Kelly—W. S. Jewell has been appointed sales manager of the Boston, Mass., branch of the Kelly-Springfield Motor Truck Co., Springfield, O.

Schwitzer Columbia Chief Engineer—Charles Schwitzer has been appointed chief engineer of the Columbia Motor Car Division, Hartford, Conn., of the Maxwell organization.

In New Quarters—The E. V. Stratton Co., Albany, N. Y., Hudson and Stewart distributor for eastern New York, has leased for a term of years the premises now occupied by C. S. Ransom on Chapel street.

Garabrant Franklin Sales Manager—W. W. Garabrant has been appointed Franklin district sales manager for the states of Nebraska, Kansas, Missouri and Oklahoma. His headquarters are at Kansas City, Mo.

Buffalo Sends Delegation—Buffalo, N. Y., will send a big delegation to Albany at the hearing before the internal affairs committee of the Senate and tbe Assembly in regard to numerous bills affecting automobilists.

Denniston Appointed Manager—E. E. Denniston, Buffalo, N. Y., has been appointed manager of the truck sales department of J. A. Cramer, that city. Mr. Denniston will have sale of Federal, Jeffrey and Standard trucks.

Automobile Line Possible—There is talk of establishing an automobile line from Monessen, Pa., to Charleroi with a 5-cent fare. The cars will seat forty people, will be ligbted by electricity and made in every way comfortable.

Truncer Garage in Bankruptcy—E. C. Truncer, proprietor of the Northern Garage, filed a petition in bankruptcy in Buffalo, N. Y., his liabilities being $1,358.35 with assets totaling $87.90, of which $60 worth of clothing is exempt.

Inner Liners Manufactured—The Hampton Manufacturing Co. has been organized at Indianapolis, Ind., to manufacture inner liners for tires. Those interested in the company are Simon B. Nusshaum, Samuel Rubens and M. Moskin.

Little Sales Manager Borland—W. C. Little has severed his connection with the Lozier Motor Co., of Detroit, Mich., to accept a position as sales manager of the Borland-Grannis Co., of Chicago, Ill., manufacturer of the Borland electric.

Buffalo Wants Fire Trucks—Buffalo, N. Y., is in the market for two city service motor fire-fighting trucks and one automobile truck. Appropriations for purchase of these vehicles have been included in the city's estimates for this year.

New Studebaker Salesrooms—Before tbe spring is far advanced Studebaker automobile branches in St. Louis, Mo., Atlanta, Ga., Omaha, Neb., Minneapolis, Minn., Salt Lake City, Utah, and Washington, D. C., will all be housed in new homes.

Automobile Transportation Building at 'Frisco—An automobile transportation-building is to be erected by the National Association of Automobile Manufacturers at San Francisco, Cal., for the Panama-Pacific International Exposition to be held in 1915.

Internal Combustion Engine Exposition—The first annual exposition of internal combustion engines, under the auspices of the College of Engineering and Department of Agricultural Engineering of the University of Wisconsin, Madison, Wis., was held for four days recently.

New Hartford Dealers Association—Plans are under way for the formation of a new dealers association in Hartford, Conn. Due to a ruction by two business rivals in the organization a few of the members resigned. As a result it is understood that most of the members of the old association will resign from that and join the new.

New Agencies Established During the Week

PLEASURE CARS

Place	Car	Agent
Athens, Ohio	Marathon	George Moon
Buffalo, N. Y.	Rambler Cross Country	J. A. Cramer
Buffalo, N. Y.	Mercer	Ralph E. Brown Co.
Buffalo, N. Y.	Rambler	J. A. Cramer
Chicago, Ill.	Keeton	J. A. Bender Co.
Columbus, O.	Marathon	Pausch & Selbach Wagon & Auto Co.
Des Moines, Iowa	Apperson	Hawkeye Auto Co.
Des Moines, Iowa	Midland	Bernhard & Turner
Dunnell, Minn.	R-C-H	Cooper & Chute
Glassport, Pa.	R-C-H	R-C-H Auto Co.
Indianapolis, Ind.	Mitchell	B. M. Wiley
Kansas City, Mo.	Keeton	H. A. Dougherty
Los Angeles, Cal.	Case	Case Auto Sales Co.
Lonisville, Ky.	Chevrolet	Reimers Motor Car Co.
New York City	Apperson	Shepherd Auto Co.
New York City	Haynes	Geo. M. Redding
Pendleton, Ore.	Paige	Long Bros.
Philadelphia, Pa.	Edwards-Knight	Gregg-William D. Rogers Co.
Philadelphia, Pa.	McIntyre	Philadelphia McIntyre Auto Co.
Republic, Ohio	Paige	Womer & Ink.
Roseland, Ill.	Franklin	D. VanWyngarden
Sonth Bend, Ind.	R-C-H	A. J. Diermeyer
Spokane, Wash.	Paige	Consolidated Auto Co.
St. Louis, Mo.	Empire	M. W. Bond Automobile Co.
St. Louis, Mo.	Marion	Marion Motor Sales Co.
St. Louis, Mo.	Midland	American Welding & Auto Repair Co.
St. Louis, Mo.	Mogul	Mogul Motor Truck Co. of St. Louia
Syracuse, N. Y.	Sanford	A. A. Ledermann
Tacoma, Wash.	Paige-Detroit	Pacific Car Co.
Troy, N. Y.	Hudson	William D. Paine
Troy, N. Y.	Stewart	William D. Paine
Walla Walla, Wash.	Paige	W. J. McCormack
Washington, D. C.	Abbott-Detroit	David S. Hendrick Co.
Washington, D. C.	Case	J. L. Creyke
Washington, D. C.	Franklin	David S. Hendrick Co.

COMMERCIAL VEHICLES

Place	Car	Agent
Albany, N. Y.	Stewart	Alhany Garage Co.
Akron, O.	Stewart	Middlehury Garage
Atlantic City, N. J.	Stewart	Eastern Motor Co.
Buenos Ayres, Argentine.	Stewart	Pratt & Co.
Calgary, Alta.	Stewart	Motor Power & Transit Co.
Fall River, Mass.	Stewart	Robt. W. Powers
Grand Rapids, Mich.	Stewart	The Overland Co.
Hartford, Conn.	Stewart	Capitol City Auto Co.
Indianapolis, Ind.	Federal	McFarlan Six Sales Co.
Los Angeles, Cal.	Stewart	Stewart Auto Sales Co.
Medford, Mass.	Stewart	Ross Maddocks
Medicine Hat, Alta.	Stewart	Medicine Hat Garage
Montreal, Canada	Stewart	Ralph Careu
Newark, N. J.	Stewart	Edward McK. Hunt
Pittshurg, Pa.	Stewart	Alco Pittsburg Sales Co.
San Francisco, Cal.	Stewart	S. G. Chapman
Washington, D. C.	Stewart	David S. Hendrick Co.
White Plains, N. Y.	Stewart	Chas. F. Brown

ELECTRIC VEHICLES

Place	Car	Agent
Indianapolis, Ind.	Ohio	Ohio Electric Sales Co.

Add Motor Fire Equipment—Glendale and Bakersfield, Cal., have recently added motor equipment to their fire departments.

Higher License Rate—Talk of a higher license rate in New Orleans, La., has raised a determined protest from owners and dealers.

Benson Vice-President—E. R. Benson of the Studebaker Corp., Detroit, Mich., has been appointed vice-president of that company.

Large Californian Registration.—Twenty-six thousand and four automobiles were registered by the secretary of state of California in February, 1913.

Pritchards Sales Manager—T. B. Pritchards has been appointed sales manager for the V. S. Bringham Motor Car Co., Cadillac agents in Seattle, Wash.

Bailey Goes to Goodyear—I. R. Bailey has recently been appointed manager of the mechanical goods department of the Goodyear Tire & Rubber Co., Akron, O.

Firestone Branch Moves—The San Francisco, Cal., Firestone tire branch recently moved to new quarters at Van Ness avenue and Bush streets with W. M. Bell, manager.

KisselKar Agency Transferred—The Philadelphia, Pa., agency of the KisselKar has been transferred from C. H. Miller to C. H. McCausland, with J. J. Kane, Jr., as the new manager.

Suydan Goodyear Manager—James Suydan, manager of the St. Paul, Minn., branch of the Goodyear Tire & Rubber Company, Akron, Ohio, has been appointed manager of the Wisconsin, Wis., branch.

Bus Line Established—An automobile bus line has been established between Santo Domingo and San Geronimo. The same conveyances make trips to portions of the capital of the Dominican republic.

MacDonald Entertains Successor—Former highway commissioner J. H. MacDonald, of Connecticut, entertained his office associates and his successor in office, C. J. Bennett, at the Hotel Garde, Hartford.

Good Roads More Purchases—Recent improvements of the streets of Port au Prince, Haiti, has resulted in the purchase of ten pleasure cars and one truck. A rapid increase in the number of cars is expected.

Case Opens Branch House—The J. I. Case T. M. Co., Racine, Wis., recently opened its new branch house at Milwaukee, Wis., devoted exclusively to its automobile interests in the eastern half of Wisconsin.

Many Good Roads Bills—Twenty-one separate bills for new main highway routes, in addition to those included in the act of 1911, have been introduced into the present legislature in Pennsylvania and are in the hands of the public road committee of both houses awaiting action.

Reorganize Alco Sales Forces—Leigh Post, one of the vice-presidents of the American Locomotive Co., Providence, R. I., has been made head of the automobile department, and will have complete charge of the company's production and marketing of automobiles.

President Wilson Uses Horses—Contrary to expectations, President Wilson did not make appearance in the parade down Pennsylvania avenue after taking the oath of office in an automobile. Instead he and former President Taft used a large carriage pulled by four horses.

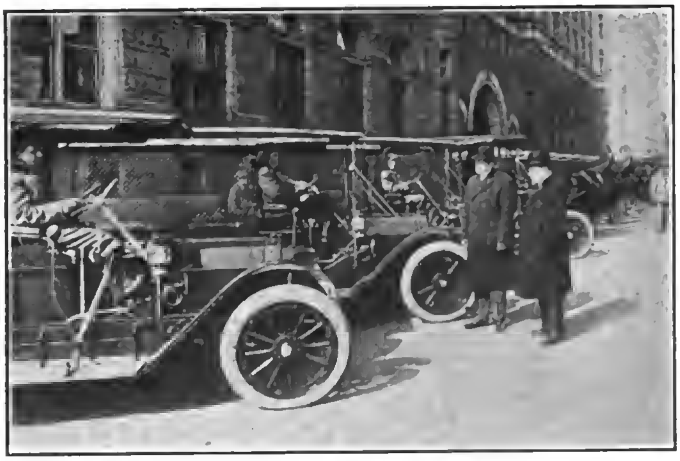
Buenos Aires' Automobile Driveway—A contract has been let by the municipal government of Buenos Aires, Argentina, providing for the construction of an asphalted automobile driveway along the Rio de la Plata, in front of the city. The work calls for the expenditure of $1,255,000.

Reynolds with New Company—E. W. Reynolds, the founder of the E. W. Reynolds Co., of Omaha, Neb., and who some time ago disposed of his holdings in that concern, has been made manager of the top department of the Western Auto Sales and Manufacturing Co., that city.

Gettysburg Taxies Taxed—By a decision of the Supreme Court the borough of Gettysburg, Pa., is now able to enact and put in operation an ordinance taxing automobiles which are used for hacking purposes on the battlefield, and the town council will likely pass such a measure in time for the coming celebration in honor of the fiftieth anniversary of the battle to be held July 1 to 4.

Club's Secret Service Bureau—In putting into effect its secret service bureau the Columbus, O., Automobile Club has a unique idea which so far has been quite a success. The club has employed a detective bureau to take care of all thefts of cars or contents from club members without any cost excepting the necessary transportation charges when the detectives are called out of the city.

President Woodrow Wilson and a party of friends in a Lozier six, near the Wilson home, Sea Girt, N. J.



An interesting occasion. Postmaster-General Hitchcock and Postmaster N. A. Merritt, of Washington, D. C., inspecting the equipment of the Washington office. At the left, under the inspection of the two officials, are the KisselKars used in parcel post work

Elmira Goodyear Agency—The Elmira Arms Company, Elmira, N. Y., has secured the agency for Goodyear tires.

Holds Speeding as Negligence—In New Jersey violation of the automobile law is evidence of negligence and may be so considered in an accident trial.

New Factory Branch—The Krit Motor Car Co., Detroit, Mich., has established a direct factory branch in Kansas City, Mo., with G. V. H. Cairns as manager.

Buick Garage Buys Property—The Buick Carage Co., Hartford, Conn., has acquired the Atterbury Garage and will remove the taxicab business to that place.

Martin Sales Manager—F. H. Martin has been appointed Eastern sales manager for the Stewart-Warner Speedometer Corp., Chicago, Ill., with headquarters in New York City.

Swinscoe Changes Position—The Weston-Mott Co., Flint, Mich., has secured the services of John Swinscoe, formerly chief engineer of Driggs-Seabury Ordnance Corp., Sharon, Pa.

Reilly Moline Manager—C. R. Reilly has been appointed manager for the Minneapolis, Minn., branch of the Moline Automobile Co., Minneapolis, Minn., to succeed W. J. Lawrence.

H. M. S. Company Formed—The H. M. S. Motor Co., New York City, recently incorporated, will deal in trucks, build bodies and repair and paint them. It is incorporated for $22,500.

Austin Studebaker Engineer—J. C. Austin, formerly chief engineer at the Regal Motor Car Co., Detroit, Mich., is now engineer of passenger cars under Chief Engineer J. G. Heaslet of the Studebaker Corp., Detroit, Mich.

Baker Manager on Jaunt—G. H. Kelly, manager of the truck department of the Baker Motor Vehicle Co., Cleveland, O., has started on an extensive Western tour in the interests of big business and service developments.

Firestone Acquisitions—G. J. Bates has recently connected with the Firestone Tire and Rubber Co., Akron, O., having charge of the sales in the pneumatic tire department. R. G. Harris has recently joined the same company as assistant advertising manager, with headquarters in Akron.

Hudson Donates $100,000—The Hudson Motor Car Co., Detroit, Mich., has agreed to donate $100,000 for the construction of the trans-continental stone road, the conditions being the same as in the case of the Packard and Willys donations.

Bellamore Armored Claimed Bankrupt—Three claims totaling $569.23 are the basis on which the Bellamore Armored Car & Equipment Co., New York City, is claimed to be insolvent. The application for involuntary bankruptcy was filed on February 26.

Chauffeurs Undergo Physical Examination—Applicants for chauffeurs' licenses in New Orleans, La., will have to undergo a physical examination in the future. Special attention will be given vision. No license will be issued to a person who is color blind or who has any other defect in sight.

New Chauffeurs' Organization—The Capital City Society of Automobile Engineers is a new chauffeurs' organization with seventy-five members in St. Paul, Minn. The society is formed to give chauffeurs opportunity to discuss automobile problems and proper care of them, and to furnish a reference to accredited chauffeurs to car owners.

Supply Dealers Organize—The Omaha, Neb., Automobile Supply Jobbers Credit Association was recently organized with C. G. Powell as president. The purpose of this association is to advance the interests of automobile supply dealers throughout the Omaha territory, investigate and regulate prices and in general work for better conditions in the trade.

Chalmers to Issue $1,500,000—With the consent of the majority stockholders, the Chalmers Motor Co., Detroit, Mich., is preparing to issue $1,500,000 in prepared stock through the banking firm of Spencer Trask & Co., bankers, New York City. The issue will permit the company to take up the floating indebtedness and will provide ample ready working capital, so that it will not be necessary to seek periodic accommodations from the banks.

Total Production Crude Oil—The total production of crude oil in the year 1911 was 220,000,000 barrels. The total production in the year 1912, as far as this can be gathered from reports at the present, will be somewhat less. The total production for the year 1910 was approximately 200,000,000 barrels. The gasoline producing crudes in 1910 figured 126,000,000 barrels; in 1911, 127,000,000, and in 1912, 124,000,000, approximately.

U. S. Interested in Tour—The United States Government has been asked to take an interest in the big pathfinding tour which the Indiana Automobile Manufacturers' Association is promoting for the proposed trans-continental stone automobile road. Permission has been requested to send a company of infantry on the tour, the soldiers to ride in a fleet of five motor trucks as a demonstration of the possibiilties of this method of transportation for the army.

Automobile Insurance Barred—The Iowa Supreme Court has held that under the Iowa laws an insurance company cannot write insurance against personal injury damage cases growing out of automobile accidents. The insurance department held that such insurance was not covered by the laws, while the attorney general held that it was against public policy. The decision says that special legislation will be necessary to legitimatize this class of insurance.

Automobile Incorporations

AUTOMOBILES AND PARTS.

Chasleston, S. C.—Only Automobile Co.; capital, $200,000. Incorporators: Santo Sottile, M. R. Rivers, Lawrence M. Pinckney.

Charlotte, Va.—Lyerly Motor Company: capital, $15,000; to do a general automobile business. Incorporator: D. K. Lyerly.

Cincinnati, O.—Fred M. Ross Spring Wheel Co.; capital, $100,000; to manufacture and deal in bubs and wheels for automobiles. Incorporators: Theodore Horstman, Fred M. Ross, W. W. Baxter, Horace Horstman, Otto Huber.

Cleveland, O.—Cleveland Motor Trucking Co.; capital, $10,000; to do a general trucking business witb motor propelled vehicles. Incorporators: J. Cbas. Ross, C. B. Goetzfreid, C. A. Cochran, Robert W. Blake, Henry Eckhoff.

Indianapolis, Ind.—Capitol Vody Co.; capital, $10,000; to manufacture metal automobile bodies. Incorporators: Elmer Hinshaw, Fred W. Henschen, Elmer W. Hughey, W. A. Lyons, R. Cogbill.

Mount Vernon, N. Y.—Motor Truck Mfg. Corp.; capital, $150,000; to manufacture engines, machinery. Incorporators: Artbur J. Albert, Louis Bertscb, Henry Hilchenbacb.

New York, N. Y.—American Truck Co.: capital, $3,000,000; to manufacture, sell and deal in automobiles, motor trucks, etc. Incorporators: Josepb F. Curtin, H. O. Coughlan.

New York, N. Y.—Veerac Motor Truck Co.; capital, $10,000. Incorporators: Harry B. McGinley, Edward L. Whittemore, George H. Hinnau.

Ravenna, O.—Ravenna Motor Truck Co.; capital, $200,000; to manufacture and sell self-propelled vehicles. Incorporators: W. F. Travos, A. N. Knutb, H. Schwartz, L. N. McKenzie, C. O. Liggett.

Rochester, N. Y.—Cartbage Auto Co.; capital, $5,000; to deal in motor vehicles. Incorporators: Frederick V. Kuhnert, Arthur W. Alderman, Chas. L. Pierce.

Rochestea, N. Y.—Rochester Automobile Exchange: to do a general automobile business. Incorporators: Ezra J. Beller, Bertram E. Wilson, W. Hayes Mitchell, Owen D. DeWitt.

Waynesboso, Va.—Waynesboro Automobile Co.; capital, $15,000. Incorporators: B. E. Watson, J. B. Young, H. M. Hanger.

GARAGES AND ACCESSORIES

Andesson, Ind.—Pierce Speed Controller Co.; capital, $25,000; to manufacture speed indicating and controlling devices. Incorporators: George W. Pierce, F. F. Mustard, U. M. McCullough.

Baltimore, Md.—Dreadnaught Tire & Rubber Co.; capital, $1,000,000; to manufacture automobile tires. Incorporators: A. F. Gilbert, Wilmer Dunbar, Walter E. Hill, C. P. Triplett.

Bedfosd, O.—Bedford Motor Bus Co.; capital, $10,000; to operate a motor bus line. Incorporators: Michael Wallner, Albert E. Smith, C. K. Brock.

Canton, O.—Harper Tire & Rubber Co.; capital, $400,000; to manufacture and deal in automobile tires. Incorporators: Warren D. Harper, James Tbomas, Albert H. Vayo, Byron B. Vaughman, Carroll Brady Bour.

Ford Adds to Establishment—The Ford Motor Co., Vancouver, B. C., has added to its establishment, a spare parts department. It has parts enough to build about forty cars.

Fire Destroys Walkerville Garage—Fire destroyed the garage of the American Auto Trimming Co., and caused a damage of more than $7,000, only part of which was covered by insurance.

San Marcos' Passenger Service—An automobile passenger service has been established between San Marcos and Luling, Tex., by Merritt & Wills. Daily trips will be made between the two towns.

Oshkosh Buying Fire Truck—The city of Oshkosh, Wis., has awarded the contract for a combination hose and chemical car for the fire department to the F. S. Hoaglin Automobile Co., that city, at $3,500.

Transfers Salesrooms—King & McDonnell, Sacramento, Cal., have transferred their salesrooms to the old Lutheran Church building at the corner of Twelfth and K Streets. They handle Michigan cars.

Banquet for Show Committee—Active, associate and contributing members of the Philadelphia, Pa., Automobile Association, recently tendered a banquet to the 1913 automobile show committee, as an appreciation of the committee's efforts in the success of the recent show.

Rubber Goods Declares Dividend—A regular quarterly dividend of 1 3-4 per cent. on the preferred stock and 6 per cent. on the common stock has been declared by the Rubber Goods Mfg. Co., of New York City, both payable on March 15 to stockholders of record on March 10. The common dividend is the same as was declared last year at this time.

Baltimore to Spend $50,000—The city of Baltimore, Md., plans to spend $50,000 this year to motorize municipal departments. Chief among these will be the conversion of ten hose wagons into automobiles, trucks for street cleaning department and park board and runabouts for the eight district engineers of the fire department, the superintendent of street lighting and the electrical engineer.

Opposed to Toll Reduction—Contending that a reduction of tolls over the Connecticut River bridge at Lyme and Old Saybrook would materially reduce revenue, the bridge commissioners are opposed to any such proposition as has been agitated of late. Mr. Haynes, who introduced the bill, claims that if the tolls were reduced there would be an increase in traffic with consequent gain in tolls.

The way icy weather drives the horses to the blacksmiths' shops. A scene in Cleveland, O., during a recent cold spell. Its significance to the motor truck manufacturer appealed to one of the officers of the Mora Power Wagon Co.

Opportunities in Foreign Markets—A foreign city has appropriated $14,280 for the purchase of four motor ambulances. File No. 10,269. A municipality in South America desires to purchase two automobile ambulances, fully equipped, and two motor buses, capable of carrying 24 soldiers. A merchant in the same city wants to hear from American manufacturers of heavy duty trucks, capable of carrying heavy loads and drawing a train of trailers as well. File No. 10,236. A business man in Portugal desires to act as agent for an American automobile manufacturer. He states that he has had experience in the automobile business. The machines must be good hill climbers and able to stand hard usage. Correspondence may be either in Portuguese or French. File No. 10,164. A foreign business man desires to receive catalogs, prices, shipping weights and measurements of the better grade of American automobiles. He is now agent for a large line of machinery. File No. 10,290. An American consular officer in a European country reports a good market for American automobiles in his district. A number of American cars have already been sold there, and a local sporting goods house desires to obtain the agency for a car. Correspondence in English. File No. 10,149. A report from an American consul states that a resident of his district desires to hear from American manufacturers of automobile tires. He desires to represent them in his country, either as general agent on a commission basis, or as exclusive selling agent. Correspondence in Italian, French or Spanish. File No. 10,309. An American consul has compiled a list of the automobile dealers and garages in his district, where American cars have had considerable success. There is a good field for increased sales, the machines being already held in high esteem. The list, as well as any of the other reports, may be had from the Bureau of Foreign and Domestic Commerce. File No. 10,322. An American now in business in a thriving agricultural manufacturing province in Europe informs an American consulate that he would like to secure an agency for a cheap runabout that can be converted instantly into a delivery wagon. He saw such a vehicle several years ago in the United States which sold for not more than $500. He is sure that a considerable business can be done with it among the farmers, but will not consider a more expensive car. Those interested will receive all information wanted by addressing the Bureau of Foreign and Domestic Commerce and by referring to File No. 10,391. An American consular officer reports that the owners of an automobile and mechanic workshop in his district desire to enter into correspondence with American manufacturers of small automobiles of 6 to 8 horsepower, accommodating two or three persons, strongly built and attractive, which could be sold for $1,000 or less. This firm is of the opinion that such a car would be in great demand, which has not yet been apparent because cars of this type have not yet been offered for sale. This company is willing to pay cash on delivery. American manufacturers of the type of cars described would do well to write at once to this firm, giving lowest terms and conditions of sale. Correspondence may be in English. File No. 10524.

Automobile Incorporations

CLEVELAND, O.—Cleveland Speed Indicator Co.; capital, $10,000; to manufacture and deal in speed indicators of all kinds. Incorporators: Arthur Friedman, Leo Friedman, O. Friedman, Marshall R. Stewart.

DOVER, DEL. Morgan & Marshall Co-Operative Rubber & Tire Co.; capital, $50,000; to manufacture rubber tires. Incorporators: R. J. Marshall, Ila P. Marshall, Morgan Howell.

EAST ORANGE, N. J.—F. C. D. Inner Tube Protector Co.: capital, $150,000; to manufacture automobile tires. Incorporators: Gilbert H. Field, James H. Christian, Thomas Dick, and Harry H. Pickings.

HARTFORD, CONN.—Hartford Auto Pump & Supply Co.; capital, $50,000. Incorporators: Henry P. Scbale, Edward E. Tryon, Thomas Lockwood.

McCOMB CITY, MISS.—Causey's No-Leak Mfg. Co.; capital, $1,000; to manufacture tire fluid.

MUNCIE, IND.—Derrickson Mfg. Co.: capital, $125,000; to manufacture a puncture proof compound for tires. Incorporators: H. S. Osborn, H. L. Kitselman, R. C. White.

NEW YORK, N. Y.—American Road Machinery Co.; capital, $1,000,000; to manufacture road machinery.

RICHMOND, O.—Sedgwick Mfg. Co.; capital, $10,000; to operate a factory for the making of a jack device for lifting automobiles from the ground. Incorporators: Richard Sedgwick, J. R. Sedgwick, James M. Judson.

ROCHESTER, N. Y.—Central Motor Supply Co.: capital, $30,000; to deal in electrical and mechanical devices. Incorporators: P. B. Barager, R. F. Glose, W. Wood, C. W. Gallinger.

ROCHESTER, N. Y.—Zimbrich Taxicab Co.: capital, $3,000. Incorporators: Herman J. Zimbrich, Alexander G. Wall, Fred Simmons.

TOLEDO, O.—D. & A. Paint Mfg. Co.: capital, $30,000.

VICTORIA, TEX.—Park Garage: capital, $10,000. Incorporators: Wilford B. Smitb, Harry U. Campbell, Geo. Clifton Edwards.

CHANGES OF CAPITAL AND NAME

BOWLING GREEN, O.—Bowling Green Motor Car Co.; capital increased from $50,000 to $100,000.

CHICAGO, ILL.—Automobile Construction Co.; capital increased from $27,000 to $100,000.

CLEVELAND, O.—Pennsylvania Rubber & Supply Co.; capital increased from $25,000 to $75,000.

COLUMBUS, O.—Midgley Mfg. Co.; capital decreased from $250,000 to $25,000.

COLUMBUS, O.—Rogers Supply & Tire Co.; capital, increased from $10,000 to $25,000.

DAYTON, O.—Air Friction Carbureter Co.; capital increased from $20,000 to $30,000.

EAST PALESTINE, O.—McGraw Tire & Rubber Co.; capital, increased from $100,000 to $1,000,000.

TOLEDO, O.—Matber Spring Co.; capital, increased from $100,000 to $300,000.

TOLEDO, O.—Rapp Mfg. Co. will change its name to Tbe Toledo Spark Plug Co.

COMBUSTION Motor Valve—Consisting of two concentric horizontal sleeves in the cylinder heads, which are divided by vertical partitions into three chambers.

The subject matter of this patent, consisting of two concentric, horizontal sleeves formed with transfer ports and positioned in the heads of a pair of cylinders is shown in Fig. 3. A valve chamber is formed across the highest portion of the combustion space and an outer sleeve O and an inner sleeve I are concentrically mounted in this chamber with a clearance just sufficient to permit of reciprocation of the sleeves. Two partitions divide the inner sleeve into two exhaust compartments and one inlet compartment and ports P E and P I in the cylinders serve to provide transfer passages between the combustion chambers and the exhaust and intake manifolds respectively. The sleeve valves are operated by means of a gearing G, consisting of a bevel gear driven off the crankshaft and two connecting-rods pinned eccentrically to the driven bevel gear, and each being connected to one of the sleeves.

No. 1,053,894—to Robert H. Adams, Detroit, Mich. Granted February 18, 1913; filed November 25, 1911.

Movable Headlight Support—Consisting of a cross-rod connected to the steering machanism and operating the rotatable lamp supports by yokes.

The device described in this patent Fig. 4 includes a pair of bearing brackets carried by supports, lamp supporting shafts S which are mounted in the brackets B and yoke members carried by the shafts S. Means for imparting rotatory motion to the operating members O consist in links which connect O to the steering mechanism, oscillating the ends of the members O when the steering gear is operated.

No. 1,053,832—to Ned Gensemer Krimmel, Pine Grove, Pa. Granted February 18, 1913; filed April 16, 1912.

Tire Construction—Being formed with two annular air spaces in the casing which preserve the shape of the inner tube.

This tire consists of an inner case C, Fig. 5, a tread T which is formed with a rib engaging C at its periphery and an intermediate case formed between the tread T and the case C. This intermediate is composed of a portion O and an inner portion I which are spaced at their centers so as to form a pair of air chambers A extending all around the tire. The inner and outer portions are engaged in the rib and their ends are held in close contact by the tread and the case C.

No. 1,053,238—to George A. Stewart and Harlan E. Goodell, Ridley Park, Pa. Granted February 18, 1913; filed January 23, 1912.

Automobile Spring Tire—In which circumferential and radial coil springs supplant the resiliency of the pneumatic tire ordinarily used.

As Fig. 1 shows the tire described in this patent is of the coil spring class and consists of an inner rim I and an outer rim O, which are mounted concentrically on the wheel felloe and between which the resilient springs are contained. There are two kinds of springs. The first kind S has the spring ends in engagement with the hooked ends of elements E which are fastened to the outer rim O, by means of serrations engaging oppositely formed serrations on the inner face of the rim O. The inner rim I carries on its outer surface an annular series of studs S 1 at which compression springs C are mounted, the outer ends of which are secured to eyes formed in blocks B, which latter are fastened to the elements E carried by rim O. It is seen that the compression springs C take the place of the inflating air used in pneumatic tires, while springs S keep the elements E from mutual displacment and the outer rim O, which carries the tread of the tire, from deformation.

No. 1,053,707—to Samuel J. Casey, Keeseville, N. Y. Granted February 18, 1913; filed April 5, 1912.

Electric Spark-Plug—The insulated electrode is inclosed in a tapered metal sleve fitting into a tapered shell.

The spark-plug, Fig. 2, consists of a metal shell S which has a tapered opening and is provided with longitudinal grooves in the walls of the inner end thereof. A tapered metal sleeve M is removable fitted into the shell S, M being formed with an outer flange in the handle H projecting from the same and through the use of which the sleeve M may be turned inside the shell S. M is formed along its side surface with off-standing lugs passing through the grooves of the shell. Inside the sleeve is a core of insulating material I surrounding an electrode passing through the entire length of it; a second electrode E through which the ignition current returns to its source is secured to the metal sleeve as shown.

No. 1,053,470—to Frank R. Blake, Malden, Mass., assignor to Blake Spark Plug Co., Boston, Mass. Granted February 18, 1913; filed January 24, 1912.

Carbureter Construction—Having air and fuel regulation valves operated by the same means.

This carbureter has a venturi tube, a fuel supply which discharges into the smallest part of that tube and a valve for the discharge. An air valve is located in the outer end of the venturi tube and it is adapted to control the pure air which enters the tube. Means for connecting both valves are provided.

No. 1,055,042—to William H. C. Higgins, Jr., Laporte, Ind. Granted March 4, 1913; filed August 20, 1910.

Automobile Headlight—For electric lamps.

In the headlight described in this patent an annular sleeve is secured to the rear end of the reflector and has a longitudinally extending recess serrated on one side. A curved spring member is secured to the sleeve and at its free end is provided with a slotted guideway adapted to register with the recess, but of less width than the latter. A socket member extends through the sleeve and has a locking lug projecting through the recess mentioned, a terminal plug being connected to the rear end of the socket and a bulb to the front of the terminal.

No. 1,054,746—to Walter E. Christian, Kenosha, Wis. Granted March 4, 1913; filed May 27, 1912.

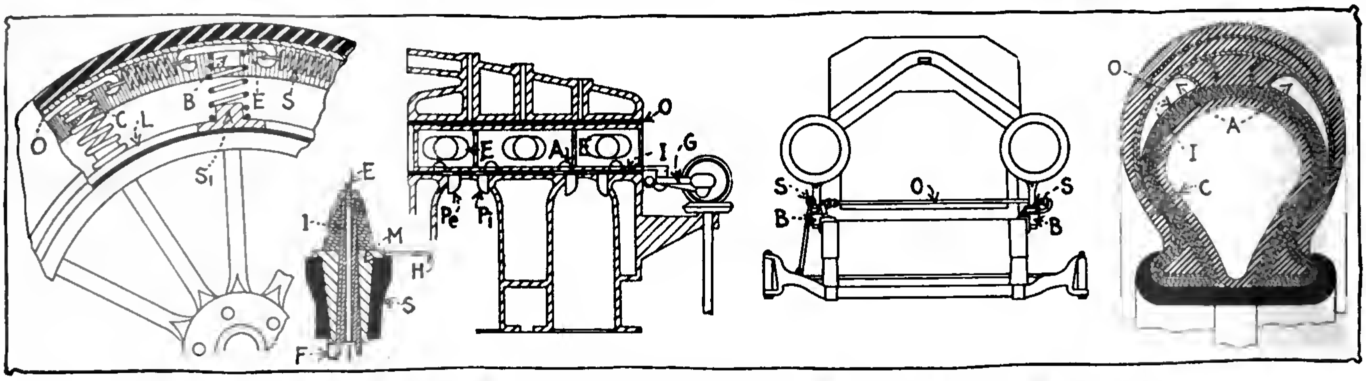
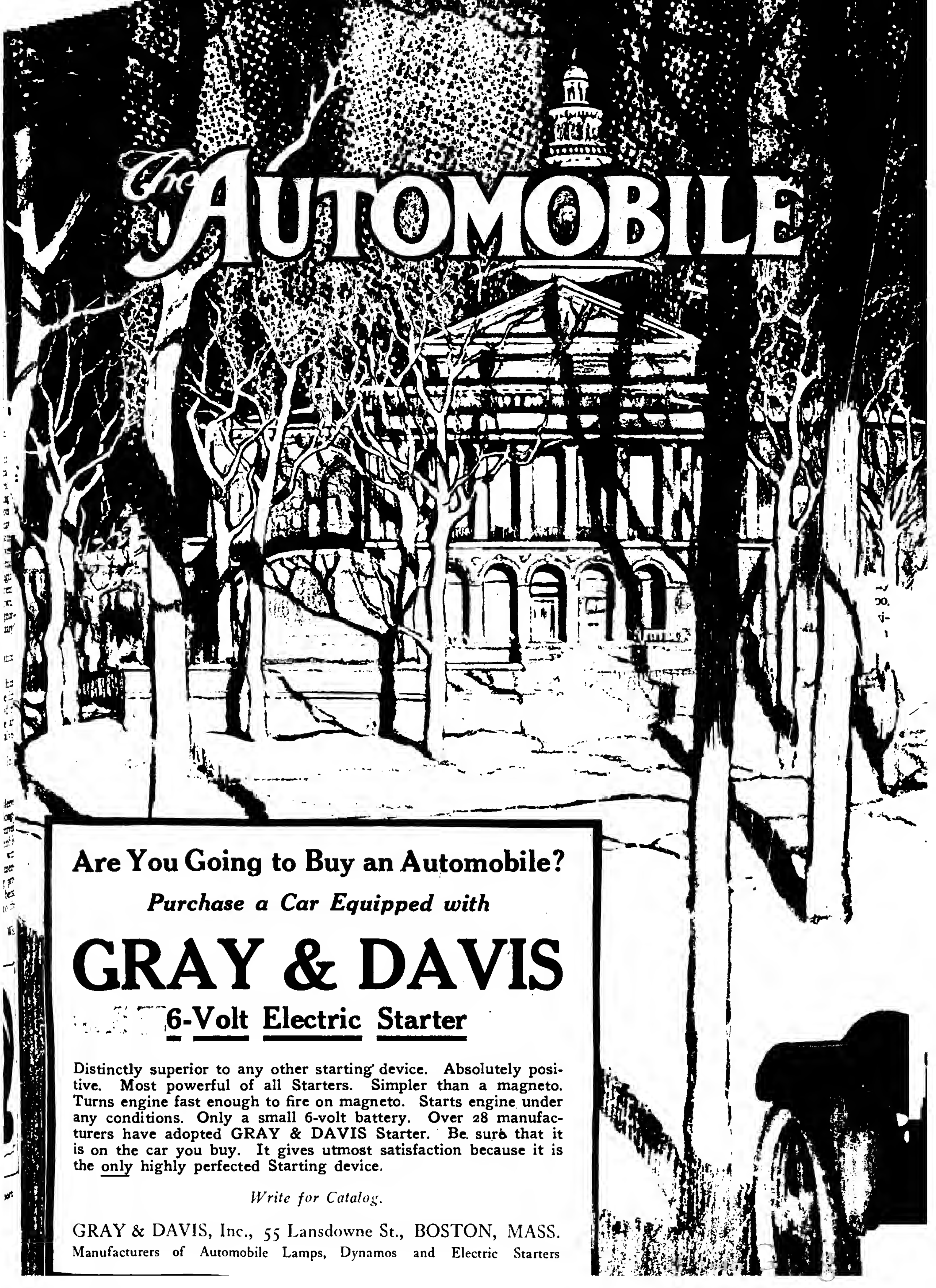


Fig. 1—Casey spring tire. Fig. 2—Blake spark-plug. Fig. 3—Adams motor valve. Fig. 4—Krimmel movable headlight support
Fig. 5—Stewart & Harlan tire construction


The AUTOMOBILE

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VOL. XXVIII NEW YORK—THURSDAY, MARCH 20, 1913—CHICAGO No. 12

The AUTOMOBILE

Road Building in the United States

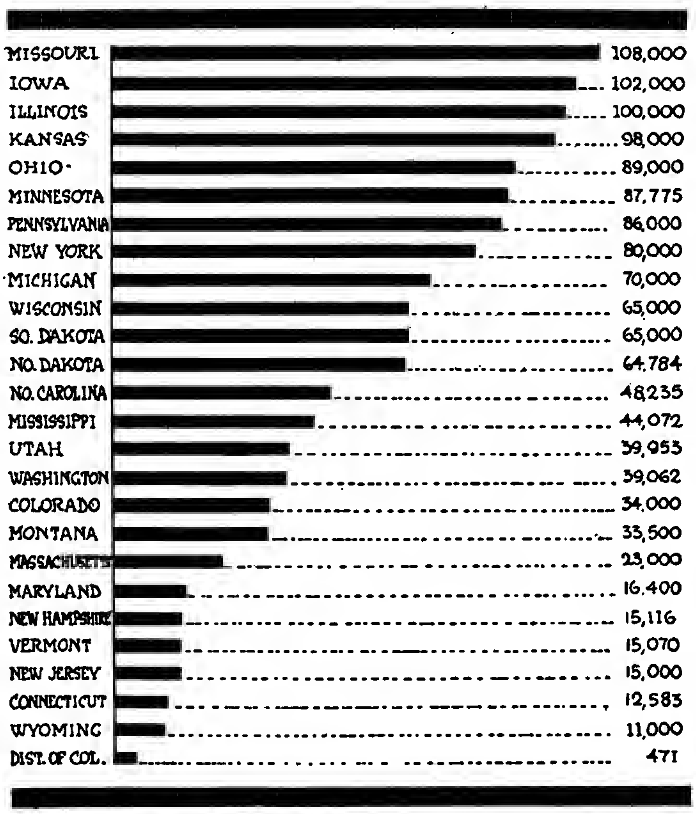
Statistics from Thirty States Representing More than 1,300,-000 Miles of All Types of Road Show What It Costs To Make Improved Highways Throughout the United States

DURING the year 1912 $62,691,425 was spent by twenty-nine states and the District of Columbia in the construction of good roads. It is impossible to obtain data from the remaining states for various reasons. They have either no organized road department, or are still in an experimental stage, or have no accurate cost-keeping system. The twenty-nine states which are named in the table published on page 667 are of interest, however, because they have gone into the matter in such a way that data on the construction of American roads is at last becoming obtainable

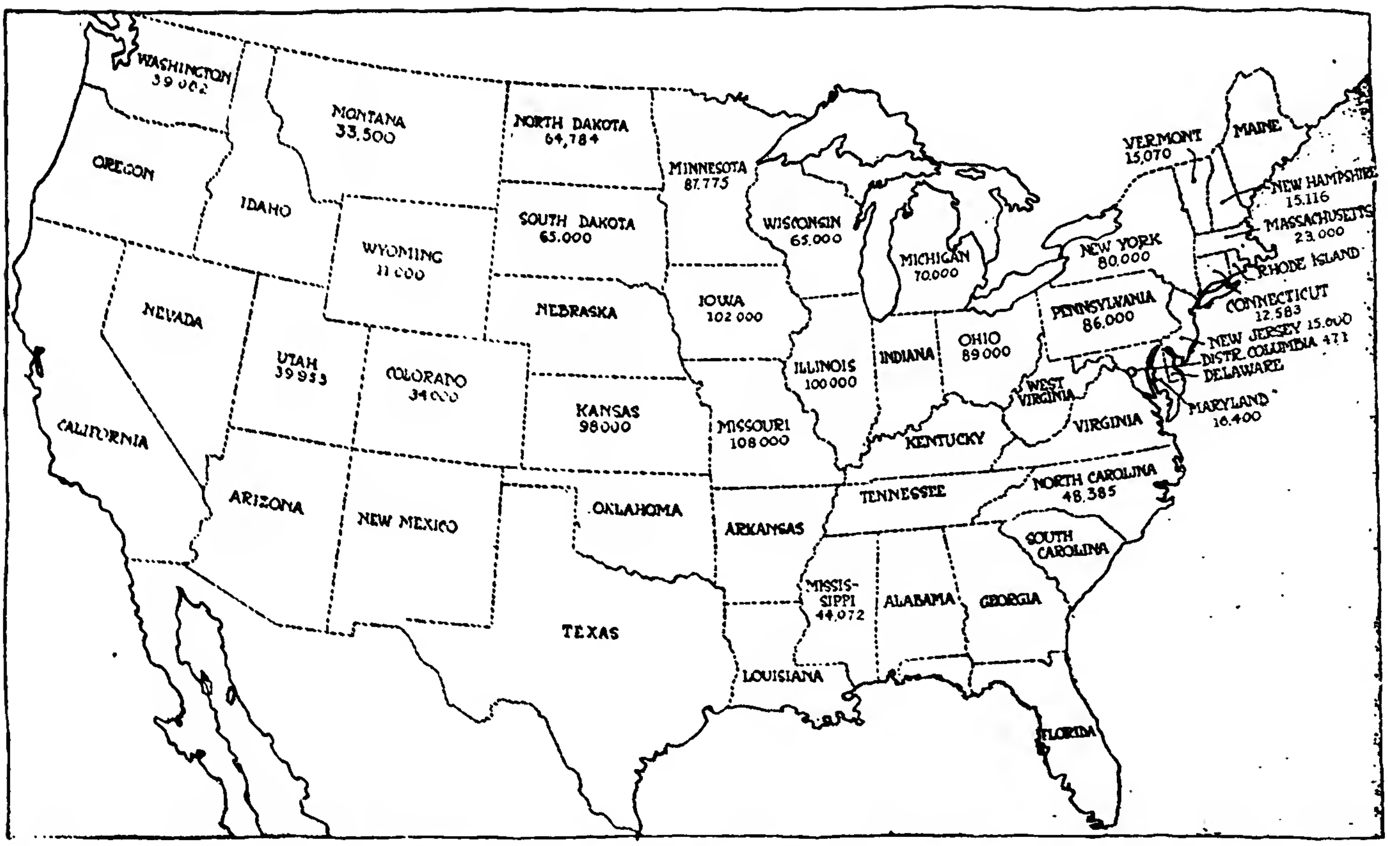
New York spent more money than any other state in the Union. During the year of 1912 approximately $15,-000,000 was expended on the highways of this state. More than 3,000 miles of new road were built and more than 10,000 miles of highway were shaped, crowned and standardized as to width. There are more than 80,000 miles of various kinds of roads throughout the state of New York, 11,000 of which may be classed as improved roads. It cost the state $1,363 per year for each mile of improved road, including the new construction work.

Illinois spent $7,500,000 during the fiscal year ending July 1, 1912. There are 100,000 miles of roads in the state, of which approximately 10 per cent. are improved. The improved roads consist of gravel, crushed stone and macadam, while the remaining 90,000 miles of unimproved roads are dirt. Many of the dirt roads are excellent and are cared for by local authorities. The State Highway Department secures its funds from appropriations made at each session of the Legislature, that for the past fiscal year being $100,000. The township road and bridge funds for the state amount to approximately $6,000,000, and in addition there is a hard road tax of $1,500,000. The state commission maintains a force of bridge and road engineers whose services are furnished the township officials when requested. The commission itself has no authority over road and bridge matters, and the advice given by its engineers can be taken or not as seen fit by the township authorities. It cost the state of Illinois $750 per year for each mile of improved highway, including construction work, figured on the basis of last year's reports.

Iowa has a total of 102,000 miles of highway, upon which it has spent during the past year $7,000,000. There are but 2,500 miles of improved highway in the state, of which a very small percentage is macadam. There are between 2,000 and 3,000 miles of stone road in the state, while the remaining 100,000 miles are dirt. Scattered sections of the roads are faced with gravel or some bituminous material. Most of the roads built during 1912 were dirt, the small percentage of gravel and similar roads being negligible in comparison. The money for road building in Iowa is secured by direct taxation, although some of the local



Comparative diagram showing the total miles of road in the twenty-nine states and the District of Columbia, the only divisions of the United States in which figures are obtainable at the present time



Map of the United States showing the total number of miles of road in each of twenty-nine states and the District of Columbia. No figures are obtainable on other sections of the country

organizations in various parts of the state help buy subscription work.

Washington has 39,062 miles of highway. Of this, 11,896 are improved; 7,826 miles of the improved roads are dirt, while the remaining improved roads are mostly gravel, the total mileage of macadam being but 184. During 1912 there were 400 miles of new roads built. These were chiefly gravel, with some bituminous macadam, water-bound macadam, brick and concrete. The mileage of highway improved last year is 2,000, the work done being chiefly regrading, crowning and draining, and in some cases by the addition of a hard surface. The cost per mile of improved highway was approximately $450 per mile for the year of 1912. This low cost per mile is doubtless due to the large mileage of improved dirt roads which require little labor and practically no foreign material requiring cartage and its ensuing expenses.

Kansas is another state which spent considerable money during the year of 1912 on roads. There are 98,000 miles of highway in the state, of which but 480 miles are improved. The remaining 97,500 are principally dirt. In the construction of new roads and maintenance of the old the state spent $4,275,-000. The total of miles of improved highway, as given above, does not include the improved dirt roads which comprise the majority of those listed in the mileage above. The state spent about $50 per mile of road, which would indicate that very little work was done through vast sections of the state, and that it was possible to do what repairing was necessary at a very low figure on account of the great mileage of the dirt roads. Only 60 miles of new roads were built during the year, these being of macadam, gravel, sand-clay and oiled earth.

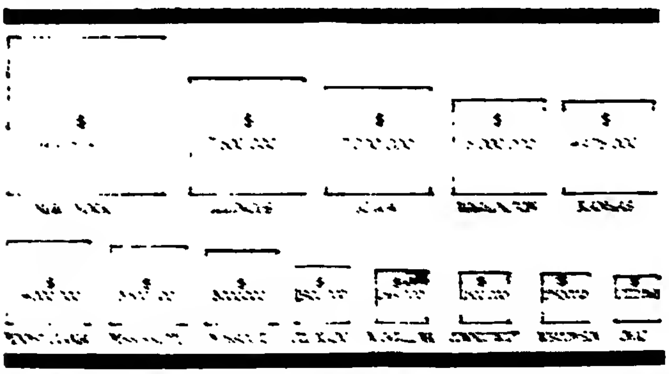


Diagram showing the relative amounts of money spent by all states which expended over $1,000,000 on roads during 1912

Mississippi has a total road mileage of 44,072. Of this 1,000 miles are improved. Of the improved roads 40 miles are macadam, 30 miles are crushed stone and about 500 miles are gravel. One-third of all the improvement work on road-building varies throughout the different counties of Mississippi, but on an average is somewhere in the neighborhood of $30 per mile, according to statistics furnished by the Department of Agriculture and Commerce. Mississippi spent $3,500,000 for roads during the past year. This makes an average of $3,300 per mile of improved road, including the new roads built. This cost is higher than that of other states when it is figured to include 333 miles of road which were improved during 1912.

Pennsylvania has a total road mileage of 86,690, of which 861 miles have been constructed by the State Highway Department. During the year ending September 1, 1912, 4,500 miles of road have been repaired and put in good condition for travel. Four million dollars have been spent on the construction of the new roads and the maintenance of the old. The money for the state highways is appropriated by the State Legislature, which in May, 1911, voted sufficient funds for the two fiscal years ending June 1, 1913. This means that a total of $2,000,000 per year during the years of 1911-1912 and 1912-1913 is available for highway use.

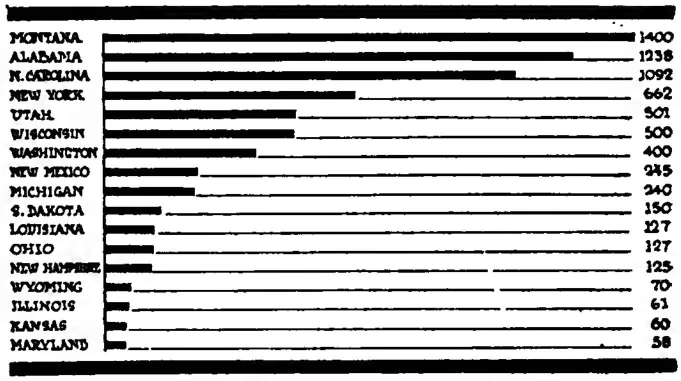
Ohio has 89,000 miles of road. Of this 25,000 is improved highway. The percentage of improved highway, the total highway is probably higher in Ohio than in any other state. Of the improved roads 10,000 miles are macadam and stone, 14,500 of gravel and 500 of brick and concrete. There are 64,000 miles of dirt road in the state, most of which are unimproved, but which are passable in good weather. The money spent in Ohio up to October 1 during the year 1912 amounted to $1,122,060. This was all given out in contract work. The cost per mile for the year of improved roads, including those freshly constructed, amounted to $400 per mile. Money is secured by appropriation through the Legislature at Columbus.

Missouri is another state which has spent a large amount of money last year in the construction of roads. About $3,000,000 being spent during 1912. There are 108,000 miles of road in this state, of which 4,750 are improved; 103,250 miles are dirt roads and are in good condition at favorable periods of the year. Of the improved roads the larger part are gravel, this type claiming about 3,500 miles, while the stone roads make up the remainder of 1,250 miles. There is established in connection with the state treasury a fund known as the general state road fund, which shall be used for no other purpose than that of the permanent improvement of the highways within the state.

Wisconsin has approximately 65,000 miles of highway. According to the United States Office of Public Roads there are 10,000 miles of these highways that have been improved, but the number is closer to 12,000. Most of the roads are dirt, but considerable work is being done along the line of macadam. Along the Fox River Valley experimental concrete roads have been constructed for the first time in Wisconsin.

Not a few states are carrying on experimental work with a view of determining the best surface to withstand wear of both climate and traffic and at the same time to be moderately cheap. The state of Illinois, for example, built 61 miles of experimental roads of different types during the year 1912. Results from these are not yet obtainable, but are expected to be of great value in determining cost and advantages of roads of different type.

The vast stretches of roads throughout this country are still of the dirt or earth type. These make excellent surfaces in good weather and after a stretch of bad weather can be restored by dragging. Where the percentage of dirt roads is greater compared to improved roads and macadam, asphalt and other artificial surfaces it will be noticed that the cost per mile of the road is materially less even where the dragging is thoroughly



Comparison of the number of miles of road constructed in 1912 by those states which have kept records

carried out and the dirt road kept in the best possible condition. The main disadvantage of this road is, of course, its tendency to rut wherever traffic is frequent. In the neighborhood of the larger cities and towns throughout the country it is necessary that some such hard artificial surface be used.

The majority of states which use convict labor are in favor of this method of maintaining and constructing the roads. There are, however, many dissenting opinions, even among the counties of the states which, as a whole, favor the use of convicts. In Mississippi the question was put to those various counties using convict labor what was thought of it and if it was profitable. Some thought the results were good and others did not. Alcorn County, for instance, says that it costs 80 cents per day for convict labor and the value of the work is 50 cents. It is a loss. Clay County, on the other hand, says it costs 80 cents per day with very good results. Pontotoc County says it costs about $3 per day and the value of the work is about $1.50, and is, therefore, a loss. Greene County says it costs about $1 to handle the convict and the value of the labor is $1.50 per day.

It has always been stated that American road construction was devoted too much to the building of roads and not enough to the maintenance.

TABLE OF HIGHWAY STATISTICS OF ALL STATES IN WHICH FIGURES ARE AVAILABLE.

STATE	Total Miles of Roads in State	Miles Improved Highway	Miles Macadam Roads	Miles Gravel	Miles Asphalt	Miles Dirt	Miles Stone	Miles Brick and Concrete	Other Roads	Miles Built in 1912	Improved in 1912	Money Spent in 1912	REMARKS
Alabama	....	....	....	....	....	....	....	....	..	1,238	3,780	$ 25,332	
Colorado	34,000	300	....	150	....	....	....	....	..	..	250	1,900,000	
Connecticut	12,583	3,030	665	774	....	1,214	6	....	376	..	....	1,500,000	Figures except appropriation are for 1911
Dist. of Col.	471	390	94	164	181	....	31	....	3	7	....	223,600	
Illinois	100,000	10,000	....	....	....	90,000	....	....	..	61	....	7,500,000	End fiscal year July 1
Iowa	102,000	2,500	....	4,500	....	100,000	2,500	....	..	Exper.	....	7,000,000	
Kansas	98,000	450	250	....	....	97,500	....	....	200	60	10,000	4,975,000	
Louisiana	....	....	....	....	....	115	....	....	12	127	....	199,931	
Maryland	16,400	382	305	....	....	....	....	2	75	58	165	892,602	
Massachusetts	23,000	20,700	....	....	....	....	....	....	..	..	....	500,000	
Michigan	70,000	1,500	300	....	....	69,700	....	....	1,200	240	....	125,000	Fiscal year ends July 1
Minnesota	87,775	....	....	....	....	....	....	....	..	..	4,305	....	
Mississippi	44,072	1,000	40	500	....	43,532	30	....	..	..	333	3,500,000	
Missouri	108,000	4,750	....	3,500	....	103,250	1,250	....	3	..	....	3,000,000	
Montana	33,500	7,000	25	....	....	33,475	....	....	..	1,400	....	750,000	
New Hampshire	15,116	1,890	500	1,400	....	....	....	....	..	125	....	450,000	
New Jersey	15,000	4,590	....	....	....	....	....	....	..	..	....	....	No other information available
New Mexico	....	....	....	7	....	282	....	....	423	245	....	78,613	
New York	80,000	11,052	7,092	....	....	....	8,500	....	4,830	662	11,052	14,915,141	
North Carolina	48,235	3,449.5	1,175	683	89	44,785	....	....	89	1,092	....	1,569,140	Figures for 1911
North Dakota	64,784	64,623	....	161	....	64,623	....	....	75	..	....	700,000	
Ohio	89,000	25,000	10,000	14,500	....	64,000	....	500	..	127	....	1,122,060	
Oklahoma	....	....	....	....	....	....	....	....	..	..	....	20,000	
Pennsylvania	86,690	....	....	....	....	....	....	....	..	..	4,500	4,000,000	For 2 fiscal years ending June 1, 1913
South Dakota	65,000	28,000	11	....	....	64,989	....	....	..	150	2,000	250,000	
Utah	39,953	1,644	47	....	....	1,441	133	....	23	501	....	570,006	
Vermont	15,070	4,000	....	900	....	....	225	....	..	..	190	425,000	
Washington	39,062	11,896	184	2,588	....	34,503	....	....	787	400	2,000	5,000,000	
Wisconsin	65,000	12,000	....	....	....	64,497	....	3	..	500	....	1,250,000	Mostly dirt roads
Wyoming	11,000	2,000	....	....	....	....	....	....	..	70	175	250,000	
Total	1,368,211	222,146	20,688	29,827	270	877,886	13,334	505	8,096	7,063	38,750	$62,691,425	

NOTE.—In the following states either no figures are available or there are no state roads: Arizona, Arkansas, California, Delaware, Florida, Idaho, Indiana Kentucky, Nebraska, Oklahoma, Rhode Island, South Carolina, Tennessee, Texas and West Virginia.

Thomas Stock in Trade Brings $51,000

C. A. Finnegan Makes Purchase—Good Will, Patents and Patterns Valued at $400,000 Included in Sale

BUFFALO, N. Y., March 18—*Special Telegram*—C. A. Finnegan, of the Empire Smelting Co., Depew, N. Y., purchased today, at the receivers' auction in this city, the good will of the E. R. Thomas Motor Co., all of its patents, patterns and stock in trade at the plant here and also at its branch departments in New York, Boston, San Francisco and Los Angeles for $51,000. In the catalog of the receivers these assets of the company were valued at $400,000.

Mr. Finnegan is a former Louisville, Ky., man, and it is reported, by a dispatch from that city, that he is considering Louisville as a location for an automobile manufacturing plant. He formerly headed a similar concern in that city.

The sale opened Monday, March 17, and it is expected that it will be concluded by Friday of this week when the last article to be sold will be the Around-the-World Trophy, presented by *Le Matin* of Paris and the *New York Times* to the Thomas company as winner of the New York to Paris race some years ago. The sale includes 5,843 catalog lots and over 400 bidders are at present in the city looking after various parcels of the sale.

Opportunities are being given at this auction to prospective buyers to examine the various parcels of goods in advance so that the auctioneer refers to each parcel by his catalog number when put up for sale.

During yesterday and today many of these parcels have been sold including paints and brushes, automobile tires, electric motors, sheet metal working tools, lathes, electro plating machinery and thirty-five lots of machinery from the experimental shop.

This auction gives promise of being one of the biggest ever conducted in this country. It was authorized last December by Judge Hazel, who issued orders to receivers George C. Finlay and Adolph Rebadow. J. E. Conant & Son, auctioneers, Lowell, Mass., are conducting the sale.

Those in attendance at the auction not only represent the entire American industry but many European representatives are present. More than 10 inquiries from foreign buyers were received previous to the opening of the sale and their interests are being looked after by American buyers.

Crown 30 To Make Its Debut

LOUISVILLE, KY., March 15—The Crown Motor Car Co., a new automobile concern, announces that during the coming year it will build a car to be known as the Crown 30. The car is listed at $350. The main plant is to be located in this city.

The new car will be fitted with a four-cylinder, two-cycle block motor with 2.875-inch bore and 3.5-inch stroke having a five-bearing crankshaft, and being suspended at three points. It has no valves nor gears to create noise. The motor operates on either gasoline or kerosene, the makers claiming 30 miles to the gallon. Cooling is by means of a tubular radiator. Wheelbase is 80 inches. The 14-inch steering wheel is to be at the left as well as the control lever. Drive is by friction, the makers claiming a variation from 1 to 60 miles per hour and reverse. A feature of the construction is the use of wire wheels. Chrome nickel steel is used throughout shafts and rear axle and high carbon manganese steel in all parts requiring stiffness. The body is of the English torpedo type and full equipment is standard.

C. H. Lambert is secretary and treasurer of the company, which was incorporated in South Dakota last February for $500,000. Half of this capital is paid in.

Petition Filed Against Bergdoll

PHILADELPHIA, PA., March 17—Three creditors of the Louis J. Bergdoll Motor Co., of this city, instituted proceedings today in the United States District Court to have the motor car company adjudged an involuntary bankrupt.

The creditors who petitioned the court and their claims are: W. C. Rhodes, Inc., $1,696.85; Chilton Co., $505, and the Castle Lamp Co., $1,772.85. It is alleged that during the past 30 days preferential payments amounting in the aggregate to over $33,000 have been made by the automobile company as follows: to Erwin R. Bergdoll, $31,200; C. A. Bergdoll Coal Co., $400. and the North Broad Street Realty Co., $1,500.

An official of the Bergdoll company declared this afternoon that if the proceedings did not interrupt the marketing of the company's output it would continue solvent.

Judgment for Willys-Overland

BUFFALO, N. Y., March 19—(*Special Telegram*)—The Willys-Overland Co., Toledo, O., was awarded a judgment of $5,895.83 against Gustave R. Poppenberg, Buffalo, in a decision filed with the county clerk at Buffalo Tuesday by Clark H. Timerman, referee. The papers filed claim Mr. Poppenberg in 1909, and 1911, was agent in Buffalo for Overland cars. Contract expired in 1910, but Poppenberg was unable to ascertain whether he was to have new contract and consequently in August, 1910, Mr. Poppenberg bought Overland cars amounting to $19,630. But when time came to renew contract Ohio manufacturers refused to grant renewal. Poppenberg demanded settlement of account under previous contract claiming rebates and damages for sales in his territory and other items. Willys-Overland company then sued to recover purchase price of automobiles bought by Poppenberg. Purchase price of cars amounted with interest to $22,675.83, which amount was undisputed by the Poppenberg concern. Timerman, as referee, awarded Mr. Poppenberg in his counter claims $16,780, Willys-Overland Co. securing balance.

Auto-Ette Announces Cyclecar

CHICAGO, March 15—The Auto-Ette Co., Chrisman, Ill., is announcing a light car for $368, which, although of small-car size and of standard tread, is built along cyclecar lines. It has a 96-

inch wheelbase and a 56-inch tread, but uses 26-inch motorcycle wheels and motorcycle tires.

The motor is a De Luxe twin motorcycle motor made by the Spacke Machine Co., Indianapolis, and is rated at 9 horsepower. This is air-cooled and with the two cylinders set at an angle. The engine shaft chain-drive connects to a countershaft with an epicyclic gear in connection, giving two speeds and reverse. From the countershaft the drive is taken by two 28-degree motorcycle belts, thus doing away with differential and tending toward great simplicity. The weight is given as 400 pounds and the speed at from 2 to 50 miles per hour. The Auto-Ette company is planning on 1,000 cars for this year.

The Niagara Motors Mfg. Co., which recently moved its plant from Buffalo, N. Y., to Dunkirk, N. Y., turned out its first machine from the new factory Saturday, when shipment was made to New Orleans. The company now employs twenty-five men, new machinery is being installed and the average output weekly from the start will be five automobiles.

G. R. Truck Co. Needs Money

GRAND RAPIDS, MICH., March 17—A committee comprising E. Alfred Clements, L. A. Cornelius, M. Kirsch, Frank T. Hulswit and William F. McKnight has issued a statement to stockholders of the Grand Rapids Motor Truck Co. setting forth the need of additional capital and proposing that the holders of the $154,000 in preferred stock turn in their certificates in exchange for common stock, and that an additional $100,000 in 7 per cent. preferred stock be issued. The members of the committee agree to take $50,000 worth of the new preferred stock, providing the whole amount be raised. The proposed preferred stock would carry a bonus of 50 per cent. in common stock.

Wagenhals Plans Stock Increase

DETROIT, MICH., March 15—The Wagenhals Motor Car Co. is planning a capital stock increase from $100,000 to $500,000 within the next week or 10 days. With the coming of the parcels post, which has been very favorable to the tri-car types of delivery machines, such as the Wagenhals, the concern's activities have been greatly increased and orders have been placed by it for parts for 500 of the three-wheelers, according to W. G. Wagenhals.

U. S. Truck Bids for April 15

WASHINGTON, D. C., March 18—*Special Telegram*—Sealed proposals for furnishing the United States government with a number of motor trucks have been issued by the General Supply Committee. The bids will be opened in this city April 15. The bids call for one electric motor mail wagon of 1,000 pounds capacity, one gasoline motor wagon of 1,000 pounds capacity, four electric trucks of 2,000 pounds capacity, four gasoline motor trucks of 2,000 pounds capacity, one electric truck of 3,000 pounds capacity and one gasoline truck of 3,000 pounds capacity. Manufacturers desiring to put in bids should make application to the General Supply Committee for specifications and blank forms. Successful bidders will likely be called upon to furnish more trucks than the schedule now calls for.

Shipment Book Completed by N.A.A.M.

Is a Ready Reference To Facilitate Return of Automobile Freight Car Equipment To Detroit Factory Rails

DETROIT, MICH., March 11—Continuing its work of furthering the shipments of automobiles from Detroit and other cities, the Traffic Department of the National Association of Automobile Manufacturers has just completed the compilation of a booklet containing a list of all the automobile freight car equipment of all railroads. This booklet, which is intended as a ready reference to facilitate the return of this equipment to the home rails and to automobile manufacturing territory, is being sent to all railroad officials and to automobile makers as well.

As the automobile industry is dependent for its shipping facilities on the freight cars listed in the booklet, the co-operation of all railroad officials and employees in the prompt and proper handling of these cars is urgently requested in a letter which accompanies the list and which reads as follows:

"To railroad officers:

"It is well known that automobile factories cannot use ordinary hox cars hecause the doors in such cars are too small.

"We are inclosing a pamphlet which shows cars which have doors of special sizes and construction for handling automobiles, and it is on these cars and the efficient handling of same that the automobile industry must depend for its transportation.

"This automobile equipment has an important duty to perform. It must handle annually more than 100,000 carloads of automobiles valued at something like $300,000,000.

"We appreciate the effort made hy railroads to handle this situation. Nevertheless, it is apparent that the importance of prompt and proper handling of automohile equipment is not fully appreciated hy many under whose jurisdiction these cars come. Location statements of automobile equipment show such a scattered condition of these cars that we are forced to the helief that automohile equipment is counted and figured as part of the general car balance, in other words, as so many hox cars. An examination of car records indicates that many of these automobile cars, after being relieved of a factory load in the West or South, are used as ordinary hox cars, and either retained in local service or reloaded and routed at variance with railway rules and without regard to the requirements of the automohile industry. There are a great many such 'tramp' automobile cars scattered through the West and South today.

"The shipping of automobiles from factories is now at its height and for the next few months will approximate 10,000 carloads per month.

"Unless there is steady movement of automobile equipment hack into manufacturing territory the railroads serving the shipping points will be unahle to meet the demand.

"Therefore we appeal to Western and Southern railroads to recognize this condition, and to check their records for these automobile cars, sending home any that you find on your rails. And we urge Eastern railroads to issue renewed and positive instructions that will insure control of all automohile equipment coming to your rails from now on for use in automobile traffic. National Association of Automobile Manufacturers, Inc. J. S. Marvin, General Traffic Manager."

Case Company Shows Gain

RACINE, WIS., March 17—The annual report of the J. I. Case T. M. Co., Racine, Wis., shows a splendid increase in the automobile department for 1912 as compared with 1911. The general income account of the big concern is as follows:

	1912.	1911.
Gross sales	$14,854,945	$9,163,749
Operating expenses	12,084,172	7,654,559
Net income	2,770,773	1,509,191
Charges	606,338	448,240
Surplus and dividend	2,264,485	1,060,951

Gross sales in all departments show an increase of 60 per cent. and the increase in net income is approximately 50 per cent. The amount available for dividends on the $12,000,000 preferred, 7 per cent. cumulative, outstanding was 2.7 times the amount required, leaving a surplus of 18 per cent. available for the common stock.

Of the gross sales of $14,026,633.93 in 1913, the domestic sales aggregated $9,841,782 and the export sales $4,184,851.93.

The Schildwachter Carriage Co., New York City, has filed a voluntary petition in bankruptcy. The assets of the company are $23,583 and its liabilities $36,486.

Associations Are United

Automobile Chamber of Commerce, Inc., Is Formed by Merger of the N. A. A. M. and A. B. of T.

New Corporation to Continue Present Work of the Parent Organizations—Has Over 100 Members

NEW YORK CITY, March 19—The Automobile Chamber of Commerce, Inc., was organized here today by a formal merger of the former National Association of Automobile Manufacturers and the Automobile Board of Trade. The purposes of the new body are to advance each and every interest of the automobile industry and its members, to work for the enactment and enforcement of beneficial laws and to promote harmony among the members of the industry; finally to "acquire by grant, gift, purchase, devise or bequest, to hold and to dispose of such property as the purposes of the corporation shall require, subject to such limitations as may be prescribed by law, including inventions, letters patent and processes, or rights thereunder, for the benefit of its members and not for pecuniary profit."

The officers of the corporation are: Charles Clifton, president; W. C. Leland, vice-president; Col. George Pope, treasurer; R. D. Chapin, secretary. The board of directors is composed of the following: Charles Clifton, Charles C. Hanch, Hugh Chalmers, Sydney Waldon, Samuel T. Davis, W. C. Leland, Windsor T. White, William E. Metzger, H. O. Smith, Albert L. Pope, L. H. Kittredge, R. D. Chapin, G. W. Bennett and H. H. Rice.

In a general way, the work of the new corporation will be along the same lines as that of its parent bodies. There is a possibility, however, that new kinds of work will be taken on. As for the arrangement of Dyer licenses for the members, who number 100, this will be settled in the near future.

Akron Situation Is Quiet

AKRON, O., March 18—The situation in the rubber workers' strike here has been exceedingly quiet during the past 3 or 4 days. The manufacturers say that more men are constantly returning to work. The Goodyear plant is now working day and night and the Goodrich-Diamond and Firestone plants are about to put on night shifts.

AKRON, O., March 19—(*Special Telegram*)—D. M. Goodrich was elected director of the B. F. Goodrich Co., in place of W. B. Miller at annual meeting last week. No election was made to fill place of W. B. Miller, who resigned, as vice-president.

Automobile Union Formed

MILWAUKEE, WIS., March 17—A new federation of union workmen, membership in which will be confined to employees of automobile and parts factories, has been organized at Milwaukee as the result of the Smith and Milwaukee Motor Co. strikes. The title is United Metal Mechanics' Union, auxiliary of Milwaukee Lodge No. 66, International Association of Machinists.

Have Operating Plan for Columbus

COLUMBUS, O., March 17—Proposal that the Columbus Buggy Co., which recently went into the hands of a receiver be taken over by the creditors and operated until all of the uncompleted product on hand can be finished and sold, is made in the report of the committee of creditors named on February 13, to investigate the status of the company and make recommendations as to the best method of procedure. The committee is composed of George W. Bright, E. R. Sharp, George W. Lattimer, T. C. Dunlap, B. G. Watson and D. N. Postelwaite.

The committee says that it believes if the business of the company is revived and continued under proper management, the creditors' claims might be paid eventually almost in full. On the other hand, the committee thinks, if the business were to be disposed of in the usual course of a receiver's sale, without the co-operation of creditors, the percentage paid to the creditors would be very uncertain.

DETROIT, MICH., March 15—W. M. Anthony, comptroller of the Maxwell Motor Co., Inc., has moved the executive offices of the concern all to Detroit, the accountants and others connected with this department all coming to this city last week. The general offices at Woodward and Warren avenues are now in full swing and here will be handled all of the business of the $37,000,000 concern.

MILWAUKEE, WIS.—At the annual meeting of the Sternberg Mfg. Co., of Milwaukee, manufacturing commercial vehicles, all of the officers were re-elected as follows: President, William Sternberg; vice-president, E. M. Sternberg; secretary, Victor L. Brown; treasurer, Robert L. Hayssen. Mr. Brown was also continued as general manager.

NEW YORK CITY, March 19—The midsummer meeting of the Society of Automobile Engineers will be held on the steamer City of Detroit on Lake Michigan on June 5, 6 and 7. The

Automobile Securities Quotations

Despite the fact that the Akron situation is apparently improving constantly, the market was rather unstable this week, and it was especially in rubber and tire stock issues that a downward trend was in evidence. Goodyear common led in this respect, with a drop of 40 points as against last week's closing figure; Firestone common lost 22, Goodrich common 12, Miller 10 and Swinehart 7. The other stocks, as a consequence, were also weak.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	150	165
Ajax-Grieb Rubber Co., pfd	..	..	95	100
Aluminum Castings, pfd	..	..	97	101
American Locomotive, Co., com	36	37	35½	36
American Locomotive Co., pfd	106	107	104	106
Chalmers Motor Company, com	..	..	115	125
Chalmers Motor Company, pfd	..	..	100	102
Consolidated Rubber Tire Co., com	12	20	15	20
Consolidated Rubber Tire Co., pfd	30	40	..	79
Firestone Tire & Rubber Co., com	200	205	270	280
Firestone Tire & Rubber Co., pfd	107½	110	104	107
Fisk Rubber Co., com	..	..	..	..
Fisk Rubber Co., pfd	..	..	..	102½
Garford Company, preferred	..	..	95	100
General Motors Company, com	31	32	29	31½
General Motors Company, pfd	78	78½	76	78
B. F. Goodrich Company, com	..	..	27½	28½
B. F. Goodrich Company, pfd	..	..	93	97½
Goodyear Tire & Rubber Co., com	338	342	345	355
Goodyear Tire & Rubber Co., pfd	108	110	101½	103
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	5	10
International Motor Co., pfd	..	..	35	45
Lozier Motor Company	..	..	..	25
Miller Rubber Company	..	..	175	185
Packard Motor Company	104	107	100	103
Peerless Motor Company	..	..	115	125
Pope Manufacturing Co., com	40	42	20	22
Pope Manufacturing Co., pfd	73	76	..	65
Reo Motor Truck Company	8	10	11½	12½
Reo Motor Car Company	23	25	20	21½
Rubber Goods Mfg. Co., pfd	100	105	103	106
Studebaker Company, com	..	..	29	30
Studebaker Company, pfd	..	..	86½	90
Swinehart Tire Company	..	..	88	95
U. S. Motor Co., com	..	..	..	8
U. S. Motor Co., 1st pfd	..	..	..	33
U. S. Motor Co., 2nd pfd	..	..	..	65
U. S. Rubber Co., com	50½	51	59½	60½
U. S. Rubber Co., 1st pfd	111½	112½	104½	105½
White Company, preferred	..	..	103	108
Willys-Overland Co., com	..	..	62	64
Willys-Overland Co., pfd	..	..	92	97

details of the program for this meeting have not been settled upon as yet. It is known, however, that a number of members of the Institution of Automobile Engineers and the Society of Motor Manufacturers of England will be guests of the S. A. E. at the time of the midsummer meeting. The itinerary program of the English Society follows:

Wednesday, May 17—Leave Tilbury by the SS. *Minnewaska.*
Monday, May 26—Arrive New York.
Monday and Tuesday, May 26 and 27—In New York.
Wednesday, May 28—Leave New York for Pittsburg.
Thursday, May 29—In Pittsburg.
Friday and Saturday, May 30 and 31—In Indianapolis.
Sunday, Monday, Tuesday and Wednesday, June 1, 2, 3 and 4—In Detroit.
Thursday, Friday and Saturday, June 5, 6 and 7—Lake trip on steamer (S. A. E. Summer Meeting).
Sunday and Monday, June 8 and 9—In Cleveland.
Tuesday, June 10—In Buffalo. Here the party will be divided, and those who wish may return direct to New York. The remainder will proceed to Providence.
Wednesday, June 11—In Providence.
Thursday, June 12—In Bridgeport and New Haven.
Friday, June 13—In Hartford.

Among the works and factories which it is the intention of the party to visit are the Cole, Henderson, Marion, Marmon, National, Stutz, and Waverley at Indianapolis; the Cadillac, Ford, Chalmers, Hudson, Packard, and Timken Axle at Detroit; the Peerless, Winton and Stearns at Cleveland and the Pierce-Arrow at Buffalo.

As the program notifies that ladies are specially invited it would seem that the customary excursions are to form a part of the approaching visit.

Members of the party who continue the trip to Providence will visit Brown & Sharpe Works there, and later the Locomobile factory at Bridgeport. Some carriage works at New Haven and various tool and other factories at Hartford will also be inspected.

Market Changes of the Week

Tin proved again to be the most important change in the markets. A loss of $2.65 occurred, though higher opening cables from London had the effect of renewed interest in the local market, prices advancing under the influence of the better cables. This lack of interest has been the cause of the recent slump. While the market for refined copper is very quiet and actual business of small dimensions, stock for early shipment is under pretty good control, and for prompt delivery from $.14 7-8 to $.15 a pound for electrolytic and Lake copper. The lead market is quiet. A fair volume of sales is reported. Lead fluctuated throughout the last week and ended on Tuesday with a gain of $.05. There was an absence of new developments of importance in the linseed oil situation, as there were no changes in prices. Both petroleums from the Pennsylvania and Kansas wells remained constant and firm. Automobile scrap remained constant at $.09 7-8.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.....	.08¼	.07⅝	.07¾	.07¾	.07⅝	.07⅝	— .00⅝
Beams & Channels, per 100 lbs.......	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Copper, Elec., lb...	14⅞	.14⅞	.14⅞	.14⅞	.14⅞	.14⅞	....
Copper, Lake, lb...	.14⅞	.14⅞	.14⅞	.14⅞	.14⅞	.14⅞	....
Cottonseed Oil, bbl.	6.38	6.37	6 38	6.38	6.32	6.35	— .03
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil, Menhaden, Brown..	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 gals.......	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime...	.90	.90	.90	.90	.90	.90	....
Lead, 100 lb......	4.30	4.20	4.20	4.35	4.35	4.35	+ .05
Linseed Oil.......	.47	.47	.47	.47	.47	.47	....
Open-Hearth, Steel, ton......	29.00	29.00	29.00	29.00	29.00	29.00	....
Petroleum, bbl., Kansas crude...	.88	.88	.88	¼ .88	.88	.88	....
Petroleum, bbl., Pa. crude	2.50	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	¼ .68	.68	.68	.68	.68	.68	....
Silk, raw Italy....	....	4.30	....	....	4.30	4.35	+ .05
Silk, raw Japan...	....	3.70	....	....	3.70	3.72½	+ .02½
Sulphuric Acid, 60 Beaumé	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb.....	48.35	45.88	47.25	47.25	45.70	45.70	—2.65
Tire Scrap........	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	....

New Fuel For London

Shell II Has Specific Gravity of .728 to .735 and Sells for 38 Cents Per Gallon

Benzol Seems a Way Out of Fuel Difficulty—Petroleum Discovered in Large Quantities in Papua

LONDON, March 5—The price of gasoline has again been raised, and the proprietors of Shell announce that in order to meet the enormous demand, a new grade of gasoline is to be put on the market. This new fuel will be known as Shell II. It has a specific gravity of .728 to .735 and it will sell at 38 cents per gallon, while the ordinary gasoline, packed in the red cans, with a specific gravity of .713 to .720 will be sold at 42 cents per gallon, which is 2 cents per gallon in excess of that paid last week. Pratt's spirit has not been advanced and still sells at 38 cents per gallon, with Taxibus only 36 cents per gallon. Carless, Capel & Leonard have raised their Standard gasoline up to 44 cents per gallon, Movril at 42 cents, and Car-bus at 36 cents per gallon.

As has repeatedly been pointed out, the only way out of the fuel difficulty is to use an alernative fuel, preferably benzol.

LONDON, March 8—In view of the present fuel crisis, the official report received by the Australian Commonwealth authorities that a new source of petroleum supply has been discovered in Papua (or British New Guinea), is of much interest. Investigations made so far disclose the existence of gas springs and oil seepage over an area of 900 square miles. An examination of surface evidence and general geological conditions is now being made, but no applications of oil leases have been granted by the administrator while the field is being fully tested by boring.

Batavia Sues Seamless Tires

NEW YORK CITY, March 19—After having advised various tire-manufacturing companies of the alleged illegality of making casings the treads of which resemble the Batavia non-skid type, the Batavia Rubber Co., of Batavia, N. Y., has brought suit in the U. S. District Court, Southern District of New York, against the New York branch of the Seamless Rubber Co., New Haven. Conn. The claim of the bill of complaint, filed for the plaintiff by Holmes, Rogers & Carpenter of New York, is that by making a tread stated to be an exact copy of the Batavia type, the Seamless company exerted unfair competition. The Batavia company demands a perpetual injunction against the Seamless Rubber Co., to prevent it from making treads which, according to plaintiff's claims, were in several cases mistaken by buyers for Batavia treads, and it also calls for accounting of the business done in such treads in the past.

BUFFALO, N. Y., March 19—*Special Telegram*—An injunction was issued through United States District Court by Chief Justice White on Tuesday in case of Lovell-McConnell Mfg. Co., Hutchison Electric Horn Co. and Miller Reese Hutchison against International vs. Automobile League of Buffalo ordering the defendants, their officers, agents and attorneys to refrain from advertising, circulating or offering deduction, discount or rebate from prices designated by complainants at which the automobile horns made by the latter must be sold to the public as shown by tags during pendency of this action. The injunction is the continuation of a preliminary order handed down when the appeal was granted to the complainants in the Circuit Court on refusal of the court to grant certain injunctions.

Fight Bad New York Bills

Hearing To Be Given Automobilists and Makers on Tire-Dating Measure Thursday—Owners, Dealers and Manufacturers Unite in Pilgrimage to Albany To Kill Unjust Bills

NEW YORK CITY, March 19—One of the most striking of the examples of ignorant and pernicious legislation which the automobilists, dealers and manufacturers of the country have been called upon to combat in the Empire State is the tire-dating bill which was resurrected last week by the Hon. Christy Sullivan. Representatives of the tire companies and many automobilists and dealers hastened to Albany at once to protest against its passage, but they were refused a hearing and the measure was rushed through for some reason not apparent.

This is practically the same bill that was brought up last year and on which a hearing was given March 19. It was later amended and finally dropped out of sight. It appears now as an amendment to Section 394-A of the laws of 1909 and provides that:

"Motor vehicle tires are to be dated. No person or corporation shall manufacture, sell, offer or expose for sale in this state a tire for use on a motor vehicle unless the date when such tire was manufactured shall be impressed or branded upon the material of which such tire is constructed, or otherwise indicated by label securely attached thereto."

The act also provides a penalty of $50 for violation of its provisions.

Representatives of the tire manufacturers, dealers and car owners have called Governor Sulzer's attention to the pernicious character of the measure and will be given a hearing on Thursday before the Senate Committee on Miscellaneous Corporations at Albany. The bill must have the Governor's signature, of course, before it will become a law.

The worst feature of the situation is that the bill will be of benefit to no one, except, perhaps, the unscrupulous dealers against whom it is ostensibly aimed. For it would be an easy matter to fool the public with a dated tag, which could be readily changed to suit the occasion, as to the real age of a tire.

Moreover, the manufacturers' guarantee obviates the necessity for such legislation. The tire-dating feature would be the cause of hardship to the tire makers because the public, misled as to the true facts of the case by the provisions of the bill, would demand brand new tires continually. The result would be that when winter came and trade was dull the makers would have to close down their plants as no one would buy last fall's tires in the spring and when spring came there would be no possibility of supplying the tremendous demand for new tires. This is one reason the bill would make things bad for the consumer.

But to come to the fact which renders the whole measure ridiculous to the veriest tyro, automobile tires kept in the proper way are better 6 months after they leave the factory than new.

Years ago when the industry was new there was some excuse for the seeming childlike ignorance of our would-be legislators, but nowadays, when nearly all of them have cars themselves, it is not only an insult to their own understandings to promote such measures as the tire-dating bill, but an aspersion on their motives.

Correction—In THE AUTOMOBILE for March 6 the cylinder dimensions of the new six-cylinder Columbia car were given as 4.5 by 4.5 inches. The stroke of this motor will be 5.5 inches.

ALBANY, N. Y., March 13—Over sixty motor clubs of this state and representatives of dealers from New York and other cities were present here today for the hearing before the committee on internal affairs on the new motoring legislation, the delegates filling the assembly chamber which was used for the hearing. Never before has motoring New York presented such a united phalanx and never before have legislators realized the determination of motorists to have fair play in legislation. As a result of the hearing it is generally conceded that nearly all of the bills will be allowed to die in committee and that practically the Callan law of today will continue. President A. J. Deer, of the New York State Automobile Association, had charge of the delegates for the hearing. Melvin P. Bender, counsel for the organization, opened the hearing and was followed by Charles Thaddeus Terry, counsel for the dealers. Many others spoke. The new legislation aimed at was that doubling present registration fees and increasing them three- and five-fold in trucks; and that giving the secretary of state power to revoke licenses at will with hearings or not as desired. The bills arranging for owners and chauffeurs to have to give bonds before being registered were also the center of attack. Three years ago when the Callan bill was made the law of this state, the motorists only consented to a registration charge to defray the cost of identification and secure a rational operating law. It was practically a gentleman's agreement on the ground, and now when the government aims at doubling the fees without any reason other than getting more revenue it is looked upon as a breach of faith by the motorists. They threw the gauntlet down publicly, declaring that if fees are raised the constitutionality of the present registration law will be carried to the highest courts and in the meantime all registrations will be paid under protest.

Ohio Bill for Sliding Scale

COLUMBUS, O., March 17—Representative M. A. Warnes, of Holmes County, has introduced a bill in the Ohio General Assembly providing for a sliding scale in assessing fees for the registration of automobiles in Ohio. The bill supersedes the one which was introduced in the Legislature at an earlier date, but was withdrawn because it was believed to be unconstitutional. Fees ranging from $5 to $25 are proposed for the various horsepowered cars, while motorcycles are assessed $3 each.

New License Law for Indiana

INDIANAPOLIS, IND., March 17—The Indiana Legislature has passed a law requiring an annual state automobile license, which has been approved by Governor Ralston, and will become effective May 1. Heretofore it has been necessary only to pay the state a registration fee of $1, which did not have to be renewed. The new law forbids any municipality from exacting a license fee and this will mean a loss of $30,000 a year to the city of Indianapolis alone.

Under the new law the state license will be as follows: Motorcycles, $3; motor trucks, regardless of horsepower, $5; electric cars, $5; pleasure cars, 15 horsepower and under, $5; 15 to 25 horsepower, $7.50; 25 to 35 horsepower, $12.50; 35 to 50 horsepower, $15; and over 50 horsepower, $20. The purchaser is to be allowed to operate under the license number of the dealer for 15 days after buying a car or motorcycle.

The numerals on the number plate are to be 4 inches high and the color is to be changed each year. Manufacturers and dealers are to pay a license of $15 a year and may obtain as many duplicate number plates as may be required at $1 each. Automobile owners from other states, complying with the motor license regulations of their own states, need not pay an Indiana license, provided their own states grant similar reciprocity.

There is also a provision for the licensing of chauffeurs, requiring an examination by examiners to be appointed by the secretary of state. The annual license fee is to be $5. The legal speed is fixed at 10, 15, 20 and 25 miles an hour, graduated according to the manner in which each district is built up.

The revenue under the act is to be placed in a road fund and prorated among the counties of the state. Upon a second conviction of the act a chauffeur's license may be revoked three months and upon a third conviction for 6 months, to which not exceeding 60 days' imprisonment may be added.

There is also a new law in Indiana making it a misdemeanor for any person to take or use a motor car without the owner's consent.

Ohio Might Tax Automobiles

FINDLAY, O., March 15—A bill has just been introduced in the legislature providing for automobile fees to be materially raised, as follows: Electrics, $5; gasoline cars under 20 horsepower, $5; from 20 to 30 horsepower, $10; from 30 to 40 horsepower, $15; from 40 to 50 horsepower, $20; and over 50 horsepower, $25; manufacturers' and dealers' licenses, $25; copies of licenses, certificates, $25 each.

The proceeds of the licenses, less the cost of operating the department, are to be paid in to the state treasury for the improvement and repair of the roads of the state.

Idaho Has Good Road Laws

BOISE, IDAHO, March 8—On the very last day of the legislative session the Senate passed the Koelsch and Shattuck bills, both good roads measures.

The Koelsch bill provides for the creation of a state highway commission; a special tax on motor vehicles, and for convict labor on the highways. The highway commissioners will receive no pay except necessary expenses and the commission will have entire jurisdiction over the highways of the state.

A special tax is assessed on automobiles as follows: Under 30 horsepower, $20; 31 to 40 horsepower, inclusive, $25; 41 to 50 horsepower inclusive, $30; above 50 horsepower, $40. All moneys raised from this tax and from registrations and fines will go into the road fund and will be used for no other purpose.

The Shattuck bill provides for the issuance of $200,000 state bonds, the money to be used in laying out, surveying and constructing a system of state highways.

A senate joint memorial was introduced by Mr. Hart, rquesting Congress to transfer 50,000 acres of timbered land now held within the National forests by the United States within the boundaries of Idaho for the purpose of creating a fund to be used by the state for the establishment and maintenance in good repair of a system of public roads within the borders of the state.

Bad Roads Cost Third of Crops

WASHINGTON, D. C., March 16—According to a statement issued by the federal department of agriculture, an improvement in the distribution of one-third of the crops of the farms of the country would be effected through the construction of a better system of public highways in the United States. This would eliminate much of the nation's waste and effect a saving of many millions of dollars, it is declared.

As a result of investigation of the economic value of improved roads, it has been found that on the basis of a $9,000,000,000 crop, which was harvested last year, at least one-third remained on the farm. The consumer paid about $13,000,000,000 for $6,000,000,000 worth of products sold by the farmers, the latter receiving only 46 per cent. of what the consumer paid.

On the basis of these figures Logan Waller Page, director of the office of public roads, has declared that if the roads of the country were put into better shape and properly maintained it would be possible for farmers to get to shipping points at all seasons of the year and dispose of this one-third crop, which now goes to waste. The good roads would soon pay for themselves, Director Page declares, with corresponding improved conditions for all time.

Texas To Have Highway Department

AUSTIN, TEX., March 14—Prospects are favorable for the enactment by the state legislature of Texas of a bill creating a state highway department and establishing a state highway commission and the office of state highway engineer. The measure, of which Senators H. B. Terrell and H. L. Darwin are the authors, has been favorably reported by the committee on roads, bridges and ferries. It carries an appropriation of $10,000 to pay the general running expenses of the proposed department up to and including January 31, 1914. The funds for maintaining the department are to be provided for by taxing each motorcycle $2 per annum and each motor vehicle of other description $5 per annum.

SEATTLE, WASH., March 14—A new measure regulating the use of motor car signals went into effect in this city today, and covers the use of signals on motor cars and fire department vehicles. According to the new regulations the signal used must be capable of producing an abrupt sound sufficiently loud to be heard above the noise of traffic and to serve as an adequate warning of the approach of such motor cars, motorcycles or other vehicles, and of the danger to any person caused thereby. The law further stipulates that it is unlawful for persons driving motor vehicles other than fire department wagons, police department vehicles, and health and sanitation department vehicles to sound the signal more than three short, abrupt blasts in succession.

MILWAUKEE, WIS., March 14—The latest freak among Wisconsin motorists are facing at the hands of the Wisconsin Legislature is the Richardson bill, which attempts to make certain that no motorist will exceed the speed limit by requiring all motor cars sold in Wisconsin to be so geared that the maximum speed to be obtained from any car will not be more than 25 miles per hour.

Benjamin Takes Alco Sales

NEW YORK CITY, March 19—C. Arthur Benjamin has taken over the office of general sales manager of the automobile department of the American Locomotive Co., his headquarters being in this city. Before taking the place of Harry S. Houpt, who left the Alco company a short while ago, Mr. Benjamin was engaged in the automobile business in Syracuse, where he handled Packard and Hudson cars.

NEW YORK CITY, March 17—John Calder, formerly associate general manager of the Cadillac Motor Car Co., has just accepted the appointment of acting vice-president of the International Motor Co., manufacturer of Mack, Sauer and Hewitt trucks.

Paris Show Date Changed To October

Proposed To Reduce Present Slack Season Between Active Selling and Announcement of New Models

This Change Will Probably Be Accompanied by a Shortening of From 19 or 20 Days to 10

PARIS, March 8—Paris will open the European show season with its exhibition in the Grand Palais during the month of October. This change from December to October was proposed in order to reduce the present slack season between the end of the active selling period and the placing on the market of the following season's models. It is believed that by making this change at least 2 months will be gained to the French trade, for work on the 1914 models will be begun about July, instead of being held back until September, as at present. Recently the whole of the French trade has been consulted on this matter, with the result that a unanimous decision has been arrived at in favor of the early show. No official announcement has yet been made on the date of the Paris exhibition, but in view of the favorable opinion expressed by the six individual trade associations responsible for this event, the adoption of the early date cannot be doubted. There appears to be but one difficulty in the way, and this can doubtless be removed. A society of artists has an option on a portion of the Grand Palais for an art exhibition during the month of October. In view of the enormously greater importance of the automobile show, a request will be made to the artists either to change their date or find another hall, and it is not supposed that this request will be refused. Already the aeroplane manufacturers, who usually have their show in the Grand Palais in October, have agreed to change the date in order to give the automobile manufacturers a preference. With a show in the Grand Palais in October, Paris will have the first exhibition in Europe, coming before London, which has had the advantage in this respect up to the present. It is declared by the French manufacturers that the change of date has not been made in order to gain an advantage over London, but entirely in view of economic home conditions. Nevertheless, it is felt in England that Paris will secure an enormous commercial advantage by being able to have the first display of the new season's models. The date of the London show has not yet been fixed, but it will probably be held in November.

The change in the date of the Paris show will doubtless be accompanied by a change in the duration of the show. Up to the present the Paris Salon has lasted from 19 to 22 days, being open both on weekdays and Sundays. It is now proposed to reduce the period to 10 days, the show opening on a Friday or Saturday and closing on the following Sunday or Monday week. This will give 10 clear days, including two Sundays. This change is proposed by members of the trade who find that a 22-day show causes considerable inconvenience to the commercial staffs. If the short show is adopted, the exhibition will probably be kept open until 7 or 8 o'clock in the evening, instead of closing at 6, as at present. It will also be necessary to diminish, if not entirely abolish, the free passes now granted. It is believed that the total attendance will be just as great with only 10 days as with twice that number, and that the volume of business will not be diminished.

The 1913 show will again have Henri Cezanne as its general manager. A joint committee representing the six trade associations has full control over the exhibition. The president of the joint committee is Armand Peugeot, and the other members are J. Niclausse, C. Rodrigues Ely and M. Cottenet, vice-presidents; A. Citroen, secretary; M. Turcat, treasurer.

COLUMBUS, O., March 18—The big automobile carnival given here for the week ending March 15 by the Columbus Auto Trades Association was a success despite unfavorable weather conditions which prevailed for the greater part of the time. The crowds were good and sales were numerous.

HARRISBURG, PA., March 15—The fourth annual show of the Harrisburg Automobile Dealers' Association was opened this evening at the Rex Garage and Arena Theater. Hundreds of persons visited the show on the opening night. The show will continue for 2 weeks. The 20,000 feet of floorspace is taken up by thirty-five exhibitors and over 100 automobiles, including thirty different makes of pleasure cars and trucks.

BUFFALO, N. Y., March 18—At the first annual commercial vehicle show held in Buffalo, March 11-15, under the auspices of the Buffalo Automobile Dealers' Association, thirty exhibitors displayed their trucks and sales were numerous, one firm disposing of several trucks to a Niagara Falls company, while one motor vehicle was shipped to New Orleans. It is estimated that 30,000 persons attended the show, which closed Saturday night.

Alco to Make Philadelphia-Pittsburgh Trip

PHILADELPHIA, PA., March 17—A striking contrast of the old and the new methods of transportation was furnished yesterday morning when, escorted as far as the city limits by the original prairie schooner in the service of the paint company, a 3.5-ton Alco truck laden with a cargo of paint consigned by John Lucas & Co., of this city, to Joseph Horne & Co., of Pittsburgh, left Philadelphia for the first delivery of merchandise to be made by a commercial vehicle across the state of Pennsylvania.

The total distance to be traversed is over 350 miles, and as it is expected to complete the jaunt in 5 days a daily mileage of 70 miles will have to be maintained.

The old and the new—striking contrast of transportation methods by John Lucas & Co., Philadelphia, Pa.

Stock Car Race of 300 Miles for England

Race Is for Four-Cylinder Cars with Bore not Exceeding 3.543 Inches and 5.512 Inch Stroke

To Be Held on the Isle of Man September 25—Race May Be Cancelled If Entries Are Few

LONDON, March 7—The regulations governing the international stock car race for the Tourist trophy to be held on the Isle of Man, September 25, have at last been issued and they show the race of approximately 300 miles or eight laps of the circuit. The race is for four-cylinder cars with cylinder bore not exceeding 90 millimeters, or 3.543 inches, and 140 millimeters, stroke, or 5.512 inches. The minimum weight is 2,000 pounds as cars will compete in the race and includes driver, mechanic, fuel, oil, water, tools, etc. The cars must be stock in all particulars excepting that the angle of the steering column may be altered to suit the driver.

To insure stock throughout the rules are framed with special care and call for same make and size of carbureter and intake manifold as stock; stock exhaust manifold and muffler without cut-out, even if such is stock; no higher gear ratio may be used than the highest ratio fitted to stock cars; shock-absorbers may not be fitted; no extra oil feed arrangements to the motor permitted and any oil tank must be of stock size and in stock position; a gasoline tank to carry not less than 30 gallons may be used; mud guards for the wheels with continuous running boards must be used, the front guards being not less than 10 inches wide and the footboard and rear mud guards not less than 8 inches wide, and only wheels of sizes specified in the maker's catalogue shall be allowed.

The entry fee is $250 per car. The race may be canceled if not more than twenty entries are received by May 31. Entries will close June 30.

Order Fixed for French Grand Prix

PARIS, FRANCE, March 7—Victor Rigal, driving No. 1 Sunbeam, will be the first driver to start in the French Grand Prix race at Amiens on Saturday, July 12. This position has been decided by the drawing of lots, the complete order in which the cars will get away, probably at intervals of half a minute, being as follows: 1, Sunbeam; 2, Delage; 3, Opel; 4, Mathis; 5, Excelsior; 6, Th. Schneider; 7, Itala; 8, Peugeot; 9, Sunbeam; 10, Delage; 11, Excelsior; 12, Th. Schneider; 13, Itala; 14, Peugeot; 15, Sunbeam; 16, Th. Schneider; 17, Itala; 18, Peugeot; 19, Sunbeam; 20, Th. Schneider.

The race being run on a fuel consumption basis, it has been decided to allow the competing cars to fit gasoline meters of the type approved by the "octroi" of the city of Paris, on condition that the fittings are of such a nature as to make the introduction of fuel through the meter or the connections an impossibility.

INDIANAPOLIS, IND., March 17—Definite word has been received from the Peugeot company, of Paris, that two of its fastest cars, with Jules Goux and Zucarrelli as drivers. will be entered in the third annual 500-mile International Sweepstakes Race at the Indianapolis Motor Speedway May 30.

According to present arrangements Goux and Zucarrelli will arrive in America about May 12, and will proceed immediately to Indianapolis to become thoroughly acquainted with the Speedway before the day of the race. Albert Guyot, who is to pilot the famous English Sunbeam car, will arrive in America about the same time and will also train at the Speedway. Owing to the fact that all of these drivers are scheduled to drive in the French Grand Prix on July 12, it will be necessary for them to return to France immediately after the Indianapolis race.

Three Isotta Fraschini cars will be entered in the May 30 race in Indianapolis. One of these is a specially constructed machine and will be driven by Harry F. Grant; Trucco, the Italian driver, will be also on an Isotta and Gilhooley is the third man.

F. E. Edwards, chairman of the technical committee of the A. A. A., has been appointed to the same position in the 500-mile classic which takes place at Indianapolis on May 30. Until Mr. Edwards reaches Indianapolis Chester S. Ricker will be his official representative and after will act as his first assistant.

Reliability Run for Columbus

COLUMBUS, O., March 15—A 4-day reliability contest which will be conducted under the auspices of the Columbus Automobile Club will be run April 29 and 30 and May 1 and 2. The *Ohio State Journal* of Columbus, O., originated the plan and the name will be taken from that publication. The direction of details for the run is under the charge of the contest committee of the Columbus Automobile Club, consisting of L. M. Browne, Jack Means, Herbert A. Mason, Frank Girard and J. C. McIntyre. It has been decided to lay out the route from Columbus via Dayton and Richmond to Indianapolis, from Indianapolis to Fort Wayne for the second day, from Fort Wayne to Detroit on the third day and from that point back to Columbus for the fourth day. Already a number of cars have been entered for the reliability, both agents and owners. Several cups will be provided for the winners.

PHILADELPHIA, PA., March 15—The first week of the sealed bonnet, road-conditioning test being conducted by the Touring Bureau of the Automobile Club of Philadelphia was completed today and, judging by the amount of territory covered and information gleaned, gives promise of being productive of more accurate data than anything heretofore attempted in that line.

During the week a total of approximately 1,225 miles has been covered, a daily mileage of 175.

NEW YORK CITY, March 17—The Ajax-Grieb Rubber Co. has prepared for a mileage contest of its products from March 31, 1913, to April 1, 1914. There are 208 prizes ranging from $500 to $10 and aggregating $5,000 which will go to the drivers who get the most mileage out of their Ajax tires. When a tire is sold, the date and odometer readings are taken and a statement giving them is signed by the driver and owner. When the tire has arrived at the state of unserviceability the date and odometer reading are again taken by the company, when the tire is returned.

WASHINGTON, D. C., March 16—The tentative route for the motor truck reliability run of the *Washington Post*, May 5-8, has been selected, and the work of blazing the trail began today when a Marmon car, driven by Arthur Foraker and carrying Pathfinder Harry Duckstein, was sent over the course. The tentative route will carry the trucks through two states and the District of Columbia and will afford varying road conditions, including numerous hills and sandy stretches. The distance will be between 300 and 350 miles. Among the towns the contestants will pass through are Frederick, Md., Hagerstown, Md., Harrisburg, Pa., Shippensburg. Pa., and Baltimore, Md. Government officials are taking an active interest in the run and a number of them will be selected as officials.

NEW YORK CITY, March 19—The Orphans' Automobile Day Association of New York, Inc., will hold a meeting April 1 to talk over plans for this year's Orphans' Day on which some 3,000 children are to be taken out.

Array of Reasons Which Make French Truck Builders and Users Highly Conservative in the Selection of Wheels and Tires—Standardization for Draughtsmen —Practice of Oiling Through Fuel Spreads—Recent Technical Treatises

ANALYSIS of Requirements in Truck Wheels.—The data in the present state of the art of building wheels for motor trucks are presented at length by Captain D. Renaud with special reference to the types of wheel and tire which should be selected. The leading points in his exposition of the subject are, with some omission of obvious arguments and much abbreviated, substantially as follows:

Wood wheels have so far been found most acceptable in practice for heavy loads, and they are found more durable if slightly cambered, so that the spokes are assembled in a slightly conical formation, and it is an advantage to have the wheel shaft inclined correspondingly, so that the spokes are in a practically vertical position when they support the load, but the adoption of inclined wheel spindles for the driving-wheels has met with the hindrance that this construction cannot be reconciled with the customary mechanical system of driving by chains or through one central driving-shaft actuating a set of bevel-gears on the differential. The cambered wheel has the advantage of a superior elasticity, as compared with a wheel having the spokes all in one vertical plane, of greater strength against shocks from the side—having brute strength in one direction and elastisicity in the other—and in being contracted more uniformly when a steel or an iron tire is shrunk onto the felly. But in a wheel with a conical spindle there is a decided tendency to push the hub and its bearings outwardly, causing considerable end-thrust, unless the spindle is inclined. The camber of the wheel and the angle of the spindle should therefore, if possible, go together, especially as the slant of the spindle is of advantage in getting square contact of the tire with the road, if the latter is crowned, as most hard roads are.

In a number of recent constructions with shaft drive, electric transmission, special four-wheel drives or in which the driving is done through transverse wheel shafts actuating gear-and-pinion sets on each wheel, the combination of camber and set has been realized. The shaft drive used in La Buire trucks is notable in this respect, the desired angle of the wheel shafts being obtained by a new design of the differential. This is shown in Fig. 1. The driving-shaft A turns the cross-spindle carrying the two satellites BB of the differential around in its own plane, thereby turning the sleeves C and D, each with two bevel-pinions, and one of these bevel-pinion sleeves thus turns the bevel-gear E while the other turns the bevel-gear F; and it is plain that with this arrangment E and F may be inclined at any desired angle of set, as exemplified to the right in the illustration. [A similar type of differential is employed in one of the Daimler-Mercedes truck models, as described and illustrated in THE AUTOMOBILE of June 13, 1912, page 1327.—ED.]

The practice which has lately been somewhat widely adopted of forcing iron or steel rims upon the wooden wheel rim by cold pressure, instead of shrinking them on hot and allowing them to contract, cannot be recommended, as it has often been found to result in diminished durability. This is because the iron rim expands after the cold pressure ceases and allows the wooden structure to loosen up after having been compressed successively. The need of retightening the wheel from the hub follows.

The diameter of truck wheels is decided in practice by a compromise between conflicting considerations. The small wheel has the advantage of strength and small weight; it also subserves the need of a large gear-reduction in the power transmission and contributes to stability by lowering the center of gravity of the vehicle. On the other hand, all roughness of the road surface becomes a matter of importance—a drain upon the power and severe upon the spring suspension and the occupants of the vehicle—if the wheels are too small. It has been observed that a truck with driving wheels of 60 centimeters diameter could not climb a paved grade of 3 per cent. which was only slightly slippery, because the wheels slipped at every projection in the pavement. Experiments with the military trucks have resulted in demanding a minimum diameter for the driving-wheels of 95 centimeters and of 85 centimeters for steering wheels.

When it is admitted that a certain capacity for the cushioning of shocks is a desirable quality in a vehicle and that it cannot be obtained from the vehicle springs alone at the speeds demanded of motor trucks—largely because after each shock there is a period of reaction and recoil in a vehicle spring during which it is not in a fit position to receive a new shock, although the vehicle is moving on and may receive such a new shock—it becomes necessary to decide in what particular manner elasticity shall be incorporated in the vehicle wheel, where, by reason of the wheel's rotation, the elastic element can always be in readiness to act as desired and with a yield proportionate to the severity of the shock.

To make clear the requirements, elastic wheels may be classified as those with rigid rims, comprising those with an elastic hub, elastic spokes or with concentric rims movable in relation to one another, and those with deformable rims, comprising all wheels fitted with elastic tires. The latter class falls into two sub-classes; those in which the tire is continuous and those in which the elastic element is composed of a number of units distributed upon the wheel rim at more or less distinct intervals. [The author seems to overlook the combination of concentric rims with a continuous elastic tire on the outer one.—ED.]

The work demanded of the wheel is (1) to absorb vertical

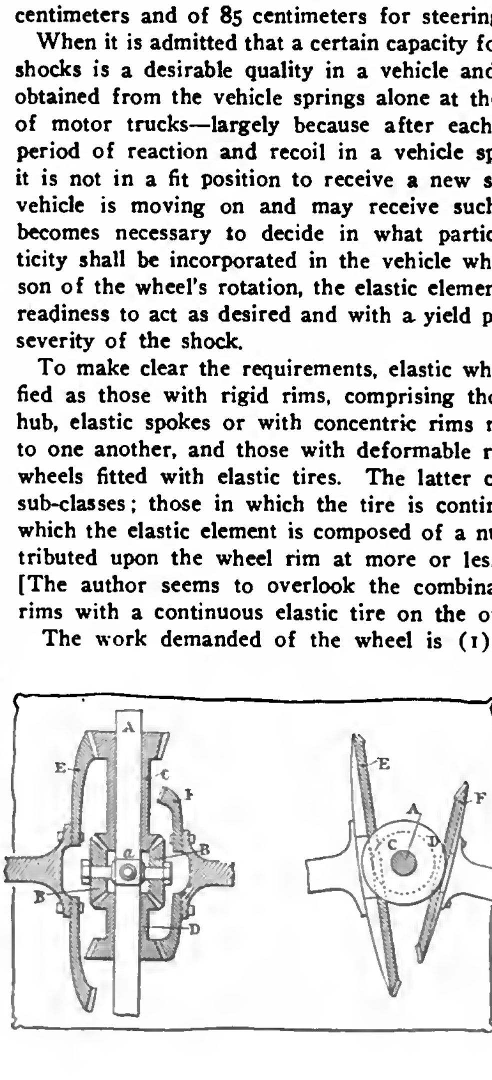


Fig. 1—The style of differential used on La Buire motor trucks, admitting of inclined wheels—driving shafts and reduced stresses upon teeth of bevel gears; thereby also rendering a greater gear-reduction practicable.

shocks acting in the plane of the wheel, (2) to obviate vibrations of materials, (3) to transmit the power yieldingly, (4) to assume transverse stability, to which may be added that (5) the circumference of the wheel must remain approximately circular, that the wheel must be (6) insensible to rain, mud, dust and snow and must be sufficiently robust without being too heavy. The adhesion to the road by which the traction through the driving-wheels is obtained must of course also be assured.

The very discussion of these diverse conditions will point out the type of wheel which is most logical.

When a wheel rolls over a lumpy road surface, the loss of momentum is so much more important as the weight of the parts which are caused to rebound is more considerable. And the shocks received are the better mitigated and absorbed the more directly they reach the elastic medium interposed between them and the rigid parts. These considerations argue directly for placing the elastic material in contact with the ground and for having the density of this material as low as possible; the property of low density being of especial value for the absorption or prevention of vibrations.

From this point of view, the wheels which respond best to the first and second of the working requirements are those fitted with elastic tires, and the elastic material ranks in this order:—Air, hollow rubber, solid rubber, metallic springs.

The elastic transmission of the motor power is well-enough met in all types of wheels excepting those equipped with telescoping spokes.

The need of lateral stability, on the other hand, eliminates the majority of special elastic wheels from consideration. At all turns of the vehicle and on roads which slope to one side, it is the wheels which must sustain the transverse stresses and safeguard the steering. The distance from the ground to the axle represents the lever arm by which the strains are applied. To reduce transverse displacement to a minimum, it is evident that the elastic medium should be placed as near as possible to the road surface. The nearer it is placed to the center of the wheel, the more it is necessary to provide special guide plates to prevent the buckling of the wheel. This consideration thus places the wheels in the following order of preference:—Wheels with elastic tires, wheels with double rims elastically joined, wheels with elastic spokes, wheels with elastic hubs.

All special provisions for strengthening an elastic element laterally involve increased weight, heavier shocks, more vibrations, sticking of sliding parts, increased care of maintenance and usually some form of lubrication, and for the latter only castor oil can be used, if rubber is employed in the construction, all other lubricants injuring this material.

With regard to the circularity of the wheel, it is evident that any flexion which constantly places the hub eccentric to the wheel rim results in a resistance equal to that met on an incline which is comparable in degree to the eccentricity [The author at this point seems to embrace a popularly accepted theory unthinkingly and without the necessary reservations, the theory holding true only if the elasticity is not exhausted in the flexion and if the flexibility curve is uniform, but not, as in the case of rubber tires, when this curve is strongly retrogressive, rendering the resistance to flexion very small at first and very great toward its limit.—Ed.]; and if the eccentricity of the wheel is made irregular by the use of separated rubber block tires, elastic spokes or multiple metallic springs, there are produced sinuous and periodic movements of rise and fall of the axle accompanied by trepidations or vibrations which are more or less harmful and detract from the quality of the transportation work.

All non-continuous elastic mediums should therefore be rejected in favor of the homogeneous elastic tire by the use of which the eccentricity created by the load is rendered regular and is reduced to a minimum.

Finally the simplest system admits most readily of robustness, and in this respect the wheel with solid rubber tires is pre-eminent, as this type of tire can be secured directly upon the smooth steel rim of the wheel by pressing onto the latter the metallic base of the tire, on one of the plans shown in Fig. 2.

The silence and road adhesion of the solid or hollow rubber tire clinch the logical preference for it, even if a wheel with additional elastic elements is chosen. At the last public tests of elastic wheels, the only type which performed satisfactorily under the conditions imposed—air-inflated tires being excluded—was the Ducasble wheel with hollow rubber tire, and while, like a solid rubber tire of 135 millimeters, of twin pattern, it can be fitted to vehicles carrying a load of 3,000 kilograms on the rear axle, it is most satisfactory at low-speed work. For truck work generally, the wood wheel with solid rubber fires is so far indicated as the most practical one by all civil and military experience, provided the dimensions of both wheel and tires, as well as rubber composition employed in the latter, are selected with close reference to load, speed and road conditions.

The all metal wheel, especially the cast-iron wheel, is superior in its resistance to climatic influences, as in the tropics, and it endures equally well or better, if it is protected against vibrations by means of a solid-rubber or pneumatic tire, but not otherwise. During the last half of the life of a solid-rubber tire fitted to it, the cast-iron wheel becomes subject to serious vibrations which are injurious to the vehicle and motor. Owing to its greater weight and uncompromising rigidity, it wears out the tire which is fitted to it at a comparatively rapid rate.

All the metallic wheels which are assembled by bolts and rivets have so far been found unable to endure speed and are, moreover, very noisy.

Since 1909 the French government has offered a subsidy for motor trucks, and the rate of this bonus is figured solely according to the economy per ton-kilometer demonstrated in practice for each truck type and without any restrictions regarding the wheels and tires. Out of 56 subsidized types, 44 are equipped with rubber tires, 8 have the rear wheels shod with iron tires and 4 have iron tires on all four wheels, but the last-named are in the way of disappearing from the field.

It is then clear that there can be no intrinsic economy in dispensing with the rubber tire equipment, since otherwise all would do so and gain a greatly reduced first cost, as well as a much wider market through their ability to sell at a much lower price.

The cost of solid rubber tires per kilometer, it has been ascertained, ranges from 10 or 11 centimes (2 cents) for a truck of 3,000 kilogram capacity to 16 or 17 centimes for a truck of 6,000 kilogram capacity, but these moderate figures can be realized only if the following rules are strictly observed.

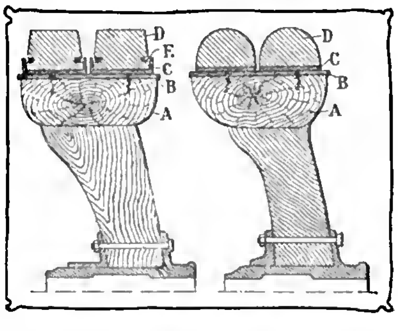


Fig. 2—Two systems of mounting solid-rubber truck tires on the iron rim of wood wheels. First, the Torrilhon method; tire secured by endless wire in channel-rim C. Second, the Bergougnan method; tire vulcanized to iron base C and latter forced hot upon wheel rim. Latter considered the superior method.

(1) Select tires according to the loads for which they will be used, and avoid overloads absolutely.

(2) Do not exceed an average speed of 25 kilometers per hour, and avoid blocking the wheels when braking.

(3) Have spare wheels, so that interruptions of service may be avoided.

(4) Examine tires every day and extract all foreign bodies which may have entered into them.

(5) During any prolonged interruption of work, jack up the wheel and axles and relieve the rubber from a continued load at a single spot.

The tire manufacturers have done their share toward economy by developing different compositions of rubber, each best adapted for certain loads. Ranging from the material used for inner tubes to ebonite, these compositions attain different degrees of hardness and toughness by vulcanization. Only the hardest will vulcanize into a firm joint with iron or steel. Only those of neighboring grades will vulcanize together. These facts have led to the simplest tire construction, in which the steel rim base of the tire is vulcanized to a rubber composition which turns perfectly hard, this to the next grade, this again to the next softer one, and the last one of these thin layers to the body of the tire. A tire of this kind endures a load of 130 kilograms per square centimeter and resists a traction pull of 75 kilograms per square centimeter. If properly dimensioned for its work, it sustains in practice only 10 to 11 kilograms of load, and the traction pull on its material does not amount to more than.4 to 5 kilograms in the case of a 7-ton truck driven over a 12 per cent. gradient.

In stating the data of wheels and tires which have so far been established by the experience of the past five years, and all of which point to the wood wheel shod with solid rubber tires, it is understood that wire wheels for trucks have not yet been tried sufficiently or in fact been sufficiently developed to offer a basis for comparison; also that a possibility for effecting economy and efficiency with rigid wheels naturally continues to exist with reference to lines of work in which slow work and soft roads constitute the predominating condition. But the average motor truck finds it economical *raison d'être* only through the time and wage it saves by its speed and the expansion of the working radius which is due partly to speed and partly, in comparison with horses, to its indifference to fatigue—From *Le Génie Civil*, Feb. 22 and March 1.

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STANDARDIZING the Draughting Room.—The firm of Seehase & Pansegrau in Berlin is now offering stencils and shapes by means of which draughtsmen can mark bolts and nuts of standardized dimensions without constructive effort, and similar contrivances are under preparation for other parts which have become standardized in various industries. The method used consists mainly in providing perforations of a transparent sheet at the determining points in the contours to be drawn. The pencil point is inserted in these holes and the marks so made are connected; though not necessarily before the inking. Some of the holes indicate centers of curves; others fix the relation to median lines of the construction. The supposition is of course that drawings are made only to a few standardized scales. For the factory's own use it is clear that the drawing of standardized parts may be entirely omitted, and the stencils may then be used only as a means for checking up the dimensions of the construction.—From *Werkstattstechnik*, March 1.

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OIL in the Gasoline.—One of the leading automobile manufacturers in France is now recommending the American expedient of mixing some lubricating oil in the gasoline in order to obtain a cylinder lubrication proportionate not only to the motor speed but also to the power and heat development of each explosion. Five per cent. of oil is said to be a suitable admixture, but it is recommended to follow this practice only while the motor is new and until the cylinder walls have become ground in. The motor is in this instance lubricated from a force-feed pump which is not co-ordinated with the throttle in any manner. *Omnia* now places the matter under the discussion with the query: If the practice is advisable in the case of a new motor, why is it not advisable always? At the same time the *Chauffeur Français* finds that a number of well-known expert drivers employ this auxiliary oiling method, usually in a three per cent. proportion, and that one manufacturer uses it in testing motors.

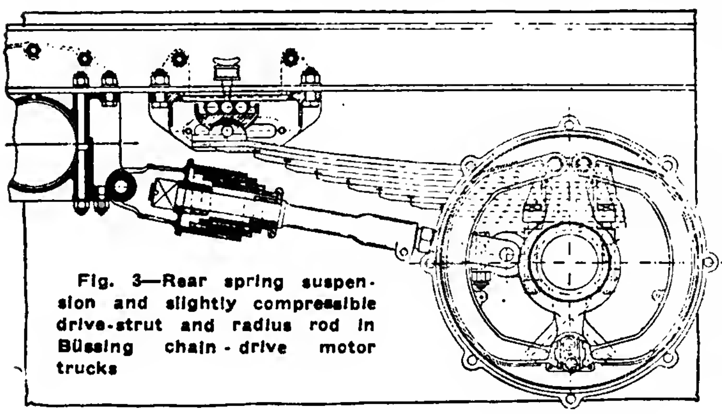

Fig. 3—Rear spring suspension and slightly compressible drive-strut and radius rod in Büssing chain-drive motor trucks

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PRIZE for an Automobile Diesel Motor—The Royal Hungarian Automobile Club, through its president, Count Alexander Andrassy, and its technical committee, has addressed a memorial to the International Association of Recognized Automobile Clubs recommending that a large prize be offered not only for a cheap and universal fuel which may be used in automobile motors, as these are now constructed, on which subject the international association has already taken action, but also for a motor construction which is fully adapted for automobile purposes and in which the cheap varieties of fuel now actually used in Diesel motors may nevertheless be successfully employed. The recommendation also includes a smaller prize for a motor which may be operated optionally with a variety of fuels without changes in its mode of operation.—From *Automobilwelt*.

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CONSUMPTION of Fuel and Lubricant in Trucks.—From a table compiled by the authorities in charge of the event it is noticed that the relation between the consumption of fuel and that of lubricant in the trucks which took part in the French annual military trials of 1912 varies widely. One of the Berliet trucks holds the record in both directions, having used only 0.0412 liters of benzol per ton-kilometer and 0.90 grams of lubricant, but seven other Berliet trucks show much higher figures, though one of them comes close to the record for lubricant. Two Aries trucks both show very low figures for fuel and also below the average for lubricant. Four Renault trucks show a fuel consumption from 0.0454 to 0.0477 and a lubricant consumption from 1.10 to 1.50 grams; a very consistent performance. In two Cohendet trucks whose fuel consumption was within the same limits the lubricant consumption, on the other hand, almost reached the permissible maximum of 7 grams per ton-kilometer.

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WARDING Off Vibration.—The rear spring suspension and the stiffly cushioning radius rod and driving-strut which form features of the Büssing motor truck, which is among those of best repute in Germany, are shown in Fig. 3, reproduced from *Der Motorwagen*. The construction exemplifies the tendency to produce constructively the necessary flexibility between running-gear and frame, in heavy trucks, while eliminating it from the frame proper.

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Memorandum of Articles Unadapted for Abbreviation

Among compendious treatises on highly specialized subjects which have recently appeared in continental publications, and copies of which, in the original language in each case, may be procured for those interested, are the following:

Bevel-gear Milling Machines. Serial, illustrated.—By Prof. Alfredo Galassini of Turin in *Werkstattstechnik*, Feb. 15, March 1 and to be continued.

The Use of Cast Steel Balls in the Shaping of Sheet Metal Parts, illustrated, 3 pages.—By E. Gay in *La Technique Moderne*, March 1.

Graphodynamic Investigation of a Gill & Aveling Four-Cylinder Automobile Motor with Variable Stroke. Serial, illustrated.—By A. Nerreter in *Der Motorwagen*, January 20 and 31, February 10 and to be continued.

Recent Lubricators—Illustrated descriptions of lubricating devices; completing the subject as previously presented in same journal: 30 pages. *Revue de Mécanique*, Jan. 31.

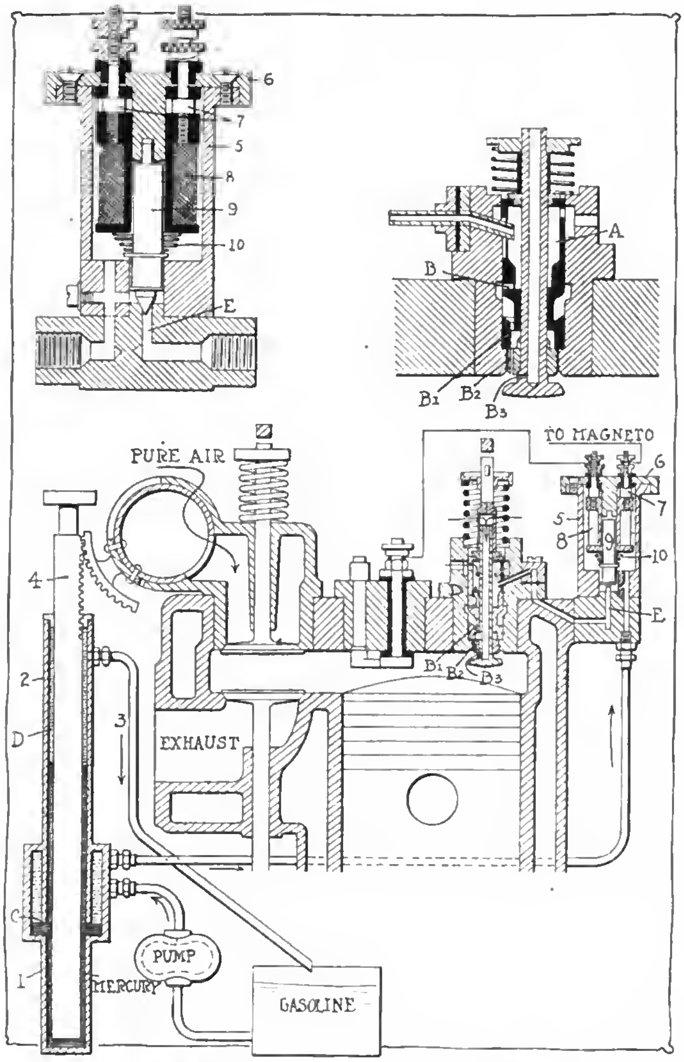

Fig. 1—General drawing of motor, showing the detail of the distributer with its magnetic coils, the pulverizer and the pressure-controlling device with its column of mercury. The fuel is carried from the tank to the pressure regulator by means of a pump placed in the position shown in the illustration

The New Bellem Oil Motor

¶ *This new motor runs on kerosene oil or crude and can be started directly on either one of these fuels while the motor is cold. This test was made upon the demonstration motor.*

¶ *It operates at the same speed as the ordinary gasoline automobile motor and being of the same size it can be substituted in the chassis for a motor of that type.*

¶ *The secret of the invention is the complete pulverization of the fuel which is effected by injecting it into the vacuum formed by allowing the intake valve to open only after the piston has gone some distance on its downward stroke.*

¶ *The valve mechanism consists of two principal parts; a pressure regulator and a distributer. The pressure is controlled through varying the height of a column of mercury and the amount of pressure used does not in any way affect the quantity of the fuel.*

¶ *A magnetic coil controls the distributer, whose opening is independent of the motor speed. A magnetic control is used which renders the opening dependent on the weight of a needle valve and the strength of a spring.*

French Kerosene Motor for Automobiles

Bellem Engine Starts Cold on Kerosene and Runs on Any Kind of Crude Oil—Uses No Carbureter nor Compressed Air

A FOUR-CYCLE motor capable of starting up cold on kerosene, of running on any kind of crude oil, weighing no more than a car motor, having a normal compression, having no carbureter and using no compressed air, has been produced by M. Bellem, a French engineer. This motor has passed beyond the experimental stage, for, it is claimed, licenses to construct have been secured by Delaunay-Belleville and by Messrs. Sautter & Harle, a French firm employed largely on army and navy work.

The similarity between the standard type of car motor running on gasoline and the Bellem, consuming kerosene or crude oils, is found in the fact that the former can readily be converted to the latter. Most of the experimental work has been done on motors so converted.

On the Bellem there are the conventional mechanically-operated intake and exhaust valves, but the intake, instead of admitting gas, allows pure air to pass through and does not open until 30 degrees before lower dead center. It closes about 30 degrees after lower dead center. The exhaust valve has the usual timing.

Automatic Intake Valve

In the head of the cylinder is fitted a combined automatic intake valve and pulverizer. With the main valves closed, there is a considerable depression in the cylinder during the first portion of the intake stroke. The suction of the piston opens the automatic valve illustrated in detail in Fig. 1. A charge of fuel having been brought up to this valve under pressure, the liquid and at the same time a certain quantity of air are brought in from A to B, through the holes B1 and then through B2. Finally, pure air is drawn through the hollow stem of the valve and the holes B3, completely pulverizing the fuel. Strong claims are made for this type of pulverizer working in a partial vacuum. In a recent test, a stone-cold, single-cylinder demonstration model was cranked by hand with the ignition cut off. At each exhaust stroke a puff of vapor came through the port, and on a mirror being held before it not a trace of condensation was to be seen. The inventor claims that he obtains cold vapors. A demonstration of this is to place a metal tube near the exhaust, heat it by a soldering lamp and drop kerosene onto the hot tube. At the same time the cold motor is cranked by hand, when the vapors coming out of the exhaust port are indistinguishable from those obtained by burning kerosene on the hot tube. *The demonstration motor, after standing all night, had cold water from the city mains run into its jacket and was started on the first pull of the handle against compression. This was repeated several times after the cylinder walls had been allowed to cool by a constant circulation of water from the mains.*

After running for 5 minutes on kerosene, this fuel was shut off and crude oil allowed to flow. No difference could be detected in the running of the motor and the exhaust was perfectly clear. Speed variations were obtained from 200 revolutions per minute running light to 1,200 revolutions per minute under load. Varying the speed as quickly as possible by use of the throttle and ignition cut-out, it was impossible to get anything more than a slight puff at the exhaust; this puff lasted but

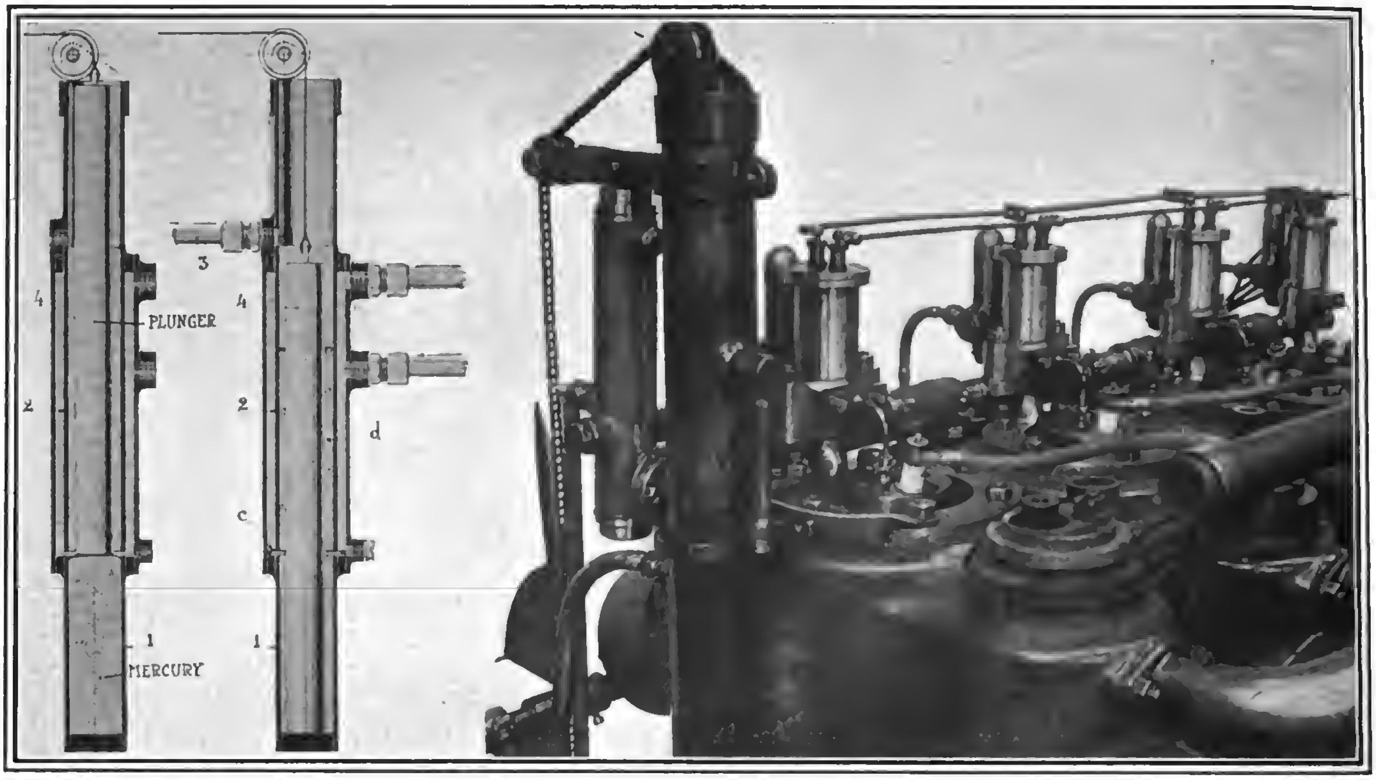

Fig. 2—Left, details of fuel-pressure device in Bellem motor. Right, top appearance of motor when fitted with the fuel pulverizing apparatus employed by Bellem

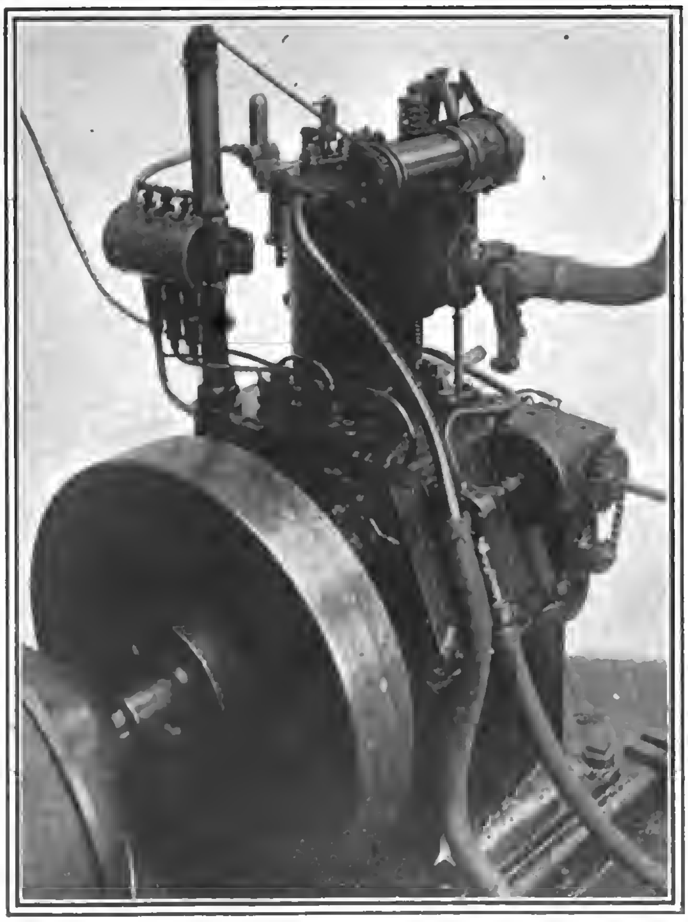

Fig. 3—Single-cylinder motor using the Bellem method of fuel pulverization. The spring of the auxiliary intake valve may be noted, projecting above the top of the cylinder, while the fuel pump is operated by silent chain from the extremity of the crank-shaft opposite the flywheel

a fraction of a second and had nothing that indicated incorrect mixture.

The secret of the invention lies in the complete pulverization of the fuel in a partial vacuum. Experiments have shown that if the same pulverizer is used in a chamber at atmospheric pressure and with compressed air passing through the valve, the results are not the same, there being a certain amount of condensation. It is claimed that the late opening of the main air valve does not prevent a complete filling of the cylinder.

The fuel, as already explained, is delivered under pressure to the vaporizer. This necessitates the use of two distinct organs, a pressure regulator and a distributer. The pressure regulator is shown separately in Fig. 2. It is fed from a kerosene tank by means of any suitable type of pump, and consists of a metal vessel, 1, containing mercury, and welded to it, a metal tube the lower end of which is level with the top of the mercury. In the tube is a plunger, 4, capable of being raised and lowered in any convenient manner, and, according to its position, varying the height of the column of mercury, D, in the tube 2. The height of the column of mercury determines the pressure of kerosene in the chamber, C. The excess of fuel passes through the mercury column and down the overflow pipe, 3, to the tank. The feed pump has a capacity slightly greater than that of the motor under full power. The amount of fuel flowing through the return pipe with the motor under power is insignificant and there is no danger of the mercury being carried through with the fuel. The plunger is connected to the air valve, thus a single operation, controlled either by governor or by hand, determines the pressure of fuel to the distributer and the amount of air admitted to the motor.

Distributer Does Not Regulate Fuel

It will be noted that the feed pipe connects the pressure chamber with the distributer placed to the right of the automatic valve. This distributer is shown separately in Fig. 4. The pressure being variable at will the distributer is not called upon to regulate the quantity of fuel in any way. Its opening has to be constant and independent of the motor speed. It will be readily understood that an opening which allowed the correct amount

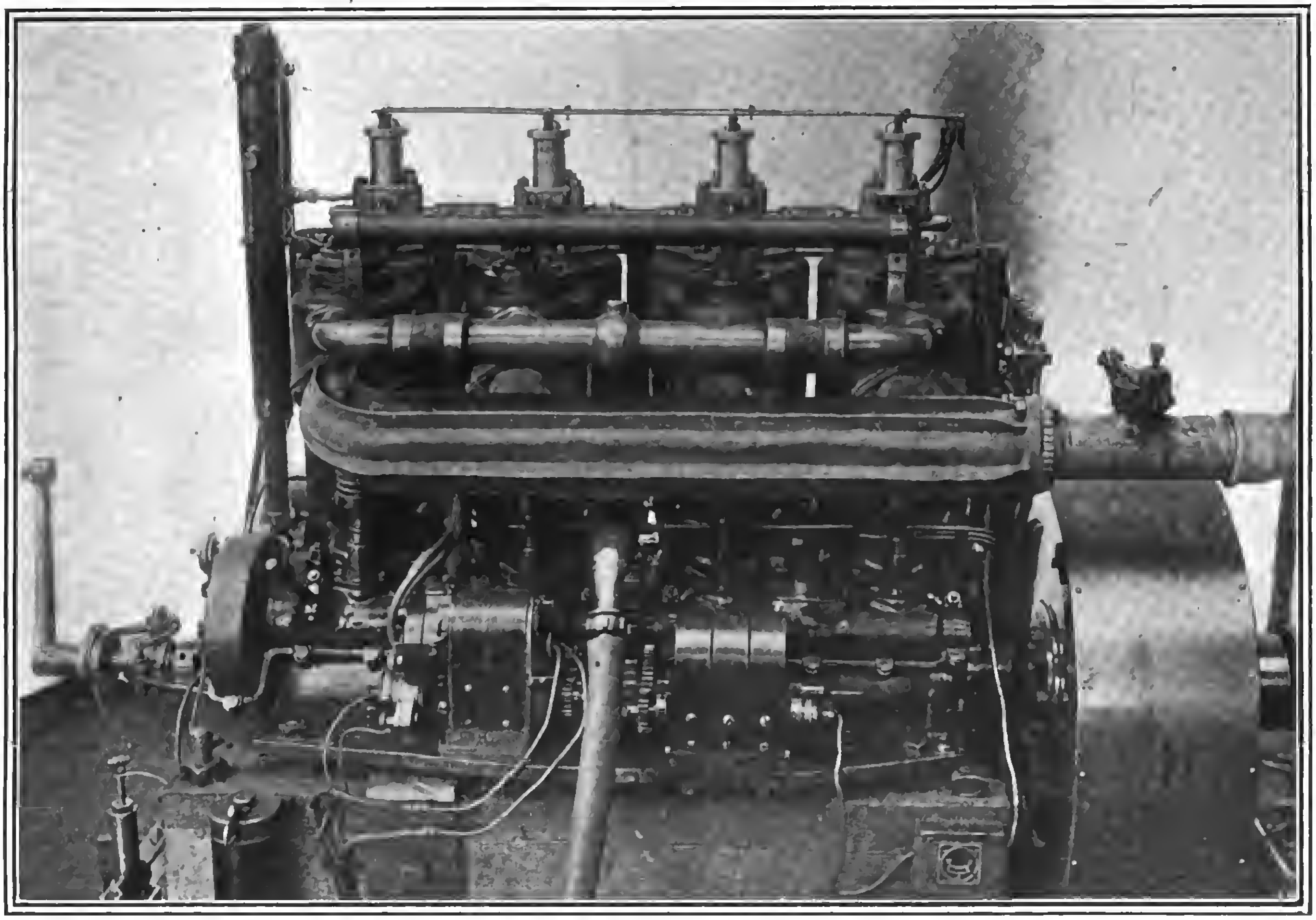

Fig. 4—Exterior appearance of Bellem motor adapted for automobile use. The magnetic control is governed by the wires running through the tubes along the top of the cylindrical distributers

of fuel to pass at 1,000 revolutions would be too great at 500 revolutions if a mechanical control was employed. With a mechanically-operated valve, also, there would be a possibility of the motor stopping with the valve open when the fuel would continue to flow until pressure had fallen off. The control is therefore magnetic, the apparatus comprising a soft iron core, 5, with a cover, 6, to which is attached the coil, 8, by means of the insulated terminals 7. In the center of the coil is a needle valve, 9, maintained on its seat by the coil spring, 10. At the moment of breaking contact on a low-tension magneto, the needle valve is raised from its seat and the fuel under pressure in the feed pipe passes through E to the pulverizer. The opening of the valve is practically instantaneous and its length of opening depends on the weight of the needle valve and the strength of the spring. The length of opening is obviously constant, whatever the speed of the motor.

In Fig. 1 the motor is shown with low-tension ignition. All the experimental models however, have been fitted with an ordinary type of high-tension magneto for the ignition and a low-tension magneto for supplying the current to the magnetic distributer. The compressions of the charge, firing and exhaust are carried out as on a normal type of four-cycle motor. When motors have been converted the compression has not been varied and has generally been between 60 and 70 pounds per square inch.

A test of one of these motors carried out at the laboratory of the Automobile Club of France is given herewith. The motor was a single-cylinder vertical of 100 by 150 millimeters, 3.9 by 5.9 inches, bore and stroke. The compression was 71 pounds per square inch.

The motor is adapted to marine, stationary or automobile use. As may be seen in the accompanying table, the crude fuel gave the greatest economy over a test running for an hour. It may be noticed that a higher rotative speed was used with the kerosene than with the other fuels and that the kerosene tests extended over a longer period.

SOME RESULTS OF TEST MADE ON BELLEM MOTOR IN LABORATORY OF THE AUTOMOBILE CLUB OF FRANCE

Module	Size of Blades in Mm.	Number of Hole	Temperature in Degrees Centigrade	Atmospheric Pressure in Mm. Mercury	Revolutions per Minute	H.P.	Corrections in Hundredths	Effective H.P.	Consumption Gallons per Hour	Specific Consumption Gallons per H.P. Hour	Observations
4	240x240	6.5	13	756	820	5.2	−2	5.1			Fuel: kerosene
4	240x240	6.5	14	756	813	5.1	−2	5.0	1.42	0.142	Test lasted 2 hours
4	240x240	6.5	14	756	811.5	5	−2	4.9			
4	240x240	6.5	15	756	811.7	5	−2	4.9			
4	240x240	7	10.5	771.5	773	5.1	−1	5.15	1.2	0.214	Fuel: Alcohol: Test, 1 hour
4	240x240	6.5	12	764.5	760	4.3	−1	4.25	0.396	0.920	Fuel, crude oil. Test, 1 hour

Motor, single-cylinder model of 100 by 150-millimeter bore and stroke. The motor was started cold with the use of kerosene only. The first test lasted 2 hours, the second test 1 hour, and the third also 1 hour. Acceleration from 183 revolutions to maximum speed under load was particularly easy.

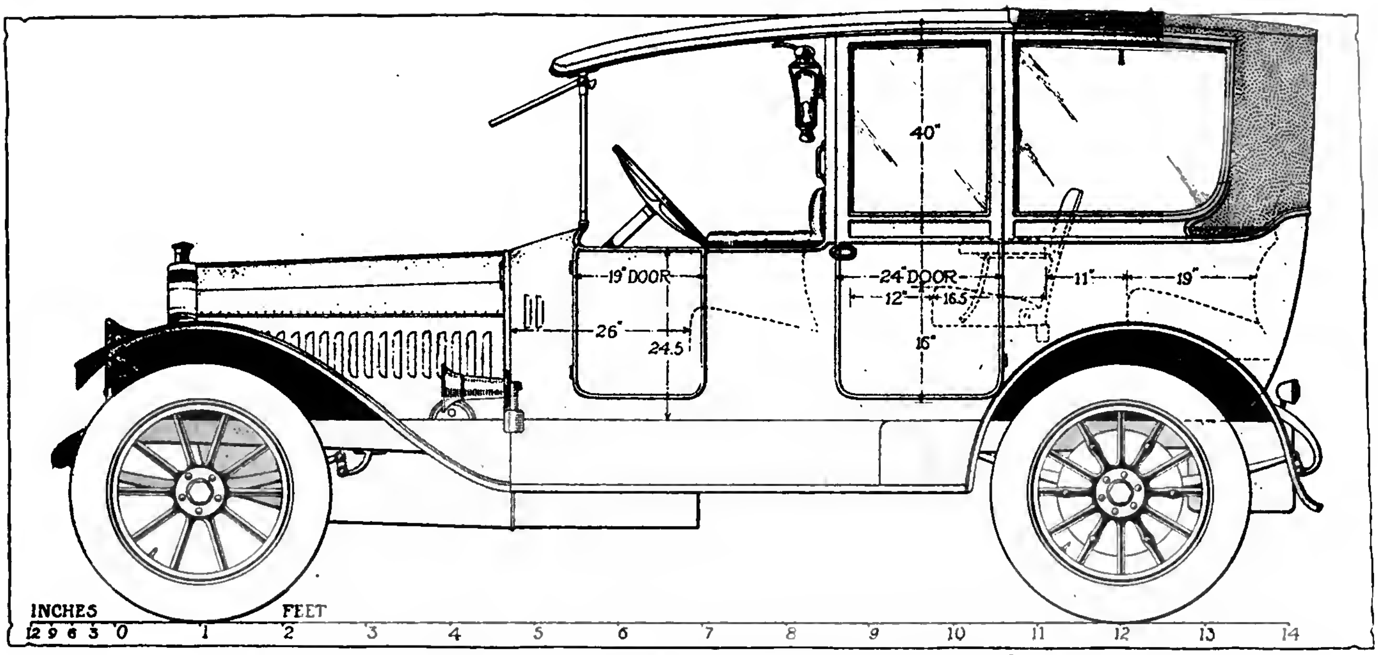

Fig. 1—Design to scale of limousine-landaulet body applied to White six-cylinder chassis

Limousine and Landaulet Types Combined

New Type of All-Season Body Meeting Increasing Favor—Notable Features Are Large Quarter Windows and New Curved Roof Line

ONE of the facts brought out at recent shows, and in particular at the last Importer's Salon in New York, was the increasing popularity of a new type of automobile body called, for want of a more comprehensive term, the limousine landaulet. As the name indicates, it combines the features of both. It has the large rear quarter windows of the limousine and the rear part of the top folds down in similar manner to the landaulet.

The ordinary landaulet has always the disadvantage of having the side quarters closed, thus preventing a clear outlook, whereas the limousine with its large spacious side and rear windows, has the distinct advantage of unobstructed view. On the other hand, the limousine is not capable of being opened up entirely, a serious limitation that suggested the need of combining the two types. This has been happily accomplished in the newer design. The limousine-landaulet has had a tryout for about two seasons in this country and for a much longer time in Europe where it originated. It is in no sense a freak design, but is a logical development in body types and it shows the public demand for an all-seasons car.

A suggested design of limousine-landaulet is given in the accompanying scale drawings. The body has flush side panels and its appearance is characterized by the straight line effect. The fore part of the body has low doors and cowl hood with storm visor windshield. The driver is free from hindrances that prevent his hearing all sounds and seeing clearly. For rain protection, drop curtains are used and when not required these are folded under the rear of the front seat.

Fig. 1 shows the complete side view of the car. The chassis is a White, Model G.F., 132-inch wheelbase, six cylinders, the hood of which has been changed slightly by sloping the top line up toward the dash and by bringing the sides outward toward the same point. This car is left drive with change and brake levers in the center. The length of the body space is ample to accommodate a seven-passenger body. The distance of the rear wheel center from the dash is 87 inches, which permits of a 24 inch door for entrance to the rear compartment.

No chassis changes are necessary. Standard front mudguards are used; the gasoline tank is under the front seat; the horn and headlights are standard and the dash lamps, which form part of the body equipment, are electric and let in flush in the dash. Provision for ventilating is also made in the dash below the lamps.

Fig. 2 shows the top folded down and the windows of the doors and quarters lowered. The windows are of the frameless type. It will be noted that the quarter window does not lower out of sight, due to the width of the body and the necessary clearance for the wheel.

The lowering of the top to effect the change illustrated in Fig. 2 is accomplished in practically the same manner as with the ordinary landaulet. The inside fasteners are released and the top lowered until the rear pillar or upright assumes a horizontal

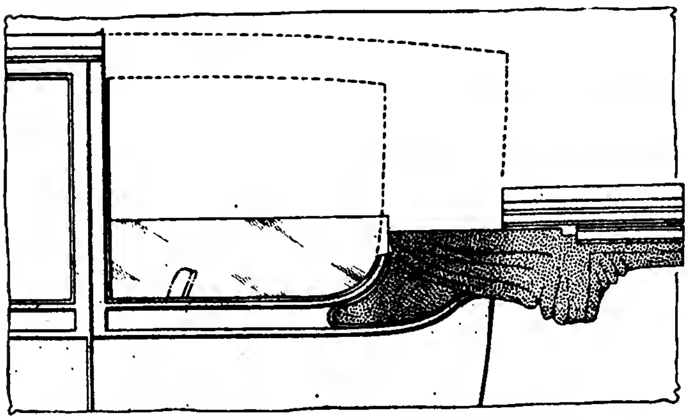

Fig. 2—Showing disposition of top when lowered

position. The toprail section, rear of the first joint, is thrown out till it lines with the pillar, and the front section of the toprail is folded back onto the line formed by the pillar and the rear section of the toprail. When down the supports of the top are concealed inside the leather. The hinges require to be very heavy as the overhang of the top in its lowered position is about 26 inches beyond the bearing point.

The roof line has a generous sweep from back to front, the drop from a horizontal at the rear across the highest part being 3 inches, while at the front windshield the drop is twice that amount, or 6 inches. The best quality landau top leather is used to cover the top, back and sides as far forward as the glass opening and there are two joints on the top covered with iron plates to keep out the water. The fixed forward part of the roof is sometimes covered with leather to match the rear part or it can be finished in the customary manner and painted. This latter plan seems to be the one most in use.

Closed Compartment Seats Five

The rear compartment is large enough to provide comfortable seating for five people, three on the rear seat and two on small seats facing forward, the width of the cushions, space between the seats and head room is indicated by figures on the various views. The auxiliary seats are of the arm chair pattern, made to fold up.

The construction of the body is wood framing, 16 gauge aluminum sheet for the panels and metal mouldings. Concealed hinges are used on the rear doors and concealed handles on the fore doors. Grab handles and pillar lamps are fitted to the front pillar and a megaphone speaking tube is located at the right of the driver on the post in the center of the front glass division.

Hand buffed leather, black and dull finished, is used for trimming the front compartment, the seat and back being tufted. The distance between the steering wheel and the seat back is 15 inches without compressing the leather, and a space of 9 inches is allowed under the wheel to the cushion.

A very suitable trimming for the interior of the rear compartment is a light Bedford cord, with lace to match, leaving a suggestion of brown in the design. The carpet should be similarly marked and the curtains striped silk to harmonize in color with the lace and cloth. A suggested interior appointment is a large size toilet case, complete with watch, mirror, etc., covered with drab Morocco with the tops silver mounted. This is placed in the middle of the front division. In the front part of the permanent roof is placed a silver mounted dome light and cord hatrack, and an electric cigar lighter could be placed on the side opposite to the mouthpiece of the speaking tube. The door pull to handles are light colored celluloid. All metal parts are silvered and the interior woodwork is natural finished mahogany.

Large pockets are located on the doors and in trimming the body, the carpet line should come far enough up on the sides, doors and front to protect the material from being damaged by the feet of the occupants. The thickness of the rear seat cushion should not be less than 10 inches nor more than 12 inches, the slant from back to front 3.5 inches and the back to be properly shaped and thick.

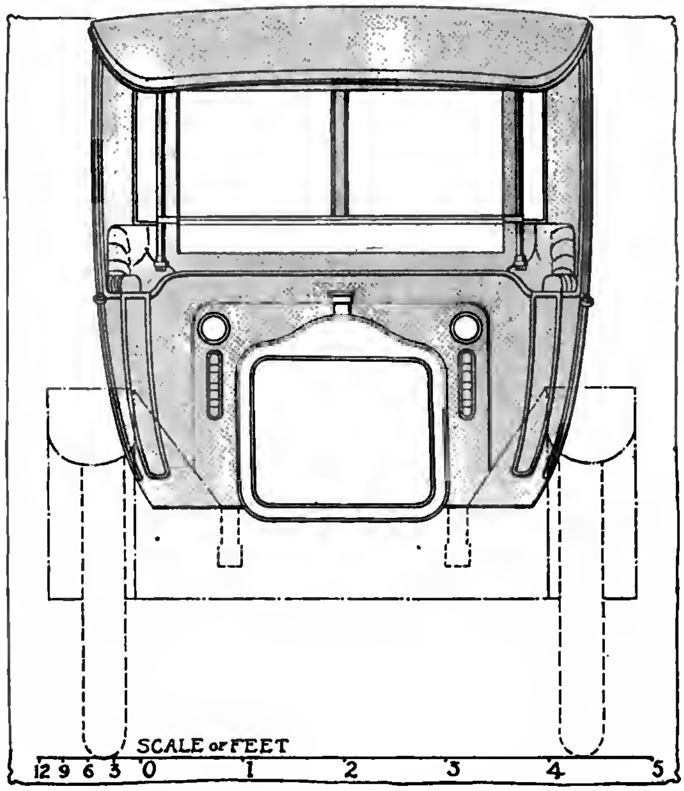

Fig. 3—Front view of limousine-landaulet design

For touring the trimming should be fitted with slip covers, so that the interior can always be made clean and free from dust. When selecting the trimming of a closed body it is becoming more the custom to consider the material and fitting from a sanitary standpoint. Many bodies are now finished inside entirely with wood except the seat cushions and the backs and sides of same. Charming effects are produced with these wood interior decorations and some combinations with wood panels and cloth borders form artistic and beautiful contrasts.

The tendency for beautiful dark colors is the prevailing idea in painting this year, and for the design illustrated, a rich dark blue for the body panels with the upper part black and black mouldings would be very suitable. The chassis could be painted blue, like the panels, with lighter blue and black striping.

The detail construction of the top will form the subject of the article to follow, in which a description of three methods of folding tops of these vehicles will be included.

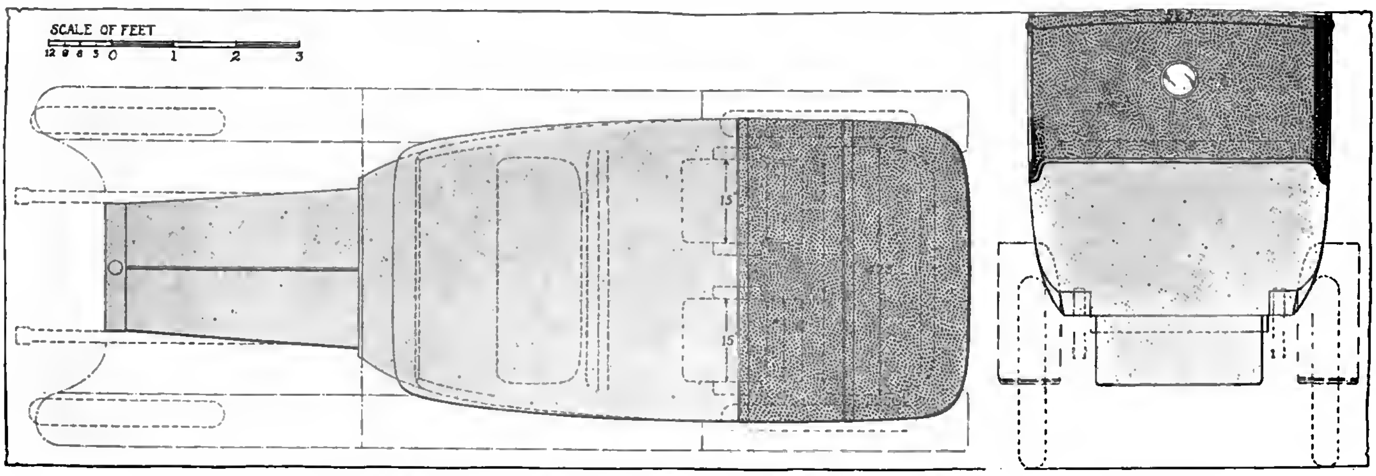

Fig. 4—Plan and rear elevation to scale of suggested limousine-landaulet body

Salesmen's System Used by Pierce-Arrow Distributing Agent

Complete Scheme for Recording Prospects, Follow-up Work, Sales and Their Exact Money Value Make Foss-Hughes Co.'s Selling Organization Strong —Nine Blanks Handled by Salesmen and Office Are Used

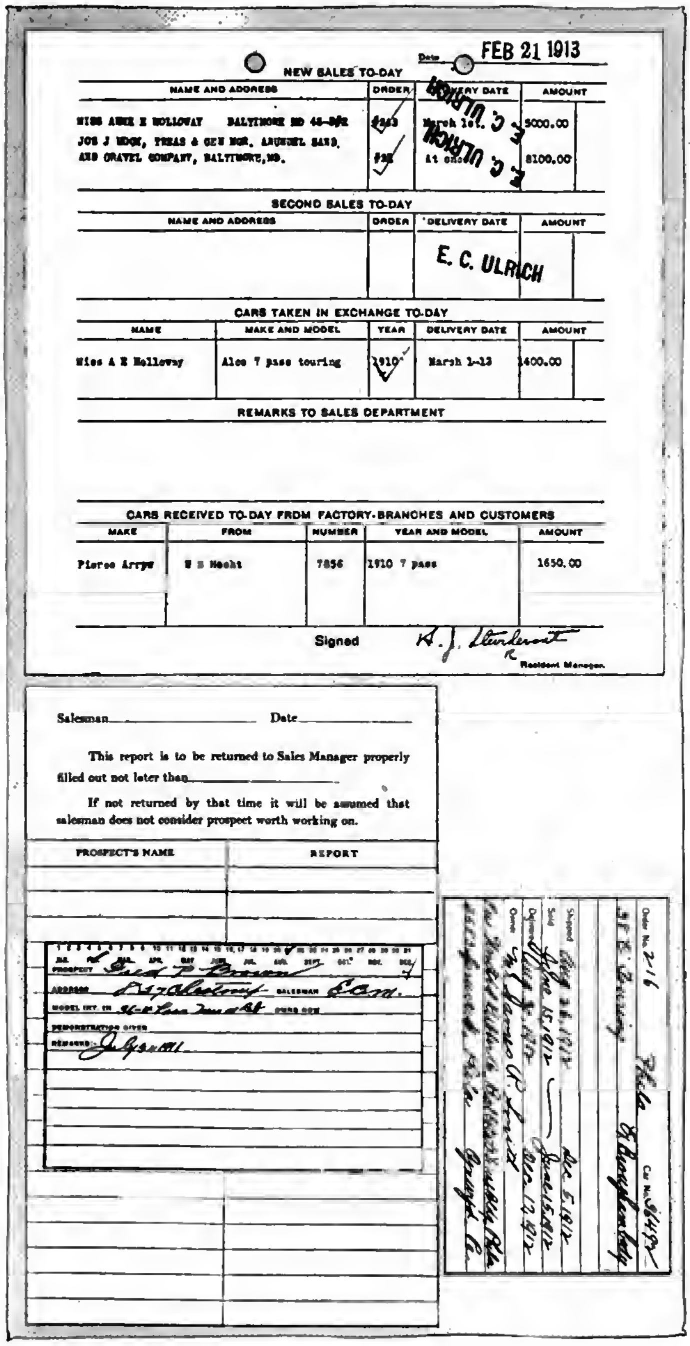

Fig. 1—Daily rocord sent from Foss-Hughes branches to Philadelphia main office
Fig. 2—Monthly salesman's follow-up report
Fig. 3—Prospective customer's filing card
Fig. 4—Card used by the Foss-Hughes Co. for making file records of car sales

SALESROOMS are no exceptions to the rule that a good system—which, it stands to reason, is the only kind worth using—tends in every case of its application to reduce loss and waste and to augment profits. A good salesroom system has the purpose, not to enslave the salesmen, but to make them freer in their application to their work and to prevent losses of sales by neglect on the part of individuals. Incidentally, it affords a possibility for the sales manager to gauge the men of his staff and to supply them with opportunities for increasing the business of the company and their own income. In short, a salesroom system enables a manager with brains to bring all his executive abilities into play.

Coming down to specific instances, it is a striking fact that the companies selling the highest-priced cars in important cities are almost unexceptionally using sales systems. One excellent system is in use by the Foss-Hughes Co., who has the Philadelphia agency of the Pierce-Arrow company and it is described below in detail, together with a complete set of illustrations of all the forms used in connection with it. The company has branches in Philadelphia, Baltimore, Providence, Wilmington and Washington. The Philadelphia office employs four salesmen for city work and a traveling man working on the road throughout the year. There are nine forms, as follows:

1. **Salesman's daily report.**
2. **Prospect's file card.**
3. **Salesman's monthly report.**
4. **Contract sales blank.**
5. **Sales file record card.**
6. **Sales force monthly record.**
7. **Second-hand car stock record.**
8. **Daily business report to main office.**
9. **Traveling salesman's weekly report.**

The order in which these forms are mentioned indicates the order of their application in case of a transaction beginning from the first visit to the final sale, including the trading in of a used car, if such is the case. The best way of forming a conception of the workings of the system is by considering each form in the order of use.

1. **Salesman's Daily Report**—Whenever a salesman comes in the store at evening, he fills out the daily report, using for this purpose a copy of the blank, Fig. 7, and making out a carbon copy. He enters the date of the day on the top of the sheet and then enumerates his various visits and their results. The sheet used for this purpose is printed on rather thin white paper, which is lined and printed black and 8.5 by 5.5 inches. Having done this, he signs the report, turns over the original to the office of the company and keeps the carbon for himself, storing it in a suitable place in his desk. Of course, he has his own pocket records in addition to the large daily reports, so that at any place and time he can inform himself on the condition of any pending or possible deal by referring to a notebook. All the salesmen's reports of this kind are kept together in one file in order of the dates, being ready for reference at any time.

2. **Prospect's File Card**—When the salesman's report is re-

¶ The system, while using nine different forms, is not cumbersome and imposes upon neither the energy of the salesmen, whose business it is to sell automobiles, nor upon that of too great a part of the office staff. ¶ The management sees to it that the system works out to the advantage of both the business and the salesmen. System is considered by it a helpful brownie and not a specter haunting the men when they are at work. This causes the men to adhere to the system. ¶ By promptly living up to the requirements of the system, the salesmen's work is made easier, as a number of detail operations otherwise weighing on their shoulders is removed, enabling them to devote all their energies to the work which is worthy of their efforts and to always operate at high efficiency.

ceived by the office, it is turned over to a clerk, whose business it is to put the information in a more handy form. For this end, a prospect's card file is used, in which there is a card for every person called upon by any one salesman of the force. This card is shown in Fig. 3; it is 5 by 3 inches, printed on thin white cardboard with blue lines and black letters. In filling out this blank the clerk first records the date, as he transfers the information from form, Fig. 7, to form, Fig. 3, in the same order as they appear on Fig. 7. The date of the first call is recorded by checking off the name of the month and the day of the month, as seen in the illustration. Then follow the name and address of the prospective customer. Spaces are provided for recording the dates of later calls and of a demonstration, if such is given, as well as the result of the same. The name of the salesman or rather his initials, the model of car in which the person visited by him is interested and the make of car owned by him at the time of the visit are also recorded in spaces provided for these records.

3. **Salesman's Monthly Report**—In order to keep prospects properly followed up, the sales management of the Foss-Hughes Co. makes use of monthly report orders, Fig. 2, a white blank, 5.25 by 8.5 inches in size, and lined and printed in black. About once in 4 weeks the sales office goes over the files of prospective customers which contain the cards, Fig. 3, and makes out one or more report orders for each salesman, on which the names of his prospects, so-called, and space for a report on the status of each case are given. After 10 days the report must be returned to the sales manager with an intelligent statement of each prospect's case. Whatever cases are not reported on satisfactorily become lost to the salesman; assuming that he is not pushing the prospect properly, the card is removed from the salesmen's prospects' file and placed on the open file, which is ready for any salesman's reference. Whoever follows up a prospect filed in this file is credited with the sale. This scheme naturally stimulates every man on the staff to close his sales as rapidly as possible.

4. **Contract Sales Blank**—When a sale is closed the salesman dictates the sales contract which is made out in the office, using a form, Fig. 5, the reverse of which is shown in Fig. 6. The contract blank is 9.5 by 11 inches and is made out with a carbon copy on green paper. Reference to the illustrations shows that the contract is a fine example of this type of form, providing for all necessary points of information and leaving no room for any doubt as to its contents. When the deal is closed, the salesman signs for the company and the purchaser opposite to the space for the salesman's signature.

5. **Sales File Record**—Sales are recorded on cards which are kept in a file; a sample card is illustrated in Fig. 4. This card is 5 by 3 inches and on the front side, Fig. 4, the name of the purchaser and his address, the model of car sold to him and

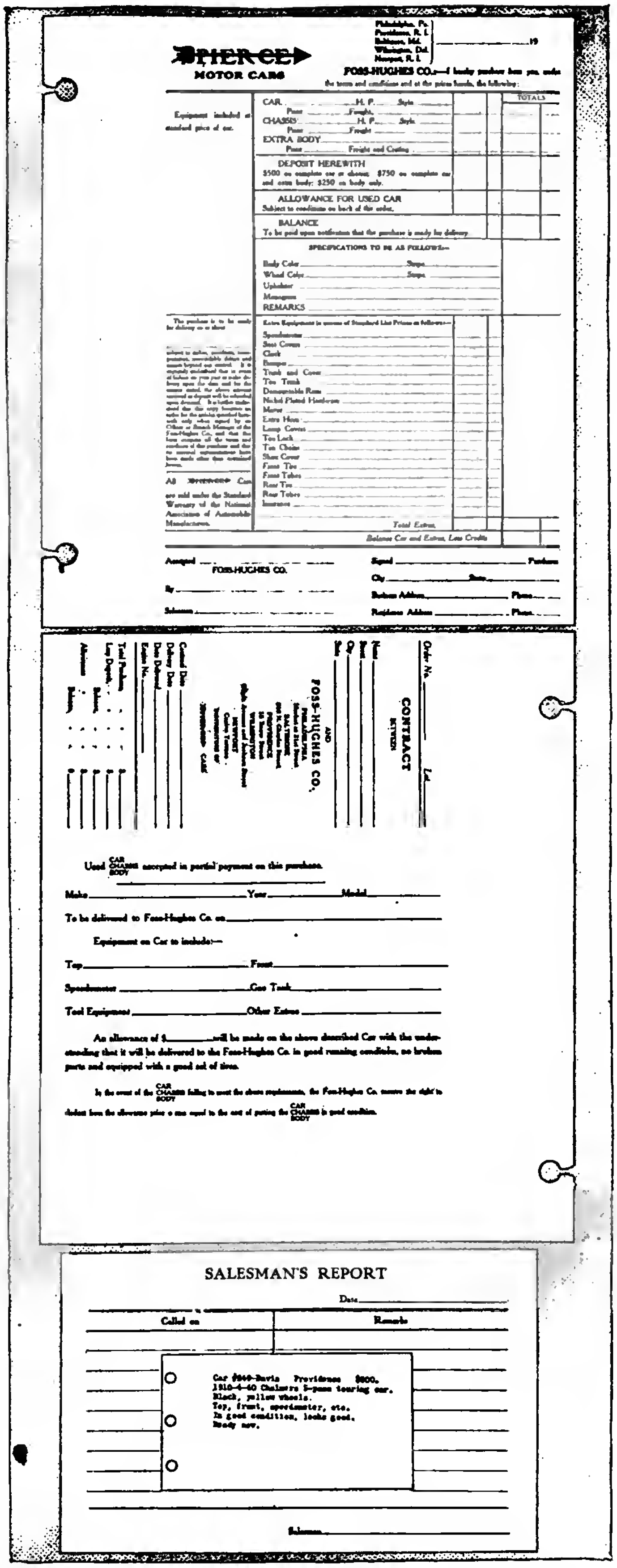

Fig. 5—Sample blank of car sales contract in the Foss-Hughes Co.'s business
Fig. 6—Reverse of the sale contract blank
Fig. 7—Daily report blank for car salesmen
Fig. 8—Sample loose leaf carried in salesmen's second-hand car stock booklet

REPORT FOR WEEK ENDING ____________________

	Place.	Hotel.	Owners Seen.	Prospects Seen.	Sales.
MONDAY:					
TUESDAY:					
WEDNESDAY:					
THURSDAY:					
FRIDAY:					
SATURDAY:					

Expense For Week:

REMARKS:

Fig. 9—Weekly report blank used by the Foss-Hughes Co.'s travelling salesman

the dates of sale, shipment from factory and delivery to owner are recorded. The orders are numbered consecutively every season but are filed alphabetically according to the owners' names. The same card shows that a car was sold to James R. Smith on June 15, 1912, this being a 38 C touring model; it was shipped from the factory on August 26 and received by the owner on August 30. At the same time with the car the salesman sold to Smith an extra brougham body, to be delivered on December 17. Consequently, this body was shipped from the factory on December 5. The reverse side of this card gives the analysis of the sale, the amount paid for the car and the allowance made for a used car, if one was traded in. The same applies to the body, so that by a glance at the card the entire transaction may be overseen from the viewpoint of profit.

6. **Sales Force Monthly Record**—As soon as a sale is made it is also registered on a monthly sales sum-up sheet, Fig. 10, on which all the salesmen's names are entered. The date, model and price of each transaction is thus recorded, and at the end of the month it is easy to total the work of each man and to make out a comparative statement showing the business of each member of the sales force. Such a statement is considered an effective stimulus to slow salesmen.

7. **Second-Hand Car Stock Record**—As indicated above, the Foss-Hughes Co. accepts used cars when selling new ones and makes an allowance for their value when turned over. It is the consensus of general opinion that with sufficient capital on hand and with a correct valuation of the used car, an individual company can make good on the used-car proposition, although this does not solve the problem of the second-hand automobile so far as the industry as a whole is concerned. In order to be able to push the sale of used cars in cases where a new car cannot be placed, the company supplies small booklets to its salesmen and in these booklets fit thin, loose leaves, 4.5 by 2.5 inches, Fig. 8. When a used car is taken over by the company the sales department office fills out a loose leaf, for each salesman, which is given to the latter so as to keep him informed of what the second-hand department affords. Of course, when a used car is sold, the salesmen are informed to that extent so that they can remove the respective leaves from their books. The leaves are kept in the books, segregated into departments which differ between Pierce-Arrow cars ready for sale, such in the shop and likewise such coming to the company at a near date; and other than Pierce cars coming to the company and ready cars. Each slip, as Fig. 8 shows, gives model, description, equipment and price of the used car.

8. **Daily Branch Report to Main Office**—As the Foss-Hughes Co. operates in five cities, it is necessary for the four branches outside of Philadelphia to send regular reports to the main office at that town. The form, Fig. 1, is used for this purpose. It is 8.5 inches square and printed black on green paper. The report enumerates and details on the sales of new and used cars made during the day, the car receipts from the factory and has a space for remarks to the Philadelphia sales department. A carbon copy of this report is filed in the branch office, while the original goes to Philadelphia.

9. **Traveling Salesman's Weekly Report**—The traveling salesman mentioned at the beginning of this article not only sends in a daily report, Fig. 7, but also a week-end statement. The Saturday report, Fig. 9, is made out on thin, white paper, 8.5 by 5.25 inches, which is typewritten as seen in the illustration. The statement gives his stopping places for all days in the week, the number of owners and prospects whom he visited, and the amounts of the sales he closed from day to day. The bottom line of the report sums up all items for all 6 days of the week.

The only shortcoming of this system is the lack of a blank for reminding the salesmen of appointments. This could be done by having salesmen include on their daily reports the next appointment with each respective prospect. The clerk who handles the prospective customers' file would also have to work a card file containing appointment memoranda as follows:

March 17, 1913. (Prospect)
Oliver P. Smith. (Salesman)
Benj. McK. Snodgrass, 1507 N. 47th St.
38 C Touring. (Model int.)

All these cards would be kept in the order of their dates, and every day the clerk would take out all the day's appointment cards and hand them to the respective salesmen.

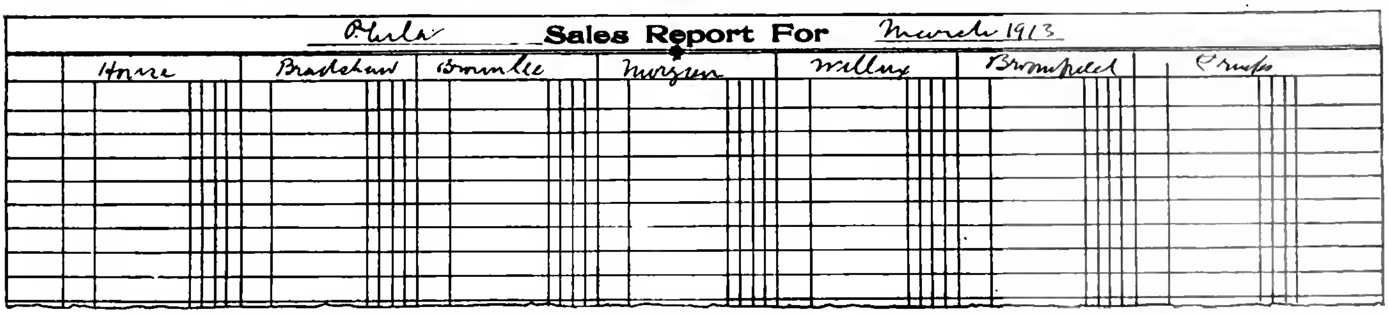

Fig. 10—Monthly comparative record sheet, on which the sales of all the salesmen of the company are entered

The Engineers' Forum

Economy in Motor Fuel

Testing Various Combinations of Kerosene, Gasoline and Ether as Fuel for Motor Vehicles

¶ C. W. Prochaska thinks that the adoption of kerosene as a motor fuel would result in an increase in price, due to the stimulated demand.
¶ W. O. Dixon gives information on the use and abuse of Motor Spirit, the new fuel for automobiles and motor trucks.

NEW YORK CITY—Editor THE AUTOMOBILE:—In our experimenting we have followed lines somewhat different from those usually taken. We have aimed to strike a happy medium and to go to the extreme on a Simplex car rated at 50 horsepower. Since last August we have used 70 per cent. kerosene, 29 per cent, 72-test gasoline and 1 per cent. ether. The cost averaged $13.80 per hundred gallons.

On several trucks we used straight 70 per cent. kerosene and 30 per cent. 70-test gasoline. In each case we supplied a small 1-gallon tank placed between the cylinders of the motors or else on the dash. Ordinary gasoline was used for starting the motor. We recommended that the motors be treated with an ample charge of denatured alcohol about twice a week, after the vehicles were turned in at night.

Our objects for making these tests were several. Kerosene alone will always give more or less trouble because of the extreme necessity to vaporize it under all conditions, especially on cold days, the number of connections and the fact that for starting the motor a fuel of higher test than kerosene is required.

From our experience, the use of kerosene alone is bound to create carbon. Without carbon, no explosion will take place. The odor is very offensive. We have used kerosene without the addition of water but the necessary fittings are so costly as to render this prohibitive for use in commercial vehicles. After careful investigation, we have come to the conclusion that, should kerosene come to be used as fuel for automobiles or commercial vehicles, the price would not remain the same because the increased demand would unquestionably cause the producer to raise the price. Also the adoption of kerosene in place of gasoline would necessitate radical changes in the motors themselves as well as in carbureters.—C. W. PROCHASKA, Gallagher-Tompkins Co.

On the Use and Abuse of Motor Spirit

CHICAGO, ILL.—Editor THE AUTOMOBILE:—The new power fuel Motor Spirit, while being designated chiefly for heavy duty gasoline engines in automobile trucks, tractors, etc., will undoubtedly find its way into the tanks of many pleasure cars, on account of its greater range of mileage and its lower cost.

Motor Spirit, while it belongs to the same group as naphtha and gasoline, differs in some respects, and must be used according to its peculiarities. For purposes of power, in the production of which it ranks well up with the so-called high-grade gasoline, Motor Spirit yields an increase of over 10 per cent., and is adaptable to all styles of motors now using gasoline.

The pungent odor noticeable from the liquid Motor Spirit, which is in some cases disagreeable, is almost entirely absorbed in the process of combustion, and leaves the exhaust almost odorless.

The bluish-white or gray smoke noticeable in the exhaust is not continuous, but is due to a sudden opening of the throttle, which throws an abnormal load on the carbureter and intake manifold, causing unusual friction of air along the inner surface of the manifold, which friction absorbing suddenly all liquid drops caused by condensation along the walls of the cold piping, carries into the combustion chamber a charge of raw spirits too rich to be entirely consumed, so is exhausted in the form of smoke, or incomplete combustion.

This fault is noticeable only in the colder weather and in a cold motor, and can be entirely, or nearly, overcome by jacketing the intake manifold above the carbureter, either for warm water or the hot blast from exhaust. If jacket is attached it should cover as much of the manifold as is practicable, and by all means should cover the parts which lay horizontal, and in which are possible pockets for lodgment of any fluid condensation.

If warm air is to be taken through the carbureter, it should be taken at both the initial, or primary, air intake, and the auxiliary or high-speed part, so that sudden opening of throttle will not cause the motor to load or back-fire when cool. The carbureter should be adjusted to a warm motor, as this is its running condition, generally allowing more air in proportion for the spirits than for gasoline, keeping the volume of mixture as thin as possible, that is feeding as little fuel as possible.

The thinner the mixture, the less the condensation. The less the condensation, the less the smoke. The less the smoke, the more the mileage.

The walls of lubricant built up in the cylinders and on the piston are not affected by Motor Spirit as quickly as by gasoline, which indicates that the amount of oil being used with gasoline can be materially decreased with perfect safety in using the Spirit. In brief, the best results, both in power and mileage economy, from the use of Motor Spirit, are obtained with just as small amount of both lubricant and fuel as is possible, using kerosene as a cleanser frequently—about a pint through primer, or through carbureter directly into air intake, once a week, and keeping the ignition system in tune.

Again—do not use an over-rich mixture.—W. O. DIXON, Standard Oil Co. of Indiana.

SYRACUSE, N. Y.—Editor THE AUTOMOBILE:—One big source of gasoline loss is in small leaks. Very frequently the gasoline valve or some of the unions leak just a drop now and then, but inasmuch as this drop is going on for 24 hours a day, it amounts to a great deal. For this reason all such places should be examined at regular intervals.

Touring in the country gives the best possible chance for economical operation, as it allows the motor to be used at a more economical point in its power. Probably 20 miles per hour represents the best speed for economical operation.—ARTHUR HOLMES, H. H. Franklin Mfg. Co.

Replacing Dry Cells with Storage Battery—Transmitting Power Through Spring—Cleaning Mohair—Long Stroke Advantages—Removing Carbon Deposit Pressures in Different Parts of Motor—Friction Drive—Strange Spark Plug

Using 6-Volt Storage Battery

EDITOR THE AUTOMOBILE:—In your department of Letters Answered and Discussed in THE AUTOMOBILE for March 6, you discussed the use of a storage battery to replace dry cells in the Delco ignition system for a 1911 Cadillac. Your subscriber asked whether he could replace the dry cells with a 6-volt battery and generator. I have been considering the same change with the exception of installing only the battery, but was dissuaded from doing so by the Cadillac people, who said, if I understood them correctly, that the system was made for dry cells and that it would not operate with a storage battery. Did I get this right? If I can replace the dry cells with a 6-volt battery I should like to do so. Perhaps I misinterpreted the discussion of the matter in THE AUTOMOBILE, as perhaps the additional unit of which you spoke was necessary because a generator was to be used. Could a 60-ampere-hour 6-volt battery be used in this case, or would it require an 80-ampere-hour 6-volt?

I might state that my principal object in changing from dry cells to a storage battery is to secure a trouble light for use in inspecting the engine and for tire troubles at night.

New York City. J. D. MARTIN.

—It would not be a feasible plan to use the storage battery for ignition unless you were installing a complete generator set, as mentioned in THE AUTOMOBILE for March 6 under the head of Letters Answered and Discussed. The reason for this is that the amperage of the storage battery of ordinary size would not be high enough. The best way to handle the situation would be to use your dry batteries for ignition and to purchase a small storage battery, say of 40 ampere-hours capacity, for exclusive use in your trouble-finding light. You could purchase the battery and lamp complete from any of the automobile supply houses for about $10. This could be recharged when necessary at a cost of about 25 cents. With one of these sets the lights would burn for more than 10 hours when used intermittently.

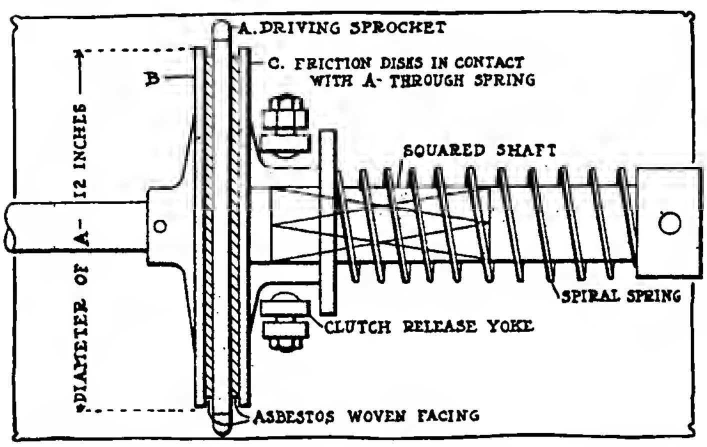

Fig. 1—Drive suggested for cycle-car type of vehicle with 10-horsepower motor

Spring Pressure to Transmit 10 Horsepower

Editor THE AUTOMOBILE:—I am building a light four-wheeled vehicle on the lines of the cyclecar now so popular in Europe, and would like to know how big and how much spring pressure is needed for the clutch in the accompanying drawing, Fig. 1, to transmit 10 horsepower for a car weighing, with two passengers, 800 pounds complete.

A is the driving sprocket held in contact with B and C disks by spiral spring, diameter D is 12 inches faced with Raybestos or similar material. Kindly let me know how much spring pressure is needed to transmit 10 horsepower to such an 800-pound car with a four-to-one gear ratio and 28-inch wheels?

New York City. WILLIAM SCHULZE.

—You would require 200 pounds for an absolutely sure drive. This is not an abnormal spring pressure for even a light car and could be readily controlled by a good linkage. The diameter of the spring is determined by the amount of space you can leave for it. The bigger the diameter, the more resilient the spring.

Cleaning Mohair Top

Editor THE AUTOMOBILE:—I have a mohair top on my automobile that is lined with a blue cloth. The cloth is badly stained and I would like to clean it. Is there anything that you know of with which it can be cleaned?

Ravena, N. Y. L. T. BURNS.

There is only one way to clean mohair. That is by the use of castile soap and warm water. If you attempt to use gasoline or any of the other volatile cleaners you will destroy the rubber interlining in the top and render it leaky. The method of procedure in cleaning is as follows:

Secure a fairly soft nail brush from any drug store and a cake of pure castile soap. Bring a pail of water to the boiling point so that by the time you get the water to the scene of operations it will be at about the temperature at which you can dip your hand in it without fear of scalding yourself. Dip the brush in the water and then rub it over the surface of the castile. This will coat the bristles of the brush with soap. The spots on the cloth are rubbed thoroughly with the soap until the white lather which will appear when first rubbing has nearly vanished. With a sponge wipe off the soap and allow the top to dry. If the spot reappears on drying, the process should be again repeated.

Buying Second-Hand Car

Editor THE AUTOMOBILE:—I should like to ask a few questions regarding second-hand automobiles. Could one buy a second-hand Hupmobile for $250?

2—What is the cheapest four-cylinder runabout manufactured?

3—How long has the Ford company been building the model T?

4—What should a second-hand 1911 Ford model T sell for?

5—Who makes parts for the Dragon car?

Washington, D. C. G. E. S.

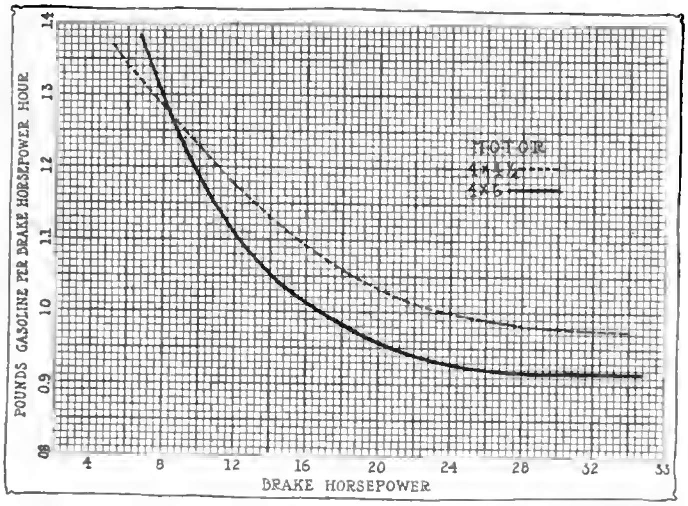

Fig. 2—Relative economy of two motors tested by the Moline company to show comparison between long and short stroke

—1—The price of the car when in the second-hand market depends on its condition in the first place and in the second place upon how anxious the owner is to change it for cash. There have no doubt been second-hand Hupmobiles sold for $250, even in the 1912 models, but the price, as a rule, is above this. This is natural when it is considered that the price of the new car is $750.

2—The cheapest runabout with four cylinders is the Metz. This is a water-cooled car of 22 horsepower with friction drive and sells for $445.

3—This is the fourth year that the Ford model T has been on the market.

4—The price depends altogether on the condition of the car and may range anywhere between $50 for a car which has seen nearly the last of its useful service, and the regular retail price of the car.

5—These parts may be secured from the Auto Parts Co., Detroit, Mich.

Advantages of Long Stroke

Editor The Automobile:—1—What main advantages has a long-stroke motor over the short-stroke type? What advantages has a short stroke over a long?

2—Is the efficiency of an underslung frame greater than that of an overslung? If so, how much and why?

3—How much more brake horsepower will a Knight motor develop than a poppet-valve motor?

4—Is there any difference in the quality and workmanship of a high-priced machine and that of a medium-priced car?

5—Will a six-cylinder motor of the same piston displacement as a four have more power and speed?

6—What is the bore, stroke, clearance and wheelbase of the big six-cylinder American underslung?

Lakewood, O. C. S.

—1—The long-stroke motor is more economical than the short-stroke type. The number of reversals of direction of the piston is less than with the short-stroke motor for a given piston displacement per minute. The motor is more flexible and has a greater reserve power. On the other hand, the short-stroke motor is lighter for the same horsepower, does not require such a high piston speed for a given number of revolutions per minute and gives the snappiness which is desirable in a high-speed motor.

2—There is no difference in efficiency in the drive of the two types of car. The center of gravity of the underslung model is lower than that of the overslung model and hence it is not so easily overturned.

3—This question cannot be answered definitely because it depends too much on the condition of the motor. For the same piston displacement per minute, however, the power developed will be about the same. The big advantage of the Knight motor lies in its silence which is equalled only by the most carefully-designed poppet types.

4—It would not be fair to state that there is better workmanship on the higher priced cars than on the medium. It is a fact, though, that there is more workmanship in parts which are not so essential except for appearance sake. This is in the line of finishing the exterior and castings, etc. It is but natural that when a man pays more for a car he gets his money's worth in time spent in manufacture, material and finish.

5—The six-cylinder motor will have less vibration and a more even torque output. The vibration of the six will be less. Otherwise there will be very little choice. The main advantages of the six-cylinder motor are its sweetness and smoothness of operation.

6—The particulars of the 6-66 American underslung are as follows: Bore, 4.5 inches; stroke, 6 inches; clearance, 12.5 inches; wheelbase, 140 inches, and wheels, 39 inches in diameter.

Removing Carbon Deposits

Editor The Automobile:—Is there any good way in which carbon deposits can positively be removed from the motor without taking it down and scraping? Are carbon removers what they are claimed to be and are the Six Little Yankees as good as the fluid removers?

Woodland, Pa. G. B. Shivery.

—There is only one way of positively removing all the carbon from your cylinders. That is by taking down the motor and manually scraping it out. Solvents of liquid nature do not do this any more than do solid solvents of the nature of the Six Little Yankees carbon remover, which you mention. Both of these solvents act in the same way. They are first gasified and the gas dissolves the projections of carbon. A smooth, flat layer of carbon on the top of the piston will not noticeably affect the motor. When a carbon deposit is built up in the form of a cone, however, the point or apex will eventually start to glow and this will result in pre-ignition and a knock in the motor.

Regarding Clement-Talbot Motor

Editor The Automobile:—Kindly answer the following questions regarding the Clement-Talbot racer:

1—How can this car have a compression of (according to your chart) approximately 145 pounds per square inch without causing pre-ignition?

2—Would this high compression be practical for commercial or pleasure cars?

Brooklyn, N. Y. Edgar Youngdahl.

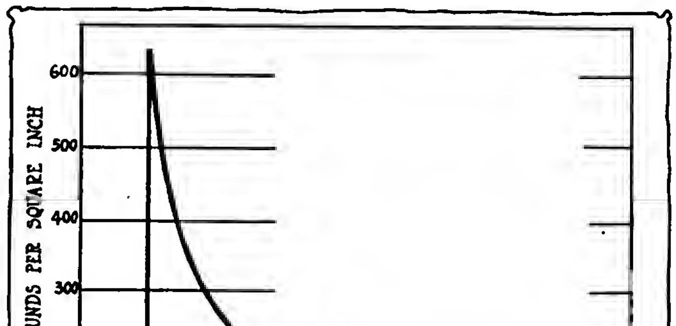

Fig. 3—Indicator card taken from Clement-Talbot motor. Compression pressure is about 120 pounds

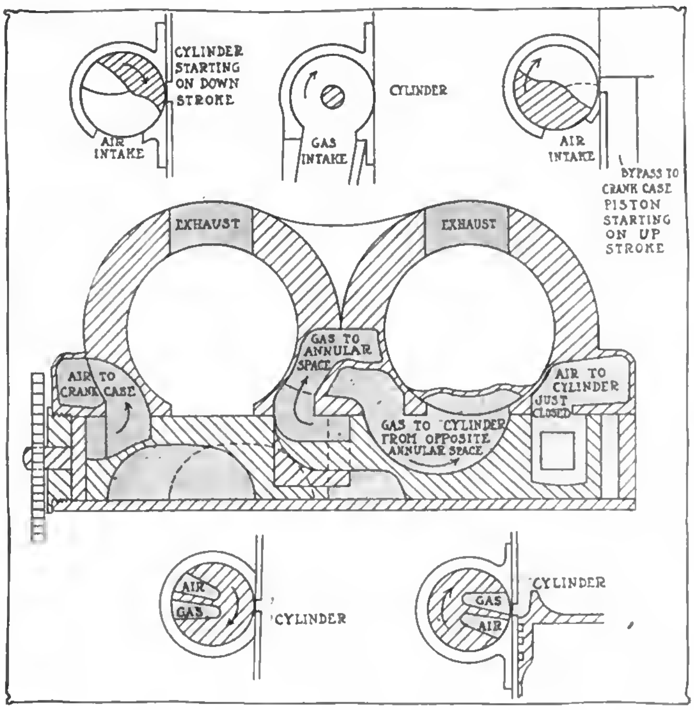

Fig. 4—Two-cylinder scavenging motor in which the gas is compressed in the annular space surrounding the cylinder and the scavenging air is taken from the crank case of the motor

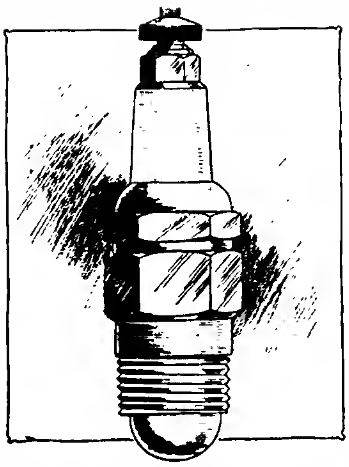

Fig. 5—Spark plug with globular base for which a reader is searching. The electrodes are evidently within the globe or the spark jumps from the rim to the globe

—1—If you will note the indicator card, Fig. 3, taken from the Clement-Talbot motor you will notice that compression pressure is about 120 pounds per square inch. The first part of the upward line being due to ignition or the beginning of the explosion stroke. It is possible to get this compression pressure without pre-ignition.

2—This compression pressure would not be practical for motors used in passenger cars or trucks as it has been found from practice that the efficiency drops off when the compression becomes too high. According to theory, the efficiency would be higher but difficulties in cooling and in getting proper combustion make the theoretical condition hard to obtain in practice.

Questions of Motor Pressure

Editor THE AUTOMOBILE:—What is the highest vacuum in the intake pipe of the average automobile motor?

2—What is the highest pressure of gas compression in the cylinder of the average automobile motor?

3—What is the highest pressure of gas after ignition in the cylinder of the average automobile motor?

4—What relation exists between these pressures? In other words, does a high-compression engine have a pressure after ignition correspondingly higher than usual, and a low-compression engine, etc., and to what degree?

5—What is the usual Diesel practice regarding pressure before ignition and after?

Philadelphia, Pa. J. H. B.

—1—The pressure in the intake pipe of the average motor is generally about 12.7 pounds absolute at average motor speeds or 2 pounds vacuum.

2—The average new automobile motor has a compression of 60 pounds to the square inch.

3—The pressure of the gas after ignition runs up to about 300 pounds to the square inch.

4—The relation between these two pressures is that which would be concluded in a formula which takes in the initial volume of the gas. That is to say, such a formula as $PV^n = a$ constant. In this formula P equals pressure and V the volume. Where the volume remains constant and the pressure rises the total pressure at the end of explosion will not bear a direct ratio to the volume except in that the higher the compression the higher the initial pressure and therefore the higher the mean effective pressure.

5—The Diesel compression pressure is 525 pounds per square inch. The fuel is injected at about 800 pounds and explosion pressure is the same as the compression pressure owing to the fact that this motor expands the gas for a short time under constant pressure.

Suggested Two-Cycle Motor Design

Editor THE AUTOMOBILE:—I have a design for a scavenging two-cycle engine, and would be pleased to have your readers express an opinion as to whether the same is practical or not.

Gas is compressed in the annular space surrounding cylinder, as in the Elmore engine, and supplied to the companion cylinder as the sketch, Fig. 4, indicates, while the scavenging air is supplied from the crankcase, as is also indicated in the sketch.

The distributing valve rotates at the same speed as the crankshaft, and is intended to control the air intake to both crankcase and gas intake to annular space surrounding the cylinder.

This cylinder should be arranged so as to be capable of retarding or advancing its rotation so as to supply more or less of the scavenging air, retarded for light loads and when running fast, and advanced when starting or running slowly to supply a rich mixture.

The question with me is, whether there would be a sufficient time for the transfer of both scavenging charge and mixture to the cylinder. I think it would be necessary under any circumstances to so construct the motor as to develop considerable compression of the gas mixture in the annular space surrounding the cylinder so that it would be transferred to the cylinder with great rapidity, and the volume of this gas should not exceed 80 per cent. of volume of the cylinder.

I have made the suggestion to an engineer of some prominence and he seems to think it is entirely practical, but would require some experimental work and considerable expense before its practicability could be demonstrated. As I have not the means to carry out the necessary experimental work I would like some further opinion regarding the matter.

I am aware that the arrangement of the crank is not conventional in this motor, but could be easily arranged for a crank of the usual type in order to avoid unnecessary vibration. With this type of engine it might be of advantage to control the admission of air from the crankcase by means of a governor so that the air passages would be closed on starting the engine and opened gradually as the speed of the engine increased, in this way performing practically the same function as the auxiliary air intake usually found in most of the carbureters of latest construction.

Grafton, W. Va. R. H. POWELL.

Looking for Strange Plug

Editor THE AUTOMOBILE:—Last summer I saw a spark-plug which I never saw used before and have inquired of about a thousand users and sellers of spark-plugs, but as yet have not found out the maker or anyone that sells or knows anything about one like it. The strange part of the plug is the part marked A, Fig. 5, a half sphere with no holes to let out the spark and apparently made of mica and neither positive or negative electrodes can be seen from without. There was no name or patent mark anywhere on the plug.

The plug was picked up on the floor of a repairshop and none of the owners of cars that were in the shop at the time knows anything about this freak and I understand the plug has now been stolen so it is impossible to send you the original for identification.

Can The Automobile assist me to find out the name of the maker or where they may be bought?

Trenton, N. J. Frank C. Wright.

—The plug which you describe, and which is illustrated in Fig. 5, does not correspond to any of the well-known makes on the market. Perhaps one of our readers, seeing this, may be able to help you find it.

Managing Friction Drive

Editor The Automobile:—In driving a car with a friction transmission how is it possible to tell whether same is slipping or not? I understand that to get the best results with this form of transmission there should always be just sufficient pressure between the disk and friction wheel to carry the load without slippage, but do not see how the driver can maintain this pressure which must constantly vary.

2—In the Cartercar the shifting lever cannot be moved until the pressure between disk and wheel is released. Why? I can see no good reason why the wheel conld not be moved along the disk without releasing the pressure. If this could be done it would greatly simplify the handling of the car.

3—Is there any advantage of placing a screen or other device in the inlet pipe for the purpose of better carburetion? If there is anything gained by the use of these devices why are they not more generally used by manufacturers?

4—What size wheels and tires are used on the majority of racing cars?

East Canaan, Conn. D. C. Canfield.

—It is possible to tell whether the drive is slipping or not by observing if the motor appears to be running faster than the load, that is to say, when climbing a hill if the motor appears to be running just as rapidly as it did on level road while the car moves forward at a greatly reduced rate of speed, owing to the load. It is true that there should be always just sufficient pressure between the disks to just carry the load, but this is out of the control of the driver and is merely up to the designer. If the drive is not slipping there is no need for you to worry about the pressure between the disks as this has been worked out at the factory before the car was delivered to you. In case the drive is slipping, however, you should write the factory and consult them as to replacing the friction band on the driving disk.

2—It is not reasonable to suppose that where the friction between the driving and the driven member is great enough to propel the weight of a motor vehicle and its occupants at a high rate of speed along level ground and up hills that the operator can readily shift these members in relation to one another. This is especially the case where they are both in motion and where the irregularity of surface of one fits into the corresponding irregularity of another.

3—Tests have been held with these screens and other devices which show better results than without them at certain speeds. This is due to the fact that they break up the gasoline. They are comparatively new and makers have not as yet become convinced of their usefulness. This is perhaps due to the fact that some of these devices were not a success.

4—The size of tires on racing cars depends altogether upon the weight of the car. The 36 by 5 size is very popular.

Explains Ford Magneto Trouble

Editor The Automobile:—In your issue of February 29 a subscriber complains that he had no spark with a Ford model T when the engine was hot. Your answer is that a hot engine is easier to start. The Ford has a flywheel magneto that will get so hot on long climbs in low gear that the magnets are temporarily weakened and the current is too weak to give a good spark.

I have more than once encountered this condition in severe mountain work, but the car will fire as well as ever if given a rest of 15 or 20 minutes. Subscriher's trouble was probably a piece of dirt under the spring at the magnets' terminal.

Denver, Col. J. A. Valentine.

To Join Protective Association

Editor The Automobile:—Please inform me how I can join the Gasoline Engineers' Protective Association of New York?

Brooklyn, N. Y. E. H. G.

—Address the secretary at 210 West One Hundred and First street, New York City.

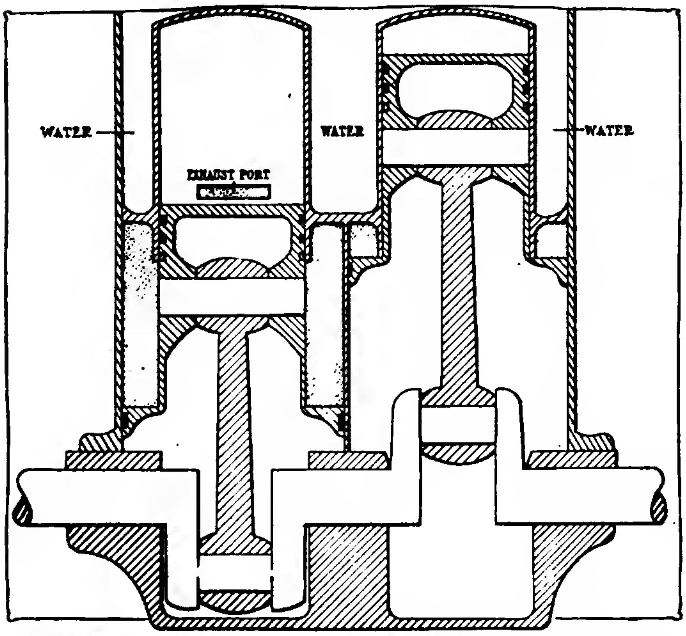

Fig. 6—Section through the two-cycle scavenging motor, showing annular compression space

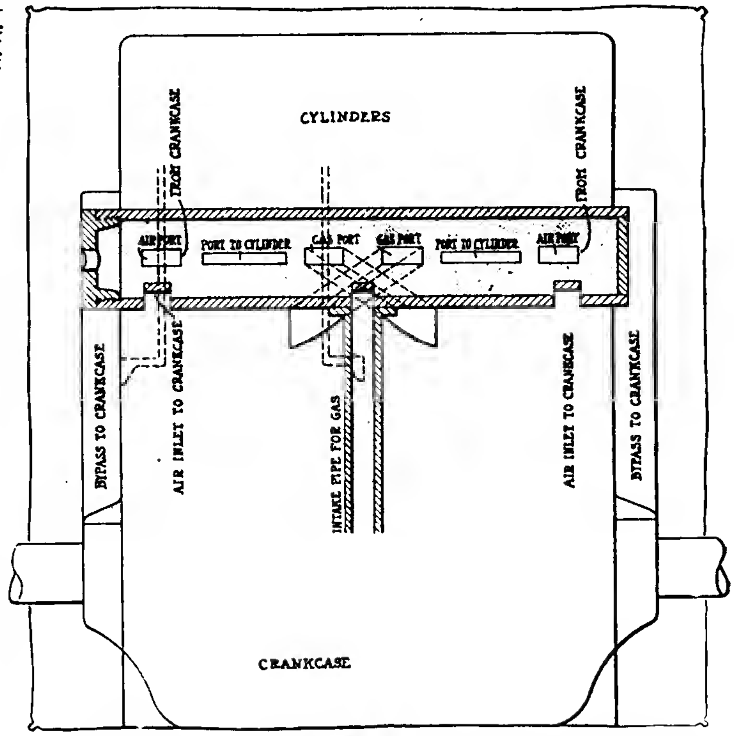

Fig. 7—Section through the gas and air ports of the two-cycle scavenging motor

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Utilizing a Profit

AN automobile dealer in a large American city recently made the astounding confession that, although purchasing gasoline wholesale at 10 cents a gallon and retailing it at 20 cents, he was not breaking even. It is nearly impossible to conceive of such a condition, remembering as we must that the gasoline was delivered into his storage tank underneath his garage, so that all he was compelled to do with it to make his profit was one handling, namely, from the storage tank into the tank of the automobile.

Where did the profit go? There are divers answers. Cheap help, susceptible to favoritism from buyers, accounts for part of the profit. Over-measure was given to many, and under-measure to a few. The system of handling was poor. The pump on the storage tank was not locked. Every time a little gasoline was needed for any purpose a small pail or can was taken to the pump. It was half filled, perhaps filled, and often little over a cupful used. The ramifications of such waste are many. It was waste in one place and waste in every place.

All he lacked was business training. He thought that enthusiasm was all that was needed. He had this, but had little else. This is a business generation, and only the dealer who conducts his business on legitimate, up-to-date lines can continue in the field.

Raising a Revenue?

A FEW New York State legislators are endeavoring to double the annual registration tax on automobiles and to make the tax on commercial vehicles as much for each ton of useful load carried as it is to-day for the entire truck. These same legislators advance as their only argument the solitary fact that automobiles and motor trucks destroy the road surface and as such they should pay the bills. In the same breath they say that taxation on vehicles should be in proportion to the amount of road destruction, and yet they let all horse vehicles go without any taxation, and while endeavoring to double the motor vehicle fees continue to keep away from taxing horse vehicles as consistently as ever.

This condition of affairs is not a new one, it is well understood by all. It was well understood three years ago when the present Callan law was accepted by the motorists, who, when accepting a state registration tax, realized that such a tax was illegal except insofar as it was needed to cover cost of identification. It was accepted by the motorists three years ago because of their desire to co-operate with the legislators in obtaining a rational working law. The motorists were willing that excess registration fees should go to the road improvement work. The legislators accepted the matter in this spirit. In a word, it was a gentleman's agreement and as such it would naturally be expected that its conditions would be observed.

Today, what is becoming of this gentleman's agreement?

Doubling present taxes on passenger vehicles and multiplying them on commercial vehicles is not the treatment that the automobilist of the state deserves and treatment that the automobilists of the state will not accept. The facts convincingly indicate that more revenue is needed, and taxing the automobilist seems an easy avenue of attainment.

Every automobilist in New York State should resist such a course—class taxation. Levying on one class of vehicles because it wears out the highway and letting all other go free.

No better evidence of the new spirit of this generation could be given than the unanimity with which the entire automobile ranks of the state united to counteract such unjust taxation a week ago at Albany. From every corner of the state came the motorists, the farmer-driver sitting side by side with the banker, the lawyer and the merchant and all agreed on the injustice of such taxation. Not only did these motorists come hand-in-hand and fight side-by-side, but they are prepared to combat to the bitter end. They are prepared to take up the only proper course, determine the constitutionality of such a law in the courts. New York automobilists have set an example for the motorists of other states, an example that should be spread country-wide. The motorist does not wish to avoid taxation, but he objects to unfair treatment. He objects to paying it all. Tax every vehicle for the use of the highway in just proportion to the damage done and all will be satisfied. Compel all classes of vehicles to carry lights and to obey the regulations and there will be no dissatisfaction.

S. A. E. Hears Rim Manufacturers in Cleveland

Makers Answer Questions Relating to the Adaptability of Their Rims to Wire Wheels, Etc.—Indiana Section Meets

CLEVELAND, O., March 12—The hearing of rim manufacturers before the pneumatic rim division of the standards committee of the Society of Automobile Engineers was completed here this evening, and owing to the dispatch of the business by Chairman Henry Souther it was possible to complete the collection of data on each type of rim submitted. The meeting was in the nature of a hearing conducted by the special committee to which fifty pneumatic tire, wheel rim, steel band and motorcycle companies were invited to attend and explain their products. About thirty-five rim makers and others interested were in attendance, while ten manufacturers availed themselves of the opportunity to present samples of their rims. Of course, there are many more well-known rims which will have to be seen by the committee, but a very good start was made.

There were three types of rims which were never before exhibited anywhere, these being the new No. 60 Stanweld, which is a light demountable of the split-ring type; the Midgley rim, which is fathered by the United States Tire Co., and a new Goodyear quick-detachable design.

Valuable Data Collected

Each maker was questioned as to the weight of his rim, whether it could be sold in competition, how it withstood service, method of operation, number of loose parts, its adaptability to wire wheels, whether the standard dimensions of the clincher tire association has been adhered to and whether it could be manufactured in any mill without special machinery. Other special questions were put in order to bring out as far as possible every point and feature of every type considered.

Following the explanation of the Standard-Welding quick detachable, which was the last of this type submitted, the afternoon session confined itself to the demountables, which are the biggest consideration of the committee, there being such a wide divergence of meritorious designs.

In addition to the questions asked of the quick-detachable exhibitors those who showed demountables—of which there were ten—were also asked as to the distance between the supports of the outer rim, whether these had any relation to the position of the spokes, as to the waterproof qualities, whether the rim would squeak in extended service, etc.

Much valuable data were collected on each type, and the quizzing of the committee members was assisted by that of the other experts in attendance but not on the committee. Criticisms offered by the latter as to contemporaries' offerings were often edifying to the division.

Nothing whatever was decided at this hearing, it being entirely for the purposes already brought out. The minutes will be gone over carefully in the Society's offices in New York and the data relative to each make will be digested and put in uniform style for the ready reference of the committee.

In closing the hearing, Mr. Souther stated that great amount of information obtained made it very evident that more time was needed by the committee and each rim concern was requested to send its samples to the Society offices in New York in time for the next meeting. In the event of any companies not being able to furnish its exhibits to the committee there, it was requested to at least send blueprints or sketches. The exhibits can be sent at any time.

Mr. Souther assured all that prompt and intelligent action would be taken by the committee and its findings reported as soon as possible.

Following the hearing the committee held a short session to determine just what method of procedure to follow in rounding up the rest of the necessary information and taking care of that already obtained. It was decided to hold the next meeting on April 2 at the New York headquarters.

The concerns having exhibits of demountable rims at the meeting were: American Rim Co. (Lambert), Anglada Co. (Parker No-Felloe), Detroit Demountable Rim Co., Firestone Tire & Rubber Co., R. W. Funk, Goodyear Tire & Rubber Co., Standard Welding Co., Universal Rim Co. (Baker), United States Tire Co. (Midgley). The Mott Wheel Works did not have a sample to exhibit, but by means of blackboard sketches O. W. Mott explained it to the committee. Several other representatives were on hand, but when called upon stated that they had nothing to say or to show at this time.

As reported briefly in THE AUTOMOBILE last week, this rim committee, which was formed at the last semi-annual meeting of the Society, is made up of men who are the recognized authorities on the subject of automobile rims, as well as several prominent engineers. There has been some criticism of the appointment of several of the rim makers on the committee, but it was shown to be desirable to have such experts, for their specialized knowledge of this particular part of the automobile's makeup is invaluable. It would have been a rather noticeable feature if none of these men had been included in the personnel of the division. The number of rim makers is in the minority, however.

The committee is made up as follows: Henry Souther, consulting engineer, chairman; H. L. Barton, assistant director of production, General Motors Co.; G. G. Behn, executive engineer, Hudson Motor Car Co.; T. W. Guthrie, secretary, Standard Welding Co.; F. H. Moyer, experimental engineer, Firestone Tire & Rubber Co.; C. E. Reddig, engineer, Timken-Detroit Axle Co.; W. C. State, mechanical engineer, Goodyear Tire & Rubber Co.; J. G. Vincent, chief engineer, Packard Motor Car Co.; C. B. Whittelsey, factory manager, Hartford Rubber Works Co.; C. B. Williams, treasurer, Mott Wheel Works. Of this committee three members were not in attendance at yesterday's meeting. These were J. G. Vincent, H. L. Barton and W. C. State, who were unable to appear due to other business matters. E. R. Hall, manager experimental department, Goodyear Tire & Rubber Co., substituted, however, for Mr. State.

Indianapolis Section Talks Fuel

INDIANAPOLIS, IND., March 14—The March meeting of the Indiana branch of the S. A. E. was held Monday evening, March 11, in a joint session with the Hoosier Motor Club. The question discussed was Motor Fuels. A paper by A. M. Potter was read by Mr. Tipper, chief chemist of the Texas Coil Company. One of the points brought out in the discussion was that the fuel value of the gasoline cannot be determined by the gravity of the liquid. It was also stated that the increasing demand for gasoline must be met by using some of the kerosene distillates, and that in using kerosene as a fuel it is simply a question of getting the correct temperature to prevent condensation.

Pneumatic Suspension for Varying Load

ONE of the difficulties associated with the use of leaf springs as a means of suspension for automobiles has been the necessity of providing for a varying load. If a car always contained its full complement of passengers the problem of the correct proportioning of the springs would be much simplified. As it is, the variation of load, necessitating a design of spring that is supposed to meet all requirements, means that at no time is the suspension of the strictly correct strength.

Attempted solutions of this problem, in the form of shock-absorbers and auxiliary springs, are numerous, more or less satisfactory results accruing to several of them. But even in the case of the best it is generally felt that there is still room for considerable development before the ideal suspension is realized.

In this connection the pneumatic principle seems to offer possibilities to which, apparently, insufficient attention has been given. There are, however, several experimenters in the field. One of these, the Cowey Engineering Co., London, England, has, after trials extending over 2 years, brought its product to a state of practicability.

The Cowey device is not so much an auxiliary fitting as it is a complete suspension system. It consists of four air cushions applied to the rear ends of all four leaf springs, as shown in Fig. 2, and supplied with compressed air from a small reservoir conveniently located on the chassis. The feature of the system is that the pressure in each of these cushions or cylinders is made to vary exactly with the load borne by that particular corner of the car at any time.

A section through one of the air cylinders, Fig. 1, shows the method of attaching to the chassis and also the connection existing between the device and the end of the spring. Each unit consists essentially of a plain cylinder vertically arranged on a bracket fixed to the frame and opening at its upper end into a compression space having the appearance of an ordinary water-jacket. The lower end is open to the air. A piston provided with a well-oiled leather cup on its upper surface, constituting an absolutely air-tight joint, is free to slide within the cylinder. The piston rod or compression member between the piston and the spring is shackled only at its lower end, the other end simply resting in the recessed under surface of the piston.

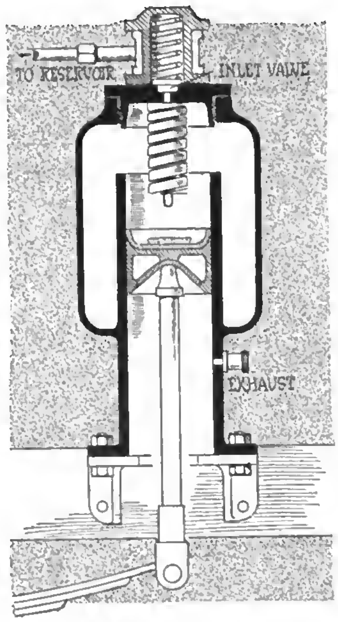


Fig. 1—Section through one of the air cylinders which are bracketed to the side members of the chassis

At the top of the cylinder casting a spring-loaded inlet valve is in direct communication through small copper piping with the air reservoir, as shown in Fig. 2. The plunger rod of this valve extends downwards toward the piston and is surrounded by a buffer spring, the lower end of which meets the piston when the latter is in its highest position. A small hole drilled in the cylinder wall, and forming an exhaust port, determines the lower limit of the piston stroke.

The air reservoir is supplied direct from a simple non-return valve fitted to one of the valve caps of the engine. By this means the pressure of air in the tank is maintained so long as the engine is running. This pressure is such that the automobile is supported on the four air cushions with the pistons occupying a normal position, as shown in Fig. 1.

Assuming this to be the case, and the car traveling over the road, the following action takes place: When an inequality of the road surface is met the piston is caused to move up or down and if the bump is severe enough the upper surface of the piston either strikes the plunger rod of the inlet valve, or, on the other hand, drops low enough to uncover the exhaust port. In running the car with the rear seat empty, then, immediately a person enters, that side of the car on which he is seated sinks a little over the piston. This action brings the upper surface of the piston near to the valve rod so that with each ensuing lump in the road surface a small quantity of air enters until the piston is again occupying its normal mid-stroke position. When the passenger gets out, the pressure in that particular cylinder, being too great, raises that corner of the car so that the piston approaches its lowest position in the cylinder. The first inequality then encountered frees a portion of the air through the exhaust port, and so allows the piston to return to its normal position.

For information respecting this system of suspension we are indebted to our contemporary, *The Motor*, England.

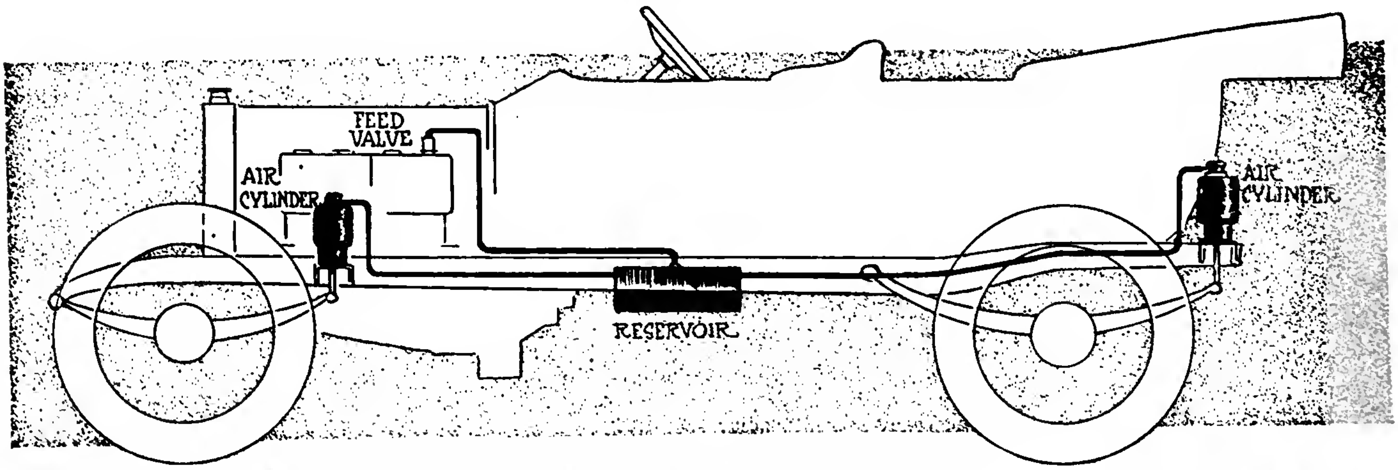


Fig. 2—Outline of the Cowey pneumatic suspension for automobiles in which the load is supported on four air cushions attached to rear ends of the leaf springs

Garage Men Protest Against Separators

Regulations of the Municipal Explosives Commission

Article XI

¶ *Sec. 376. No garage permit authorizing the storage of volatile inflammable oil shall be issued for any premises which are not provided with an oil separator, trap or other similar apparatus attached to the house drain for the purpose of preventing volatile inflammable oil from flowing into the sewer; provided, however, that the Fire Commissioner, may, upon recommendation, exempt from these requirements a garage drainage into a short sewer line.*

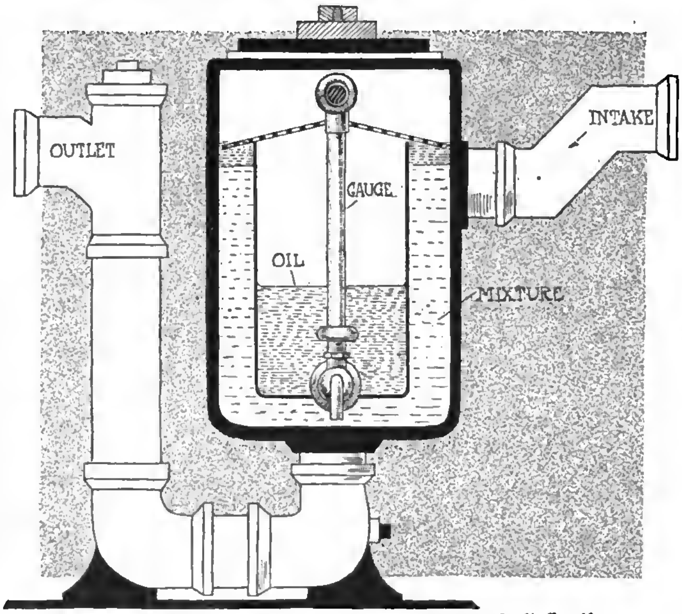
¶ *Sec. 396. Each oil separator installed in a garage shall be connected to the house drain, and shall be so arranged as to separate all oils from the drainage of the garage.*

¶ *Sec. 397. The oil receptacle of an oil separator shall not exceed 50 gallons capacity, and shall be emptied as often as may be necessary to prevent the oil from overflowing; and such oils as are recovered from the separator shall be removed from the garage within 24 hours after being taken from the separator.*

¶ *Sec. 398. All oils spilled on the floor of a garage shall be removed by sponging or swabbing, and poured into the drain leading to the oil separator.*

NEW YORK CITY, March 18—There are three sides to the garage separator situation as it now stands in New York City. First, there is the law which is printed on this page; second, there is the garage man who protests against the expense; third, there is the separator manufacturer who has to make a separator good enough to comply with the wishes of the fire department and cheap enough to suit the pocketbook of the garage man.

The presence of inflammable gas in the sewers of a city is a menace to its population. If it is possible to have an explosion in the sewers of the city, powerful enough to hurl manhole covers high into the air with a reasonable chance of falling on the heads of passing pedestrians or playing children there is something wrong. The fire department is responsible for street explosions. It is the business of the Municipal Explosives Commission to minimize the dangers of these explosions by doing everything possible to prevent them. For this reason they have passed the law requiring the garage to be provided with a separator.



Diagrammatic view of separator; note layer of oil floating on top of water. Separation takes place in large tank

The average garage man is no plutocrat. The sum of $300 extracted from his receipts strikes him a blow in a spot which affects him most seriously. The law must be obeyed or the fines amount to more than it would cost to install a separator. There is only one course to take in a matter of this kind. That is to combat the law and this is now being done.

The garage owners of New York City have combined and have an attorney who represents the entire organization. A test case has been carried into the courts and it is upon this that the matter now rests. There can be no doubt that the decision of the court in this case will decide the future of many of the small garage men who have great difficulty in making their business pay. If the device were cheaper, there can be no doubt that the garage keepers would have installed them without protest. Most of the larger garage owners have done so now.

The separator manufacturer is between two fires. He must meet the severe requirements of the Municipal Explosives Commission and he must meet the pocketbook of the garage man.

The fire department tests each installation separately. There are in New York four concerns which manufacture separators for garages. Each of these has a number of installations in reputable garages in the city and each has passed the individual test which consists of stirring together about 10 gallons of gasoline, lubricating oil, grease and dirt with about 50 gallons of water and pouring it down the drain pipe. Several samples are then taken at the separator outlet and tested for inflammable volatile matter. The principal test given the sample is the flash test. If it is possible to get a flash from the sample, the separator is condemned and a license refused until the separator meets the requirements.

These tests are made in the presence of an official from the Municipal Explosives Commission and are absolutely individual. There is no such thing as an accepted type of separator which stands alone on the merits of the manufacturer. It has to be tested while actually in place and has to meet requirements that are far more severe than found in ordinary service.

When the separator has passed the test a letter of the following form notifies the garage owner to that effect:

FIRE DEPARTMENT OF THE CITY OF NEW YORK
Office of the Commissioner

New York, March 4th, 1913.

American Locomotive Works,
630 Jackson Ave.,
Long Island City, N. Y.

Sirs:—You are hereby notified that the oil separator of the .... type installed at premises 630 Jackson Avenue, Long Island City, and known as the American Locomotive Works Garage, has been approved, as upon examination and test of sewage it was found not to contain volatile inflammable oil.

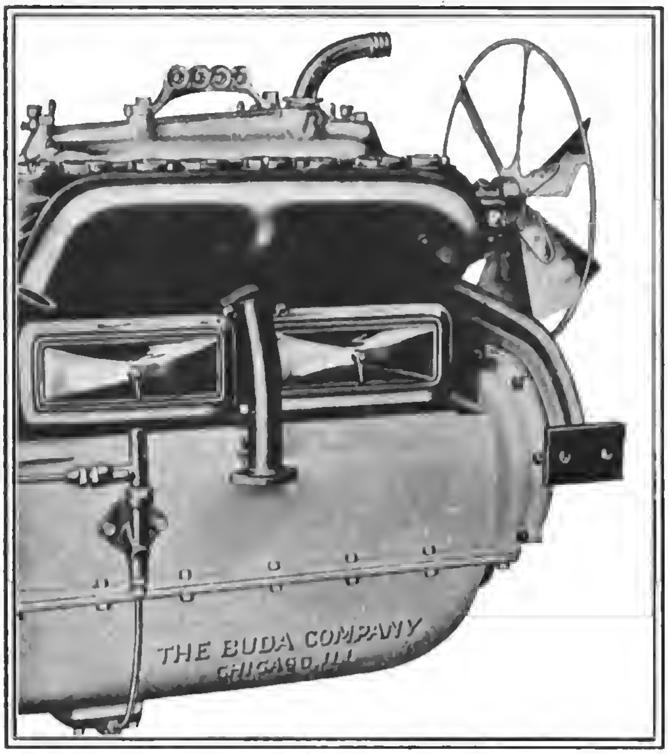
Respectfully,
WILLIAM GUERIN,
Acting Chief, Bureau of Fire Prevention.

The separators all operate on the principle shown in the accompanying sketch. The water passes through the outlet, leaving the layer of oil floating on the water to drop into the separating tank.

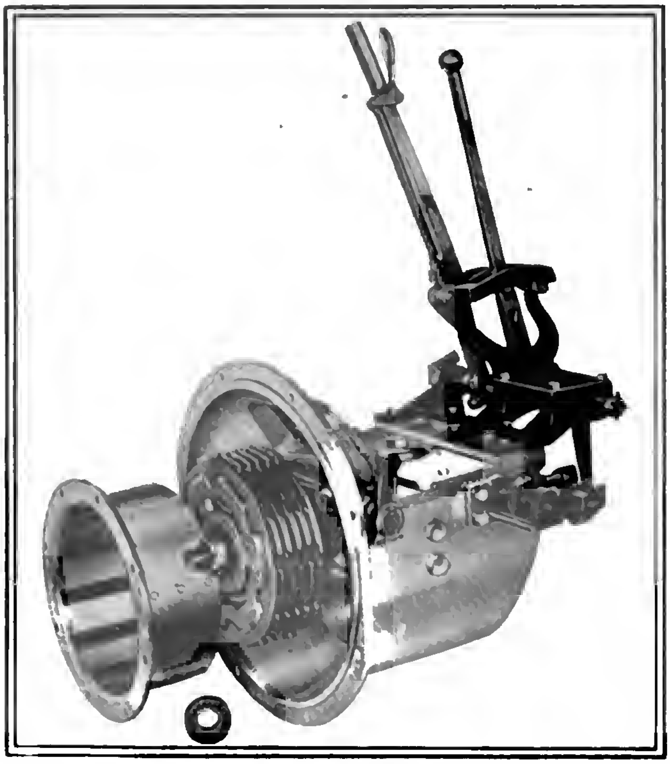
Before installing a separator the garage man must furnish the fire department with complete detailed information regarding the separator and his plans for installation.

New Tribune Car To Have Left Drive

Center Control Will Also Be a Feature—Four-Cylinder Block Motor of 35 Horsepower—Car Will Be Assembled



View of the right side of the Buda motor used in the new Tribune car, showing valve cover plates and manifolds



Multiple-disk clutch disassembled, showing the method of inclosing the parts as well as the shifting levers

DETROIT, MICH., March 17—A little over a week ago several Detroit business men, headed by L. G. Hupp, organized a new concern in the passenger car field, known as the Tribune Motor Co. This week THE AUTOMOBILE furnishes a description of the Tribune car, which is to be entirely an assembled proposition.

The principal features will include left drive, center control and a 35-horsepower block motor, having a bore of 3.75 inches and a stroke of 5.5 inches. This motor will be used in connection with a unit power plant. It is of Buda make, of L-head construction, the valves being all located on the right side and inclosed by two easily-removable cover plates. It has a three-bearing crankshaft with long, light pistons and long connecting-rods of I-beam section. Each piston is provided with three compression rings, while the connecting-rods are fastened to the crankshaft by four-bolt straps. The camshaft is integrally constructed and mounted on three bearings. The tappets are of the mushroom type and provided with adjustments.

The principal bearing sizes are as follows:

Crankshaft bearings	Length, Inches	Diameter, Inches
Front	3.125	1.75
Center	2.5	2.
Rear	4.	2.125
Connecting-rod bearings	2.375	1.875
Camshaft bearings:		
Front	2.9375	0.875
Center	1.5	2.
Rear	2.25	2.
Valve Diam	1.875	.....

Both the crankcase and the oil pan are made of aluminum, the flange for the clutch housing connection being cast one-half integral with each half of the crankcase.

Grease Cups in Bolts on Rods

Lubrication is by force feed, the constant-splash level system being employed. All spring bolts, radius-rod bolts and torque-arm bolts have a grease cup at the head which forces grease through a hollow core in the bolt to the wearing surface.

Magneto and water pump are located at the left on brackets provided for them, which are cast as parts of the upper half of the crankcase. This part also has cast integrally with it the four arms which attach to the frame and support the motor. Timing gears and magneto and pumpshaft gears are conventionally inclosed by an aluminum cover plate at the forward end of the motor. Due to the block construction, the various manifold connections to the castings are short, one inlet gas connection and one inlet water connection sufficing. There are three openings into the exhaust manifold, however.

The ignition is by means of a high-tension magneto of the dual type, employing the Bosch style of spark-plug. The make of carbureter has not yet been decided upon.

The gearset, which is to bolt to the rear of the crankcase through a flange, is of the Brown-Lipe make. It has three forward speeds and reverse and center control levers. The gears are all mounted on Timken bearings, the sliding gear-shaft being splined. This is in every way a standard Brown-Lipe construction and includes a multiple-disk clutch, alternate plates of which are lined with Raybestos, which can be run either in oil or dry. The gears are of chrome-nickel steel. The gear ratios provided in this gearset are given: High—1 to 1. Medium—1.76 to 1. Low—3.35 to 1. Reverse—4.32 to 1.

Standard Timken front and rear axles are used, the former being of the floating type with five-pitch bevel gear and pinion.

The driving gear is riveted on the differential case, following the usual Timken practice, while the housing is of pressed steel. A grease retainer is provided in the shape of a tube extending from the brakes to a point close to the differential. The usual removable cap at the rear of the housing is provided for accessibility to the transmission gearing.

The steering gear is a Gemmer type S unit, having a worm and gear with ball bearings. The wheel is 17 inches in diameter.

There are two sets of brakes, external contracting, operated by pedals, and internal expanding, operated by a ratchet hand lever. There are 320 inches of braking surface, the brakes being 14 inches in diameter and 2 inches wide. Pedals are adjustable to the leg reach of the driver. A large register is placed in the toe board for heating the car in cold weather.

The frame is of the usual channel section with a single drop and braced by three cross-members, having integral reinforcing gussets at the corners. The springs are half elliptic in front and elliptic in the rear. The sizes are as follows:

Wheels are of second-growth hickory, having 1.5-inch spokes. Twelve spokes are used and six holes in the hub flanges on both front and rear wheels. Wire Wheels will be supplied, if the purchaser desires them, for an additional charge.

Front—37 inches by 2 inches. Rear—42 inches by 2 inches. The rear springs are hung directly under the rear frame cross member and underslung to the axle by means of two-piece swivel seats. The tire size is 32 by 3.5 inches.

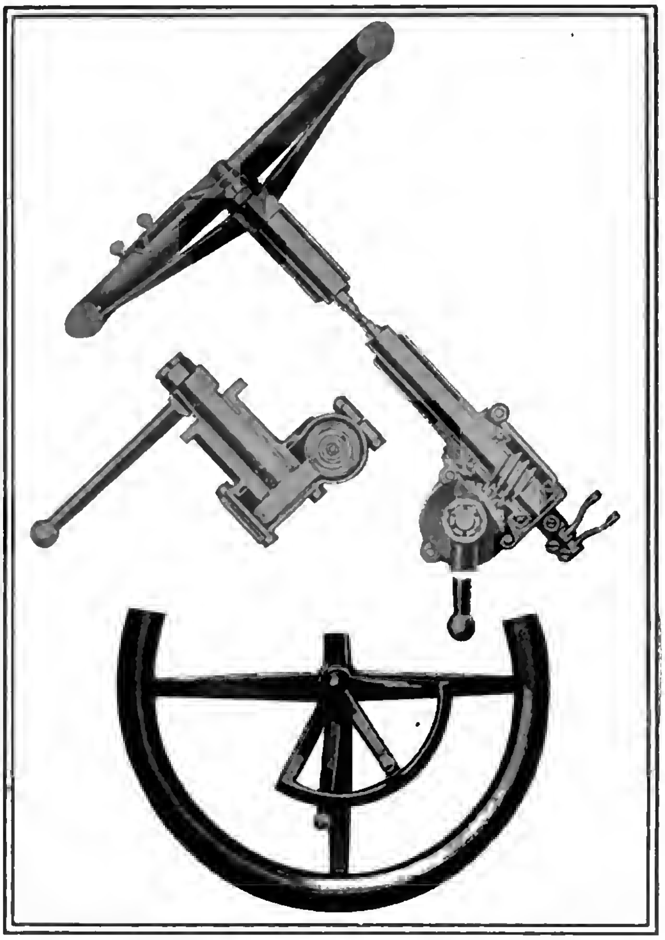
Touring Body Is Very Roomy

Looking at the touring body, which is the only style to be fitted at present, we find a very roomy design. The front seat is 41 inches wide, while the space between the front of the cushion and the dash is 30 inches. The rear seat is 47 inches wide and the distance from the front edge of the cushion to the back of the front seat is 28 inches. The gasoline tank is located under the front seat and has a capacity of 10 gallons. An 8-gallon emergency tank is placed under the cowl. The road weight of the car with the full equipment is given as 2300 pounds. The wheelbase is 116 inches.

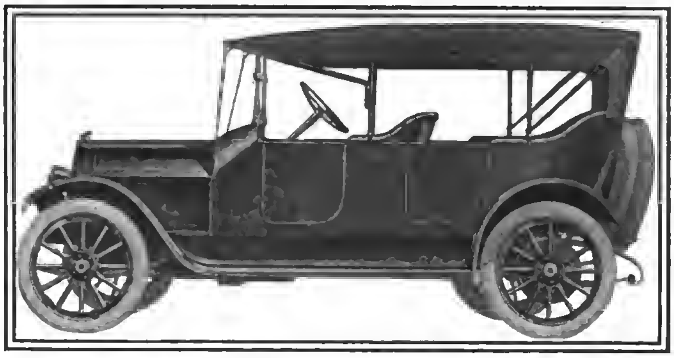
The idea in having the fenders follow the contour of the front wheels, as shown in the illustration, to the running boards is to provide ready access to the motor and other parts under the hood.

Perusal of the body shown herewith will reveal the fact that there are no side lights, which is a rather unusual feature. The head lights are so constructed as to make side lights unnecessary. In each lamp are placed electric bulbs of two sizes, the smaller to be used for city driving, and the larger being used for road work. Current to either of these two sets of lights is controlled from the driver's seat.

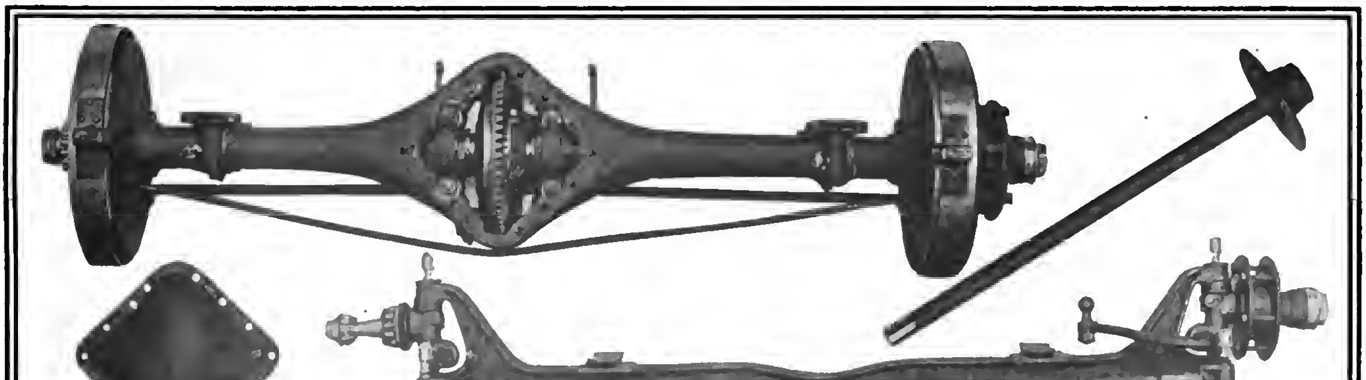
The equipment includes top, windshield, curtains, speedometer, electric horn and demountable rims, in addition to the usual complement of tools, robe and foot rails, and so on.



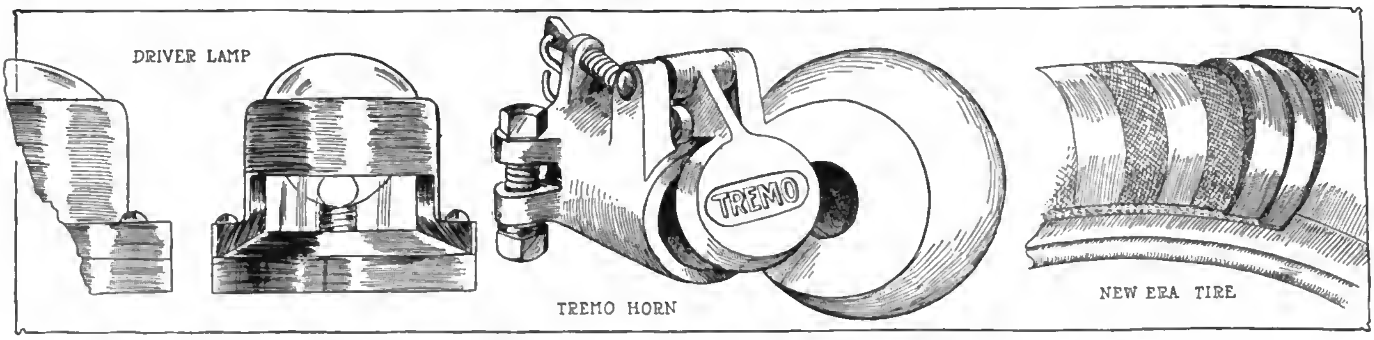
Details of the steering gear used on the Tribune car



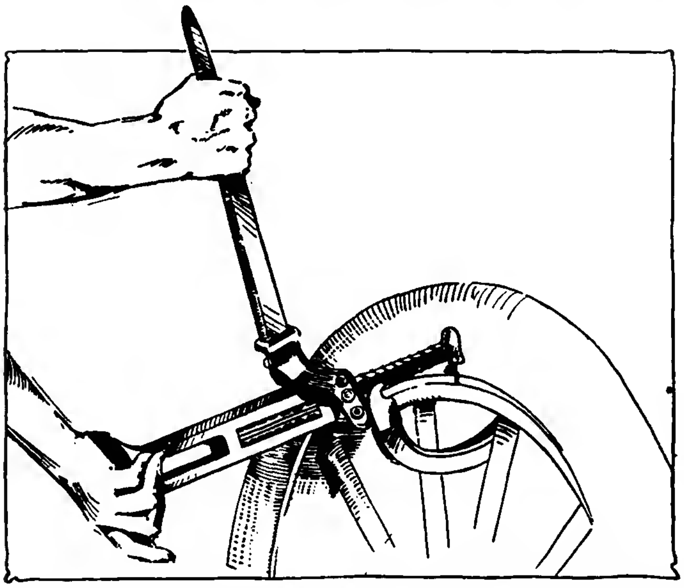
The Tribune is made only in the touring type at present



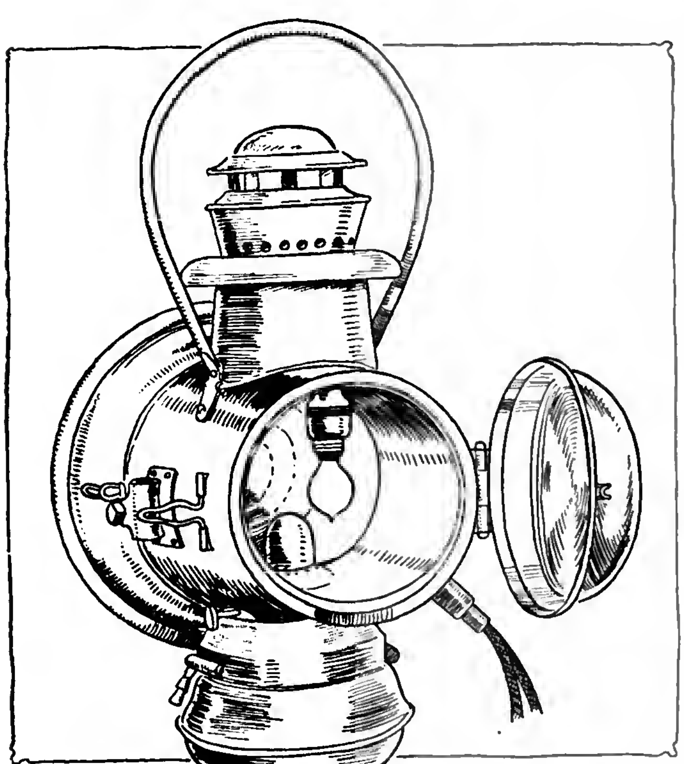
Rear axle with cover plate removed to show bevel gear. At right is shown an axle shaft and below that the front axle



Sketches of the Driver lamp, the Tremo horn and the New Era tire which were represented at the recent shows



Peerless jacks, besides elevating automobiles, may be applied for removing tires



The line of Ham lamps is adaptable for the use of either oil or electricity

Show Accessories

Part. II

THERE were so many accessories shown at the recent big exhibitions at New York, Chicago and Boston that it was impossible to describe them in the show issues of THE AUTOMOBILE. A number of them, each of which is illustrated, are taken up herewith:

Driver Lamp—These lamps are made in such manner that the bulbs cannot be stolen, cannot rattle and do not require polishing. They may be used for side or tail lights and operate on a 6-volt cell. The tail lights are so designed that they are operated from the rear of the car to comply with the Illinois state law and similar laws pending in other states whereby it is required to control the tail light from the rear. They are sold by the Standard Auto Supply Co., Boston, Mass.

Tremo Horn is designed for Ford cars and is operated by the exhaust. It is fitted to the exhaust pipe of the car by clamping the horn-shank directly to the pipe. It can be attached in a few moments. The horn is operated by a pedal which opens a flapper and allows the exhaust to be blown across the mouth of the whistle. A feature of the horn is that it can be blown when the motor is throttled down as well as when it is operating at higher motor speed. It is made by the D. Henry Bonner Company, Cambridge, Mass.

New Era Springs are made to fit standard makes of cars, and can be furnished in any desired color. They replace the original spring in case of breakage. They are made of high-carbon steel and of such quality that it would be more satisfactory to buy the complete spring than to risk the type generally made by local blacksmiths who use as a rule a low-grade carbon steel. A large assortment is carried in stock and springs may be secured at short notice. They are made by the New Era Mfg. Co., Waterbury, Conn.

Peerless Automobile Jacks—The Oliver Mfg. Company, Chicago, Ill., manufactures jacks for automobiles. The Peerless jack is very practical in that it may be used in tire removing as well as jacking. It consists of a jack support, a curved base which digs into the ground preventing tipping of the jack, a hollow-swivel top and a handle. One of the most important features is the attachment for loosening and removing tires. This attachment is a bracket, which is hooked onto the jack, when the latter is to be used for the work of removing tires, and placed between the spokes to push the tire off, or over the tire to pull it off.

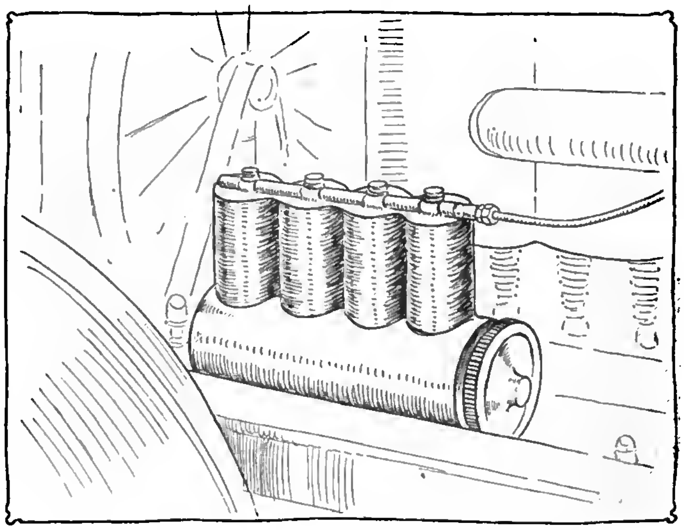
Ham Adaptor Lamps—The C. T. Ham Mfg. Co., Rochester, N. Y., manufactures automobile lamps. They are so constructed that oil or electricity may be used. The bodies are made of heavy brass, riveted throughout and reinforced with steel plates on the sides to take the strain on the brackets. The electrical device is suspended inside the lamp in such a manner that it clears the oil burner completely. By this system of adjustment, the electric light is in full focus of the reflector without interfering with the oil burner. It is wired between the cylinders of the lamp and connected to a permanent plug fastened to the outside of the lamp. All the other lamps are built on the same principle, with the same construction.

Peerless Tire Pumps—The Peerless four-cylinder pump, which may be driven by hand, engine and an electric motor, is manufactured by the Peerless Accessories Manufacturers, Chicago, Ill. It is built as a four-cylinder pump. It is finished in black enamel, with nickel trimmings. The pump is equipped with a dial-pressure gauge which shows the steadily increasing pressure in the tire as the pump is operated, either by hand or power. There is no danger of over-inflating as the gauge shows the exact air pressure in the tire at all times. The hose connection automatically opens and closes the valve in the tire. The pump is mounted under the hood or footboard and is driven by gears or chain from some exposed shafting on the engine or transmission. It is operated by a knob which together with the gauge is mounted on the dash. The Peerless four-cylinder hand pump turns with a crank and is clamped to the running board in a few seconds. The portable electric pump for garage purposes is very light. It is of the same construction as the engine-driven type. There is a gauge on the top of the pump which shows the air pressure in the tire. It can be moved to any part of the garage and attached to ordinary light sockets.

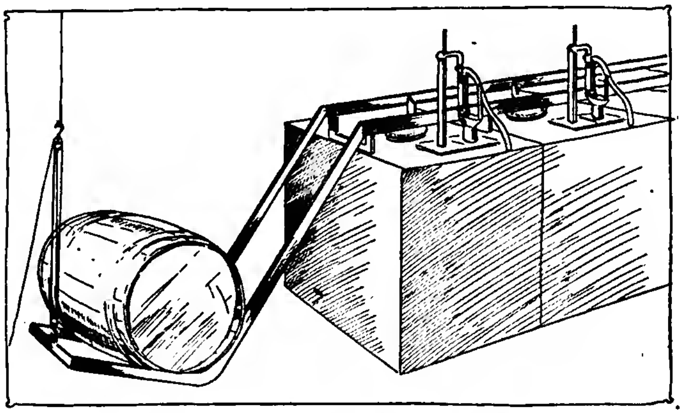
Wallmann Fuel Tanks—The Wallmann Mfg. Co., Milwaukee, Wis., manufactures oil-storage systems for factories, garages and stores. The Wallmann system No. 12 is made for the private garage. It is made of heavy galvanized steel, riveted and soldered to make it absolutely airtight. It is painted with rustproof paint and tested by air pressure before it is shipped. The filling pipe is 2 inches in diameter and has a vented double valve-cap with a hinged hasp which can be locked. The lubricating outfit, No. 14, is of the same construction as No. 12, but its use is for lubricating oils, paints and other non-explosive oils; it may be placed on the floor of a room with a gauge showing the quantity of oil in the tank at any time. A combination storage outfit is also made, containing five separate tanks and pumps, with an arrangement for raising barrels for the purpose of filling the tanks. The company also specializes in accessories pertaining to the storage of gasoline, such as pumps, buckets and funnels.

Barco Exhaust Signals—The Barco Brass & Joint Co., Chicago, Ill., manufactures the Barco chimes and valves. The chimes are attached to the exhaust pipe and operated by the valve attachment manufactured by the company, by means of a pedal at the footboard. The mechanical features of the exhaust valve are that it gives an unobstructed passage when the valve is open, and does not cause back pressure. It closes the horn outlet tightly and throttles the tone perfectly. The valve is self-cleaning. It consists of only three parts. The chimes are made of brass with an aluminum core. The method of installation is by sawing a section out of the exhaust pipe between the engine and the muffler and slipping the valve on with the proper end toward the engine.

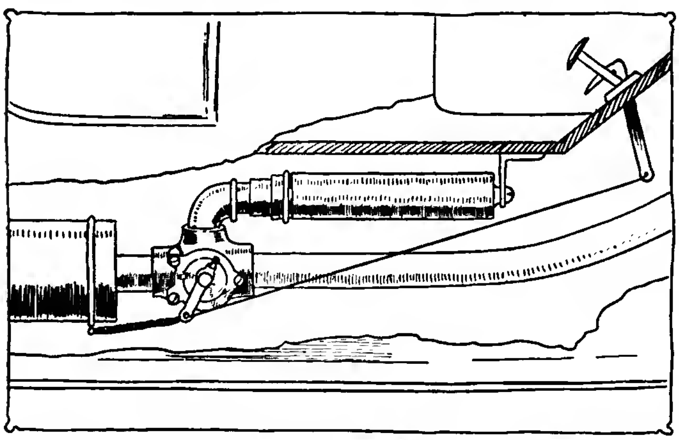
Universal Tire Sundries—A tire tread and a few types of repair boots are being manufactured by the Universal Tire Protector Co., Angola, Ind. The Universal tread is made from a heavy quality of chrome tire leather, extending from rim to rim, averaging approximately 7 gauge, and upon this body are mounted a traction armor and reinforcement. This armor attachment is built up separately of two and three-ply leather specially prepared. This in turn is mounted upon the main body with four rows of heavy flat-head rivets, which are the only rivets passing through the main body. This construction leaves the inside surface of the tread perfectly smooth and free from rivet shoulders. The tread is locked on the rim by a pair of double-end locks on each side of the tread, providing four points of adjustment on each side. The connection and adjustment of the tension bands is accomplished by a separate, self-retaining connecting lug for each point of adjustment. The tension is made with a strong tool for the purpose. The Junior adjustable inflation boot is a new product. The new repair boot consists of specially designed double-loop, double-studded felloe grip. It is made with two pairs of 1.5-inch anchor straps riveted to the edge of the boot, under the side plates. The boot is placed over the deflated tire, the anchor straps are adjusted in the felloe grip and then the tire is inflated. There are two other repair boots manufactured by this company, a plain clincher and an armored-clincher type. These, like all the others, are made with the rigid, curved side plate, conforming the boot to the shape of the tire and furnishing the rigid support along the rim line.



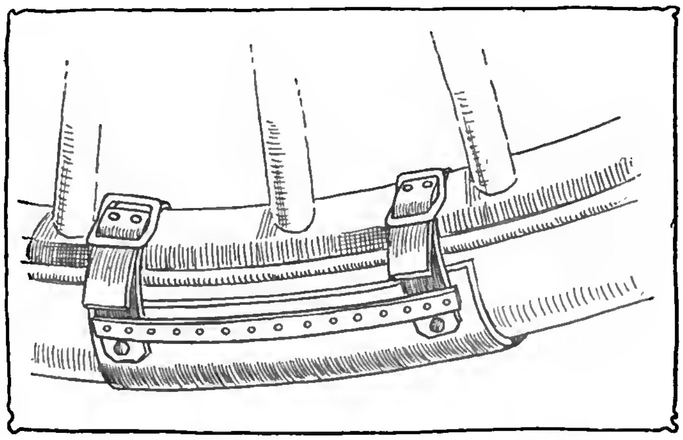
One method of installing Peerless tire pumps on a car



Wallmann outfit for the storage of oil and gasoline

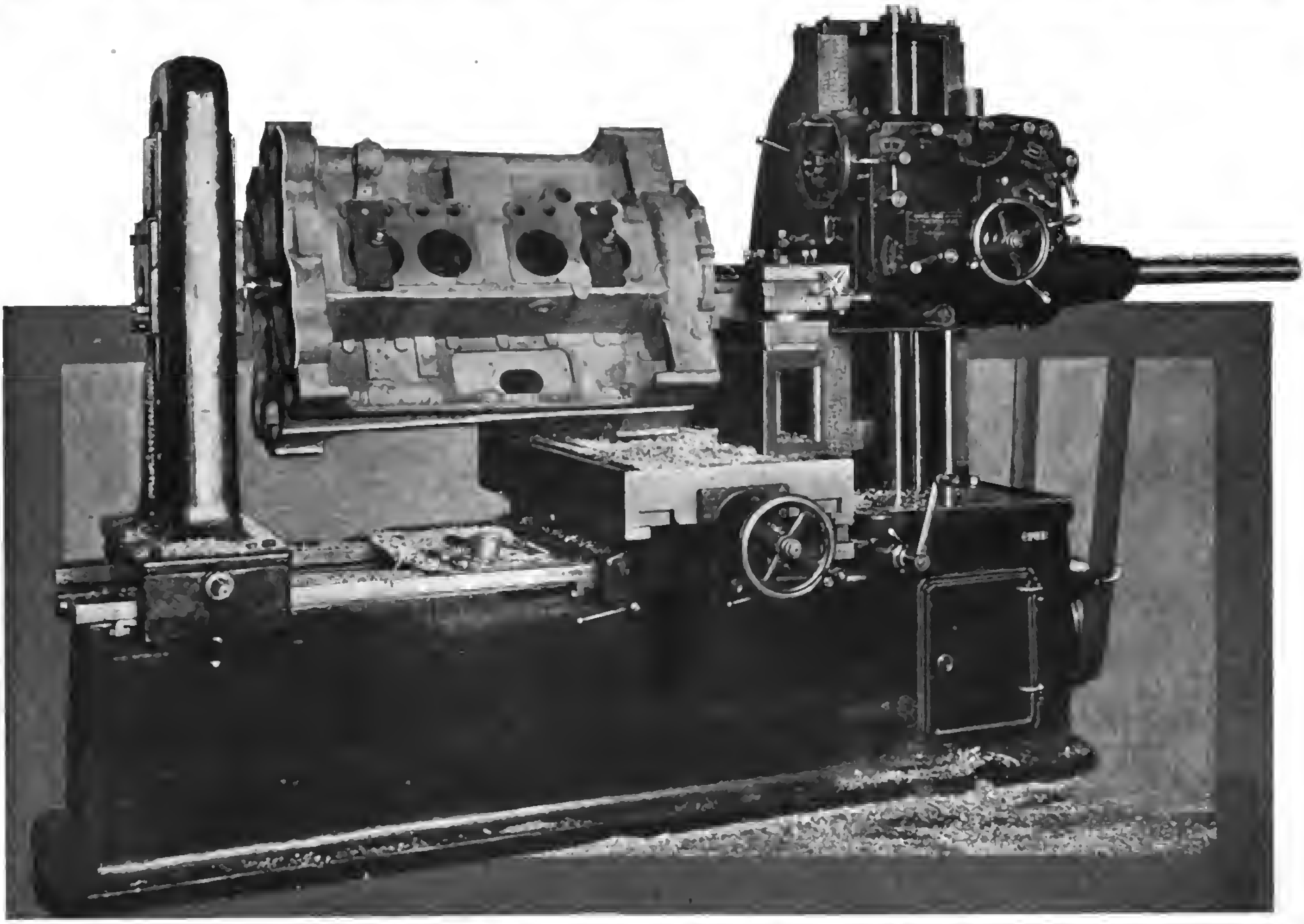


Showing method of attaching the Barco horn to the muffler



One of the repair boots of the Universal company

Factory Miscellany



Horizontal boring mill which is used in the boring and milling of crankcases in Jas. Cunningham's Sons Co. factory, Rochester, N. Y.

THIS horizontal boring mill can bore and machine two crankcases in 50 minutes. It dispenses with the use of a very heavy swing lathe and can take care of two of the cases at the same time. The illustration shows the machine with two crankcases which are having the rear ends faced off. Before facing off the ends the holes for the shaft have been bored and scraped to perfect alignment and the cases have then been mounted on a single arbor and placed in the machine. A complete circle is used to caliper the ends for the sake of accuracy. One man can operate the entire machine as the parts which are worked upon are not too heavy for him to handle economically and it requires the setting-up work but once an hour. With the heavy swing lathes previously used in this work the time required was approximately double and two men would have been working on the two crankcases instead of one. The machine described is used in the Cunningham factory at Rochester, N. Y.

LORD BALTIMORE'S Plant—The Lord Baltimore Motor Car Co., Baltimore, Md., has closed negotiations with the Board of Trade in Washington, Pa., to build a factory 255 feet square, occupying 2½ acres. Work on the construction of the new factory will be pushed with all possible haste. The building will be of steel and concrete, one story in height, and will be thoroughly equipped for the making of motor trucks. The company in its new factory will be prepared to turn out 4,000 trucks annually. It will only aim the first year, however, to manufacture 2,000 cars, increasing its output later. It will employ in the neighborhood of 100 men.

Shaffer Adds to Keeton Plant—C. B. Shaffer, president of the Keeton Motor Co., Detroit, Mich., has ordered several additions constructed to the new factory.

Hoover Plant Doubled—The Hoover Steel Ball Co., Ann Arbor, Mich., will double its plant. The present factory is entirely of brick and concrete construction and fireproof.

Maxwell's Machine Shop—The Maxwell Motor Co., Dayton, O., has awarded contracts for an addition to its machine shop. This structure will be 27 feet by 168 feet, built of brick or frame.

Swinehart's New Factory—The announcement is made by the Swinehart Tire & Rubber Co., Akron, O., that a new factory building will be erected which will almost treble its output during the coming year.

Factory for Saginaw—The Wilcox & McKim Mfg. Co., St. Louis, Mo., capitalized at $125,000, and making automobile parts, has decided to locate in Saginaw, Mich. One hundred and twenty-five men will be employed at the start.

New Hudson Factory—The Hudson Motor Car Co., Detroit, Mich., contemplates the building of a third factory building within the next year. The new structure is 578 feet in length by 90 feet in width and supplants the section of the factory grounds which resembled a tented city. By the spring of 1923 the size of the Hudson plant, if it grows as is planned by the company, will consist of fully fifteen individual factory buildings averaging 600 by 80 feet.

To Build in Stockton—J. E. Goodman, who recently organized a company capitalized for $100,000 in Stockton, Cal., to build puncture-proof tires, will shortly erect a plant.

Canton Rubber Company Enlarges—The Canton Rubber Co., Canton, Ohio, is planning to enlarge its plant and has petitioned the city council to acquire a small tract of city property located near its present plant.

Dreadnought Tire Builds—The Dreadnought Tire & Rubber Co., Baltimore, Md., recently incorporated with a capital of $1,000,000, contemplates the erection of buildings and installation of machinery to manufacture automobile tires and miscellaneous rubber goods.

Shotwell-Harris Plant—The Shotwell-Harris Co., Minneapolis, Minn., has approved plans and will ask for bids soon on the construction of a plant in the automobile district at Sixteenth street and Hennepin avenue, for the manufacture of tools and dies.

Alliance Purchases Site—The Alliance Motor Car Co., Alliance, Ohio, has purchased a site upon which will be erected a two-story factory building which will be used for the manufacture of automobiles. It is expected to have the plant completed soon after April 1.

Halley Extensions—Halley's Industrial Motors, Ltd., has been making large extensions to its works at Yoker, Glasgow, which are expected to be completed by the middle of March. As a result the company expects shortly to be able to double the output of the factory and thus to overtake its orders and to ensure prompt delivery. The new works cover about 1 1-2 acres of ground.

Rapp Holds Meeting—A special meeting of the Rapp Mfg. Co., Toledo, Ohio, was recently held for the purpose of authorizing a change of the firm name to the Toledo Spark Plug Mfg. Co. An increase in the capital stock from $15,000 to $25,000 was also voted at this meeting. Additional space in the Toledo factories building has been acquired and the plant will occupy three times its present floor space, while $10,000 will be expended in new machinery to facilitate working conditions and provide means for a greater output. It is said that when the plant is enlarged and the new machinery installed it will have an output of 4,000 spark plugs a day.

Four Wheel Drive's Plant—The Four Wheel Drive Automobile Co., Clintonville, Wis., organized 3 years ago to manufacture commercial and passenger cars utilizing the Zachow-Besserdick patents for drive to both front and rear axles, is about to realize its long cherished plan of establishing a new plant. Several months ago the capital stock was increased from $50,000 to $250,000, and on March 1 the additional stock was reported sold. The board of directors in special session immediately voted in favor of starting at once upon the construction of a new plant, to consist of three buildings, two of them to be 100 feet by 120, and the other, a power plant, 60 feet by 80. The buildings will be erected adjoining the present plant, the former Zachow-Besserdick machine shops, which will be used for patterns and warehouse. The company will thus be enabled to more than quadruple its output and will employ 500 men.

The Automobile Calendar

Shows, Conventions, Etc.

March............Indianapolis, Ind., Spring Automobile Show, State Fair Gronnds, Indianapolis Automobile Trade Association.

March............Nashville, Tenn., Annual Show, Nashville Automobile Dealers' Association.

March 17-22.......Norfolk, Va., Annual Show, Armory Bnilding, Norfolk Automobile Trade Association, Inc.

March 19-22......Springfield, Ill., Annual Show, Springfield Commercial Association, W. L. Chapin, Mgr.

March 19-26.......Boston, Mass., Annnal Truck Show.

March 20-24.......New Orleans, La., Annual Show, N. O. A. D. A.

March 24-29.......Indianapolis, Ind., Annual Automobile Show.

Mar. 27-April 3....Quincy, Ill., Mississippi Valley Automobile Show, H. F. Hofer, Director.

March 31-April 5..Manchester, N. H., Automobile Show, Dealers' Association, J. H. Graham, Manager.

April 1-6..........San Francisco, Cal., Motor Truck Show, Coliseum Hall. *Motor Field.*

April 5-19.........Pittsburgh, Pa., Annual Show, East Liberty Market House, Dealers' Association.

June 5, 6, 7........Detroit, Mich., Midsummer Meeting of Society of Automobile Engineers.

Race Meets, Runs, Hill Climbs, Etc.

May 30...........Indianapolis, Ind., 500-Mile Race, Speedway.

July 1.............Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Association to the Pacific Coast.

July 1-16..........Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.

July 8-16..........Winnipeg, Man., Midsummer exhibition, A. C. Emmett, Manager.

July 27-28.........Tacoma, Wash., Tacoma Road Races.

Nov. 24...........Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.

Nov. 26...........Savannah, Ga., Grand Prize Race, Automobile Clnb of America.

Foreign

March 31.........Montevideo, Uruguay, International Competition of Agricultural Motor Vehicles.

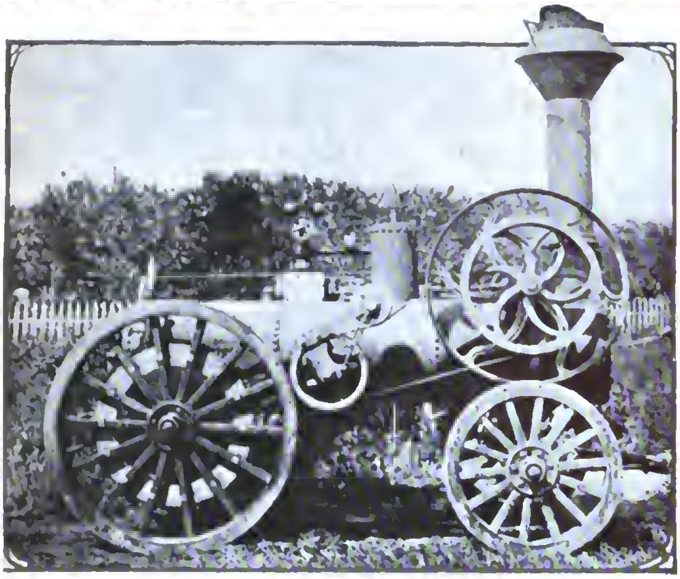
April.............Barcelona, Spain, International Exhibition.

May..............St. Petersbnrg, Russia, International Automobile Exposition, building of Michael Maneze, Imperial Automobile Club of Russia.

July 12...........Amiens, France, Grand Prix Race.

Sept. 25..........Isle of Man, International Stock Car Race.

The Locomobile Co. of America's factory at Bridgeport, Conn., which occupies a 50-acre tract on the shore of the Bridgeport harbor and has a water front of almost a mile



Copy of an old photograph, showing the early application of power to a road vehicle by itself. This photograph was taken in the year 1873. It was the ingenious application to an old threshing machine engine by the president of the Sternberg Mfg. Co., Milwaukee, Wis., of almost the same principles now used in modern motor trucks. Note the gear drive

Waverley electric delivery wagon in service of the United States parcel post, Indianapolis, Ind.

Exterior of the service station and salesrooms of the Foster Motor Car Co., Virginia and North Carolina, distributors for the KlineKar in Richmond, Va.

MOTOR Ambulance Wanted.—Tenders for the supply of a motor ambulance and two motor hose tenders required by the Johannesburg municipal council will be received up to March 28 by the Town Clerk, Municipal Offices, Plein Square, Johannesburg, South Africa, from whom copies of the contract form may be obtained. As the time for receipt of tenders is limited, only firms having agents in South Africa who can be instructed by cable will be able to avail themselves of this opportunity. All inquiries will be answered at the Bureau of Foreign and Domestic Commerce, Washington, D. C., File No. 10559.

Briggs Lord Baltimore Engineer.—H. M. Briggs has succeeded O. R. Bisler as engineer of the Lord Baltimore Motor Car Co., Baltimore, Md.

Motz Washington Branch—The Motz Tire & Rubber Co., Akron, O., has opened a branch at 1012 Fourteenth street, N. W., with F. G. Fickling as manager.

English Company Moves.—Trier & Martin, Ltd., has changed its offices from Great Portland street, W., to Trinity Works, New Church Road, Camberwell, S. E.

Organizes Vulcanizing Company—G. W. Smith of Beloit, Wis., has organized the Beloit Vulcanizing Co. and established a tire and repair shop at 415 Broad street.

Twyman Pennsylvania Tire Agency—The Twyman Motor Car, Columbus, O., has taken the agency for the Pennsylvania line of tires. J. A. Johnson is the manager.

Purchases Beloit Garage—W. H. Gragg has purchased the Allen Garage and business in Beloit, Wis. It is the first garage to be established in Beloit, having been built by Harry Vail in 1908.

St. Onge Leaves Detroit Electric.—W. J. St. Onge has resigned his position as advertising manager of the Anderson Electric Car Co., Detroit, Mich., maker of the Detroit electric. He is succeeded by W. P. Haines.

Fire Truck for Wilmington—A motor fire truck is to replace a horse-drawn extension truck now in use by the Wilmington, Del., Fire Department. A committee appointed to consider the matter visited the Webb factory at Allentown, Pa., recently.

Tracy Opens New Branch.—R. B. Tracy, western manager of the Michelin Tire Co., Milltown, N. J., has opened a new branch at 1106 Hennepin street, Minneapolis, Minn. This branch takes care of the territory of North and South Dakota, Minneapolis and Northern Wisconsin.

Mayer Carbureters for Coast.—The Maydwell Co., of Los Angeles, Cal., has taken the distributing agency for Mayer carbureters on the Pacific Coast. The Los Angeles company has branches in San Francisco and in Seattle, Wash., and will establish service stations in connection with each of the branches.

Reedy Invents Carbureter.—I. R. Reedy, of 1136 W. Third street, Dayton, Ohio, has invented a new carbureter which it is claimed will run an automobile at an angle of 60 degrees with its own supply. It is claimed to be adaptable for aeroplane use and is claimed to be of superior character because the angle of its use does not affect mixture.

Thompson Keeton Sales Representative.—C. W. Thompson, Rochester, N. Y., has become identified with the Keeton Motor Co., Detroit, Mich., as sales representative for the State of New York, covering territory east of Batavia, N. Y., and northern counties of Pensylvania, with the exception of four counties in the northwestern section of the state. He will tour in a Keeton Six and thus cover territory.

Drawback on Axles.—A ruling has been made by the Treasury Department, Washington, D. C., that drawback shall be allowed under section 25 of the tariff act of 1909, on motor car axles manufactured by the McCue Co., Buffalo, N. Y., with the use of imported annular bearings. The drawback allowance shall not exceed the number of bearings appearing in the exported axles as shown by the sworn statement of the manufacturers filed with the collector of customs at Buffalo.

New Agencies Established During the Week

PLEASURE CARS

Place	Car	Agent
Adrian, Mich.	Cole	C. E. Simmons
Asheville, N. C.	Cole	Enterprise Machine Co.
Baltimore, Md	Cole	Cole Sales Co.
Bath, N. Y.	Cole	Wm. H. Hopkins
Beaver Falls, Pa.	Cole	Seanor & Williams Co.
Berlin (Ont.) Canada	Cole	Aaron Bricker
Bismarck, N. D.	Cole	Lehr Motor Sales Co.
Boston, Mass.	Nyberg	Clyde H. Smith Motor Co.
Boston, Mass.	Palmer-Singer	H. A. Clapp
Breese, Ill.	Cole	Breese Garage
Brockton, Mass.	Cole	L. E. Reynolds
Buffalo, N. Y.	King	Monroe Motor Car Co.
Buffalo, N. Y.	Lenox	Monroe Motor Car Co.
Buffalo, N. Y.	Marion	Monroe Motor Car Co.
Carroll, Ia.	Cole	J. E. Osborne
Charleston, Miss.	Cole	Thompson Anderson
Charlevoix, Mich.	Cole	J. A. Vought
Chattanooga, Tenn.	Cole	Hirsch Bros.
Connellsville, Pa.	Cole	Connellsville Garage
Columbia, Tenn.	Cole	Columbia Motor & Implement Co.
Columbus, O.	Crow-Elkhart	Clintonville Garage & Auto Co.
Covington, Tenn.	Cole	Walter Haynie
Crestline, O.	Cole	Crestline Garage Co.
David City, Nebr.	Cole	Doty Motor Co.
Detroit, Mich.	Lozier	Berkeley Garage
East Hampton, N. Y.	Franklin	Halsey's Garage
Eustis, Fla.	Cole	N. R. Herrick & Co.
Hamilton (Ont.), Can.	Cole	Patterson Auto Sales Co.
Hammond, Ind.	Cole	Mrs. Laura Heintz
Hartford, Conn.	Cole	M. J. Bliss
Hazleton, Pa.	Cole	Adam Eidam
Joliet, Ill.	Cole	S. J. Harrigan
Keokuk, Ia.	Cole	Ayer Mfg. Co.
Little Falls, N. Y.	Cole	N. B. Bronner
Moberly, Mo.	Cole	John N. Taylor
Milwaukee, Wis.	Cole	Cole Motor Co.
Morris, Ill.	Cole	Osmanson Bros.
Muskegon, Mich.	Cole	W. P. Marshall
Newton, Ia.	Cole	Barngrover Auto Co.
Oakland, Cal.	Cole	W. J. Freeling
Paterson, N. J.	Cole	Ford Auto Co.
Philadelphia, Pa.	Henderson	Motor Sales Co.
Pensacola, Fla.	Cole	Gulf Coast Garage & Sales Co.
Port Richmond, L. I.	Cole	I. A. Silvie, Jr.
Pueblo, Colo.	Cole	Tyler Auto Co.
Quebec (Que.), Can.	Cole	Frank Campbell
Rochester, Vt.	Cole	F. J. Robinson
Sacramento, Cal.	Cole	J. S. Casey
Salem, Ore.	Cole	Chamberlin Bros.
Saskatoon (Sask.), Can.	Cole	Robert McIntosh
Sherrard, Ill.	Cole	Kinsey & Danielson
Springfield, Mass.	Cole	Shean Auto Station
Strong City, Kans.	Cole	Jacob Hinden
Syracuse, N. Y.	Franklin	Bull & Young
Tampa, Fla.	Cole	West Coast Auto Co.
Topeka, Kans.	Cole	Vesper & Evans
Toronto, Ont.	Berliet	Conboy Carriage Co.
Traverse City, Mich.	Cole	William Goode
Victoria (B. C.), Can.	Cole	Moore & Pauline
Washington, D. C.	Case	R. C. Creyke
Washington, D. C.	Cutting	Cutting Motor Sales Co.
Watseka, Ill.	Cole	Burnham & Body
Wilkes-Barre, Pa.	Cole	D. & H. Auto Co.
Williamsport, Pa.	Cole	E. L. Sheffer
Winona, Minn.	Cole	Gate City Garage

COMMERCIAL VEHICLES

Place	Car	Agent
Chicago, Ill.	Sternberg	Foraker Motor Truck Co.
Columbus, O.	Service	Service Motor Truck Co.
Huntington, L. I.	Sternberg	Bergen Garage, Inc.
Ottawa, Can.	Stewart	Ontario Motor Car Co.
Philadelphia, Pa.	Brown	Bartlett Garage, Inc.
St. Paul, Minn.	Sternberg	E. F. Morgan Co.
Toronto, Ont.	Stewart	Ontario Motor Car Co.

Bassett Heads Case Branch—F. E. Bassett will be manager of the new Milwaukee, Wis., branch of the J. I. Case T. M. Co., Racine, Wis.

Miller Brothers' New Salesroom—Miller Brothers, automobile dealers in Glens Falls, N. Y., have opened up a new salesroom in that city.

Gray Goodyear Manager—C. H. Gray has been appointed manager of the Milwaukee, Wis., branch of the Goodyear Tire & Rubber Co., Milwaukee, Wis.

Johnson, Manager Ford—F. T. Johnson has joined the forces of the Ford Motor Co., Detroit, Mich., and has been made manager of the Omaha, Neb., branch.

Adding to Garage—The Haney-Pistor Co., Kewannee, Wis., is building a large addition to its garage and salesrooms. It will be of concrete construction and will have room for fifty cars.

College Station Wants Apparatus—The State Fire Marshal has recommended the expenditure of $21,713 at the Agricultural and Mechanical College, College Station, Tex., for better fire protection.

Goodhart Goes to Lippard-Stewart.—H. H. Goodhart has been made advertising manager of the Lippard-Stewart Motor Car Co., of Buffalo, N. Y. He was formerly with the Franklin Automobile Co., Syracuse, N. Y.

Wants Fire Apparatus.—A committee headed by City Judge Daniel Crowley has requested the fire commissioners of Ithaca, N. Y., to recommend to the common council of that city the purchase of a combination hose and chemical automobile.

Express Company in Kutztown—Kutztown, Pa., citizens have organized the Kutztown and Reading Automobile Express Co. to carry freight between the two places, stopping en route at Fleetwood, Blandon, Temple and Hyde Park on several trips daily.

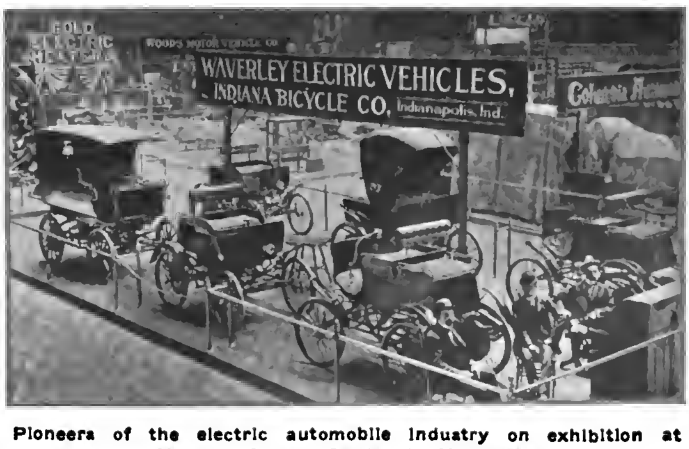
Lowry Promoted—S. W. Lowry will shortly take over the control of the Southern territory of the Pacific Coast for the Pennsylvania Rubber Co., Jeannette, Pa., with headquarters at Los Angeles, Cal. Mr. Lowry is now manager of the company's Pittsburgh, Pa., branch.

American Cars in Trinidad—American cars are used almost entirely on the British island of Trinidad, off the coast of South America. During 1912 forty-four cars were imported during the year. The popular preference is for a light car that does not cost over $1,000, but some market exists for better cars.

Washington Club Business Proposition—A paid membership of 293 has been reached by the newly organized Washington, D. C., Motorists' Association. This organization is purely a business proposition entirely devoid of the social end of the automobile. The new association desires to place in membership all persons within the District of Columbia interested in the adoption, use and maintenance of the motor-driven vehicle.

Clubs Join in Tire Test—Means for comparing in a measure road condition in the United States and England will be afforded by the results of a series of certified tire tests that are about to be undertaken with the same make of tire by the Automobile Club of America and the Royal Automobile Club. The local test will be conducted by the technical laboratory of the A. C. A., and like the English trial, will be of 10,000 miles' duration.

Wants Electric Automobile Agency—An American consular officer reports that a resident of his district, who has been engaged in the automobile trade for many years, desires to secure the local representation of American manufacturers of electric automobiles, including touring cars and commercial vehicles. These manufacturers are requested to send him their catalogues and price lists, together with a statement showing their annual output of the various classes of cars referred to. If it appears that satisfactory arrangements are likely to be made, the inquirer will probably visit the United States in order to get in touch with the manufacturers. All information may be had by addressing all inquiries to the Bureau of Foreign and Domestic Commerce, File No. 10,584, Washington, D. C.



Pioneers of the electric automobile industry on exhibition at Madison Square Garden in May, 1899

The naw Baker electric roadater, a product of the Baker Motor Vehicle Co., Clevaland, O.

Newton with White—M. R. Newton has become director of publicity for the White Co., Cleveland, O.

Swinehart's Buffalo Agency—The Swinehart Tire & Rubber Co., Akron, Ohio, recently opened an agency in Buffalo, N. Y.

Kulas Peerless Sales Manager—E. J. Kulas has become the general sales manager of the Peerless Motor Car Co., Cleveland, O.

Six-story Supply House—W. S. P. Oskamp has plans for a six-story fireproof automobile supply house in Cincinnati, O.

Cross Holly Sales Manager—The Holly Bros. Co., Detroit, Mich., announces the appointment of C. W. Cross as sales manager.

Newark Franklin Dealer Moves—E. D. Carlough, Franklin dealer in Newark, N. J., has just moved into new quarters at 35 Halsey street.

Ridler Pope Sales Manager—F. M. Ridler has been promoted to the position of sales manager of the Pope Mfg. Co., Hartford, Conn.

New Supply House Opened—The Post & Lester Co. has opened an automobile supply store at Waterbury, Conn. W. H. Lewis is manager.

Babcock Firestone Advertising Manager—E. S. Babcock has been appointed advertising manager of the Firestone Tire & Rubber Co., Akron, Ohio.

Case Company's New Salesrooms—The J. I. Case T. M. Co., Inc., Racine, Wis., announces the opening of a new automobile salesroom in Milwaukee, Wis.

Becker Establishes Baltimore Agency—Howard Becker has taken the agency in Baltimore, Md., for the Michigan and Wizard igniting and lighting storage batteries.

Miner President Hartford Association—S. A. Miner was elected president of the Hartford Automobile Dealers' Association, Hartford, Conn., at a recent meeting.

Williams Franklin Advertising Manager—W. H. Williams has been promoted to the position of advertising manager of the Franklin Automobile Co., Syracuse, N. Y.

Rochester Planning Apparatus Additions—Rochester, N. Y., plans to add two motor-driven hose carts to its fire-fighting equipment within the next few months.

Offer City an Automobile—The Hansen Automobile Co., Wilmington, Del., has offered to give the city a runabout for the use of the chief of the fire department.

New Brazilian Tariff Schedule—Publication has just been made of the new tariff schedule in Brazil and no increases were made on automobiles or on automobile sundries.

Best Promoted—Leigh Best, one of the vice-presidents of the American Locomotive Co., Providence, R. I., has become head of the automobile department of that company.

Mackemer-Pinkerton's Salesrooms—The Macemer-Pinkerton Automobile Co., Galesburg, Ill., recently opened a new salesroom at 256 East Simmons street. It handles the Ford car.

Doherty Henderson Manager—The Henderson Motor Car Co., Indianapolis, Ind., has appointed H. W. Doherty as Northwest district manager, with headquarters in Tacoma, Wash.

Hainea Anderson Advertising Manager—W. P. Haines has been appointed advertising manager of the Anderson Electric Car Co., Detroit, Mich., succeeding W. J. St. Onge, resigned.

Moskovics with W., C. & P.—F. E. Moskovics has become associated with the Wyckoff, Church & Partridge Guy Vaughan interests, which are to produce a new light six-cylinder car.

Automobiles in Bar Harbor—The bill repealing the law which excludes automobiles from Bar Harbor, Me., will become effective as soon as Governor Haines of Maine affixes his signature to it.

New Geneva Garage—Plans have been completed for the construction in Geneva, N. Y., of a large garage of reinforced concrete. The garage will be constructed in Exchange street by F. Madia.

Phelps with Moline—R. W. Phelps, sales manager of the Great Western Automobile Co., Peru, Ind., has been appointed assistant sales manager and publicity man for the Moline Auto Co., East Moline, Ill.

Baltimore Companys New Quarters—The Chesapeake Motor Co., Baltimore, Md., Hupmobile agent, has acquired 1018 Morton street as its salesrooms and garage and will also conduct a storage business there.

Automobile Incorporations

AUTOMOBILES AND PARTS

Akaon, O.—Summit Automobile Co.; capital, $10,000; to manufacture and deal in pleasure and commercial motor vebicles. Incorporators: E. J. Eblen, J. M. Sauder, F. L. Metz, Racbel Sauder, Almira Elben.

Boston, Mass.—Westcott Motors Co.; capital, $8,000. Incorporators: Orris W. Nelson, Harvey L. Kemp, Geo. H. Learned.

Baooklyn, N. Y.—Montauk Motor Co., Inc.; capital, $10,000; to do a general auto business. Incorporators: Louis F. Obse, James K. B. Webber, Morton Foster.

Charleston, S. C.—Arby Automobile Co.; capital, $200,000. Incorporators: Santo Sottile, M. R. Rivers, L. M. Pinckney.

Cincinnati, O.—Armstrong Motors Co.; capital, $10,000; to manufacture and deal in automobiles and all parts thereof. Incorporators: James H. Armstrong, Luella S. Armstrong, Clara M. Eggers, S. S. Stewart, Harry Bronworth.

Cleveland, O.—Gustav Schaefer Wagon Co.; capital, $55,000; to manufacture wagons, vebicles and automobile bodies. Incorporators: Gustav Scbaefer, Henry G. Scbaefer, Charles E. Mortiz, Artbur Kruse, Anna M. Schaefer.

Decatur, O.—Dawson Automobile Co.; capital, $10,000. Incorporators: Earle M. Dawson, Cbas. E. Dawson, Florence L. Dawson.

Detaoit, Mich.—Detroit Antomobile Exchange; to deal exclusively in used cars. Incorporators: G. C. Farnsworth, R. M. Drysdale, E. W. Pingree.

Detroit, Mich.—King Motor Car Co.; capital, $200,000. Incorporators: J. G. Bayerline, Arteman Ward, Jr., F. A. Vollbrecbt.

Datroit, Mich.—Moore Truck & Mfg. Co.; capital, $20,000; to manufacture motor trucks. Incorporators: F. A. Moore, H. A. Peters, C. W. McColl.

Indianapolis, Ind.—Ray Harronn Co.; capital, $50,000; to manufacture and sell motor cars. Incorporators: Ray Harroun, E. G. Baker, E. C. Sonrbier.

Mt. Vernon, N. Y.—Motor Trnck Mfg. Corp; capital, $150,000; to manufacture and deal in motors, engines, etc. Incorporators: H. Hitchenbacb, L. Bertscb, A. J. Albert.

New York City.—Associated Anto Mechanics Inc.; capital, $100,000; to deal in autos and auto parts. Incorporators: Charles Tichenor, Harry Barnes, William J. Hoover.

Naw York, N. Y.—Brady Murray Motors Corp; capital, $55,000; to deal in motor trucks, cars, autos, etc. Incorporators: Artbur T. Murray, Samuel T. Marcus, Cbarles Wein.

New Yoak, N. Y.—Commercial Truck Co. of America; capital, $3,000,000. Incorporators: J. F. Curtin, H. O. Dougblan, J. M. Satterfield.

New York, N. Y.—Henry Tobin Co., Inc.; capital, $50,000; to deal in automobiles. Incorporators: Henry Tobin, Ricbard F. Tobin, Jos. B. McDonough.

New Yoak City.—The Albert E. Eldredge Corp.; capital, $7,000; to manufacture motors, machinery, etc. Incorporators: A. E. Eldredge, John J. H. Poillon, Julia M. Wilkinson.

Patchocue, N. Y.—John R. Swezey Antomobile Co., Inc.; capital, $5,000. Incorporators: John R. Swezey, Nathaniel N. Swezey, Ella B. Swezey.

Pineville, Ky.—Cumberland Motor Co.; capital, $50,000. Incorporators: N. J. Weller, A. W. Bryant, M. J. Moss, John A. Pitman.

Pittsauach, Pa.—Gibson Motor Car Co.; capital, $3,000,000; to manufacture and deal in engines, motors and all equipments thereto. Incorporators: J. H. Maboney, E. D. Johnson, C. E. Gibson.

Rochestea, N. Y.—Rochester Automobile Exchange; capital, $500. Incorporators: Bertram E. Wilson, W. Hayes, Mitchell Dewitt, Owen D. Dewitt.

Salt Lake City, Utah.—Deseret Motor Truck Co.; capital, $50,000. Incorporators: Ira Cole, Domine Burns, J. E. Fleige.

Wyandotte, O.—Moore Truck & Mfg. Co.; capital, $20,000; to manufacture trucks.

GARAGES AND ACCESSORIES

Alliance, O.—Alliance Rubber Co.; capital, $100,000; to manufacture and deal in rubber goods of all kinds including automobile tires. Incorporators: Geo. C. Russell, Milton Bejach, W. H. Purcell, M. S. Melbourne, Robert Auld, Sr., F. E. Dussell, H. F. Bobecker.

Baltimore, Md.—Dreadnaught Tire & Rubber Co.; capital, $1,000,000. Incorporators: E. D. Buck, G. W. Dillman, B. M. Crawl.

Baooklyn, N. Y.—F. & P. Auto Transportation Co., Inc.; capital, $70,-

Carpenter's Indianapolis Office—W. W. Carpenter, western representative of the Jones Speedometer Co., New York City, will be located in Indianapolis, Ind. He has taken an office at 1201 State Life Building.

Bosch Magneto Appointments—The Bosch Magneto Co., New York City, has appointed the following firms as distributors of its various products: Ballou & Wright, Seattle, Wash., and E. A. Featherstone, Los Angeles, Cal.

Civic Garage in Rochester—The Board of Contract and Supply, Rochester, N. Y., recently awarded contracts for the immediate construction of the new civic garage which has been advocated for that city for the past year. It will cost $22,411.

Large Garage in Birmingham—The Cumberland Motor Car Co., Birmingham, Ala., recently moved into one of the largest garages in the South. Two show rooms each 100 feet long are provided. Several standard cars are carried by the company.

Stoll Assistant Sales Manager—O. E. Stoll has been appointed assistant sales manager of the General Motor Truck Co., Detroit, Mich., to fill the vacancy occasioned by the transfer of E. J. Kilborn to Chicago, Ill., as manager of the branch there.

Great Western car designed as a combination limousine and ambulance in Peru, Ind.

Gray & Davis Baltimore Agency—The exclusive agency in Baltimore, Md., for the Gray & Davis lighting and starting system is held by the Auto Electric Co., which is also conducting a service station to care for automobiles equipped with this system.

Colleges Interested in Automobiles—To encourage visits by the engineering classes of the large universities, the sales department of the Lozier Motor Co., Detroit, Mich., has issued invitations to the more important colleges throughout the country for a visit of inspection to the factory in Detroit.

Highway Engineering Course Success—The winter course in highway engineering at the Ohio State University, Columbus, O., is realizing the hopes of those who started the movement. The enrollment is sixty, not including the senior engineers who are regularly attending and the juniors who attend part of the time.

Ricker Opens Indianapolis Office—C. S. Ricker, formerly chief engineer of the Henderson Motor Car Co., Indianapolis, Ind., has opened an office at 1201 State Life Building, that city. Mr. Ricker will do consulting engineering work for several automobile companies and a considerable amount of publicity work also.

Hoover Purchases Flanders Department—The Hoover Steel Ball Co., Ann Arbor, Mich., has purchased the steel ball department of the Flanders Mfg. Co., Chelsea, Mich., which has been in the hands of a receiver since December 6, 1912. It is the intention of the Hoover company to move this department to its new factory at Ann Arbor.

Milwaukee Buys Five Cars—The commissioner of public works, Milwaukee, Wis., has contracted with the Mitchell Automobile Co., Milwaukee, Wis., for five passenger cars for the use of its various officials. The contract for two 1 1-2-ton trucks for the waterworks department was awarded to the Kissel Motor Car Co., Hartford, Wis.

Gemmer's Air Starting Device—It is reported that G. A. Gemmer, formerly of the Gemmer Mfg Co., Detroit, Mich., maker of steering gears, is organizing a company to manufacture an air starting device which he has invented. It is said to be built upon the principle of the electric starter, having a combination pump and motor, the entire outfit weighing about 50 pounds.

Ajax Offers Prizes—Five thousand dollars in prizes are offered in an annual service competition for Ajax tires, beginning April 1 next and terminating on March 31, 1914, by the Ajax-Grieb Rubber Co., Trenton, N. J. For the chauffeurs who in that space of time make the best mileage records out of their Ajax tires there are altogether 208 prizes to be distributed among the winners.

Automobile Polo in London—Richard Klegin, an American promoter, recently arrived in London, Eng., and commenced negotiations for automobile polo games in that city during the coming season. He purposes to bring over the eight participants from the games held in Madison Square Garden, New York City. The contests will occur either in the Olympia or at the Shepherd's Bush Stadium probably in May.

Automobiles in Lansing Schools—Lansing, Mich., has adopted a plan whereby the pupils will receive an automobile education. They spend the first year in school and after that they divide their time equally between school and shop, either in the automobile or gas-engine shop. After a short vacation they will alternate between school and some Lansing plant, where they will get the practical experience and also will be paid for their work.

Automobile Incorporations

000. Incorporators: William O. Goddard, Frank K. Fairchild, Geo. A. Logan.

BUFFALO, N. Y.—V. W. Bonham Mfg. Co., Inc.; capital, $20,000; to manufacture auto pumps, other pumps and machinery of all kinds. Incorporators: Edward C. Schwingel, E. S. McCready, James R. Pratt.

CINCINNATI, O.—F. M. Rose, Springfield Co.; capital, $100,000; to manufacture a patented automobile wheel.

DETROIT, MICH.—Superior Fonndries Co.; capital, $30,000; to do foundry work. Incorporators: Jos. Sturges, W. L. Willard, H. T. Peters, R. T. Holte, J. G. Williams.

INDIANAPOLIS, IND.—Motor Starter Mfg. Co.; capital, $40,000; to manufacture motor starters. Incorporators: S. M. Brundage, W. J. Sylvester, H. J. Herff.

KINGSTON, N. Y.—Brown Auto Supply Co.; capital, $7,000. Incorporators: Emerson Brown, Lewis Brown, Rodney B. Osterhoudt.

MILWAUKEE, WIS.—Escott's Auto Livery & Garage Co.; capital, $15,000. Incorporators: F. A. Escott, Clara A. Escott, Richard S. Witte.

MINNEAPOLIS, MINN.—O. Fenstermacher; capital, $300,000; to handle accessories.

MUNCIE, IND.—Derrickson Mfg. Co.; capital, $125,000; to manufacture automobile accessories. Incorporators: Harry S. Osborn, H. L. Kesselman, B. C. White.

NEW YORK, N. Y.—Auto Signalite Co., Inc.; capital, $2,000; to deal in automobile supplies. Incorporators: Robert C. Norton, Anna D. Chersan, Lelema E. Koblish.

NEW YORK CITY.—Charles E. Hottnm, Inc.; capital, $20,000. Incorporators: Charles E. Hottum, Maud J. Hottum, William H. Coffey.

NEW YORK, N. Y.—Continental Rubber Works Selling Agent, Inc.; capital, $3,000; to deal in rubber goods, tires, etc. Incorporators: Clarence E. Thornall, Willis A. Darling, Walter S. Tullis.

NEW YORK, N. Y.—Dayton Automobile Repairing Co., Inc.; capital, $5,000. Incorporators: Chas. E. Holst, Victor Drummond, Valentine E. Mott.

NEW YORK CITY.—New York Oil & Grease Co.; capital, $60,000; to manufacture and deal in lubricating oils, greases, etc. Incorporators: George T. Roberts, Garfield Carson, George G. Francis.

NAW YORK, N. Y.—Peteler Shock Absorber Corp.; capital, $50,000. Incorporators: James L. Allen, Charles L. Moreau, Frederick O. Lyon.

NEW YORK CITY.—Seeing New York Automobiles, Inc.; capital, $10,000; to operate sight seeing automobiles. Incorporators: Geo. H. Mulligan, Thomas Frost, Joseph V. Fallon.

NEW YORK CITY.—Universal Shock Eliminator, Inc.; capital, $15,000; to manufacture devices for eliminating road jars and shock to autos. Incorporators: Richmond Weed, Emile Dreyfns, Leslie S. High.

RACINE, WIS.—Wisconsin Electric Co.; capital, $50,000; to manufacture electrical appliances and devices. Incorporators: Louis Hamilton, C. H. Beach, W. W. Storms.

RHINELANDER, WIS.—Oneida Garage & Machine Co.; to open a garage and repair shop. Incorporators: Will Gilligan, Edwin Priebe.

ROCHESTER, N. Y.—Durno Mfg. Co.; capital, $100,000; to manufacture mechanical appliances for automobiles. Incorporators: John H. Durno, John F. Turk, Milton Noyes.

THOMASVILLE, GA.—Clark's Resilient Tire Filler Co.; capital, $100,000; to manufacture tire fillers. Incorporators: J. T. Clark, A. B. Clark, J. E. Golden.

UTICA, N. Y.—Divine Tire Co., Inc.; capital, $225,000. Incorporators: Charles W. Wicks, A. James Eckert, Bradford H. Devine.

VICTORIA, TEX.—Park Garage; capital, $10,000. Incorporators: John Fraser, J. T. Linehaugh, W. H. Crain.

WASHINGTON, PA.—International Combustion Loco Co.; capital, $1,000,000; to manufacture, buy, sell and deal in locomotives and internal combustion machines of all kinds. Incorporators: Thomas H. McKay, James W. McKay, John G. Gray.

WHITESTONE, N. Y.—Whitestone Garage, Inc.; capital, $5,000. Incorporators: Herhert A. Tretman, John A. O'Fee, Mary E. O'Fee.

CHANGES OF CAPITAL AND NAME

COLUMBUS, O.—Rogers Supply & Tire Co.; capital increased from $10,000 to $25,000.

DETROIT, MICH.—Gies Gear Co.; capital decrease from $50,000 to $25,000.

MIDDLETOWN, O.—Miami Cycle & Mfg. Co.; capital increased from $1,100,000 to $2,064,500.

AUTOMATIC Carbureter Design—In which the increasing suction of the motor enlarges the air intake port and widens the cross area of the venturi tube surrounding the nozzle.

This carbureter, Fig. 1, consists of a casing, the upper portion of which contains a passage I communicating with the intake manifold, while the lower portion includes an air-inlet port. The latter surrounds the lower portion of the gasoline nozzle N and is normally almost entirely closed by the cylindrical mantle of a sleeve S. The lower portion of the sleeve is tapered to fit the similarly shaped portion of the carbureter body. This sleeve is slidable in the main, vertical passage concentrically in which the nozzle N is in place. At low motor speeds the sleeve closes the air passage around the nozzle almost entirely. If, however, the throttle is opened farther, the increased motor suction tends to increase capacity of the contracted passage and in the effort to do so lifts the sleeve until a wider portion of it surrounds the opening of the nozzle. Incidentally the intake surrounding the lower, tapered end of the sleeve is raised and the air passage capacity of this opening increased as well.

No. 1,055,352—to Charles J. Pembroke, Rochester, N. Y. Granted March 11, 1912; filed August 9, 1911.

Resilient Wheel Construction—In which a solid spoke is held in place by springs at both ends and two sides.

The wheel described in this patent includes a rigid central portion forming a hub H as well as a number of spoke-holding chambers S which are radially disposed around the hub. The rim R of the wheel surrounds the hub as a center, being held in relation thereto by means of spokes S1. The solid spokes are held in approximately constant distance with regard to H by means of coiled cushion springs C disposed at both ends of the spokes. The spokes are encased and the casings connected by parallel plates forming a wheel frame, solid portions of which project into the space between the two plates. There are guides G, a number of which is used on two sides of the spoke adjacent to the neighboring spokes, and between each guide and the frame portions adjacent to it cushioning springs are provided. The total compression of these springs is in excess of the torque of the wheel, so that the drive may be taken from the hub to the rim through the spokes, while the cushion springs at both ends of every spoke allow for the percussions caused by driving the wheel over the road inequalities.

No. 1,055,835—to Frederick F. Tighe, New York City. Granted March 11, 1913; filed August 24, 1911.

Shock Absorber—Embodying friction members and a toggle joint between the absorber and the car frame.

The shock absorber, Fig. 3, consists of an annular shell S, a centrally chambered, radially slotted core element C and floating shoes which engage the shell frictionally. In the chamber of the core there is a longitudinally grooved member, the grooves having convergent floors; wedge-like gibs work in the grooves and slots. A resilient toggle joint T connects the gibs and the shoes, one end of which joint is secured to the chassis frame. Means connected to the axle cause relative engagement of the grooved member and the gibs so as to wedge the toggle joint means, if the axle is moved relatively to the car chassis.

No. 1,053,417—to George Cushing Martin, Los Angeles, Cal. Granted February 18, 1913; filed March 19, 1910.

Pneumatic Tire Casing—In which a coating of vulcanized rubber holds the threads of the fabric at their elastic limit.

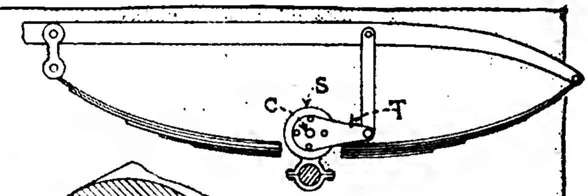
This patent deals with a tire casing, Fig. 4, having separated edges and comprising a body of fabric and a coating of vulcanized rubber. The fabric body has its threads uniformly tensioned in the casing structure to approximately the elastic limit of the material and the threads are held in this condition by the vulcanized rubber.

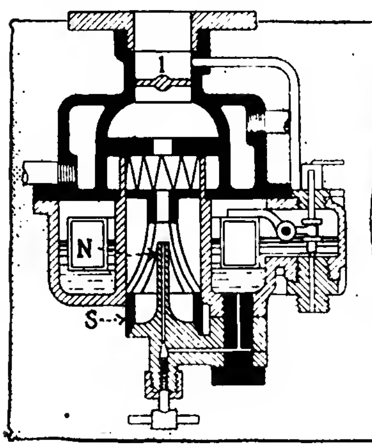
No. 1,055,744—to Nelson W. McLeod, St. Louis, Mo. Granted March 11, 1913; filed May 10, 1912.

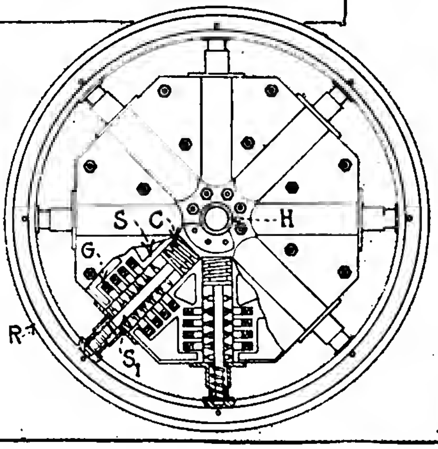
Illuminated Number Plate—In which non-transparent numeral signs are secured to a glass plate, behind which a light is in position.

This patent describes a combination number plate and light, Fig. 5. The same comprises a box which has a reflector and a lamp; the front end of the box is open and a number of lugs are disposed along the inner edge of the box front. These lugs are threaded internally. A rectangular frame member formed of L bars is so shaped as to fit for receiving a glass and lips on the edges of the rectangular member are adapted to be bent against the back of the glass after it is in place in the frame of that member. Lugs on the L-shaped bars are threaded internally to register with the threaded operations of the lugs on the box, and screws project into both of each pair of registering lugs, number members being secured to the bars lying over the glass.

No. 1,055,813—to Warren H. Seaser, Fresno, Cal. Granted March 11, 1913; filed February 2, 1912.







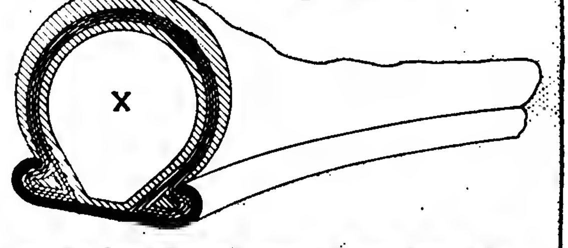


Fig. 1—Pembroke carbureter. Fig. 2—Tighe spring wheel. Fig. 3—Martin shock absorber. Fig. 4—McLeod tire. Fig. 5—Seaser number plate

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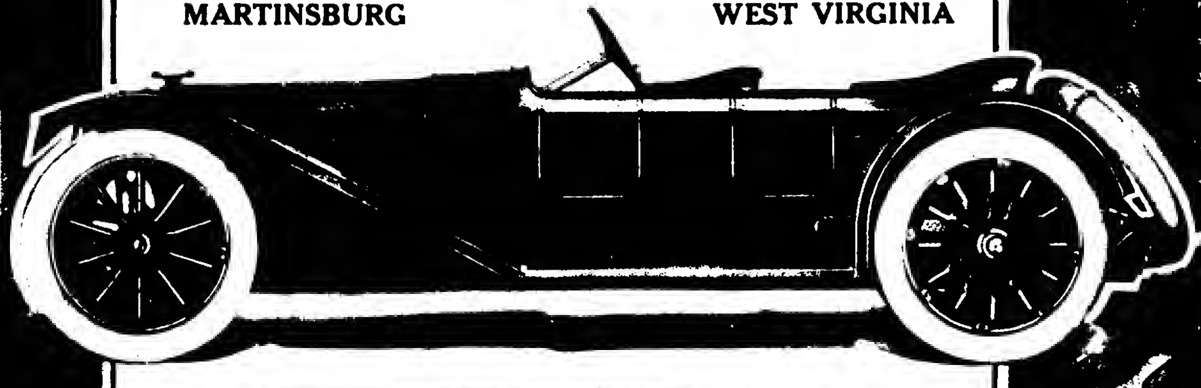
NEW YORK, MARCH 27, 1913.



Vol. XXVIII New York—Thursday, March 27, 1913—Chicago No. 13

The Automobile

Cars Taxed on Unused Horsepower

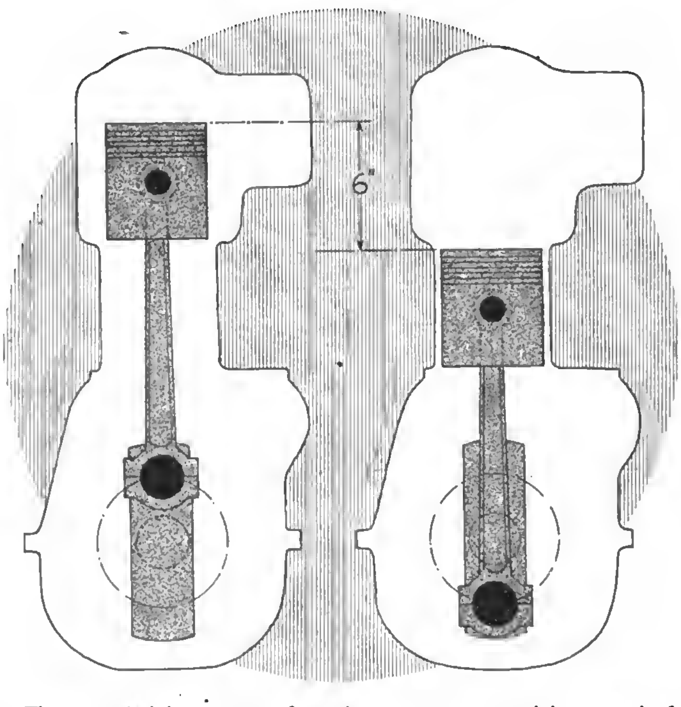
Motor Never Develops Rated Power When Traveling At Speed Permitted By Law

¶ *To be taxed by the state upon a certain piece of property and then to be forbidden to use that article would be impossible. Today in seventeen states the automobile owner is taxed according to the horsepower of his car and is then virtually forbidden to use it because the speed laws of the state will not permit the motor to be driven fast enough to develop the rated horsepower. A piston speed of* 1,000 *feet per minute is assumed in the formula used by the secretaries of state in calculating the horsepower. The average car when traveling fast enough to have* 1,000 *feet per minute of piston speed, would be going* 35 *miles an hour. The driver of that car would be fined.*

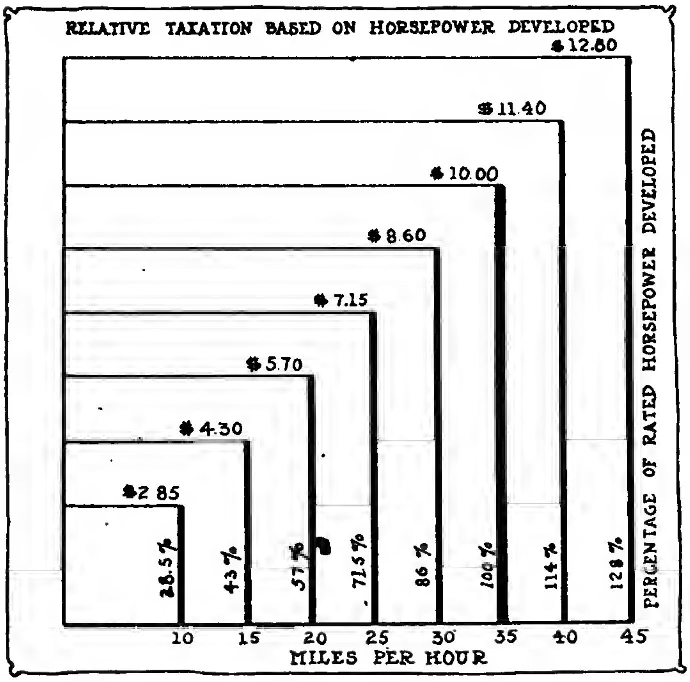
IF automobiles are to pay an annual registration tax based on their rated horsepower, then the horsepower formula used at present in establishing a car's power gives too high a rating, because with our present speed laws it is impossible to make use of the total horsepower given in the rating. This state of affairs is manifestly unfair to the automobilist.

Our speed laws will not permit you to drive fast enough to use it. If you observe the speed limits of the state in which you live you will rarely, if ever, utilize more than 57 per cent. of the horsepower you pay your annual registration upon. In other words, you are paying 43 per cent. too much registration tax. You are paying a tax on horsepower that the laws of the state will not permit you to make use of in average traveling.

Legislators have proceeded on the assumption that road destruction by an automobile is directly in proportion to the horsepower of the machine, but they forget that an automobile motor is capable of generating widely varying amounts of power and that the power generated is in direct proportion to the speed at which the engine works. If the speed of an engine, and by speed we mean the number of revolutions the crankshaft makes per minute, is 100 revolutions per minute, a certain horsepower is generated; double the speed and you will double the horsepower; treble the speed and your horsepower is increased three-fold. This ratio of increase continues until engine speeds of 1,500 revolutions per minute or more are reached, when, with not a few motors, the power fails to keep step with the increase in crankshaft revolutions. Then, in the language of the layman, the horsepower that an automobile consumes in traveling



The accepted horsepower formula presupposes a piston speed of 1,000 feet per minute. A motor with a 6-inch stroke as above, would travel a foot at each revolution—a thousand feet in a minute at 1,000 revolutions per minute



The tax for a 30-horsepower car in New York is $10. The above chart shows the maximum horsepower developed by such a motor at different speeds and what the tax should be if really based on the horsepower at definite speeds. A summons is often served in Greater New York for a speed of 15 miles an hour

along a highway always bears a direct relationship to the engine speed, and when you limit the speed of a vehicle on the highway you place a limit on the engine speed and curtail the amount of horsepower that the engine requires to generate.

In calculating official horsepower in the different states for computing the annual registration tax that an automobilist must pay, a formula familiarly known as the S. A. E. or A. L. A. M. formula is used. This formula has been used for years and has been official in Great Britain for many seasons. That it provides a satisfactory and just means of calculation is vouched for by the fact that several years ago in England a commission of the leading engineers was appointed to re-draft it to meet what were described as modern conditions. This committee, after making official tests of many hundreds of motors and delving generally into the subject, reported that no other method of calculation could be brought out that would meet the requirements and give general satisfaction to all better than the existing one.

This horsepower formula, given in a footnote, is based on two

Speeds at which important cars attain the A.L.A.M. rating based on a piston speed of 1,000 feet per minute. Note how few develop this at the generally illegal rate of 30 miles an hour

Car	Stroke	A.L.A.M. Horse-power	Gear Ratio	Wheel Diam-eter	Feet per Minute, Piston Speed 30 Miles per Hour	Miles per Hour at 1000 Feet Piston Speed
Packard 48	5.5	48.2	3-1	36	770	38.9
Pierce 66	7	60	2.7-1	38	836	35.85
Alco 11-60	5.5	54.1	2.63-1	37	660	45.5
Buick 40	4.5	28.9	3.75-1	36	788	38.1
Cadillac	5.75	32.4	3.5-1	36	940	31.9
Chalmers 18	5.25	43.8	3.75-1	36	920	32.6
Cole 50	5.25	32.4	3.94-1	36	964	31.2
Fiat 56	6	45.95	3.5-1	37	898	33.4
Ford T	4	22.5	3.64-1	30	815	36.8
Hudson 54	5.5	40.9	3.43-1	36	882	34
Hupmobile 32	5.5	16.9	3.86-1	32	1111	27
Locomobile M	5.5	48.6	3.21-1	37	801	37.5
Metz 22	4	22.5	3-1	30	672	44.7
Peerless 37	7	60	2.6-1	38	805	37.3
R.C.H.	5	16.9	4.25-1	32	1108	27.1
Stutz 4	5.5	36.10	3-1	34	816	36.8
White	5.13	22.5	3-1	34	761	39.5
Overland 69	4.5	25.6	3-1	32	708	42.4

motor functions, first, the piston speed in feet per minute, and, second, the diameter of the cylinder. Piston speed must be appreciated to understand the horsepower rating. The diagram on the opening page explains it. It means the lineal distance in feet that each piston travels in a minute of time. With a motor with 6-inch stroke, the piston travels 6 inches plus 6 inches, or 1 foot, in each crankshaft revolution. If the motor is working at 100 revolutions per minute the piston speed is 100 feet per minute; if at 1,000 revolutions per minute then the piston speed is 1,000 feet per minute. If the motor stroke is 5 inches, the lineal piston travel is 10 inches per revolution and 833 feet per minute. In the formula in question the piston speed is assumed to be 1,000 feet per minute and the assumption is that the motor is working at such speed when it generates the horsepower given by the formula.

In seventeen states the rate of taxation is based on the S. A. E. or A. L. A. M. rated horsepower of the motor. According to careful measurements the actual horsepower required for average travel under level road conditions is 25 per cent. of this.

The S. A. E. horsepower is based upon a piston speed of 1,000 feet per minute. At this piston speed the average car would be covering ground at the rate of 35 miles an hour, a rate far in excess of that allowed by law, but nevertheless assumed as a basis of taxation. When traveling at the legal rate of speed, which in the majority of states is 25 miles an hour, the horsepower developed by the motor with wide-open throttle is a little over 70 per cent. of that rated, and the condition of wide-open throttle at this speed is only possible with antiquated cars or in hilly country.

For every revolution of the crankshaft, the piston makes a trip down the length of the stroke and then up the same distance. If the stroke of the motor is 6 inches, the piston travels a foot in each revolution. At a piston speed of 1,000 feet per minute the motor is making 1,000 revolutions per minute.

Tax Based on 30 Miles an Hour

A common practice in touring work is to have the gear reduction between the motor and the rear wheels at a ratio of 3 to 1. While the motor is making 1,000 revolutions the wheels are revolving 333 times. The circumference of a 34-inch wheel measures 8.9 feet. In 333 revolutions it covers a distance of 2,963 feet, or .57 mile—more than a half-mile a minute. This is the speed that the motor tax is based upon—much greater than the speed permitted by law.

The Fiat car has a stroke of 6 inches. At a piston speed of 1,000 feet per minute it travels at the rate of 33 miles an hour. The rated horsepower of the Fiat car is 45.95. In New York state the tax is $15. In Greater New York the owner of the car is liable to be summoned for driving over 15 miles an hour. The greatest horsepower that the motor could develop under any road condition, at this speed, using the S. A. E. rating, is 21. The tax on a 21-horsepower car in New York is $5.

In Vermont this same Fiat car would be taxed to the extent of $45. The legal speed limit on the roads of this state is 25 miles an hour. The maximum horsepower that the Fiat motor could develop at this speed would be 35. This is 10 horsepower less than that rated and is the maximum which could be used by a law-abiding citizen upon the roads of this state. This 10 horsepower, however, is taxed as much as the 35 he may use.

It has frequently been argued that the weight of the car should be taken into consideration in taxing the car. At the automobile races run at Dieppe, France, June 25 and 26, 1912, close observations were made upon the road to note the effect of weight and speed as destructive agents. The road circuit covered 48 miles and was traversed 564 times by cars of various weights. The speed at which these cars traveled averaged close to 60 miles an hour. The following points were noted:

1—The road was left in perfect condition on the straight lengths.

2—Where skidding in axial or lateral direction took place the surface was broken.

3—In cases of wheel slippage due to the use of excess power not absorbed in propulsion owing to insufficient traction, the road surface was cut.

These trials furnished conclusive proof, according to the report of M. Lumet, "That on a perfectly smooth road, the speed, the weight or the power have no destructive effect on the road. On the other hand, however, the ratio of the adhesive weight of the car to the available power of the driving shaft must be such that the car cannot skid. . . . . One should note, however, that the road surface was frayed at the bottom of inclines, just where the speed was changed for the upgrade."

If horsepower does not affect the road, it seems unfair to use it as a basis of taxation. The tax on motor vehicles has for its sole object the recompense of the state for the use of the roads and for the necessary clerical work attached to identification. If horsepower is used as a basis on account of its indirect bearing on road destroying factors, then that actually utilized by the different cars should be studied. In the accompanying table on this page is a list of typical cars and the speeds at which the piston velocity is 1,000 feet per minute. Note how the gear ratio affects this problem, the size of the wheel and the stroke of the motor. For purposes of illustration a column is devoted to the piston speed reached by these motors at a rate of 30 miles an hour. This is the speed permitted by the state of New York in the sparsely populated sections of the state. There are but two cars that attain 1,000 feet per minute piston speed at this rate. It is impossible within the law to make use of the horsepower used as a basis of taxation by the state with a high-powered car.

Present Tax Favors Small Cars

The small cars, like the Hupmobile and R. C. H., are taxed $5 in New York state. They approach the nearest to utilizing the full power at which they are registered. In certain sections of the state where they are permitted to travel at the rate of 30 miles an hour they do attain the high piston speed of 1,000 feet per minute, but what tourist races about the roads through these sections of the state at an average rate of 30 miles an hour? With these small cars, as in the larger models, the motor only reaches the speed used as a tax basis when in low gear.

It has been found from experience that the average speed made by touring parties on fair roads is very close to 18 miles an hour, regardless of the size or weight of the car. This includes the necessary slowing down for bad stretches in the road and for passing through villages. If this were used as the basis, the owner of a six-cylinder Pierce-Arrow car rated by the S. A. E. formula at 60 horsepower would be charged for 24 horsepower instead. The owner of a Ford car would be charged for 9 horsepower.

A situation has recently arisen which has rendered the horsepower basis for taxation a matter which is uppermost in the minds of automobilists as a class. For the past few years the ratio of the stroke of a motor to its bore has steadily been increasing. This year the average stroke-bore ratio for American motors was 1.22 against 1.17 of last year and this advance has been typical of the history of the past 5 years. The increase in the length of the stroke with the bore remaining the same has given an increase in horsepower.

Derivation of A. L. A. M. Formula

The indicated horsepower of a motor is equal to the mean effective pressure, times the piston area, times the piston speed, divided by 33,000 and also divided, in the case of a four-cycle motor by 4. In equation form this is expressed:

$$\text{I.H.P.} = \tfrac{1}{4}\,\frac{P\,A\,S}{33{,}000}$$

In the A.L.A.M. or S.A.E. formula the piston speed is assumed to be 1,000 feet per minute, for area A, we substitute its equivalent .7854 D^2, the pressure P is assumed to be 90 pounds and the mechanical efficiency 75 per cent. bringing in N, the number of cylinders we have

$$\text{B.H.P.} = \frac{90 \times .7854\,D^2 \times 1{,}000 \times N \times .75}{33{,}000 \times 4} = \frac{D^2 N}{2.489}$$

$$\text{or: B.H.P.} = \frac{D^2 N}{2.5}$$

States which tax on horsepower basis and the amounts for different horsepowers. These are based on the A.L.A.M. formula and in many instances the Secretaries of State are thinking of adopting a formula which will give a higher rating

STATE	TAX ON HORSEPOWER RATING				
	10	20	30	40	50
Alabama	7.50	12.50	17.50	20.00	20.00
Connecticut	5.00	10.00	15.00	20.00	25.00
Idaho	5.15	7.50	12.50	20.00	20.00
Illinois	4.00	4.00	6.00	8.00	10.00
Indiana	5.00	7.50	7.50	15.00	15.00
Kentucky	5.00	5.00	10.00	10.00	20.00
Maine	5.00	5.00	10.00	15.00	20.00
Massachusetts	5.20	5.20	10.00	15.00	15.00
Missouri	2.00	3.00	5.00	7.00	8.00
New Hampshire	10.00	15.00	15.00	20.00	25.00
New Jersey	3.00	5.00	5.00	10.00	10.00
New York	5.00	5.00	10.00	15.00	25.00
Oregon	3.00	3.00	5.00	7.50	10.00
Pennsylvania	5.00	10.00	10.00	10.00	15.00
Rhode Island	5.00	5.00	10.00	15.00	25.00
Vermont	10.00	20.00	30.00	40.00	50.00
Virginia	5.00	5.00	10.00	10.00	20.00

The makers of automobile engines have realized the gains made in the horsepower of which the motor is capable and some have come to the conclusion that the A. L. A. M. or S. A. E. formula no longer gives a just rating of their motors since it no longer approximates the maximum power it is possible to get from the motor on the block of the testing laboratory. They have not infrequently expressed themselves as dissatisfied with the formula and have offered tentative suggestions for new ones.

The secretaries of state have noted these remarks and have come to the conclusion in some instances that since the formula seemed to be too low for the maker it must be also too low for taxation purposes.

It must be remembered that the motor upon the block is a different proposition from the motor in the car. Few owners can keep the motor in the condition that it is in when on the blocks of the testing room at the home plant. Little changes of carbureter adjustment, valve timing, tappet clearance, etc., not to mention carbon accumulations, and the numberless other items which enter into the efficiency of the motor, cut down the power output. The S. A. E. formula may fall short of the motor on the blocks, but it is without exception in excess of what the motor is doing on the road.

A car driven over a level road at a rate of 20 miles an hour requires from 5 to 8 horsepower to maintain that speed. Why should the owner of that car be taxed for 30 or more horsepower?

What the automobile user has to contend with in Vermont. Under the most adverse conditions, traveling at the legal rate of speed he falls far short of the rated horsepower which is used as a basis of his taxation

Car	A.L.A.M. Horsepower	Horsepower at Legal Rate of 25 Miles per Hour	Present Tax $1 per A.L.A.M. Horsepower	Tax if Based on Horsepower Developed on Road at Legal Rate
Packard 48	48.2	30.9	$48	$30
Pierce 66	60	41.8	60	41
Alco 11-60	54.1	29.7	54	29
Buick 40	28.9	19.3	28	19
Cadillac	32.4	25.4	32	25
Chalmers 18	43.8	33.6	43	33
Cole 50	32.4	26.1	32	26
Fiat 56	45.95	34.4	45	34
Ford T	22.5	15.25	22	15
Hudson 54	40.9	30.1	40	30
Hupmobile 32	16.9	15.6	16	15
Locomobile M	48.6	32.4	48	32
Metz 22	22.5	12.6	22	12
Peerless 37	60	39.5	60	39
R.C.H.	16.9	15.6	16	15
Stutz 4	36.1	24.0	36	24
White	22.5	14.6	22	14
Overland 69	25.6	13.4	25	13

Who Defends New York Tire-Dating Bill?

No One Claims Responsibility at Hearing—Illinois Also Afflicted with Similar Bill—Much Automobile Legislation in Other States

NEW YORK CITY, March 25—A hearing was given on the tire dating bill at Albany last Thursday before the Senate Committee on Miscellaneous Corporations. Several of the large tire companies sent their representatives and the others were represented by Sidney S. Meyers, Jr., who is acting as counsel for all the large tire companies in the country in fighting this objectionable measure.

In the course of the hearing the tire manufacturers vainly endeavored to ascertain who wanted the bill passed, in what way the bill would better existing conditions in the tire industry and, in a word, why this bill, which was supposedly peacefully laid to rest last March, has been resurrected.

The members of the committee seemed to be absolutely ignorant of the bill on which they were supposed to pass. As to the state of mind of some of the members of the committee, only three out of seven of whom were present, by the way, the following conversation is illuminating:

Mr. Meyers: May I ask, Senator Stilwell, what the real object of this bill is?

Mr. Stilwell: I know nothing about the bill.

Mr. Meyers: May I ask you, Senator Sullivan, what the real object of this bill is?

Mr. Sullivan: You will have to ask the introducer, Mr. Oxford. (Mr. Oxford, it was stated, was then in New York.)

The bill in question was introduced in the Senate on January 20, 1913, by Senator Sullivan, chairman of the above committee, who afterwards gave the bill to Mr. Oxford, to introduce in the Assembly, which was done on February 17, 1913. Thus the statement made by Mr. Sullivan, "You will have to ask the introducer, Mr. Oxford," is an example of the old game "button, button, who has the button?"

Mr. Meyers brought up the point that the bill is unconstitutional because it is class legislation, stating that:

"It provides for the dating of tires for use on motor-propelled vehicles and thus excludes tires for use on buggies, baby carriages and bicycles.

Senator Stilwell distinguished himself by replying as follows:

"You say it takes out a class and puts it on motor vehicles only. Are they not the only dangerous class of vehicles? Baby carriages are not as dangerous as motor vehicles, are they? Let's be sensible men."

Among the numerous remarkable statements made by the members of the committee the following passage, taken from the official record, is exceedingly illuminating in regard to the status of the men who represent the people of the Empire State at Albany:

Mr. Meyers: In order to be fair, you must keep in mind your specific powers.

Mr. Stilwell: We make the law.

Mr. Meyers: But you are not above the Constitution.

Mr. Stilwell: Yes, sir, we make the law.

If the authorities at Albany permit this uncalled-for measure, which will work so much harm to the legitimate tire manufacturers, to be enacted into law it will conclusively prove that something is wrong. The tire companies are putting up a manly, straightforward fight against the passage of the bill, although it seems practically impossible to find anyone who is in favor of the passage of such a measure.

The makers are determined to fight the passage of the bill to the limit and if it is passed over their opposition, they will carry the matter to the courts.

CHICAGO, ILL., March 22—A bill fashioned along the lines of the one that is before the New York solons, which will require that all tires made or offered for sale in the State of Illinois be stamped with the date of manufacture and also dated when repaired, etc., has been offered at Springfield by Senator Manny and referred to the committee on parks and boulevards. The bill is a short one and the interesting part of it says:

> It shall be unlawful, within this state, for any person, firm or corporation to sell, resell, or otherwise dispose of, any tire to be used on any motor vehicle unless the same shall have been properly stamped, clearly and legibly, and in the English language, with a die, and in such manner, designated thereon, the date when such tire was originally manufactured or made, and when, if such be the condition, such tire was repaired, with the date of such repair, and whether the same is a new or second-hand tire, and when or not the same had previously been used, and such tire, when new, shall have a tag pasted thereon, showing the ingredient, composite and component parts thereof.
>
> A fine of not less than $50 and not more than $200 shall be imposed for each offense.

Minnesota has a tire-stamping law, which, however, is not enforced, it being claimed that the authorities recognize that it is unconstitutional. The tire manufacturers, it is understood, have long wanted to make a test case in the Gopher State, but have had no opportunity.

Colorado Gets Highway Commission

DENVER, COL., March 21—Motorists and good roads promoters throughout Colorado are elated over the enactment of a law creating a highway commission and setting aside a fund of $750,000 for the construction and improvement of roads. The bill has been passed by the legislature and signed by Governor Ammons, and contains a clause putting it into effect immediately.

Iowa Insurance Bill Passes One House

DES MOINES, IA., March 22—A bill providing insurance against losses sustained by owners of automobiles in accidents passed the Iowa house of representatives this week. As originally introduced, the bill provided for insurance to indemnify the automobile owner driving his own car against damages he might incur as results of an accident. Before passed, however, the bill was amended so that the person or property injured may have the first right to bring suit against the insurance company, and receive his claim, if just, before the insured shares in the benefits of the policy.

Lippincott for Interstate Licensing

TRENTON, N. J., March 25—Job H. Lippincott, State Motor Vehicle Commissioner of New Jersey, dissatisfied with the results of the reciprocity licensing system as now used in that state, is proposing a system differing very much from all in use at present. At present, while New York and New Jersey have full reciprocity, the number of New York cars touring in New Jersey is very large and Jersey's roads are depreciated without anyone paying for them.

The proposed system of Commissioner Lippincott is claimed to be automatic in regulation and revenue, including as it does but one registration and making interstate travel possible without annoyance or delay.

The foundation of the scheme is an interstate license issued by the state in which the automobilist resides. The license tag is so designed as to denote the state in which the car is owned, and the license is to be charged for proportionately to the horsepower of the machine. The fee is to be assigned to the state in which the car is owned and if the license is to be extended for travel in any other state or states, an additional fee representing a percentage of the home license fee is to be charged for each additional state. It would then be necessary for the motor vehicle office of the home state to notify the state or states, for which extensions have been granted, of the licensing of the car, giving the number, color, etc., of the tag and forwarding to the foreign state a check for the amount paid for the license extension. It would, of course, remain for the state where the extension holds good to suspend or revoke the license. Each state should use all the money received from automobile licensing for road improvements.

Family Licenses for Delaware

WILMINGTON, DEL., March 20—Under a bill passed a few days ago and which went into effect yesterday, when it was signed by Governor Miller, family operators' licenses are now obtainable, at a cost of $8 per annum. Heretofore each operator, no matter how many there were in a family, had to have a separate license at $5 a year.

Ohio Representatives Pass Bills

COLUMBUS, O., March 24—The Hite bill is the most important of a number of bills passed in the Ohio house of representatives last week. It provides for a yearly levy of .5 mill for a period of 10 years for the improvement of the highways. The bill, if enacted into a law, will produce $36,000,000 in 10 years. Of the amount raised by the levy, 25 per cent. is to be used in building the market road system and 75 per cent. in building the system of inter-county roads.

Another bill was passed establishing the Portage plan in Ohio. This provides that any association, concern or individual may subscribe 10 per cent. and the county 90 per cent. toward the improvement of any road.

A bill was passed compelling township trustees to drag every road at least two times yearly with a split-log drag.

Still another bill was passed to take the place of the Garrett law, which had been invalidated by the Supreme Court; the new measure provides that in the improvement of roads abutting property owners may pay 10 per cent., the township 15 per cent., the county 25 per cent. and the state 50 per cent.

Detroit Cars Facing Taxation Scheme

DETROIT, MICH., March 25—Detroiters are fighting the proposed motor car tax law, which seeks to impose a specific state tax on motor cars, rather than a local tax. Mayor Marx and several of the city assessors have recently appeared at Lansing to speak against the bill and have offered facts to show that for the coming year the city will lose about $200,000 in taxes if the bill becomes a law. There are about 8,000 privately owned automobiles in the city and the tax derived therefrom last year amounted to $188,640, based on an average valuation of $1,050 per car.

Only $2 Fee for Federal Officials

WASHINGTON, D. C., March 24—*Special Telegram*—Under the ruling of corporation counsel, members of Congress and executive officers of the federal government who are legal residents of other states, will not be compelled to conform to the new automobile regulation imposing upon non-residents the same fee as is assessed by their home state against district automobilists.

The question arose in connection with the application of Senator Gallinger, of New Hampshire, for a district automobile license. Corporation Counsel Thomas informed H. M. Woodward, secretary of automobile board, that, for the purpose of obtaining a license to use his automobile here, it has been decided that Senator Gallinger is a resident of the District.

In view of this decision the commissioners today approved the recommendation that members of Congress and executive officers of the government, who are required by law to conduct their official business in Washington, be considered resident of the District for the purpose of this regulation. The cost to them for a license will be $2.

The regulation was aimed principally at the Maryland authorities, who have refused to enter into reciprocal arrangements with the District for the use of the roads by automobilists. Under it non-resident applicants for an automobile license are required to pay the same fee as is charged by their state against residents of the District.

Illinois Government Favors Good Roads

CHICAGO, ILL., March 24—That the men at the head of governmental affairs in the State of Illinois are in favor of legislation looking toward a permanent system of good roads in the commonwealth was made plain by William McKinley, speaker of the state legislature, at the good roads dinner held Saturday night under the auspices of the good roads committee of the Chicago Association of Commerce at the Hotel Sherman.

Speaking for Governor Dunne, Speaker McKinley said that while not committing himself as to the relative merits of any of the four or five bills under consideration in the legislature, he was heartily in favor of road improvement in the state. But he was not prepared to say what method to pursue to obtain them. He suggested a campaign of letters to the legislature when the favorite bill came up.

Thirty different organizations of business men throughout the state were represented at the dinner. In addition, the 40,000 clubwomen of the state had their hearing in the person of Mrs. F. W. Blocki, of Chicago. Henry Paulman spoke for the automobilists and Edwin R. Wright, president of the State Federation of Labor, spoke for organized labor in the interest of the use of convicts on road work. The pleas of the rural letter carriers, farmers and truck gardeners and the school teachers in favor of state highway improvement were presented by representatives of their organizations. A plan as outlined in a good roads bill was presented by Richard Finnegan, secretary of the Illinois State Highway Improvement Association and received the indorsement of the meeting.

Truck Club Against McAneny Scheme

NEW YORK CITY, March 20—At the monthly meeting of the Motor Truck Club last night the proposed vehicle taxation measure conceived by Borough President McAneny of Manhattan was discussed. This scheme proposed to tax vehicles according to the load carried by its wheels, the reason given being the destruction of city pavement by automobiles. According to the proposed fee schedule some big trucks would have to pay as much as $1,000 a year. The truck club members recognized that the enactment of the measure would greatly handicap the truck business and the use of trucks in New York, while the conclusion was reached that by specifying a minimum tire width the pavement could be sufficiently protected.

GRAND RAPIDS, MICH., March 25—The Supreme Court of Michigan has held unconstitutional the clause in the state automobile law of 1909, which makes the owner of a motor vehicle liable for any injury occasioned by the negligent operation, by any person, of the owner's automobile. This is a distinct victory for the motorists of the state. This does not affect chauffeurs, who are held to be paid servants of the car owner, who is strictly responsible for such employee's actions while the vehicle is under his control.

Price-Cutting on Patented Article Is Infringement

Decision to That Effect Handed Down in United States Supreme Court of Great Importance

CHICAGO, ILL., March 25—Word was received here from Washington today of a decision, to the effect that a dealer selling patented articles at cut prices anywhere within the jurisdiction of the Circuit Court of Appeals at Chicago is liable for infringement of patent, had been handed down in the United States Supreme Court. This will undoubtedly have a bearing on the future sale of automobile accessories.

Whether the construction of the law now in force in Chicago is to be the law of the entire country hangs on the decision in another case now pending before the supreme court involving a broader question than that in the case decided. This case, which has been advanced for argument April 7, is a suit for infringement of patent brought by a patent medicine manufacturer against a Washington druggist for ignoring the stipulation on the label which states that the nostrum could not be sold for less than a given price. In the lower courts the claims were not allowed and the court of appeals of the District of Columbia has now asked the supreme court for instructions.

The Fair Department Store was made a defendant in the old Circuit Court of Chicago by the Kobler Die & Specialty Co. in a suit for damages because of the sale by The Fair of a gas-beating device which the Kobler company controlled under a patent. The question tried was whether The Fair had violated any law in selling the devices for $1.25 each, whereas the Kohler company manufactured them for sale at $1.50 and attached a notice to each device imposing the condition that the device shall not be sold at less than $1.50.

According to Walter Chamberlin, who took the appeal to the supreme court for the defendant the supreme court has affirmed the decision of the circuit court of appeals that patentees could include in their patent notice a fixed sale of price. Attorney Chamberlin argued that the circuit court went without its jurisdiction in making such a decision, which he held was against public policy, established a monopoly, and was a violation of the Federal Constitution.

The decision of the supreme court in this case is at variance with a decision handed down in the United States district of New York in February when the judge held that patented articles may not be sold at a fixed price.

DETROIT, MICH., March 26—F. R. Bump, assistant general manager of the R-C-H Corporation, has resigned. J. F. Hartz, president of the corporation, will take charge of Mr. Bump's duties for the present.

$450,000 Company to Make Hearses

GRAND RAPIDS, MICH., March 20—The Michigan Hearse & Automobile Co., capitalized at $450,000, was organized here today for the manufacture of motor trucks, with motor hearses a special line, and horse drawn hearses.

The new firm, which is among the first to specialize in the building of motor hearses, is a merger of interests of the Michigan Hearse & Carriage Co., which has been in business here for the past 10 years, and the Grand Rapids Motor Truck Co., manufacturers of 1.5 ton commercial vehicles, which removed to Grand Rapids from Decatur, Ind., about 1 year ago.

The present working forces of forty men at the hearse factory and fifty-five at the truck plant will be at once augmented to 160 men.

INDIANAPOLIS, IND., March 14—At their regular annual meeting, held at the plant in this city, recently, the stockholders of the American Motors Co. re-elected the entire board of directors and the following officials: J. I. Handley, president; D. S. Menasco, vice-president; J. D. Bright, treasurer; V. A. Longaker, chairman of board and general manager.

Automobile Securities Quotations

NO definite trend can be said to have prevailed through the past week, and the number of advances were about equal to that of losses. The principal influence of recent weeks, namely, the Akron strike, having been practically eliminated, the tire stocks regained much of their former strength, Goodyear common advancing 15 points, Goodrich common 4, Fisk common 3 1-2, Miller 5, U. S. Rubber 2 and Swinehart 7. Firestone common, however, dropped 5 points. Among automobile manufacturing securities Chalmers was notable for its advance of 5 points, while Pope dropped 3, Willys-Overland 6, U. S. Motor first preferred 23 and second preferred 35. The comparative tabulation for 1912 and 1913 follows:

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	150	160
Ajax-Grieb Rubber Co., pfd	..	..	95	100
Aluminum Castings, pfd	..	..	95	99
American Locomotive Co., com	38½	39½	34½	35
American Locomotive Co., pfd	107½	108½	104	107
Chalmers Motor Company, com	..	..	120	135
Chalmers Motor Company, pfd	..	..	100	102½
Consolidated Rubber Tire Co., com	12	20	15	20
Consolidated Rubber Tire Co., pfd	30	40	..	79
Firestone Tire & Rubber Co., com	233	236	265	275
Firestone Tire & Rubber Co., pfd	108	110	103	106
Fisk Rubber Co., com	..	..	..	..
Fisk Rubber Co., pfd	..	..	103	106
Garford Company, preferred	..	..	95	100
General Motors Company, com	30	30½	28	33
General Motors Company, pfd	77	77½	76½	77½
B. F. Goodrich Company, com	..	..	31½	32½
B. F. Goodrich Company, pfd	..	..	94	96½
Goodyear Tire & Rubber Co., com	396	400	360	370
Goodyear Tire & Rubber Co., pfd	108	110	102½	103½
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	5	10
International Motor Co., pfd	..	..	35	45
Lozier Motor Company	..	..	..	25
Miller Rubber Company	..	..	180	195
Packard Motor Company	104	107	98	102
Peerless Motor Company	..	..	115	130
Pope Manufacturing Co., com	37	40	17	22
Pope Manufacturing Co., pfd	78	80	62	68
Reo Motor Truck Company	8	10	11½	12½
Reo Motor Car Company	23	25	20½	21½
Rubber Goods Mfg. Co., pfd	100	105	104	106
Studebaker Company, com	..	..	28½	29
Studebaker Company, pfd	..	..	88	93
Swinehart Tire Company	..	..	95	102
U. S. Motor Co., com	..	..	..	8
U. S. Motor Co., 1st pfd	..	..	..	10
U. S. Motor Co., 2nd pfd	..	..	..	30
U. S. Rubber Co., com	52½	53	61½	62
U. S. Rubber Co., 1st pfd	113½	114	104½	105½
White Company, preferred	..	..	103	108
Willys-Overland Co., com	..	..	56	63
Willys-Overland Co., pfd	..	..	90	98

McLaughlin Wins from Grand

WASHINGTON, D. C., March 24—The Interstate Commerce Commission has handed down an opinion in the complaint of the McLaughlin Motor Car Co., Ltd., vs. the Grand Trunk Railway Co., of Canada, *et al.*, in which it is alleged that unjust and unreasonable charges were made for the transportation of automobile parts from Flint, Mich., to Oshawa. The commission found that the rates charged were unreasonable and ordered reparation paid to the complainant. In its opinion the commission said it did not believe that automobile chassis knocked down should be charged as high a rate as that provided for chassis set up or for complete automobiles.

Yale & Towne Company Sues Dealers

NEW YORK CITY, March 25—The Yale & Towne Mfg. Co., of this city, has filed suit against the General Automobile Supply Co. and Smith-Haines, both of this city, for alleged violation of the Yale & Towne trademark. The bill of complaint charges that the defendants in both suits sold locks, stating them to be of the Yale type. Inasmuch as the name Yale is protected legally, the complainant holds that this alleged practice on the part of the defendants is illegal and the Yale company prays for injunctions preventing the defendants from continuing the sale of such locks, as well as an accounting of the business done in these products.

Market Changes of the Week

Tin proved to be the most important change in the markets this week, gaining $.63 per hundred pounds. Under the influence of the better London cables the market here was firm and higher yesterday, but without any great show of activity on the part of operators to either buy or sell, and at the close the market was inactive though firm. A steady business was reported in lead here yesterday on the basis of $4.35 per hundred pounds. Both electrolytic and Lake coppers suffered losses of $.00 1-8 per pound. Beyond a moderately good demand from consumers, there is but little change to note in the copper situation here. Leading sellers claim a steady run of good buying orders, and buying may be viewed as of very fair proportions. Domestic scrap rubber remains in a firm position. A moderate demand continues to be received from reclaimers and fair-sized clearances are still noted to various foreign countries. Collections are reported to be light and stocks are comparatively rather light. Automobile tire scrap rubber is calling at $.09 7-8 per pound. Cottonseed oil rose $.05. The oil market has shown so much firmness of late that some of the traders thought it about time for a moderate reaction and were afraid to pursue the buying side any further.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.	.07⅝	.07⅝	.07⅝	.07⅝	.07⅝	.07⅝	....
Beams & Channels, per 100 lbs.	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Copper, Elec., lb.	.14⅞	.14¾	.14¾	.14⅞	.14⅞	.14¾	—.00⅛
Copper, Lake, lb.	.15	.14⅞	.14⅞	.14⅞	.14⅞	.14⅞	—.00⅛
Cottonseed Oil, bbl.	6.37	6.40	6.38	6.38	6.40	6.42	+.05
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil, Menhaden, Brown	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 gals.	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime	.90	.90	.90	.90	.93	.93	+.03
Lead, 100 lb.	4.35	4.35	4.35	4.35	4.35	4.35	....
Linseed Oil	.47	.47	.47	.47	.47	.47	....
Open-Hearth Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Petroleum, bbl., Kansas crude	.88	.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa., crude	2.50	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	....
Silk, raw Italy	....	4.30	....	....	4.30	4.35	+.05
Silk, raw Japan	....	3.70	....	....	3.70	3.70	....
Sulphuric Acid, 60 Baumé	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb.	46.00	46.13	46.13	46.20	46.22	46.63	+.63
Tire Scrap	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	....

Trunk and Fisk from Thropp

CHICOPEE FALLS, MASS., March 26—Justice Hale in the U. S. Court of Appeals, First District, a few days ago affirmed the decision of the district court declaring the patent No. 822,561 issued June 6, 1906 to P. D. Thropp, void and invalid, on the grounds of anticipation. The De Laski & Thropp Circular Woven Tire Co. thus lost to the Fisk Rubber Co., of this city, whom they had sued for infringement of the above-mentioned patent during the past 4 years.

The patent covers the form of mold used in the making of Fisk one-cure, wrapped-tread tire casings.

Buick Sues Père Marquette on Rates

WASHINGTON, D. C., March 24—The Buick Motor Car Co., Flint, Mich., has filed complaint with the Interstate Commerce Commission against the Père Marquette Railroad Co., charging the imposition of unjust and unreasonable rates from Flint, Mich., to Richwood, O. The complaint charges that rates fixed by defendant company on automobile shipments from Flint to Richwood are in excess of those charged to Dayton from Flint on the same road and further by 70 miles than to Richwood. It is alleged that competing lines charge 40 cents less on the hundred on automobiles for similar distances. Reparation to the sum of $53.30 is asked.

Merger of Flanders and Maxwell Completed

Detroit, Dayton and Tarrytown Plants of the Organization Rapidly Resuming Capacity Production

DETROIT, MICH., March 25—As a final action in the merger of the Flanders Motor Co. of this city, with the Maxwell Motor Co., Inc., the holders of stock in the former were last week given shares in the parent concern on the basis of about half a share of Maxwell preferred stock, and one each of second preferred and of common stock for each share of Flanders stock.

Following the usual procedure in such negotiations, the books of the Flanders company were completely gone over and audited and the plant and stock inventoried before the formal transfer was made, which accounts for the delay. All Flanders liabilities are assumed by the Maxwell Motor Co., and all its indebtedness squared away.

The plants here, namely the Flanders, Brush and Alden Sampson plants, are not operating to capacity yet but men are being taken on as rapidly as possible and before long some 9,000 men will be employed. The Dayton, O., plant where Stoddard-Daytons were formerly made and the Tarrytown, N. Y., factory, old home of the original Maxwells, are also taking on many employees and settling down to serious business.

Chandler Buys Factory Site

CLEVELAND, O., March 25—The Chandler Motor Co., of this city, closed a deal yesterday with the Belt & Terminal Realty Co., for 6 acres of land on the Belt line of railroad for a factory site. The ground is located at St. Clair and 131st streets. The company is already pushing plans ahead to erect a concrete and steel fireproof factory which will be completed by July 1. This factory will be 120 by 420 feet. The company is making rapid progress with its Chandler light six on which shipments will begin July 1. Already distributors have contracted for a large portion of the first year's output and indications are favorable for an encouraging reception of the new car by the country at large.

Dunlop Company to Double Capital

TORONTO, ONT., March 22—The Dunlop Tire & Rubber Goods Co. is to double its preferred capital, and with this object in view they will issue $300,000 worth of preferred shares. In addition to the $293,000 preferred stock now paid up (7,000 shares of the original issue authorized having been cancelled) there are outstanding $700,000 and $500,000 in bonds. It is the intention to apply later to the Montreal and Toronto Exchanges to have the entire preferred listed. The operations of the company embrace the whole of Canada, branches having been establishd in no less than eleven of the leading cities. Since 1905 the sales have increased from $369,362 until last year they reached an aggregate of $2,310,585. For 14 years a dividend of 7 per cent. per annum has been paid semi-annually on the preferred stock, the total distribution in this way reaching $285,520.86.

Batavia Issues $100,000 in Stock

NEW YORK CITY, March 24—The Batavia Rubber Co., Batavia, N. Y., capitalized at $500,000, is issuing $100,000 worth of 6 per cent. preferred stock, the total stock of that class amounting to $250,000. The company has a surplus of $62,754. The added capital is needed for expansion purposes.

Finnegan Buys Bulk of Thomas Company Property

Total Realized at Auction from Thomas Assets Was $256,400—Finnegan May Manufacture Cars

A. A. A. Opens Washington Branch—New York Stoddard Dealers Bankrupt—Grand Palais Dilapidated

BUFFALO, N. Y., March 22—This afternoon at 5 o'clock auctioneer Conant disposed of the last article in the auction of the property and stock-in-trade of the E. R. Thomas Motor Car Co., 1192 Niagara street. The sale opened Monday, March 17. About 400 bidders were in attendance on each day but the bidding on the articles was not exceptionally heavy, although the entire sale brought good returns.

Fifteen of the Thomas cars went at $1,900 each. These and most of the other articles were bought by Mr. Finnegan of Depew. Although the price officially bid and paid for lot one of the Thomas stock by Mr. Finnegan, was $51,000, he paid $5,360 additional for other machinery, working tools, lathes and other material not included in the first lot.

Immediately after the sale, Mr. Finnegan, who is president of the Empire Smelting Co., and who previously had purchased the patents, patterns and stock-in-trade of the Thomas factory including machinery, tools, lathes and other articles, stated to THE AUTOMOBILE representative that he would carry along the Thomas product in much the same manner as did the Thomas officials. This led to the belief that Mr. Finnegan, who formerly headed a motor car company in Louisville, Ky., is about to make a second incorporation in the automobile field but for the present Mr. Finnegan prefers not to discuss his plans for the immediate future. However, he hinted that he was about to manufacture automobiles but where he would not say.

Mr. Finnegan also bought the famous New York to Paris racer for $200. The famous New York-Paris trophy, also bought by Mr. Finnegan, brought $300, or $100 more than the racer that won it.

Lot No. 2 of the assets of the Thomas Motor Car Co. was disposed of for $6,000 to the Shiffman Iron & Metal Co., Detroit, Mich.

The entire receipts from the sale of the Thomas assets aggregated $256,400, divided as follows: Monday, $84,500; Tuesday, $17,400; Wednesday, $72,200; Thursday, $49,300; Friday, $11,300; Saturday, $21,767. About 2,000 persons attended the sale during the 6 days. Registered for the sale from the various states were the following number of men: New York State (outside of Buffalo), thirty-six; Michigan, seven; Pennsylvania, twenty-nine; Indiana, six; Missouri, four; Rhode Island, three; Illinois, eleven; Maryland, one; Montana, one; Delaware, one; Minnesota, four; England, six; New Jersey, four; Kansas, one; Ohio, eighteen; Maine, one; Connecticut, four; Massachusetts, nine.

Post Office Bids to Open Next Week

WASHINGTON, D. C., March 24—(*Special Telegram*)—About April 1 the officials of the post office department will call for bids for furnishing the service for carrying mails in various Eastern cities. Regarding the use of motor vehicles the call for bids will say:

Proposals to perform service in any of the routes named in automobiles, of such style and construction as may be acceptable to the second assistant postmaster general, instead of in wagons drawn by horses, will be received. Each proposal must be accompanied with statement giving description of motor vehicle it is proposed to use, with horsepower of engine and speed per hour that will be made.

In the event of a proposal for automobile service being accepted, the department reserves the rigbt to rearrange the schedules shown in the advertisement for route, and to change the running time, so as to provide schedules better adapted to the more expeditious mode of transportation.

The department reserves the right to reject any or all of such proposals.

In New York the call will be for eighty motor [illegible] capable of carrying 6,000 pounds and twenty motor vehicles [illegible] each 3,000 pounds. The post office department will answer all inquiries about the proposed service.

A. A. A. to Open Washington Branch

NEW YORK CITY, March 25—The American Automobile Association will open branch headquarters in the Riggs Building, Washington, D. C., April 1. This move has been contemplated by the executive board for several months, in fact, since the movement for national construction and maintenance of highways took definite form. It is the intention of A. G. Batchelder, chairman of the executive board, to spend approximately one-half of each week at this branch.

Next Week Busy One for S. A. E.

NEW YORK CITY, March 26—During the coming week the Society Automobile Engineers will conduct a considerable amount of business. On April 1, during the morning the council meeting of the society will be held at the headquarters of the Metropolitan section, 1784 Broadway, while in the afternoon the fuel committee will hold a meeting to outline its work which is to be done in co-operation with the Automobile Chamber of Commerce. On the following day the wheel standardization committee will meet in New York to take up the work that was begun at Cleveland this month.

NEW YORK CITY, March 21—The Stoddard Motor Co., of this city, which formerly handled Stoddard-Dayton products for the old U. S. Motor Co., has been declared a voluntary bankrupt. The liabilities, aggregating $253,338, are all due to the Maxwell Motor Co., Inc., and the assets are $66,988. The Maxwell company has decided to take the distribution of its products in its own hands.

PARIS, FRANCE, March 19—The Grand Palais, where the salon of motor cars is held annually, is said to be in a very shaky condition. The various floors creak and the weakness of the construction became more pronounced by the flood several years ago. Since then $160,000 was estimated by a commission to be needed to put the building in shape, but nothing has been done.

English Motor Experts Organize

NEW YORK CITY, March 25—According to a London, Eng., dispatch, there has been organized in that city, the London Chamber of Motor Experts, an organization of automobile specialists formed for the purpose of inspecting and passing on many inventions intended for the automobile field. It is the purpose of the organization to charge a nominal fee for the examination of patents and the conducting of tests with various apparatus, etc.

LONDON, March 14—In July, under the presidency of Prince Arthur of Connaught, an Imperial motor transport conference

Detroit To Pay Higher Freight for Better Service

will take place in this city. All the recognized bodies connected with the manufacture and use of motor vehicles as well as other engineering experts connected with the Dominions and Colonies are represented on the executive committee. Not only will the conference devote its attention to the business of touring motor cars, but also to the whole problem of the transport of motor vehicles whether for pleasure or industrial purposes. As far as arrangements have gone, it is anticipated that Prince Arthur of Connaught will receive the delegates on Friday, July 18, and that on the following day, the Industrial Motor Vehicle Exhibition which will be opened at Olympia will be visited. On the following Monday and Wednesday further meetings of the conference will take place and the final meeting will be held on Saturday, July 26.

Canada Get 468 Cars in January

WASHINGTON, D. C., March 24—During January, 1913, of the 2,157 automobiles which were exported to foreign countries from the United States, Canada got 468, the total value of which was $593,700. British Oceania came next witht 403 machines imported of a total value of $386,833, and the United Kingdom next with a total of 374 to the value of $258,463. Then came South America, importing 351 machines of a total value of $393,079, Asia and other Oceania, 193 of a total value of $182,600 and the rest following in this order:

France, West Indies and Bermuda, Europe, other than the countries listed; Mexico, Germany, Italy. All other countries took a total of ninety-three machines of a value of $103,118.

During January the United States imported seventy-one machines of a total value of $174,689, as against January, 1912, when it imported eighty-four machines of a total value of $199,197. Of the machines imported, twenty-four came from France, twenty-one from Germany, ten from Italy, eight from the United Kingdom and eight from all other countries.

Wants Cole Stock Returned to Him

INDIANAPOLIS, IND., March 24—Lee Watson, of Texas, has hrought suit in the local courts against J. J. Cole, S. J. Kuqua and J. Frank Morrison asking that a transfer of 165 shares of stock in the Cole Motor Car Co. made to them in September, 1910, be set aside. He also asks that he be allowed hack dividends and that the court fix the price he shall pay for the stock he sold.

In his complaint, Watson alleges he sold the stock for $17,500 as the result of misrepresentations of conditions.

Columbus Buggy Still Tied Up

COLUMBUS, O., March 24—A proposition made by F. R. Huntington, a hanker of this city, to pay 35 cents on the dollar for the elaims against the Columbus Buggy Co., now in the hands of the receiver, has been refused.

Another plan to pay the creditors 66.6 cents on the dollar is being worked out hy the creditors' committee and will prohahly be announced within a short time. In the meantime the large plant of the concern on Duhlin avenue is practically idle.

YORK, PA., March 22—All records for attendance were broken during the first week of Harrisburg's fourth annual automobile show last week. The exhihition is the most complete ever held by the Harrisburg Automobile Dealers' Association and exhibitors report having done much business during the first week of the show.

City's Shipping Facilities Inadequate—Railroad Men To Confer with Detroit Manufacturers

Canada Ranks First in Importing American-Made Cars During January—Columbus Buggy Plan Fails

DETROIT, MICH., March 22—Freight traffic managers and other railroad officials who are in convention in this city this week made it clear to Detroit manufacturers and other shippers that in order to accede to the demands for increased railway terminal facilities and quicker and better service in the transportation of package freight and carload lots the only possible means was hy the increasing of the existing freight rates. The present charges are so low in view of the large increase in cost of transportation that Detroit cannot expect any hetter service until they are put on a proportionate hasis. Before long a proposal will be made to Detroit manufacturers by those railroads which have been investigating the conditions here.

Paul Wadsworth, general traffic manager of the Delaware & Hudson, in his talk before those gathered at a banquet tendered the visiting railroad officials by the Board of Commerce admitted the inadequacy of the city's shipping facilities, and showed that while the railroads are able to cope with the situation of certain periods of the year, they are unahle to meet the vastly greater requirements of other seasons. This is largely due to the plan of the many automobile factories of bringing out new models for spring delivery and being less active during the early fall and winter months. Terminals to handle the enormous business of these busy seasons would mean a large investment, and at the same time they would not be used at the slack times.

Co-Operation with Railroads Urged

Railroads are operating at a very close margin of profit, according to the Delaware & Hudson official. During the last 5 years, money has not heen very easy to ohtain for improvements of equipment and in further touching upon the financial side of the railroads' problem stated that most loans had to be on short time paper, that of long terms meaning a high rate of interest and a permanent tax upon the property. Many of the roads have reduced their dividends and thus damaged their credit in the borrowing market. Detroit shippers were urged to cooperate in every way possihle with the roads, who are no less interested in efficient and quick service than are the former.

Another speaker showed that the roads are further harassed by their employees on all sides demanding higher pay.

Last summer, automobile manufacturers were compelled to store their finished cars in tents and other temporary quarters owing to the freight car famine. Detroiters contend that the least the railroads can do is to take as good care of this city's shippers as they do of those in other cities. The lack of foresight in the rapid growth of Detroit in the past few years was given as the chief reason for the present inadequacies of shipping.

The contemplated increases mean only one thing—that the car buyer will have to pay the piper. Automobile makers do not pay the freight on the cars which are sold by their agents and therein lies the time-worn reversion to the pocket of the ultimate consumer. Increased freight rates will also mean an increased cost to the buyer of parts in other cities—this will favor Detroit in that it will cause makers in other localities who depend upon Detroit-made parts to think of getting closer to their supplies.

General view in Grand Hall, showing the uniform stand decoration, which was also a feature of the passenger vehicle show

Six New Types at Boston Truck Show

BOSTON, MASS., March 24—The annual exhibition of commercial motor vehicles which opened in this city a week ago and closed here tonight has proved to be one of the best yet held by the Boston dealers because of the amount of retail sales made and the general interest engendered in motor trucks by the exhibition. The attendance was not large but the amount of business done was large in proportion to the numbers attending. The entire New England territory was well represented and many of the sales made were to outside Boston purchasers.

With a total of fifty-four exhibitors, the show numerically takes third place in comparison to the Chicago and New York truck shows as Chicago had seventy-six exhibitors and New York sixty-six. The Boston list of exhibitors included practically all of the big concerns with the exception of two or three which were left out because of lack of room to suit them or for other reasons. The list shows forty-eight makers of gasoline machines, six electric machine representatives and one maker of steam cars, this being the first truck show at which the Stanley steam trucks have been displayed.

The Boston show had its quota of new trucks not seen at either New York or Chicago, this list including the front-wheel drive Eldridge electrics made in various load capacities; the new Edison electric made in Lawrence, Mass.; the Sowers gasoline truck built in Boston, and the Victor built in Buffalo. The Eldridge vehicles all use the Couple-Gear wheels which incorporate an electric motor in each. These wheels are mounted in front and permit of the use of large diameter artillery wood wheels with metal tires in the rear. The rear wheels vary in size, depending on the load carried but approach 72 inches in diameter and carry steel tires 4 inches wide and 1 inch thick.

Little can be said of the trucks exhibited so far as chassis details are concerned. Each show, however, has its own peculiar styles of bodies and so important are these becoming that the more interesting types will be reviewed herewith. One novel body was that of a large Tarvia spreader on a 6.5-ton Alco chassis. The body is a tank wagon style and has provision for heating the tarvia inside the tank from a steam road roller.

A type of body local to Boston is that of the furniture-moving companies which is not of the inclosed van type but of the open express style. These bodies approximate 13.5 feet in length, are 5 feet wide and the sides are 2 feet high.

Among the concerns exhibiting bodies of this type were Packard. Kelly, Knox, Atterbury, Lauth-Juergens and others.

The Packard company exhibited an interesting ice-cream body for a Boston house. The body is made with a front compartment and a rear compartment separated by an aisle extending crosswise between them. The front compartment measures 4 feet, 2 inches long, and 4 feet, 4 inches wide; the rear compartment is 3 feet, 6 inches long and 4 feet, 4 inches wide; between the two is the aisle, 25 inches wide, reached by a step.

The Peerless exhibit contained a sight-seeing car with capacity for forty people. It has been built for use in Porto Rico, where it will operate on schedule over a route 120 miles across the island, making the trip in one direction each day. It resembles open trolley-car construction rather than the conventional sight-seeing style. There are five cross-seats, which should accommodate six persons each. At the rear are two short longitudinal seats with baggage space between them. Entrance is by means of two steps at each side, these extending the entire length of the seating portion of the vehicle. These steps fold in when the vehicle is traveling. The total weight is 8,500 pounds, and the speed 12 miles per hour. The body is built on a 3-ton chassis which has a motor with four cylinders each 4.5 by 6.5 inches bore and stroke. There are four of these vehicles at present operating in Porto Rico and two more are being shipped.

Unconventional delivery wagon of General Vehicle Co.

The various exhibit spaces showed bodies intended for a variety of uses. Naturally dumping types for coal and building construction trades were in great numbers. They were shown by White, Packard, Peerless, Pierce, Locomobile, Velie and some others. Peerless shows two types, one in which a rack-and-pinion method of dumping is used and the other in which the front end of the body is elevated by means of two vertical chains passing over upper and lower sprockets. There are many examples of special bodies for such concerns as bakers, furriers, confectionery houses and other concerns using vehicles of 1,500 pounds capacity and over. The White company showed one body for a confectionery house in which a metal interior is used. Provisions are included for a series of adjustable shelves, there being three of these, extending from end to end of the body, thereby increasing its useful floorspace four-fold. Other concerns exhibited bodies showing a variety of good decorative designs. One of these was an Autocar sold to a Boston furrier. Practically three-quarters of each side is given over to a drawing of a polar bear, very suggestive of the trade in which the vehicle operates.

Of the new vehicles, the largest exhibit was that of the Eldridge Mfg. Co., Boston Mass., building front-wheel-drive electrics, and electric tractors with three and four wheels. One of the vehicles exhibited was a 5-ton Watson stone wagon in which the floor is hinged at each side and opens downward to unload. This wagon is fitted to take removable batteries so that two batteries can be used in the same day. The vehicle has a speed of 6 miles per hour. The rear wheels are 56 inches in diameter and are shod with 4-inch steel tires. On the 5-ton coal wagon the rear tires are 68 by 4-inch steel bands 1.25 inches thick. Another vehicle is the cart especially designed for alley use in Boston. It is a three-wheeled vehicle with a driving wheel in front, and a metal dumping body mounted between the two large steel-tired rear wheels. The vehicle has a 2-ton capacity and is especially intended for maneuvering in cramped quarters where it is impossible to use a standard vehicle. It has a mileage radius of 25 per charge of battery and is set to operate at 6 miles to the hour.

The Eldridge tractor was shown connected to a trailer for the lumber trade. It is a four-wheel design carrying its own battery and has a fifth wheel for supporting the forward end of the trailer. Its load is 5 to 7 tons and its speed is 8 miles per hour.

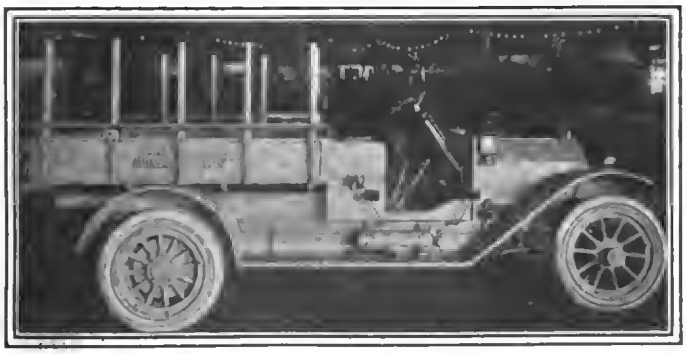
The Edison electric truck is built by the Edison Electric Vehicle Co. of America, Lawrence, Mass., and is made in 1,000 2,000 and 3,000 pound sizes. All of these are built with side chain or shaft and worm-gear drive. They carry Edison batteries and use General Electric or Westinghouse motors. The 1,000-pound vehicle has a speed of 12 miles per hour, and a mileage radius of 55. It uses 34 by 2.5-inch solid rubber tires all around. The load-carrying space measures 3 feet 6 inches wide and is 6 feet long. This delivery vehicle is designed for such trades as grocers, butchers, bakers, laundries and department stores. The 2,000-pound wagon has a mileage of 60 per battery charge, and a speed of 4 to 12 miles per hour. It has four forward speeds and three reverse. The 3,000-pound vehicle is suitable for express work and industries needing this capacity.

Dumping gear of coal wagon on Velie chassis

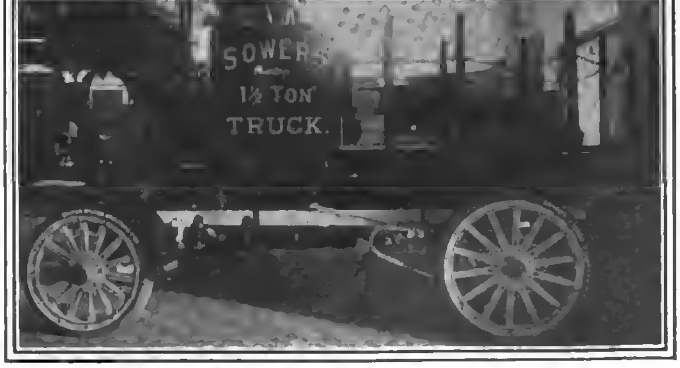
It has a speed of 10 to 12 miles per hour, and a battery range of 50 miles. The chassis measures overall 154 inches and the loading space is 44 by 105 inches. Axles are either Timken or Standard. The David Brown worm and wheel are used when shaft drive is fitted.

The 3,000-pound Sowers truck is manufactured by the Sowers Motor Truck, of Boston. It is a conventional motor-under-the-seat type with three-speed gearset, combined jackshaft and differential and side-chain drive. The vehicle has a loading space 10 feet 6 inches long and 5 feet wide. The wheelbase measures 110 inches and its maximum speed is 16 miles per hour. The front and rear tires are 36 by 3.5 and 40 by 4. The motor is a four-cylinder Wisconsin type with 3.75-inch bore and 5-inch stroke. The cylinders are cast in block and have inclosed valve parts Other motor features are Bosch magneto, Schebler carbureter the thermo-syphon cooling. The gearset is selective. Steering wheel and control levers are on the right side. The company expects to market soon a 2-ton vehicle with the motor under the hood, with the steering wheel on the left side, with levers in the center, and a wheelbase of 136 inches.

A truck not seen at New York or Chicago shows, but one which was placed on the market last fall and which was exhibited is the Marmon. This is a 1,500-2,000-pound delivery wagon set to operate at 20 miles per hour. It is largely fashioned after the four-cylinder Marmon passenger car chassis and has the motor under a forward hood and uses shaft drive. The rear tires are double pneumatics. The wagon is fitted with a self-starter and has right side steeling and control.



Marmon truck has double pneumatics on rear wheels



Boston built Sowers truck of 1.5 ton capacity

French Press, No Longer Indifferent to American Design, Dissects a Small Mechanical Detail—The Fag End of Mechanical Efficiency—Experimental Iron-Tired Wheels—Mission of the Worm Drive—Memorandum of Recent Technical Treatises

CRITICISM of American Drive-Shaft Construction.—Disquieted by the ability of American manufacturers to sell automobiles which please the public at a lower price than European makers are compelled to ask, members of the technical press in the three principal industrial countries of the old world are at pains to point out flaws in those details of design where a cost reduction has been effected through a simplification of the current European practice. As this new attitude represents a great improvement upon the position previously taken, which consisted in a general denouncement of American workmanship and a sneer at mass-production methods—as if these methods were incapable of development in the direction of accuracy in the results—an example may be quoted of the more definite criticism now coming into vogue. The subject is a drive-shaft construction which was shown in an American car exhibited at the last Paris salon and which is not without a parallel in other American cars.

The construction is shown diagrammatically in Fig. 1, and its details are referred to as follows:

"The transmission has a single universal and the rear axle is oscillating. The drive-shaft is inclosed in a tube constituting both torsion rod and driving-strut. But this tube does not terminate either in a hinged fork stay or in a ball-and-socket joint—pieces which are expensive to produce. To its end there is secured a lever AD which is fixed at D and cannot turn around this point, with the result that the angle ADQ is invariable. This lever is journaled at A to a rod AB which at its front end is journaled to the side of the gearbox and transmits both push and reaction. It is placed at an angle which makes its prolongation pass through O, the point of contact of the vehicle wheel with the ground. In the mind of the designer, what should take place is this: The reaction due to the application of motor power gives rise to a force y which is applied at the point D, at the spot where the drive-shaft revolves in a ball-bearing mounted in the tube, and acts in a vertical upward direction. On the other hand, the driving-push, transmitted from the driving-wheels through the tube, may be represented as a horizontal force Z_1 and applied at A, and it can be resolved into the two forces m and t_1. If the dimensions of the parts AD and AB are suitably chosen, y and t_1 can be made equal and opposite, so that one offsets the other, and there remains then only the force m which works in the direction of the rod AB exerting a simple compression stress upon it. An expensive piece of machinery, a fork or socket joint, has thus been replaced by a simple rod of negligible cost and by a lever which is riveted to the tube and also inexpensive. The solution is seductive.

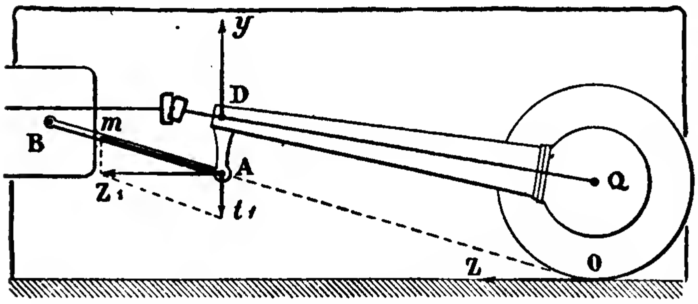


Fig. 1—Diagram of construction denounced by French critic

"If the force of the driving-push is changed through operation of the motor or the gears, the reactions vary in the same manner, and it may be expected that the forces m and t_1 will always offset one another. And, if the brakes are applied, the reaction y changes direction, acting now vertically downward, but at the same time the driving-push is changed into traction, so that its direction is similarly reversed, and one may still hope that the two forces will be mutually compensated."

Having thus represented the presumable reasoning of the designer, the critic proceeds to show by a mathematical development of the subject that m and t_1 cannot balance against one another unless the rod AB is infinitely short in comparison with DQ, and this would be the construction corresponding to a fork or socket joint; also that the resultant of these two reactions is an upward thrust which has to be absorbed in the universal and the rear bearing of the gearbox to the detriment of these parts, and that this thrust is greater, other things equal, the more the direction of the drive-shaft departs from the horizontal.

As might be expected, the critic is able to show that a still much greater discrepancy between the two reactions arises when the brakes are applied. Comparing with recent French construction [as in Peugeot racing and other cars] which also tends toward simplification, he suggests that the American construction which divides the stresses between the rod AB and the universal is certainly inferior to the method consisting in absorbing the driving-push in the vehicle springs and the motor torque partly in the torsion tube and partly in the universal. By the latter method the movements of the rear axle are at least not hindered, as the critic believes he has shown mathematically that they are in the American construction, and do not create unnecessary additional stresses upon the universal or the bearings and other organs.

The critic shows further that all one-sided movements of the rear axle and wheels tend to deform the drive-shaft, the rod AB or the lever AD, and that either these parts—particularly the rod AB and the shaft—will be deformed or else the one-sided movements will be effectually resisted, the running qualities and the durability of the vehicles being impaired in either case. The construction is therefore to be completely rejected, he concludes.—From *Technique Automobile et Aérienne*, February 15.

[The careful reader will not fail to notice that it is essentially a man of straw whom the critic has transfixed with his lance, partly because a construction exactly like the one described by him is not common among American automobiles and partly because its merits and demerits depend largely upon other features in the construction of the vehicle—the degree of flexibility of the frame and its cross-members, for example; also upon the nature of the spring suspension and the relative dimensions of the drive shaft, the rod AB, the torsion tube and the universal. The work of an automobile is such that without some compromise relating to the possible relative movements of its parts—based on an indeterminate flexibility here and there—there would not be any automobiles built today that the general public could afford to buy. If an objection can be taken to a compromise construction mainly dictated by a desire for reducing the cost of manufacture and the selling price, a stronger objection might with equal right be raised against the general tendency among French manufacturers to save a little expense for fuel by equipping cars with very small high-speed motors with high compression, whose average work in average service must be a good deal harder for the material put into them than similar work is for the larger motors used in the small American cars. In both cases there is a question of saving involved, and it seems to be a question of general judgment and experience whether in either case the saving is actually effected or is bought too dearly.—Ed.]

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TWO Aspects of Efficiency.—Usually the efficiency percentage of a motor or of a mechanical movement is looked upon and estimated from the wrong end. If one mechanism is found by test to have an efficiency of 96 per cent., and another has 92 per cent., there is a tendency to consider the difference as unimportant. The latter is only one-twenty-fourth less efficient than the former, it is said. If the relations are as 80 and 90, the difference is considered greater than in the first case. Yet it is only with reference to the power requirements that this view holds good. When wear and durability are concerned, efficiency should be measured backward from the 100 per cent. An efficiency of 96 means 4 per cent. of waste, while one of 92 means 8 per cent. of waste in one form or another. The waste means generation of friction and usually a corresponding amount of wear and deterioration. To begin with, the first mechanism is then in operative perfectionment twice as efficient as the other, and, as wear advances in a geometric progression, as a rule, the difference in the degrees of efficiency of the two mechanisms under comparison will soon be still much greater under the same amount of work; that is, one will prove much less durable than the other. A case in point is the enormously enhanced serviceability that is obtained from ball-bearings by the minutest attention to accuracy and finish, although the nominal initial efficiency may be raised only 1 per cent. by the extra work and care.

On the same principle, an 80-per cent. efficiency is twice as good as a 70-per cent. efficiency, so far as any consideration of practical importance is concerned, excepting that relating to the required power, and in the case of a mechanical device, where thermal efficiency in the utilization of expanding gases is not in question and where the majority of the wasted power finds expression in wear, one of 70 per cent. efficiency will usually be found to be worth much less than one-half, from the standpoint of the investor who wants value for his money, than another mechanism serving the same purpose and reaching an efficiency of 80 per cent. Hydraulic transmissions may constitute an exception, in so far as some waste heat in them may be disposed of by radiation without causing wear of the working parts.

This important and neglected viewpoint has recently been justly emphasized in connection with tests of worm gears for automobiles made at the Lanchester works in England.

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STATUS of the Worm-Gear Drive—Some variations in the current reports concerning the properties and peculiarities of worm-gear drives for automobiles are accounted for by F. Carlès in a review of automobile mechanics. With regard to silent operation, he says, the worm gives complete satisfaction. In a properly established worm-drive, silence is obtained at once and continues so long as the gear lasts. Wear of the parts does not affect it, and this is perfectly natural, since there is no interruption in the contact between driving and driven members; scarcely even at a reversal of the direction. There are cars in England which have run 60,000 miles and are as silent as at the start. But while the silence is not affected by the wear, the efficiency is.

On this subject of the efficiency of the worm drive a great deal has been printed during the past 2 or 3 years. From some tests made by the Oerlikon company of Switzerland it seemed reasonable to infer that the efficiency of the worm-drive was at least equal to that of the bevel-gear drive, and this inference was presented to the world, somewhat hastily. The tests gave an efficiency of 97.5 per cent. for a worm with five threads acting on a bronze wheel with 68 teeth. The motor used was operated at 780 revolutions per minute. In a Glaenzer worm-drive acting upon a wheel with roller teeth the average efficiency was found to be 93 per cent. With some optimism, it was then possible to suppose that the worm was slightly superior to the bevel-gear, which under the most favorable conditions gives an efficiency from 90 to 95 per cent. On the other hand, a table compiled from data furnished by manufacturers shows that the efficiency of the worm-drive in automobile practice is lower than that of the bevel gear except at high motor speeds, such as from 1200 to 1800 revolutions per minute. At the low speeds it even drops to an average of 70 per cent. This difference between a maximum of more than 97 per cent. at some tests to 70 per cent. under certain practical conditions may be reconciled by assuming that the efficiency is first of all a function of the gear-reduction in the drive, and this reduction can never be the most favorable in automobiles on account of the need of having the gear reversible, for which purpose the thread of the worm must have a pitch of about 45 degrees. This cannot be be varied materially, and it seems to be the upshot of the data that with this pitch the efficiency drops rapidly when the speed of the worm shaft is reduced.

The worm drive has however important advantages relating to lubrication and wear. Owing to the relatively large surfaces which are in contact, the driving pressure per square millimeter is much smaller than in a bevel-gear drive. Consequently the oil is not so readily driven out from between the working surfaces, and the wear is reduced to much less than it would be supposed to be from the amount of sliding friction involved in the action. The latter factor, on the other hand, makes the need of providing an unfailing lubrication imperative. The rate of wear is, on the whole, considerably slower than that of a bevel-gear, if the worm-drive is well made and carefully lubricated. The consumption of oil for this purpose is large.

The security against breakage of teeth is much greater than in a bevel-gear drive by reason of the reduced driving-pressures per unit of area, as referred to.

The data, in so far as they have been established, point thus to the worm drive as desirable for a high powered, luxurious and fast limousine, with which a reduced efficiency, meaning the loss of a few horsepowers, incurred when the vehicle is driven slowly, is a matter of no consequence. But for its application to slow-moving trucks and low-powered small cars the demonstration in favor of the worm-drive is still to be made.—From *La Vie Automobile*, Feb. 22 and March 1.

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IRON-TIRED Truck Wheels.—While it is the universal experience that the apparently high cost of a solid-rubber tire equipment leads to a lower all-around upkeep cost than that obtainable with steel or iron tires in the case of motor trucks which travel normally at from 8 to 15 miles per hour over hard roads, it is widely believed that the situation may be different in the case of heavy motor vehicles which need not be driven faster than 8 miles per hour at any time, either loaded or empty, and whose work lies mainly over soft roads, or even over macadamized roads. In the United States considerable motor truck work of this nature may be contemplated in connection with mining enterprises, interurban freighting and for the transportation of garden and farm produce, in which lines any saving in tire upkeep and a simplification of the tire equipment would also be especially appreciated and would tend to open up a market for motor trucks which has barely been touched.

Captain Renaud, whose data upon truck wheels and tires in general were presented in part in these columns last week, also refers to some of the experiences and experiments made with iron-tired wheels in France, where however the prevalence of stone pavements in towns and villages accentuates the drawbacks of iron tires, while little transportation work is offered that must not be done at all seasons of the year if at all; so that also at this point a difficulty is experienced with iron tires in the poor traction and steering qualities on snow or ice which have so far been characteristic of them.

As iron or steel tires in all vehicles, except steam tractors and slow-moving agricultural implements and machinery, can be used with wood wheels only, if ruinous vibrations shall be avoided, one of the foremost problems in connection with them is to obviate the loosening of the wooden construction and the onerous re-tightening which such loosening necessitates. In the French artillery steel tires were tried because a thin steel tire, sufficiently hard to be elastic, holds the wood wheel together more strongly and more lastingly than a heavier iron tire, but it was found that the hard steel tire gives considerably poorer traction than a soft iron tire, especially on stony roads or pavements; and for driving wheels of a truck or other vehicle this disadvantage is of importance. In the end, the steel tire also succumbs to the same trouble which overtakes the iron tire in much shorter time. The hammering which the metal tire receives on the road—especially of course on rough stone pavements—lengthens it and thereby loosens it from the wood rim, and then it is that the wheel must be retightened, from the hub outwardly, in order to fill the enlarged tire. With heavy loads, hard roads and high speed this necessity arises very soon.

Mr. Renaud suggests that it should be possible to effect an improvement, in the way of combining the better traction of soft iron tires with the greater durability of hard steel tires, by providing a tire which is hardened next to the wood rim while the outer surface portion is kept soft, as might be done by spraying the inner surface of the tire with water when it is red-hot, [similar processes being in use in the manufacture of vehicle springs]; but no such method has yet been perfected.

Some iron-tired wheels have been developed in the French automobile industry which are designed especially to minimize the troubles arising from the stretching of the tires. A wheel used for the lighter models of Purrey steam trucks and also for the rear wheels of some Berliet gasoline trucks is shown in Fig. 2 and the machine used for tightening this style of wheel is represented in Fig. 3. The special feature is that the rim is made of as many pieces as there are spokes and that hardwood wedges C are employed at both ends of the spokes for tightening purposes, as shown in the drawing. The metallic hub is slightly conical. As soon as any looseness is noticed in the wooden structure, two semi-sleeves, N in Fig. 3, of suitable thickness are pressed in between the hub and the wooden wedges, and, if necessary, metal wedges may also be inserted at other points.

On the very heavy models or Purrey steam trucks which carry loads from 15 to 20 tons, the type shown in Fig. 4 is used. Here full sectors of wood are compressed very strongly within an assembling ring 30 millimeters thick, and upon the latter there is shrunk a tire 60 millimeters thick. The spoke sectors are aligned by radial tenon-pieces inserted in mortised spaces in the meeting-edges of the sectors. The hub is put in place by strong hydraulic pressure, and one such wheel weighs 700 kilograms. It remains tight for a long time, but it is necessary to renew the outer tire when it has been worn down to one-half of its original thickness. The same principle has been applied by Berliet in the type of wheel shown in Fig. 5, but the shape of the spokes has been made more sightly and the construction of the central portion has been modified so as to make the retightening method illustrated in Fig. 3 applicable. This demountable wheel thus consists only of spokes, wedge pieces abutting against the hub and the double iron tire, the wood rim being eliminated—From *Le Génie Civil,* March 1.

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Compression Cocks and Burnt Fingers.—The pet cocks in most motors is so bored that the handle lies horizontal when the cock is closed. When opening it while the motor is running one is liable to get the fingers burned from the flame which shoots out. By boring it so that the handle hangs downward when the cock is closed this is not so likely to happen; neither will the cock turn open of its own accord.—From *Automobil-Welt,* January 31.

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Memorandum of Articles Unadapted for Abbreviation

Among conpendious treatises on highly specialized subjects which have recently appeared in continental publications, and copies of which, in the original language in each case, may be procured for those interested, are the following:

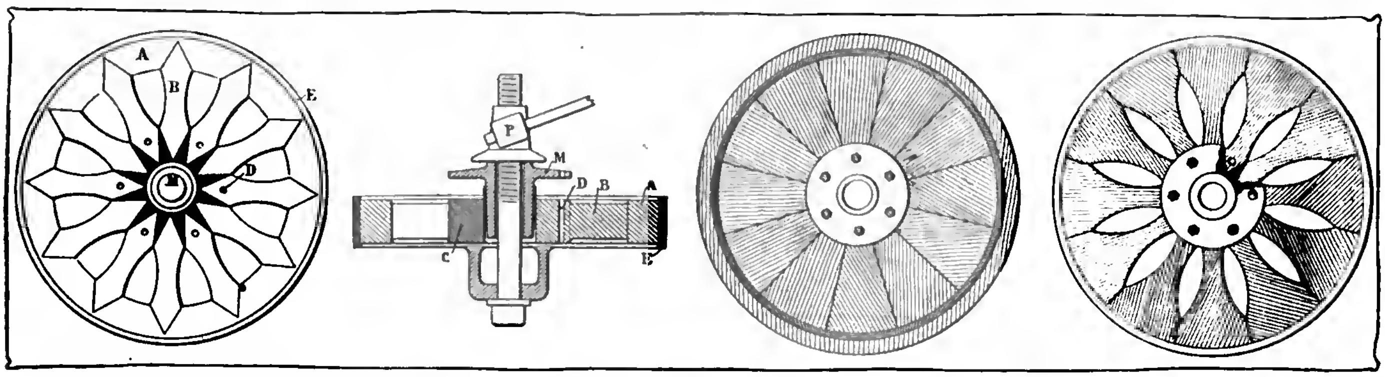
The Calculation of Springs—giving simplified methods for calculating coil springs, partly after Siebeck. Serial begun September, 1912, closed February, 1913. In *Fer et Acier.*

The Shaping of Involute Spur and Bevel Gear Teeth.—7 pages, graphic and mathematical.—By P. Gerlach in *Werkstattstechnik,* February 1.

The Sunderland Gear-Cutting Machine (straight spur and helicoid gears).—Brief illustrated description.—By H. Féron in *Le Progrès Industriel,* Feb. 15.

The Operating Mechanism for Non-poppet Valves.—Description of movements employed and principles involved.—By Praetorius in *Der Motorwagen,* Feb. 28.

Compressors for Gas Turbines.—Illustrated descriptions of different methods; to be continued.—by Wilhelm Gentsch in *Die Turbine,* March 5.



Figs. 2, 4 and 5—Iron-tired wood wheels used for heavy motor trucks in France. Fig. 3—Screwpress used for retightening the types shown in Figs. 2 and 5

Time for Cleaning the Car

Old Oil and Mud Should Be Removed and the Surface of Body and Trimmings Given a New Finish

Accessories Such As Top, Lamps and Upholstery Need Special Attention in the Spring

THE time is fast approaching, indeed, is already here, when the car owner must consider the matter of putting the car in condition for the spring and summer campaign on the road. Nothing attracts more attention or excites more favorable comment than the neatly varnished car with lamps, fenders and other accessories shining fine and clean under a new garb of material, the top and upholstery cleaned and renovated and everything, in fact, conditoned to a nice point of harmony throughout.

A very large number of cars this spring will, upon examination, be found in a sufficiently good condition to need only a good rubbing down and a simple coat of varnish applied.

This work carries with it, naturally, some attention to lamps, fenders, top and other furnishings in order to get the car out in a well-balanced condition.

Cleaning Old Oils From the Car

It is usually quite a job to start the grease and smeary accumulations and get them thoroughly cleaned off the car, and particularly off the chassis or running parts. A combination of crude oil and turpentine—one part of oil and two parts of turpentinue being recommended—swabbed on quite generously and left to attach and soften up the grease is more certain and effective than other mediums for the preliminary process. Use a case knife or two, a couple of small hook scrapers and a common putty knife for scraping and cleaning parts which the oil and turpentine mixture fails to loosen. Finish off by saturating the greasy parts of the surface with a dressing of clear turpentine and then with strips of clean burlap scrub dry and clean It is important that the grease and oil be cleaned off thoroughly. This is not always attended to as it ought to be, which accounts for the great number of shabby, unkempt appearing cars yet in the prime of their usefulness.

The body surface of the car should now be rubbed with pumice stone flour and water sufficiently to lay down any surface roughness and to develop a clean, receptive surface. Any defects, or bruises, or chipped places need to be touched with color made to match as closely as possible the color of the car. Owing to the fact that, as a rule, it is almost impossible to match the old color which is usually more or less faded and not uniformly faded, this touch up color should be applied very carefully and sparingly with none of the color allowed to run over the edge of the blemish. In mixing the color always use enough rubbing varnish to cause the color, when applied to the surface, to dry with a gloss. In this state it is then prepared to retain in the drying process its original shade, as shown in the container after mixing. A color with a pronounced gloss reflects more light than it absorbs and therefore when exposed to the light upon the surface remains a "fast color."

It is a good plant to give the chassis, also, a light rub over with the pumice stone flour and water. Apply this and do the rubbing with a small fleece wool sponge, which is less likely to cut through the sharp edges of spokes, springs, etc. Give these parts the necessary touching up, practicing the same care in this work on the chassis as upon the body surface.

For the body of the car use a finishing varnish that dries, in proper surroundings, out of the way of dust in 6 hours and is fit to use in active service in three days. Such varnish should be bought for its capacity to resist the action of mud, water, grease, etc.

For the chassis a varnish is recommended that will resist to the utmost the destructive action of soap, mud, water, grease and oils. Such a varnish should dry free from dust in 3 hours and harden ready for use in 2 days.

In connection with these touch up and varnish jobs it not infrequently happens that after the body surface has been given the pumice stone flour and water rub surface checks appear to a depth and in such variety as to call for two coats of varnish instead of one, in which case the first coat should be a rubbing varnish made to dry in from 20 to 24 hours. This extra coat of varnish serves to penetrate the cracks and seals them. Give this coat a nice, uniform rubbing with pumice stone flour and water, clean up carefully and apply the finishing coat. Even the car with the body surface considerably slashed with checks, both fine and large, can be made with the two substantial coats of varnish to look almost like new.

In the case of a car showing the color faded and bleached out—its original shade and lustre quite gone, in fact, it is practically labor and material thrown away to try to touch up a surface of this kind. The better way—the only way, in a word—is to clean the surface of grease and foreign substances and then sandpaper down smooth and clean with No. 1 sandpaper, after which dust off clean and apply a solid coat of color. To get satisfactory results with one coat of color it will be necessary to use the same shade of color that was used in previously painting the car. In preparing this color, which should be a japan ground one, thin down with pure turpentine and to every six parts of color add one part raw linseed oil, this latter forming the binder to fasten the color to the surface. This color will dry over night, whereupon it may be striped in the morning and late in the afternoon given the rubbing coat of varnish.

Special attention should be given the guards, fenders and under parts. It often happens that these parts are in much worse condition than other parts of the car and when such is the case they require an extra coat of some hard drying varnish that dries out of the way of the dust in 2 hours and hardens over night.

In doing over the lamps in color it is the best practice if a baking oven can be secured to bake the pigment on. A color varnish baked on the lamps at 170 degrees for 6 hours will give an unsurpassed finish for such parts.

The Top Often Deserves Attention

The car top and the upholstery deserve attention. If rubber or leather, sponge off with tepid water. What the requirements are can then be judged. A good hand buffed leather top will hardly, if at all, need any further treating until the enamel of the leather wears thin. The rubber top after a season's wear, if not before, will need a thin application of some good reliable dressing, and the same treatment may be given the leather top when the enamel begins to look shabby. Although mohair top dressings are advertised and are doubtless good preparations, we should hesitate to use anything on mohair until the fabric begins to look the worse for wear. A good, thorough brushing with the whisk broom will do wonders for the mohair fabric, which has not the clean appearance it once possessed.

For the upholstery, if of cloth, the vacuum cleaner is a splendid device. Even in the case of leather it will take every atom of dirt or other accumulations from around buttons, binding, etc. Door jambs and interior parts of the car which are painted and varnished had best be given a dull finish or a polished finish. If finished in high gloss the parts show finger marks and hand blemishes readily. Just fetch these parts up in varnish and if they are to be polished use polishing varnish for the last coat. Rub the varnish in due time with pumice stone flour and water and then with some reliable polish rub until the generated friction brings out the high, sharp brilliancy that is proof against finger marks, etc.

Gear Changing and the Clutch Brake

Silent Changing Rendered Easier By Clutch Brake Which Permits Control of Gear Before Meshing

By E. P. Batzell

¶ *Good results in gear changing can only be secured when the pitch velocities of the meshing gears are practically alike. It is desirable that a partial connection between the motor and clutch be maintained during the operation of changing gear, but the clutch should always be released momentarily on actual contact of gears so that any existing difference in pitch speed between the two members will not transmit a shock to or against the mass of the clutch.*

¶ *If properly fitted and provided with a means of adjustment a clutch brake is of advantage in gear changing.*

¶ *When starting, the clutch should be entirely disengaged, so that the full braking action of the clutch-brake is applied, thereby bringing it to rest. When changing to a higher gear, the clutch should be only partially released so that the brake only slows down the driving member of gearset. When changing to a lower gear, the pedal should be operated so that the clutch-brake is not brought into action at all. The clutch member can then increase its speed with the engine, during the free period of changing.*

THE noiseless shifting of change-speed gears requires that the driving and driven gears, which are about to be meshed, rotate with equal pitch velocity. Unless this is so there will be some shock between the gear teeth when they come in contact. It is clear that the required change of pitch velocity when going from one gear combination to another should be in the rate of the respective ratios of these two combinations. Being extremely difficult to control the speed of the secondary or driven element of the gearbox, because it is rigidly interconnected with the driving wheels of the vehicle where the only available speed control medium is the brakes, it is common in driving practice to use the motor and the clutch for regulating the relative pitch velocity of the gears to be meshed. This regulation is exercised on the primary or driving part of the gearbox.

Motor Is the Chief Factor

The motor is the chief factor for proper gear meshing when it is necessary to change from a higher to a lower gear without stopping the vehicle. Most frequently the motor performs the desired function automatically. In this case of speed changing the secondary gear to be meshed has a higher pitch velocity with the initial gear ratio in use, than its respective primary gear has. Consequently the latter has to be speeded up in the rate of the new ratio to the initial one, if clashing is to be avoided, because the pitch velocity of the secondary gear would vary only with the vehicle speed. Necessity for use of a lower ratio without stopping, generally would appear after the motor becomes overloaded using the initial higher ratio. By easing off the clutch without materially decreasing the throttle opening when going from high to neutral, the motor gets a few moments for speeding up and carrying away with it also the clutch and the primary gear parts of the gearset, before the driver has time to pass from the neutral to the lower gear. It will be noticed, that during this gear change it is not desirable to interrupt entirely the driving connection between the motor and the primary part of the gearset. It depends on the nature of the clutch and on the driver's familiarity with its functioning whether or not the motor acceleration will produce the desired result in speeding up the primary gear to that extent, when the pitch velocities of both gears to be meshed are equal.

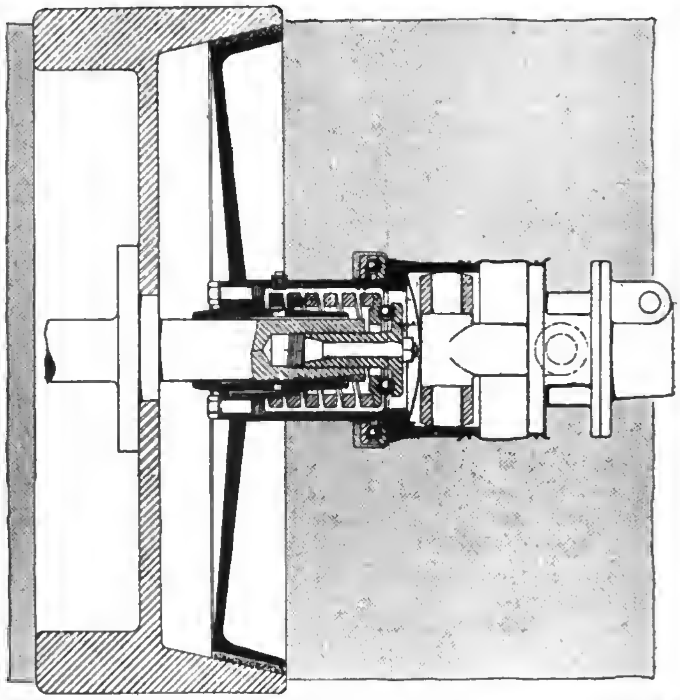


Fig. 1—Cone clutch to which brake was applied with advantage

Cone Clutches Disengage Readily

Cone clutches without springs for gradual engagement generally can be very readily disengaged from the motor. A slight motion on the clutch pedal might be sufficient to disconnect the motor and the primary gear and consequently, although the motor will accelerate as mentioned the velocity of this primary gear will not increase and therefore the lower ratio gears will be clashed. The result is still worse if the clutch is equipped with a powerful brake, inasmuch as the clutch-driven member together with the primary transmission gear might be stopped entirely instead of being speeded up. Cone clutches with springs for easy engagement, as well as multiple-disk and band clutches, especially those with a more or less elastic medium between the driving and driven parts, like lining, cork inserts, etc., are easier to handle during the described period of gear changing, even when they are provided with brakes. However, inasmuch as the clutch brake is not essential here, a slight releasing of the clutch serving the purpose, the clutch brake is preferably arranged so as to act only after the clutch is already more or less out. *When going into a lower gear grating of teeth invariably will occur, if the clutch brake is very strong and acts from the moment of slightest clutch releasing motion, unless the clutch friction surfaces continue in slight engagement, during a part of this releasing motion.* That forms the reason why the gradually engaging clutch types give better results in this connection. In practice certain clutches with a strong brake incorporated in their releasing construction are purposely made with a heavy secondary member. For instance a multiple-disk type with thick plates alternating with thin ones carries the thick ones on the driven member, the increased inertia of the latter permitting better shifting into lower gear as has been demonstrated by actual comparison of this construction with one which had thin disks on the same driven member.

The speed of the vehicle could have some influence on the unfavorable effect of the clutch brake when changing gears as explained; most often, however, this gear change will take place with the motor getting overloaded and consequently at about the same low revolutions per minute. It may be mentioned, though, that in general a quicker gear change is necessary when the motor runs slowly at the beginning, and the effects of the clutch brake are also more pronounced here than in the case of a higher initial speed.

The matter of the motor speed at the moment of engagement of the gears when making a change from one gear to another is a very important factor, especially to the novice in driving an automobile. One of the hardest things for the new driver to learn is the knack of changing gears. The main reason for this is that he has great difficulty in gauging the correct speed of the motor. It must always be remembered that the car speed at the moment of shifting is an important factor.

Motor Should Be Disconnected

The method of changing to lower gears without entirely disconnecting the motor from the transmission works perfectly in theory and also in the hands of skilled operators, but it could be rather harmful for the gears if an attempt were made to mesh a pair of them when their pitch velocities are not practically alike. In any event, to avoid possible trouble it is preferable to release the clutch entirely for a moment when the gears are coming together, whereby any shock between them will not be transmitted against a more or less considerable resistance as represented by the motor partially engaged through the clutch.

Being rather an interference when changing to lower gears with the vehicle in motion, on the contrary the clutch brake appears very essential for quiet meshing of gears from lower to higher ratio. In this case the secondary gear rotates with a lower pitch velocity, than the primary one to be meshed with it—assuming constant vehicle speed. The regulation of these two velocities can be accomplished more or less satisfactorily by the motor, disconnecting it from the gearbox and slowing it down. But it is not always feasible to slow the motor down to the exact desired revolutions per minute.

The clutch should be the principal functionary here, it serving for disconnecting the motor and also permitting to reduce in any desired rate the rotation of the primary gearbox member. This is so if the clutch-driven part has no force tending to carry it away after the driving motor parts even when it is completely released. The writer recalls a certain cone clutch Fig. 1, which had a ball thrust bearing in the releasing collar and also one between the crankshaft and the clutch spring, which acted on the driven member directly. It depended on the state of these two thrust bearings and on that of the clutch centering bearing which of the two efforts prevailed, the friction effort of the inner thrust and centering bearings toward dragging the clutch driven member after the motor, or the friction of the thrust bearing in the releasing collar tending to stop it from following the motor. This uncertainty of a complete clutch stop when it is released made a clutch brake indispensable for good gear shifting from a lower gear to a higher one. The shifting into any gear when the car is standing was particularly difficult with this clutch when without a brake, because often the rotating primary gearbox member caused grating of teeth with the stationary secondary member without meshing into it, until this grating had overpowered the tendency of the former to rotate. On the other hand this clutch permitted an easy meshing on the road from high into lower gear. The change to a higher gear with the vehicle in motion was better than when stationary, though the releasing of the clutch could not stop entirely the spinning of its driven member without application of the brake. On account of all the above this clutch had to be equipped with a brake, but this was made adjustable and it came in action only after the clutch was partially disengaged. Thus, when starting the vehicle one generally pushes out the clutch entirely, stopping its driven member by the brake. When changing to a higher gear with the vehicle in motion this operation automatically is done in a very short time, the driver releasing the clutch only for a moment and often merely partially. This slows the driven member without stopping it, thus giving again good gear meshing. The gear change on hills, from higher to lower gear remained easy, because the clutch had to be pushed out very little inasmuch as it had no springs under the leather. The brake, not coming into action here, could not prevent the driven clutch member from gaining some speed with the motor during the time when the gear changing passed through neutral. It took a little practice and the gears could be meshed quietly on any occasion.

It is of interest to give here the data of this clutch relative to the inertia of its driven parts and braking effort on the same, because these figures may be used for comparison with other clutches. The idling motor speed is about 250 revolutions per

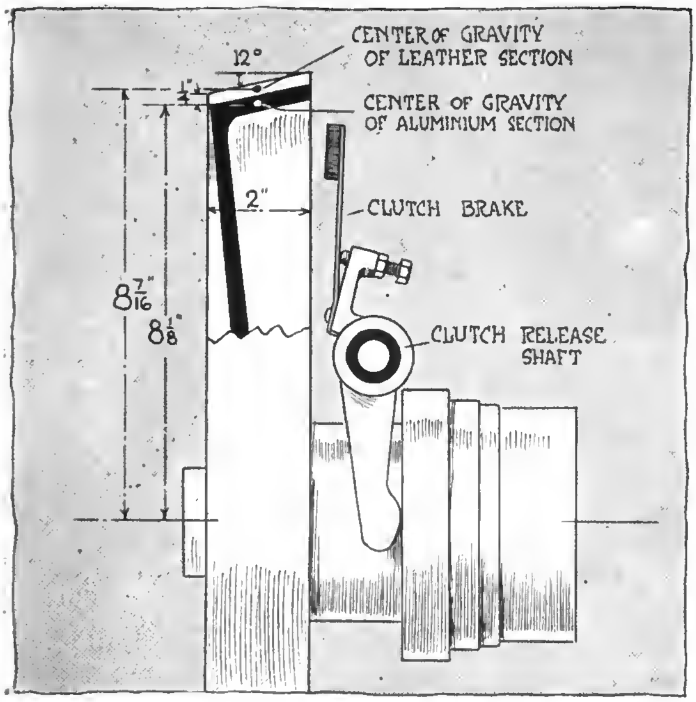


Fig. 2—Dimensions of clutch showing also adjustable clutch brake fitted to release shaft

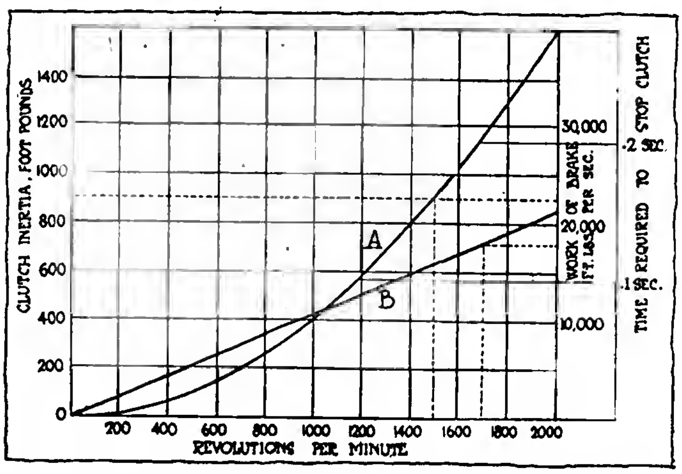


Fig. 3—Curves showing work absorbed by clutch brake at various speeds

minute. The clutch dimensions are shown in Fig. 2. The total inertia can be written as being composed of the inertia of the different clutch parts:

$$T = \Sigma \frac{Mv^2}{2}$$

The mass M_l of the leather band is

$$M_l = \frac{.036 \times 2\pi \times 8.437 \times .250 \times 2}{32.16} = .0297\text{—its inertia:}$$

$$I_l = \frac{.0297 \times \left(\frac{2\pi \times 8.437 \times 250}{12 \times 60}\right)^2}{2} = 5 \text{ foot-pounds.}$$

The mass M_r of the aluminum cone rim is:

$$M_r = \frac{.093 \times 2\pi \times 8.125 \times .375 \times 2}{32.16} = .111\text{—its inertia:}$$

$$I_r = \frac{.111 \times \left(\frac{2\pi \times 8.125 \times 250}{12 \times 60}\right)^2}{2} = 18.0 \text{ foot-pounds.}$$

Total inertia including clutch leather rivets, cone spokes, etc., can be estimated at $I = 25$ foot-pounds.

Assuming that the friction effort of the thrust release bearing equals the friction of the spring thrust and clutch centering bearings, the clutch brake should be considered as the only means serving to stop the cone from rotation. The clutch brake acts directly against the back of the clutch cone as in Fig. 2 and its spring presses the fiber pad with a force of about 12 pounds. The braking moment of this arrangement with a co-efficient of friction .20 between fiber and aluminum figures as:

$$T = \frac{12 \times .20 \times 8.5}{12} = 1.7 \text{ foot-pounds.}$$

Under assumed conditions this brake can stop the cone after it turns a number of times

$$R = \frac{I}{2\pi \times T} = \frac{25}{2 \times 1.7} = 2.33$$

This action is fast enough for any gear meshing when starting the car. Practical observation of the clutch brake action confirms the foregoing calculation and from this one can derive that the calculated figures for clutch inertia and the corresponding proper brake moment could be recommended for practice in similar cases. Of course the rate of action of the brake is different at different motor speeds when disengaging the clutch. Whereas the clutch inertia increases with the square of the motor speed, the work performed by the brake remains simply proportional to this speed. Illustrating graphically for the described clutch, curve A, Fig. 3, represents the clutch inertia and curve B the

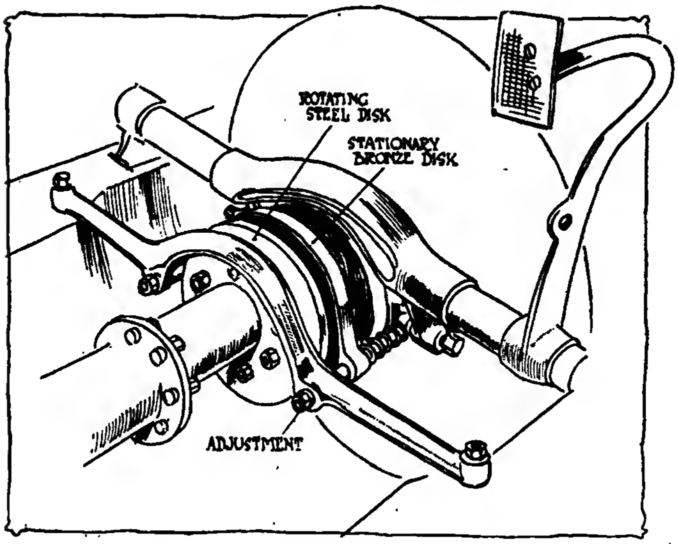


Fig. 4—Conical and flat types of clutch brakes

work of the brake during 1 second acting with the initial revolutions per minute. The desacceleration as caused by the brake action remains practically constant regardless of the motor speed. From the equation conecting acceleration j, velocity v, and time t which is, $v = jt$, it will be noticed that the time required to stop the clutch will increase in a rate equal to the initial speed, in other words, to the initial clutch speed, or. curve B, Fig. 3 could represent also this time in a proper scale, as indicated there.

The foregoing example dealing with a cone clutch without springs under its leather, afforded an opportunity to study the subject in figures, assuming that a very slight motion withdrawing the cone from the driving flywheel is sufficient to disengage them entirely. It is well to compare these obtained figures with those of clutches with provision for gradual engagement, and in which therefore the driving member continues to drag along the driven one during a great part of the clutch releasing movement, especially if the latter member rotates with little resistance as for instance when the gears are neutral and no clutch brake is provided.

It should be mentioned that a cone clutch of similar dimensions to the above, with the same style and strength of clutch brake but with spring plungers under the cone leather for gradual engagement, invariably caused tooth grating, unless the cone was pushed out to the extreme of its motion. It is proper to deduce, that in this case the available braking effort was not sufficient to overcome the tendency of the clutch cone to follow the flywheel during the beginning of the clutch releasing travel, because the range of friction between the flywheel and the cone became greater on account of the spring plungers under the leather.

Multiple-Disk Is Easy Engaging

A multiple-disk clutch with lining or with cork inserts is a fair example of the easy engaging type. The inertia of the disks will be figured in an approximate manner by assuming a mean velocity v for the whole mass of the disk, this velocity v being that of the mean radius of the disk. The mass of the disks in one example of a clutch with cork inserts equals $M_d = .34$.

The inertia of the disks at 250 revolutions per minute totals:

$$I_d = \frac{M_d \times v^2}{2} \quad \frac{.34 \times \left(\frac{2\pi \times 4.8125 \times 250}{12 \times 60}\right)^2}{2} = 19.5 \text{ foot-pounds.}$$

The clutch drum inertia similarly figured approximates 7 foot-pounds, which with the inertia of other parts can bring the total clutch inertia of its secondary or driven part to about 30 foot-pounds.

This clutch is provided with a brake incorporated directly in its release cover. The braking is done by the action of a 360-pound spring on a fiber collar 3.406 inches outside diameter by 2.219 inches inside diameter. The torque of this brake is to be figured from the equation

$$T = \frac{P \times f \times (Z_2^2 \times Z_1^2)}{2Z_2}$$

where are P — the total acting pressure on the collar = 360 pounds, f — the coefficient of friction of greasy fiber and metal = .10, Z_2 and Z_1 the outside and inside radii of the collar.

Therefore,

$$T = \frac{360 \times .10 \times (1.703^2 + 1.109^2)}{2 \times 1.703 \times 12} = 3.62 \text{ foot-pounds.}$$

Comparing these figures with those of the cone clutch in the foregoing, it will be noticed that although the inertia of the disks in this multiple-disk clutch is about 20 per cent. greater than in the cone clutch, the braking torque used is about 213 per cent. greater. This multiple-disk clutch gives a very satisfactory performance in practice. The clutch brake is of a type which acts immediately with the beginning of the clutch release, and therefore it necessitates the great mass of disks used for a good gear charge from high into low. A slight pressure on the pedal is enough to release the clutch so that gear changing can

Among the New Books

Many Technical Works of Interest to The Automobilist Are Announced By the Publishers

THE spring crop of technical books is now available for the manufacturer of automobiles as well as the student and interested owner. Many of exceptional merit have been recently sent to press and THE AUTOMOBILE will publish a short explanatory review of these as they appear. The following are offered for sale at the present time and should meet the popular demand.

MAGNETO AND ELECTRIC IGNITION. By W. Hibbert, A. M. I. E. E. Published by Whittaker & Company, New York City. 154 pages, 4 by 6 inches, with 90 illustrations. Cloth, $0.70.

Some time ago the same author brought out a work entitled "Electric Ignition for Motor Vehicles" and it is this which has furnished the basic idea for this later book. This work takes up the basic principles of the electric ignition system and by simple analogies carries them through so that they may be understood by a reader who is not trained in electrical terms. All types of ignition systems, both high and low tension, are discussed.

THE FREEZING POINT, BOILING POINT AND CONDUCTIVITY METHODS. By Harry C. Jones, Professor of Physical Chemistry in the Johns Hopkins University. Published by the Chemical Publishing Company, Easton, Pa. 75 5 by 7.5-inch pages; illustrated. Cloth, $0.75.

This work treats of three methods of chemical analysis. First, the application of the freezing-point method to the determination of molecular weights and to the measurement of electrolytic dissociation. Second, the application of the boiling-point method to the determination of molecular and electrolytic dissociation, and, third, the application of the conductivity method for the solution of the same problems.

GAS POWER. By C. F. Hirshfeld, M.M.E., and T. C. Ulbricht, Cornell University, published by John Wiley & Sons, New York. 209 pages, with sixty illustrations. Cloth, $1.25.

This book consists of eighteen chapters, of which the first three are devoted to a study of the theory of the gas engine and its fuel. The next two chapters are devoted to the historical development of the gas engine and its modification, while the remaining chapters take up the cooling, control, ignition, carburetion, classification, etc., of modern motors. Stationary, marine and automobile engines are taken up along with a short chapter on gas producers. Each chapter of the work, in treating of its subject, follows the development of that particular part of the gas engine from the early times up to modern practice. For instance, the chapter on ignition has one article devoted to a history of ignition, bringing in such devices as the open flame, etc. The earlier forms of electric ignition are then discussed and finally, examples of modern practice are given. In concluding the work the author dwells on the performance of different motors and the effect of different possible gas engine conditions.

DICTIONARY OF AUTOMOBILE TERMS. By Albert L. Clough, published by the Horseless Age Co. New York. 357 pages, with numerous zinc illustrations. Cloth, $4.00.

Everything from A to Z in the automobile line is defined in this work. It would no doubt be a handy book for the struggling layman in reading some of the technically involved automobile literature now extant. The work is arranged in alphabetical order and is, as the title suggests, a dictionary.

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occur between any of the available combinations when the vehicle is in motion. On changing to low gear this slight release gives the partially engaged clutch a chance to follow the speeding up motor, overcoming the retarding effort of the brake, if the motor were loaded hard under the high gear and, retaining a fair throttle opening, quickly picks up during the moment when passing from one gear to another. When changing to a higher gear equally good results are obtained because the motor generally is more or less shut down during this operation and consequently it does not increase the speed of the disks so readily above the desired amount, nevertheless preventing them from being stopped entirely by the powerful brake action. It is only when in neutral with the vehicle at rest that the clutch must be pushed out to its limit, so that the disks disengage entirely and consequently can be stopped by the brake. It is a matter of construction which makes this clutch brake always act when releasing the clutch. That is the reason why this type of clutch has also proven less satisfactory with light disks on the driven drum instead of the heavy ones, the lighter disks making more difficult a proper change from high to low gear when the car is in motion.

The two cited examples give reliable figures for two extremes of clutch types as encountered in practice—one possessing sudden release and engagement, the other very gradual. It should represent little difficulty to estimate from figures of these examples the necessary data as to clutch inertia and corresponding clutch brake capacity for any ordinary case, for instance, when preparing an experimental design. The final dimensions, however, would have to be settled through trial, because individuality is apt to vary the results and also the requirements of what is to be considered satisfactory clutch and clutch brake action.

Referring to constructive features of clutch brakes it is well to indicate some of their peculiarities from a few actually used designs. The design shown at the left in Fig. 4 is unsatisfactory, because the metal cone brake acts very suddenly and strongly, it being strong enough to exert a very noticeable brake action on the motion of the vehicle proper when the gears are in mesh, as is the case when coasting down hill with a free engine. On the other hand, it acts at the extreme end of releasing motion, which does not cause much trouble for quiet gear meshing when the vehicle is in motion. This construction has given place to another one of the same make, shown to the right in Fig. 4, the flat brake being less sudden and powerful. Both types of brakes would show a very appreciable amount of wear, when used often, with gears in mesh. It is desirable to have the clutch brake act gradually, for instance through an elastic medium. Fig. 5 shows a brake backed up by springs, another variety having been given in Fig. 2. These two types should be the most satisfactory, because they permit adjustment of the clutch brake as to force of action and also as to the moment of action.

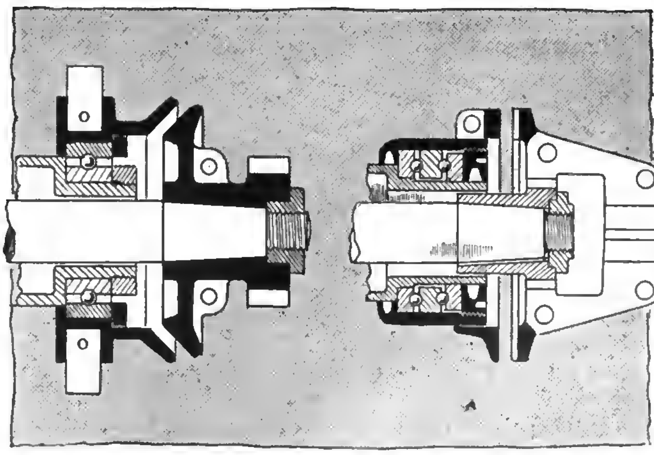

Fig. 5—Bronze to steel clutch brake used on the Lozier

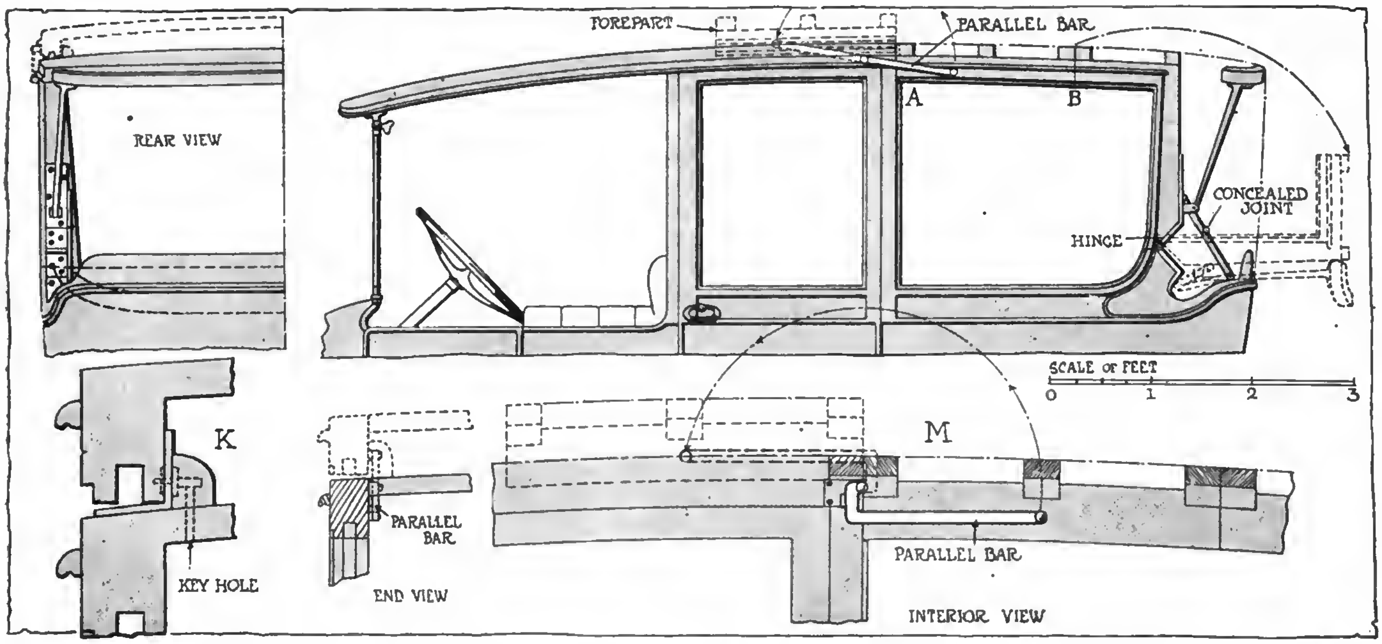

Fig. 1—Scale drawings of folding top for limousine-landaulet, showing also alternative method of fitting parallel bars to the top section

Folding Tops for Limousine-Landaulets

Three Alternative Methods of Construction Show Simplicity of Operation —Neat Appearance Obtained by the Use of Concealed Supporting Joints

IN this article constructive details are given of three hoods designed to fit the new Limousine-Landaulet type of body which was described more generally last week. It will be seen on referring to the accompanying scale drawings that all three designs of hood are identical as far as outside dimensions and points of division are concerned, differing only in the method of hinging and supporting the rear portion when lowered.

The older form or that used on the first cars brought to this country, is shown in Fig. 1, which comprises a side elevation and half rear view. The body is shown stripped of the leather covering so that the construction can be more clearly seen. The top in its folded position is indicated by dotted lines and the arc of travel by arrow marks.

The fore section, or that part of the top between the points marked A-B, is movable and is placed on top of the permanent roof, being controlled and guided by two parallel bars, that are placed one on each side. This top section rests on angle irons. the same length as the top section, which are fitted permanently to the roof.

To fasten the top section on the roof, there are two spring box locks of the regulation pattern, fastened to the inside of the vertical web of the angle iron as shown at K so that the lock bolt is horizontal. A wood block covers the exterior part of the lock completely, preventing the entry of water. On the lower side the key hole extends through the roof, and the lock is operated by inserting a key from the inside of the body and throwing the bolt until it engages with a slot on the inside of the toprail of the top section. This lock in conjunction with the side parallel bars form an effective means of holding the top section firmly in place without rattling.

The falling portion of the hood swings about a point situated a few inches from the base of the rear window pillar, where a particularly strong hand forged hinge is fitted. Great strength is necessary here as the entire strain of the lowered top is taken by the hinge.

The shape of the hinge opening is such, the cut of the pillar being at 45 degrees, that when down the hinge forms its own stop. This is clearly shown in Fig. 1.

A concealed jointed rod is used across the angle of movement to contribute to the support of the top when raised. A great deal of strain is thus taken off the top fasteners. In order to throw this joint, the upper end is fitted with a square nut, to which a key can be applied and the joint broken preparatory to falling the top. The opening in the trimming through which the key is fitted to the joint is covered with a flap of the trimming material. This concealed joint is short on account of the limited space for folding when the top is down, and also by the fact that the body is round at the rear corner. Consequently the lower end of the joint cannot be put very far back. This joint is shown both in its raised and lowered positions.

The toprail rear of the cut B is framed solid to the pillar and when lowered occupies the position indicated by the dotted lines. The sizes of the framing material of the bows and pillars are the same as used on the ordinary landaulet, with the exception of the rear pillar and the rear bow. This pillar is made wide on the side to allow stock for a generous bearing surface for the lower hinge. Below the hinge and above the moulding, the wood is also higher up than usual, on account of the tendency of the leather to fold or creep under at this point when lowered. The wood filling prevents this and holds the leather in place.

The rear bow is made of ample proportions and the corners are rounded to follow the shape of the body.

The fasteners used are the regulation landau top pattern, two being used at each cut. In addition dowel pins and plates are used at each end and in the center of the bows.

This design of top construction has a practical value in that part of the top is placed where weight does not count, over one-third of the total weight of the top, or rather that part of the top that falls, being supported overhead. It has the slight drawback, however, of being rather cumbersome to shift.

An alternative method of attaching the top section is shown at M, Fig. 1.

A partial end view shows the relation of cranked parallel bars, which are arranged inside the body, to the toprail. These bars operate in precisely the same manner as the outer bars in the first design, but being inside permit a much cleaner external appearance to that part of the body. They are plated, and their presence does not detract from the appearance of the interior.

Both positions of the top are shown in the drawing, which shows also how the bent part of the bar passes round the roof top rail, occupying a perfectly flat position on top and out of sight.

Fig. 3 is another method of construction that is very popular today, owing chiefly to its trim appearance, and despite the very serious weakness of having so much weight overhanging the bearing point when the top is down. Practically, the lower hinge is the medium of supporting the entire top. As in Fig. 1, this hinge is hand forged and very strong.

The movement of the parts when folding are indicated by the arrow marks, the cuts at C and D correspond to those of A and B of Fig. 1. The hinge I is the regulation landau three prong hinge, one member of which supports the bow. The hinge at the cut D is similar to a straight door hinge, only narrower, and it is fastened to the inner wall of the toprail only. Landau top fasteners are used, two being placed at each cut under the bows. In addition there are two more used at the cut D, one being placed at each side on the inside of the toprail. Further security is afforded by the use of dowels and plates at the ends and in the center. Grab handles are placed one at each side under the cut C to control the lowering and raising of the top.

The weight of the top when down will insure its staying reasonably steady. Between the members that touch, rubber blocks are fastened to insure silence and protection of the surfaces.

Point J on the side elevation of this figure represents the extreme rear point that bearing for the top when down can be established. There is an overhand of 26 inches from this point to the extreme rear edge, and a distance of 7 inches between it and the center line of the lower hinge pin. Taking into account the weight of the leather covering, this would seem, from the figures, to be a rather dangerous overhang, but as many are in use it can only be deduced that constructional strength of the hinge meets the situation. Its neat appearance evidently more than compensates for this apparent mechanical defect, for this type is the most popular of the methods employed.

In this, as in other features of automobile construction, care in the building as well as in the subsequent handling goes a great way towards producing satisfactory results.

A method that overcomes the slight mechanical weakness of the previous design is shown in Fig. 3. The construction is identical with the exception that an outside joint has been substituted for the concealed joint in Fig. 2. The lower joint Fig. 3 extends beyond the actual body length and the bearing point of the top when down, is 18.5 inches from the back end and 14.5 inches from the center of the hinge. These figures are certainly more conducive to stability than those previously noted, and the life of the top will be longer under equal usage. The bearing of the top on the lower joint prop is an iron support that extends downward from the upper joint prop. When the top is raised this support is concealed back of the joint, and when lowered it rests on the lower prop, thus making an ideal bearing.

Some Durable Color Combinations

The combination of gray body, with red striping and red running gears is durable provided first-class materials are employed. The work is performed in a thorough manner and the finish is made rich and strong with plenty of varnish.

The most durable colors, all things considered, are probably the browns, blues, greens and grays. There are so many shades of each of these colors that a very long list of colors is available from them. The present show season has shown that the above colors, including, possibly, maroon, are the favorite automobile colors today.

For a seven-passenger touring car paint the body dark Napier green and the chassis a light shade of the same color and stripe both body and chassis with double .0625-inch lines of black.

Many car owners prefer the dark shade of Napier green for the car entire with black lines of striping. This makes a finer looking car. Brunswick green, a little mellower green, dark shade for the body and light shade for the chassis, the car striped throughout with double lines of black, is another attractive combination.

Silk green, dark shade for the body and medium or light shade for the chassis, striped with two .5-inch lines of black .5 inch apart with two fine lines of gold running through the center of this space, gives a splendid effect on a big touring car. This is a very durable color and nothing in the line of greens is more attractive.

It is important for the car owner to bear in mind that any of the grays, with the exception of the very palest ones, show dust and dirt to the minimum extent, and are kept in repair at small expense as compared with some of the other colors.

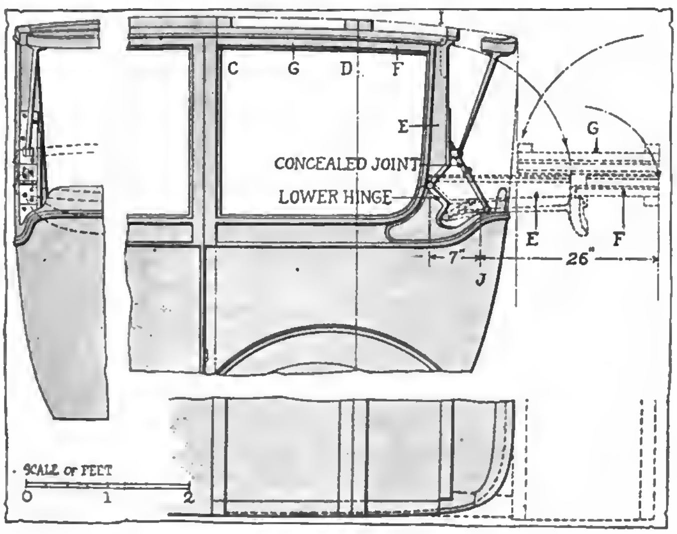

Fig. 2—Folding top design in which all operating parts are concealed within the hood

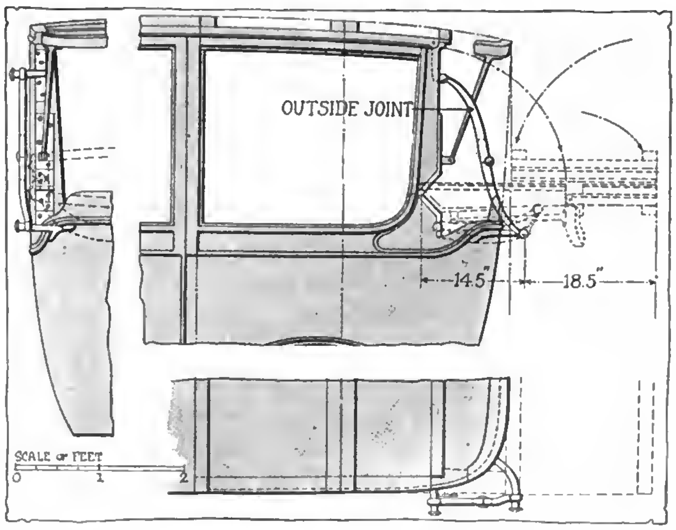

Fig. 3—Top for limousine-landaulet, in which additional support is provided by use of outside jointed rod

Truck Inspection Reports

Two Original Systems Used by New York Branches of Truck Factories

If Properly Handled the Inspection System Is a Direct Asset to Dealer and User

SYSTEMATIC truck inspection and its advantages were taken up in THE AUTOMOBILE of March 6, and in that issue a number of inspection systems used by metropolitan branches of various truck factories were described. It was shown that inspection itself is undoubtedly a valuable practice to adopt which not only helps to sell a truck but also to keep the customer satisfied when the machine is in service and thereby acts to induce him to buy another truck of the same make if he requires one.

In the preceding article on this subject a number of inspection systems were described which, with a single exception, consisted in the company periodically sending inspectors to the truck owner's place. In the case of the exception the company fixes a day on which the truck of a certain owner runs over to the company's service plant to be looked over and have necessary minor repairs made. In all cases the inspectors instruct the drivers how to make small repairs and adjustments or they make them themselves.

A procedure differing slightly from the general rule is used by the New York branch of the Knox Automobile Co. The company does not feel satisfied by having its inspectors look over its products now and then, but a special scheme for getting at the weak sides of the drivers handling Knox trucks has been evolved. This scheme includes the use of a daily report made out by the truck driver for the first 60 days after the truck has been delivered to its owner. The report is made out on a specially designed record blank, Fig. 2, which is furnished by the Knox company to the truck owner's driver with instructions to make out one every day and to send it to the branch office. As Fig. 2 shows, the card, which is 4.25 by 7 inches and printed black on tan cardboard, is so designed as to afford space for recording the work of a car done on a certain day, the miles run, the gasoline and oil used, the loads carried and the weather. Besides this there is space for entering the various stops made by the truck, with such details as indicated by the headings of the spaces in Fig. 2. The card is marked with the date and the name of the driver as well as that of the owner. On the reverse side there is a space for reporting fully all work done on the truck, the cause of all delays, troubles or accidents, no matter whether they occurred in the garage or on the road. If there are no remarks on the reverse of the card designed for this purpose, the company assumes that the driver is either operating

KNOX AUTOMOBILE CO. **INSPECTOR'S REPORT**

NAME .... DATE ....

JOB NO. .... ORDERED BY .... CAR NO. ....

	Final Test
MOTOR	....
CONNECTING RODS	....
WRIST PINS	....
VALVES	....
VALVE SPRINGS	....
CYLINDERS	....
FAN AND BEARINGS AND BELT	....
OIL PUMP AND CONNECTIONS	....
OIL PUMP PRESSURE	....

	Final Test		
BODY	....		....
CHAINS		GREASE CUPS	....
DRIVING SPROCKETS		POWER	....
DRIVEN SPROCKETS		SPEED	....
REAR AXLE		RATTLES	....
FRONT AXLE		OVERLOAD	....
BONNET AND FASTENINGS		GENERAL APPEARANCE	....
ENGINE PAN		DRIVER	....
GASOLINE TANK AND CONNECTIONS		INSTRUCTION BOOK	....
MUFFLER AND CUT OUT		TIME OF ARRIVAL	....
MUD GUARDS		TIME OF LEAVING	....
ODOMETER RECORD .... MILES		INSPECTED AT	

....

....

....

INSTRUCTIONS TO INSPECTOR:

Check above items if O. K.—If not O. K., state the trouble or condition. If corrected by Inspector, mark "Rep'd."

No. 1 INCOMING TEST MADE BY ....

No. 2 FINAL TEST MADE BY ....

Fig. 1—Inspectors' report blank used by the New York service department of the Knox Automobile Co.

the truck perfectly or neglects the preparation of full and correct records. An inspector is therefore sent to look over the truck and to watch the driver's work. Thus, in the course of 2 months, the driver is made acquainted with all the various parts of the mechanism. Thereafter an inspection is made every month, which is very similar to the inspections of other companies, including, as it does, a careful examination of the mechanism, watching for noises, squeaks and lost motion, etc. Small repairs are made by the inspector or by the driver under his supervision. After the inspection is over, the inspector returns to the service department of the company and fills out his report, Fig. 1, a blank printed black on white paper, 8.25 by 10.75 inches. This blank provides spaces for filling in the name of the inspector, the job number—all the jobs are numbered consecutively—the name of the truck owner and the number of the truck, as well as the date of the inspection. The inspector, as he goes over the various parts of the car, checks them on the report form, if they are O. K., while if this is not the case he states the trouble of each specific part on the form. If he makes a repair himself, he states so on the report. The same blank is used for testing trucks before putting them in the repair shop and in this case a final test is made after the work is completed to see whether or not the troubles have been eliminated. The inspector making the test signs the report, which is filed in the office of the service department, ready for reference at any time.

Autocar Prefers Night Inspection

Another original and apparently very efficacious system is used by the Autocar Co.'s New York branch. This company sends out its inspectors every 60 days, and, while most concerns try to have their inspectors work in daytime, the Autocar practice is to give nightly inspection service wherever possible, so as to interfere as little as possible with the business of the trucks. As a matter of fact, half the Autocars in New York are inspected at night. Here, too, an inspector makes his calls at intervals of approximately 60 days and when going to see a truck he inspects it in substantially the same manner as other company's inspectors do their trucks. If necessary he takes out the machine and gives it a road test to find out troubles which are not developed by an inside inspection and test. He makes his notes, instructs the driver as to what is necessary, makes slight repairs and adjustments or shows the driver how to make them and then return to the company's service department. At the office of the latter he fills out a report stating what parts of the truck are in need of repair, what repairs he himself has made, which seem to be the characteristic faults of the driver, and so forth. He turns over this report to the office of the service department. There the report is given a number—all inspections are consecutively numbered from the beginning until the end of the year—and every day the reports of the previous day are typewritten on several sheets with four carbon copies. One of these sheets is cut up and the reports are sent to the various truck owners, calling their attention to the troubles with the truck and the repairs required, if such are necessary. One set of sheets is filed in the office of the service department for future reference; the second is sent to the maintenance engineer's office, the third to the service department's shop and the fourth is used for the owner's reports mentioned above.

Inspection Records As Money Savers

This system has the advantage that if a truck owner comes in at some time or other, claiming that a certain part of his machine is not up to specifications, he can be shown that it was his driver who neglected to properly care for the part and that he, the owner, was advised of that once or repeatedly. In this way the inspection report is an actual money saver to the company and prevents abuse of the guarantee by truck users whose machines are not treated properly.

Of course, as the reports are filed numerically, a key for reference to the truck owners' names is necessary to make the system ready for reference at a minute's notice at any time. For this purpose a card file is used which contains records of all inspections made on all trucks in the Metropolitan territory. There is a car for each truck in the territory, filled out like the sample, Fig. 3. By reference to a record card it is easy to put before an owner, within less than half an hour, the records of all inspections made on one or all of his trucks and to show him what are the causes of inefficient operation, if such is in evidence. The cards are filed in order of the owners' names.

Daily report of KNOX automobile in the service of

....

Driver ....Date ....

Called at	Time of arrival	Time of leaving	Miles (Odometer)	Weight of load	Unloaded lbs.

CAR NO..................CAPACITY..................LBS.

WEATHER ....TEMP. ....

ROADS ....KIND OF LOADS ....

GASOLINE USED ....OIL USED ....

MILES PER GAL. ....MILES PER HOUR ....

Important—Write remarks on other side.

Fig. 2—Driver's daily report blank for Knox trucks

INSPECTION CARD

Name John C Smith & Co

Street No. 15 William St Town N. Y. State N. Y.

Date delivered Oct 15-1912 Saleeman Mallina

Chassis No. 10001 Eng. No. 14732 Type 21-UC

DATE	REPORT NO.	INSPECTOR	DATE	REPORT NO.	INSPECTOR
12/16/12	1723	D. Kuel			
2/22/13	248	F. Hilke			

Fig. 3—Autocar Co.'s Inspectors' record file card

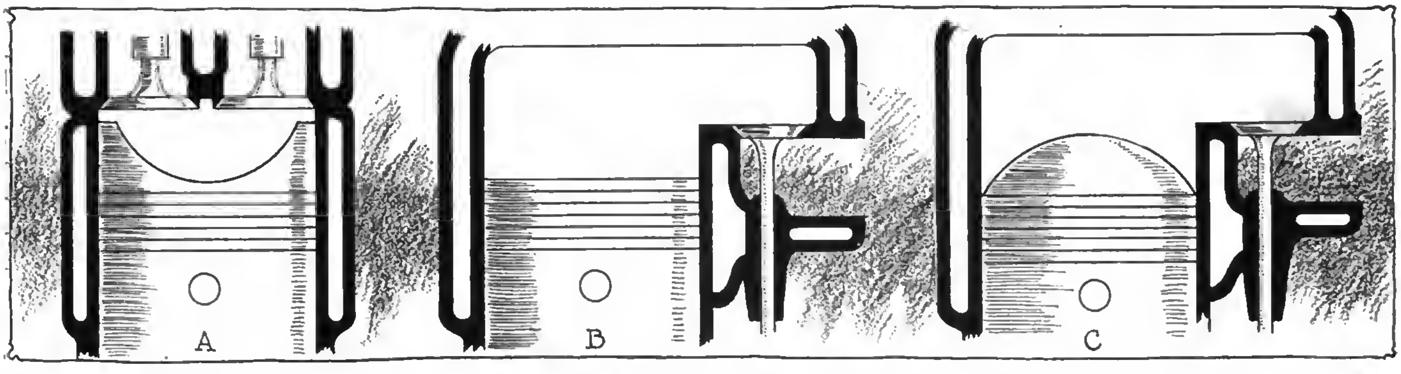

Fig. 1—Three shapes of piston head: A, concave, giving hemispherical combustion chamber; B, flat, easy to construct and used in general practice; C, convex or dome head, modified form often used. Gives strong piston owing to arch effect

What Is Rubbing Brick?—Dimensions of Racing Motors—Sand Box for Automobiles—Different Piston Heads—Chamois for Straining Work—Adjustment of E. M. F. Carbureter—Economy of Fours and Sixes

Rubbing Brick a Composition

EDITOR THE AUTOMOBILE:—In your issue of September 12, 1912, there was an article on page 523 in regard to painting a roadster, in which you said to use a rubbing brick. Kindly advise me what this rubbing brick is.

St. Louis, Mo. G. N.

—Rubbing brick or stone is a composition stone used for rubbing down rough stuff or other coarse surfacing material applied to the body of the automobile in order to get a level and smooth surface.

This rubbing brick or stone is a composition material which during the last 20 years has superseded the natural blocks or pieces of pumice stone formerly used to rub a body of pigment to a level and smooth surface. It is superior to the natural lava or pumice stone in that, unlike the latter, it does not crumble and chip off during use thus alowing the coarse particles to get under the stone and cut and mar the surface. Probably the best known rubbing brick is made in Germany, large quantities of which are used by carriage and automobile painters in this country. Excellent rubbing stone is, however, made in this country. An American-made stone known and used in practically every corner of the country by carriage and automobile painters is known as Eureka rubbing stone. This stone is doubtless obtainable in the St. Louis paint supply stores.

Bore and Stroke of Big Motors

Editor THE AUTOMOBILE:—Kindly let me know the dimensions of the Jay Eye See and the Jumbo Benz racing cars.

Pittston, Pa. R. M. S.

—The bore of the Jay Eye See is 9.33 inches and the stroke 8.625 inches. The car is a four-cylinder Fiat.

The bore of the Jumbo Benz is 175 millimeters and the stroke 200 millimeters. It is a four-cylinder car of Benz manufacture. The features of design of these special racing cars is kept secret by the factories which produce them as the rules of racing do not require that the dimensions be made public.

Automobile Ejector Sand Box

Editor THE AUTOMOBILE:—The following is suggested as a device for preventing skidding on asphalt and other slippery surfaces:

In Fig. 2 is shown a device for shooting sand beneath the tires and checking thereby the tendency for a car to skid. The mud guards are made hollow and contain a supply of sand. They are filled through a filler opening on top. A lead is taken off the exhaust pipe and by pressing a pedal the valve is opened and sand flows by gravity from the box and is then shot by the exhaust beneath the tire.

Chicago, Ill. SUBSCRIBER.

Effect of Piston Head Shape

Editor THE AUTOMOBILE:—1—What are the advantages of a concave piston?

2—Does a concave piston draw in any more vapor than a flat-top piston, same bore and stroke?

3—Does a concave piston make a low-compression engine?

4—A says a long-stroke motor uses less gasoline than a short-stroke. B says a long-stroke uses more. Which is right?

Lawrence, Mass. W. R. MOORE.

—1—The advantage of a concave piston may be perceived by a study of the three types shown in Fig. 1. The concave piston helps to reduce the area through which heat is lost. It gives the hemispherical combustion chamber, which is ideal in a motor which is small enough to use a non-water-cooled piston. It has the disadvantage of being costly to construct and to be of such form as makes a bad casting. The difficulty in the latter respect is to have it cool without cracking, to leave the material internally unstrained and to avoid projections. The convex piston, on the other hand, does not give an ideal combustion chamber shape, but is used to some extent on account of the structural strength due to the arch effect of the piston. The flat top is cheaply made, avoids pockets, although not as good as far as shape is concerned as the concave combustion chamber.

2—The concave piston will draw in the same amount of charge as will any other piston having the same piston displacement and volume of clearance.

3—The compression space with a concave piston is limited because the walls of the piston are higher than the center of its head. This does not signify that the motor must be of the old compression type because the stroke of the motor may be long enough to cause the relative volume above the piston to be very small and hence give a high compression.

4—It is generally conceded that the long-stroke motor is as a class more economical in fuel than the short-stroke. THE AUTOMOBILE published curves in the issue of March 20 on page 689 showing a record of tests made by the Moline company on long and short-stroke motors.

Adjusting E. M. F. Carbureter

Editor THE AUTOMOBILE:—I have an E. M. F. 30, which I bought the latter part of 1911. It has been running comparatively little and is in good condition. I am quite sure the carbureter is out of adjustment. Until lately it ran very well, but now it won't run on high gear. Please give me detailed information as to adjusting carbureter on high gear. Do you think there could be anything else that would affect its running on high gear except adjustment of the carbureter?

Saluda, S. C. A. E.

—There is only one adjustment on the E. M. F. carbureter. It is located on the upper side of the carbureter, as shown in Fig. 4, at A. The function of this valve is to permit the proper amount of air to be drawn into the carbureter to meet the requirements of the motor under different atmospheric and temperature conditions. In extremely cold weather the carbureter requires less air than that provided by the factory adjustment and in hot weather more air may be admitted. To give the carbureter more air loosen the thumb lock nut B provided on the valve stem and turn valve stem to right. To give less air valve stem is turned to left. In setting the carbureter open the throttle valve on the steering wheel until it is about one-fifth open with the motor running. Turn auxiliary air valve stem to left for about five turns and then turn back slowly until the point is reached at which the motor seems to run best. The probabilities are that the carbureter on your motor is getting too much air and for this reason misses when the car is turning over slowly as when pulling on high gear. A turn or two to the left on the valve stem A will probably cure the trouble. It is best, however, to start the motor and turn the valve as stated until the best running is secured.

The trouble with your motor probably lies in the carbureter adjustment, as you state, although it may be one of the following: Too large gaps of the spark-plug, weak magneto, faulty wiring or carbon. The carbureter adjustment should be tried first. The spark gaps should be 1-32 inch or less.

Four Uses Less Gasoline

Editor THE AUTOMOBILE:—I would like to know how much more fuel will a six-cylinder motor use than a four-cylinder to the mile, both being of the same size motors. My friends tell me that a six-cylinder car uses as much as a four-cylinder car. I cannot see it that way.

Great Meadows, N. J. J. M. REED.

—Giving the same horsepower and the same degree of good workmanship, the four-cylinder motor is more economical than the six. It must be remembered that one-third of the power contained in the gasoline fed to the motor is lost through the cooling water. This proportion of power lost depends on the amount of wall surface exposed to the cooling water as compared to the piston displacement of the motor. Since the surface is greater in the six than the four proportionally when the same horsepower is considered for both motors, the heat lost through cooling is greater proportionally in the six, therefore more gasoline is thrown away through the walls in a correspondingly less amount available for driving the car. This makes the four more economical than the six, even leaving aside greater frictional resistance, weight, etc.

Where the six shines is in its even torque output. Since the power strokes overlap each other the power is delivered smoothly and at an almost constant rate. Vibration is practically eliminated.

Misfires When Running Idle

Editor THE AUTOMOBLE:—I have an Amplex motor car which will misfire even when running idle. How can I remedy this trouble?

Winthrop, Mass. R. D. P.

—The seat of trouble on your car may lie in either the ignition system or the carbureter. It is more probably in the former than in the latter. In the ignition system the principal causes for misfire when the motor is turning over slowly are the weakness of the magneto, too great a gap at the spark-plug points, partially short-circuited coil, bad connections or improperly adjusted coil. In the carbureter the causes are either mixture which is too rich or one that is too lean.

In order to get the ignition system firmly in mind a diagram is shown in Fig. 6. The troubles outlined for the ignition system may be taken up one by one and the cure for each shown.

The magneto generates its electric current by inducing a flow through the windings on the armature which cut the lines of magnetic force extending between the pole pieces. When the magnets become weak, the intensity of the magnetic force is diminished and as a result the amount of current induced at low speeds is insufficient to produce a good spark. The remedy for this is to take the magneto to the nearest branch of the manufacturer and have the magnets recharged.

When the gap between the electrodes is too wide the current required to jump it is greater than when the gap is small. Besides this, the spark which is produced in leaping the gap is thinner. At low speeds the current is often insufficient to jump the gap and as a result the cylinder misfires. The gap should be not less than 1-64 inch in width and not more than 1-32 inch.

A short circuit through a part of the windings of the coil generally results in a total inability of the ignition apparatus to produce a spark, rather than in its missing at low speeds. The

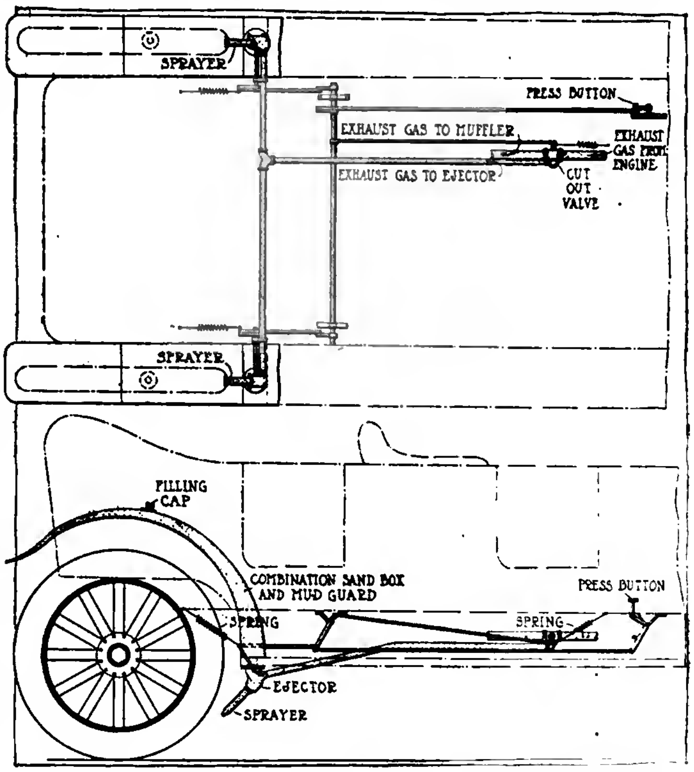

Fig. 2—Diagram showing operation of sand box on mud guards. Operated by exhaust pressure through ejector

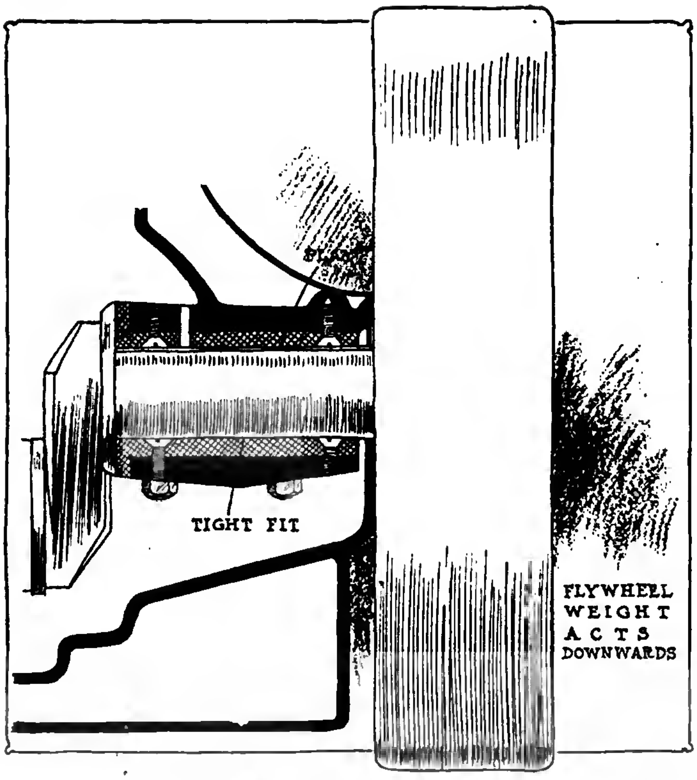

Fig. 3—How the flywheel conceals a loose bearing and thus makes it difficult to locate knock

result of such a coil condition is the same as if a coil of too small a capacity were used and the current is not boosted to a high enough voltage to jump.

Bad connections in the wiring increase the resistance to the circuit. The voltage drop in any circuit is proportional to the resistance in that circuit. It is very well possible that the current would be sufficient to produce a spark at high speeds and not enough at low speeds. It would therefore be wise to go over the wiring.

The vibrator adjustment is not apt to be at fault in this matter. It would be well though to look at the platinum points on the coil trembler and see if they are flat, and also to try a lighter and a heavier adjustment on the trembler spring. There is a possibility that this will make some improvement.

Too weak a mixture will cause a cylinder to misfire. Even with the best-designed manifolds, when the mixture is very weak, one or two cylinders will fire better than the others. To improve this condition, open the needle valve or give the carbureter less air. Too rich a mixture does not often cause misfiring, but it does occasionally happen. First try the effects of closing the air valve or opening the needle and then if this produces no good effect, try the other.

Chamois for Straining Purposes

Editor The Automobile:—I am the patentee of an automobile gasoline strainer which includes in operation a chamois skin. I propose to market the device myself through agents, having arranged for the manufacture of same. I would like very much to obtain some advice from you relative to the kind and quality of proper straining medium and other matter.

1—Are the so-called chamois skins, thousands of them, used for straining automobile gasoline, real genuine chamois skins or are they mostly sheep or goat?

2—Will goat skin suffice as well as chamois skin for the purpose?

3—Is it washable and is it not considerably cheaper than chamois?

4—What grade of chamois, goat or sheep do you advise? Is not chamois or sheep which can be washed best for the purpose—or can all grades of said skins be satisfactorily washed?

5—Will you kindly refer me to the best and cheapest source of supply for skins, chamois, sheep and goat?

6—Would not my nearness to original source of supply for skins make it possible for me to buy cheaply?

7—From what importers do you suppose I could get the best figures? It seems most skins used are imported.

8—Would domestic skins suffice as well, and what would be my nearest to original source of supply for them?

9—In what size quantities do you suppose I would have to order from foreign exporters in order for me to import skins, or would I have to be a recognized dealer?

Sedan, Kan. E. C. Courtwright.

—1—The majority of skins used for straining gasoline and which are called chamois skins are in reality sheep skins.

2—There are a small proportion of goat skins, but these are not manufactured to such a large extent, although satisfactory.

3—These sheep skins are washable, as are also the goat skins and the genuine chamois. The latter, however, are too expensive for extensive use.

4—The skin you require would be of a heavy medium grade

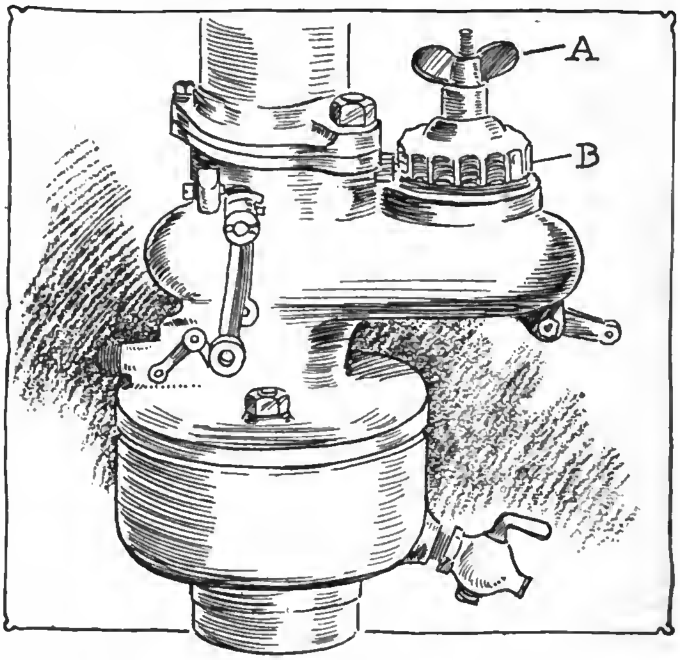

Fig. 4—Single adjustment on E. M. F. Carbureter. Wingnut A controls the air supply and mixture

oiled tanned. The domestic variety are just as satisfactory for straining purposes as are those which are imported, and besides they are cheaper.

5—Most of the skins manufactured into the so-called chamois are taken from Western sheep.

6—It would not be cheaper for you to live near the Western sheep markets, unless you were buying in extremely large quantities.

7—The Eastern markets, located in New York, Boston and Philadelphia. One of the largest manufacturers in this country is Drueding Bros., 429 Master street, Philadelphia, Pa. This concern will furnish you with any other information you desire.

8—Yes. See question 7.

9—It is sold in kips. There are thirty pieces to a kip, each piece being composed of the skin of the entire animal.

Dull Pound Given by Motor

Editor The Automobile:—I have a Carhart 1912, Falls motor, two-bearing cylinders 4 by 4.5 inches. When running on level and without too much gasoline car runs smoothly and with only slight vibration, but on picking up with more gasoline there is a distinct throb of dull character which comes with about every fourth explosion. I had motor overhauled to find cause, transmission and differential looked over and in fact every possible thing which might cause such a throb looked into. Wiring is good and perfect, timing O. K. Can you help me out? Do you think the carbureter is at fault? It is a Stromberg. I have tried every kind of mixture. This has been going on for about 6 months, but getting worse all the time. Nothing is loose.

New York City. J. C. R.

—The fact that the noise has been increasing gradually for a period of 6 months would indicate that the trouble is in the bearings of the motor. It often happens that the bearing nearest the flywheel is worn and the wear cannot be detected because the weight of the flywheel holds the shaft down tightly to the lower bearing liner. This is indicated in Fig. 3. If you will look at the bushings in the two main bearings it will be found that the trouble is in one of these.

Bent Axle Causes Tire Wear

Editor The Automobile:—One front tire shows considerable wear, but the left tire shows practically none. I have the wheels toed in .25 inch in front. Tell me, if possible, which spindle arm is bent or which wheel is out of line, or how to find out the trouble.

St. Louis, Mo. J. T.

—The condition of your front axle is evidently that which is shown in exaggerated form in Fig. 5. The wheel which is in an improper position and upon which the tire wear is greatest is nearest the bend in the axle in all probabilities. It is certain that the tire which wears quickest is on the wheel that is in such position that the contact with the ground is of the sliding rather than rolling nature. This combination of sliding and rolling motion may be readily detected by examining the surface of the tire. It will be noted that the tread has the same appearance as if it were filed or had been run over the surface of a grindstone. A series of parallel lines running diagonally across the tread will be perceived upon close examination. This is due to the fact that the wheel which is out of line is being practically pushed along the surface of the ground.

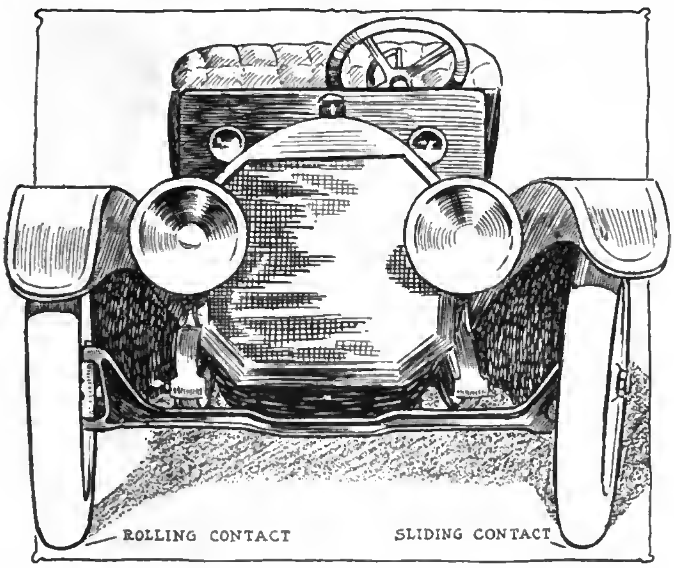

Fig. 5—Exaggerated effect of bent axle, showing how one wheel has a sliding contact with ground

The location of the bend in the axle may be found by running a straight edge along the I-beam flange. It is generally found that the bend is at the center of the axle since this is the portion which carries the greatest load. A bend in the steering knuckle is not infrequent, however, and these should be aligned also.

Another good method of procedure would be to place the car upon a floor and turn one of the wheels so that it is exactly parallel to the center line of the car. A line should be struck through the center of the wheel extending fore and aft. At the point where the wheel meets the ground a line at right angles to the fore and aft line is drawn, and extended toward the other wheel. Now from the other wheel draw a line parallel to its direction extending through the point at which the wheel touches the ground. Through the point of intersection of this wheel with the ground draw a line at right angles to the line and extend it in the direction of the first wheel. The point of intersection of these two right-angle lines will give the bend location. The bend will be found in the axle vertically above the point of intersection.

Effect of High Gas Speeds

Editor The Automobile: Is it true that better carburetion results from high gas velocities as compared to lower rates of flow with correspondingly high pressure? To what extent does this affect the atomization of the fuel?

Syracuse, N. Y. Reader.

—The fuel economy resulting from the use of air velocities higher than the average, and thus lower pressures, is quite marked. Of course, with high charge velocities, the maximum power is not realized above a certain piston speed; but the fuel economy and efficiency will be greater within the range which the high velocity device can supply without great loss per cylinder charge. This latter fact is easily demonstrated by making two series of runs with any multiple-cylinder automobile engine. One series should be made with carbureter and manifold passages of such areas that an average charge velocity of about 8,000 feet per minute is had at a velocity speed of 1,000 feet per minute, and the other series with passages which will give the above charge velocity at between 600 and 700 feet per minute piston speed.

A comparison of the two series of runs will show that up to that piston speed at which the volumetric efficiency of the engine pumping strokes falls off because of too high a charge velocity the power deliveries are approximately equal, the fuel consumption per brake horsepower hour and the thermal efficiency have each been improved. The passages giving the above charge velocity at the higher piston speeds will permit of the development of a greater power at those speeds, and are thus superior from the viewpoints of maximum economy and efficiency at maximum output, which is the condition desired.

The points which it is desired to bring out are: That the greater the pressure drop in the passages the more perfect will be the breaking up of the fuel, the more rapid will be the agitation and internal motion in the mixture column, the greater will be the vaporization due to pressure reduction; and, as a final result, the fuel will be more thoroughly vaporized, and the mixture more homogeneous. There are in present practice several examples of the above utilization of high air velocities and low pressure in the carbureter passages. In the best of these the maximum charge velocity in the manifold and past the valves is kept down to the value given above (8,000 feet per minute); and the high velocities and low pressures are both secured in the carbureter passages through several spraying nozzles, each located in a separate, small passage.

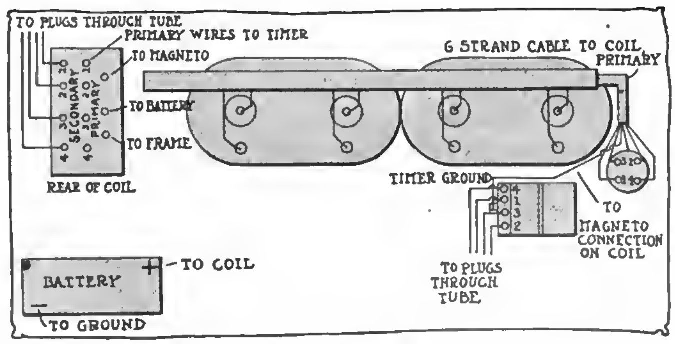

Fig. 6—Wiring diagram of the Amplex car, giving connections from battery and magneto to coil

The Automobile

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Kerosene or Gasoline

NOT a few owners of automobiles and motor trucks are pondering today on the solution of the fuel problem, wondering if some fine morning they will not awaken to read the announcement that from that date forward they will have to use kerosene in their cars, due to a gasoline shortage. There is no fear of such a contingency. The process of gradually introducing heavier gasoline will continue as it has in the past. It is fresh in the memory of the majority when 74 fuel was general, then came 68, then 64, then 62, then 60 and now it is a little lower. This gradual use of heavier fuel will continue, because the supply of crude oil demands it. The amount of 60 gasoline that can be made from a given quantity of crude is exactly double the amount of 64 fuel that could be produced. This means that if we demanded 64 fuel today we would be bringing about an exigency and the only way to meet it would be an unprecedented advance in price.

All automobile owners must be prepared to accept the heavier weight fuels. It is not surprising that many should object to this, but the objections can largely be passed over when it is remembered that in these heavier fuels are enough low-boiling points to insure a quick ignition and relatively easy starting. The self-starter has come at a most opportune time to aid in this work.

The Cost of Poor Roads

FROM the last report of the Department of Agriculture, Washington, D. C., it is apparent that bad roads are today playing their part in the high cost of living, because at least a considerable fraction of the cost is due to the farmer not being able to convey his products to market as rapidly as he should. Instead of keeping up with previous years the farmer is dropping slightly behind in deliveries, due to increased crops with no corresponding improvement in facilities for transportation.

The report shows that with wheat, corn, oats and barley the crop percentage delivered from the farm is less than a year ago. Taking the negative aspect of it 41.3 per cent. of the 1912 wheat crop was on the farms, not delivered, on March 1, whereas a year ago but 34.9 per cent. of the 1911 crop remained on the farm at that date. Similar figures apply to corn, oats and barley. When the actual number of bushels of each is taken into consideration, the amount remaining undelivered on the farm this year is vastly in excess of that of a year ago.

With this condition confronting him the farmer is still loath to see in a dollar-and-cent atmosphere the doctrine of good roads. He still remains content to pay 23 cents over per ton-mile for delivery of products when Europe is paying less than 10 cents.

Better rural roads would affect directly the distribution of one-third of the nation's crop, a large proportion of which, it is claimed, is wasted because of the farmer not being able to deliver it at seasons when he has the time and when the market is suitable. This failure in delivery is a question that should be considered by every automobilist. To the maker of passenger cars it means lack of capital with many farmers to purchase cars and at other times a lack of desire to purchase because of the road conditions. To the maker of motor commercial vehicles the message is equally important. Better roads would mean the ability of the farmer to purchase motor trucks for delivery work, and it is a conservative statement that the use of motor trucks and good roads would mean marketing a large fraction of the crop, so large a proportion, in fact, that the additional money secured by the farmer would, in not a few cases, go far to paying for the original truck investment.

Selling and the Truck Show

A MOTOR truck show is only of value to the truck maker in proportion to what he puts into it. The truck maker who begins preparing in advance for the show generally is not disappointed with results; whereas that maker who waits for the show and goes to it anticipating a landslide to his product generally leaves the show a most dejected person.

Public interest must be worked up previous to a passenger or truck show, and particularly with the truck show. One of the best informed authorities on the principles of salesmanship recently stated that "the best policy is to begin the advertising and selling campaigns a long time before the product is ready for delivery."

Electric Vehicle Men Hear Truck Paper

NEW YORK CITY, March 26—In spite of inclement weather, the regular monthly meeting of the Electric Vehicle Association of America, held in the rooms of the association in the Engineering Societies building last night, was well attended and great interest was shown in the paper of the evening, "Observations on Horse and Motor Trucking," by Professor H. F. Thomson, of the Massachusetts Institute of Technology.

Before Mr. Thomson took the floor President Williams called on L. J. Gerson, of the Wanamaker organization, who outlined the plan to be followed by that firm in marketing electric vehicles. Mr. Gerson stated that the company intends to sell cars in three ways:

Plan A—To sell cars outright with the manufacturer's guarantee.

Plan B—To sell cars outright and include 1 year's service at the nearest garage.

Plan C—To sell cars outright and to establish for the purchaser a private garage with all necessary equipment.

Plan B includes the delivery of the car at the residence of the purchaser at any time ordered from the garage, repair and unkeep work, charging of batteries, etc. Naturally, the cost of this service will be added to the cost of the car.

New Garage Sign Being Prepared

After discussion of this plan President Williams announced that the association is preparing a new garage sign somewhat similar to that employed by the Blue Book in that it bears the stamp of approval of the association.

Mr. Thomson then proceeded with the paper of the evening, illustrated by lantern slides showing the tabulations and charts included in the paper. Before dealing with these details, Mr. Thomson took up the truck problem in general as follows:

"The amount of work which any truck can do in a working day depends, first, upon the number of miles it is driven in a day, and second, upon the standing time or time taken in loading and unloading. The first item depends primarily upon the speed of the truck, although in congested districts the speed may be largely determined by the average speed of all the traffic using the street. But the second item, which is equally important, depends primarily upon the loading and unloading conditions. The importance of the effect of standing time upon the cost of operation is frequently overlooked; yet this time item must be carefully considered, particularly when motor trucks are used.

"As an illustration, consider a horse-drawn wagon which travels 15 miles per day but which is actually moving about 3 out of 9 working hours; the average speed of the wagon therefore being 5 miles per hour. If this wagon is replaced by an electric truck of the same carrying capacity, whose average speed under the same traffic conditions would be 10 miles per hour, then the motor truck could cover this same distance of 15 miles in $15/10 = 1.5$ hours; but if the loading and unloading conditions remain the same, the time required to perform the same service would be $6 + 1.5 = 7.5$ hours. That is, in 9 hours the motor truck could do only $9/7.5 = 1.20$, or 20 per cent. more work, although its speed is twice that of the horse wagon. However, in many short haul services the superior ability of the motor truck, in comparison with the horse-drawn wagon, to get into position where considerable backing and other maneuvering is necessary may be of equal importance with the greater speed of the motor.

"On the other hand, the long haul character of work offers to the motor an opportunity to utilize its superiority over horses with regard to greater speed and mileage capacity.

"The routing of delivery wagons, especially in parcel work, is another feature of operation which requires special attention. Two factors limit the amount of load which a wagon can handle on a single trip, first, either the bulk or weight capacity of the body, and second, the number of trips which must be made per day. The former factor is taken care of by the use of a body of suitable capacity. The latter factor very often curtails the number of deliveries made on a trip, as a wagon which consumes 2 or 3 hours in traveling to and from its delivery territory can evidently handle fewer parcels than the motor car which spends only an hour in going and returning.

"The ratio of the actual number of miles per day which a truck is driven to the number of miles per day it is capable of running, under average conditions and without interference from other traffic, may be called the mileage factor of the truck in this particular service. The greater the mileage factor in any service, the less will be the cost per unit of the service. Therefore every effort should be made to maintain a high mileage factor. To accomplish this when motor trucks are substituted for horse wagons may require considerable change in the methods previously employed in the service using horse-drawn vehicles only.

"In addition to a good mileage factor, the load-factor, or the ratio of the maximum load per trip to the capacity rating of the wagon, should also be kept as high as possible. If the vehicle does not carry its rated load on each trip, it is not performing the work with the greatest economy. In some lines where the quantity of work varies considerably with the season of the year, this may be a difficult adjustment, but in any case the size of vehicle should be carefully selected to fit the service in hand.

"The service of the hauling of freight from railroad freight houses to dealer's warehouse, or vice versa, presents a particularly complicated problem. This is due to the diverse conditions which must be dealt with, such as the railroad's organization of its freight houses, the relative locations of the stable, freight yard, the wholesale areas of the city, the fact that teams and merchandise frequently are owned by different parties, etc. In addition to the time often lost by a wagon at warehouse or freight house in receiving its load, there is also poor economy in the usual practice whereby a wagon moves with full load a comparatively small percentage of the working day."

Mr. Thomson then proceeded to elaborate upon the tabulations of cost and efficiency and to elucidate the charts and diagrams illustrating his paper.

The Field of Traffic Engineering

Before opening the meeting for discussion President Williams called attention to the prominence which has been attained by the comparatively new profession of traffic engineering. He pointed out that a state committee detailed to investigate the subject found that the cost of food in New York City is increased 40 per cent. by inefficient distribution. This food, which costs $350,000,000 at the piers and terminals, represents a cost to the consumer of $500,000,000 delivered at the kitchens. President Williams suggested to Mr. Thomson that it might be possible to establish a course in traffic engineering at the Massachusetts Institute of Technology. He also drew attention to the increasing night traffic in the large cities, pointing out that this is the best way to utilize the immense investment in the way of pavement which is lying practically idle nearly 50 per cent. of the time.

An animated discussion of Mr. Thomson's paper following being opened by Mr. Cabot of Boston, followed by Messrs. Kennedy, Curtis, Lloyd, Bartlett, Howland and others. The meeting was brought to an end after Mr. Thomson had answered the inquiries made in detail.

Cars participating in the winter reliability run of the Swedish R. A. C. in the Olympic Stadium before the start

N. A. G. car, which won the Goteborg hill-climb, according to the official formula rating of the club

The German Horsch car which took third place in the reliability run, rated on the official formula

Another German car, the Opel No. 5, which ranked fourth in the reliability run as announced in the official score

Fourteen Perfect in Swedish Reliability

Five Others Perfect Mechanically But Were Penalized for Not Adhering to the Official Schedule—First American Car Ranks Sixth in Run—Another American Machine Takes Second Place in Goteborg Hill-Climb

STOCKHOLM, SWEDEN, March 6—Of the sixty-eight cars entered in the Swedish Royal Automobile Club's annual winter tour, according to the official scores which have just been made public, fourteen are credited with perfect scores. Four of these were American-made. Five other cars were perfect mechanically, that is, they were not penalized for repairs, but were given demerits for not keeping the official schedule. Two of these were American. The results of the run are given in the accompanying tabulation. The Hupmobile is the first American car, ranking sixth.

The Goteborg hill climb was won by the N. A. G., while the Overland took second place with a formula rating of 2,690. These cars were the only ones to make perfect scores, as may be seen from the tabulation.

The trip was to Goteborg and back to this city, a distance of 1,181 kilometers or 738 miles. The rigor of the climate usually renders the tour a trying test for both cars and drivers but this year the mild weather rendered it simply an enjoyable trip, the only hardship being the difficulty which the drivers experienced in keeping awake.

Stop of 12 Hours at Goteborg

A stop of 12 hours was allowed at Goteborg. There were control stations at convenient points along the route where stops could be made for fuel, oil and food without penalty. The time consumed, however, was added to the schedule time, and could not be made up en route. For example, if a car remained for an hour at a control it would not be allowed to enter the next control until an hour after its scheduled time of arrival. If for any reason the car was stopped en route, the time so consumed was added to the schedule. The car could not be stopped anywhere except within the boundaries of the control station without the time being added to the arriving schedule. As a result, every contestant endeavored to keep as closely to the specified pace as possible.

The roads in Sweden are generally better than the average road in the Middle West of the United States, and although several fairly steep and difficult hills were climbed on the route covered by the tour, they were not especially trying to either cars or drivers.

Tremendous enthusiasm was shown by the great crowd which witnessed the start of the tour from the Olympic Stadium in this city and all along the route people lined the roadways watching for the appearance of the cars.

The scenery was very fine and the participants in the tour thoroughly enjoyed themselves, although 28 hours of constant travel with meals consisting of sandwiches and the contents of vacuum bottles which could be consumed comfortably only by a juggler owing to the motion of the cars, made the arrival at Goteborg a great pleasure to some of the contestants.

After checking in at the Palace Hotel in Goteborg, the cars proceeded to a fuel station where they replenished the fuel and oil supplies. Then they were driven to a large garage where competent officials were at hand to see that the cars were arranged in an orderly maner so that departure would be facilitated.

Twelve hours after checking in at Goteborg, the cars were again required to start away on the return journey. Thus many of them were on their way back to Stockholm before daybreak.

Cars which left Goteborg shortly before daybreak were scheduled to arrive in Stockholm about midnight, and at a point about .5 hour journey from Stockholm, each car was stopped opposite two red lights, which marked the starting point of a long hill. The speed of the ascent of this was timed, and figured in determining the winner of the tour, the time being taken by the observer in the car, with a stop watch specially provided for the purpose. The start was a standing one, both the car and the observer's watch, being required to start at the word "Go" from an official. At the top of the hill, which also was marked by two red lights, one on either side, the observer's watch was stopped, and as the car proceeded on its way the time was read and noted in the observer's book.

On arrival at the Grand Hotel, which also was approached through masses of people, the observer made his final notations in his book, compared watches with that of the timers, notation of any difference between the watches was recorded, then the observer handed his book over to the official and the car was dismissed. No final examination of the car was necessary, it being simply required that the car arrive at the Grand Hotel, the finishing point, under its own power.

The formula used in determining the winners of the contest is as follows:

$$R = \frac{[P\,(k+i) + 0{,}06\,S\,V^2]\,V}{0{,}01,\ nD^{2'4} \times L^{0'6}}$$

P = Weight of car in tons (1000 Kg.) with equipment, passengers and full benzine tanks.
V = The average speed of the car during the tour, in meters per second. (This year = 37.53 cm per meter.)
i = The average rise of the hill in millimeters per meter.
D = Bore of cylinders in centimeters.
L = Stroke of motor in centimeters.
n = Number of cylinders.
k = Constant, varying from 12 to 30, according to the condition of the road during the tour. This is decided by the committee just before the hill climbing takes place. (In this test it was 18.) (1913.)
S = 0,8 for small racing cars.
S = 1.0 for large racing cars.
S = 1.25 for passenger cars with torpedo bodies.
S = 1.50 for touring cars with windshield and top.
S = 2.00 for closed cars.

This formula was used by Swedish R. A. C. for first time this year, and is claimed to favor small cars.

Tabulation of the Standing of Leading Cars in Swedish Run

No.	Car	Repairs	Schedule	Formula Rating	Time on Kilometer Hill
19	• Minerva	0	0	5714	1:31.0
34	Minerva	0	0	3649	1:37.0
8	Horch	0	0	3335	1:23.2
5	Opel	0	0	3224	1:27.4
10	Scania-Vabis	0	0	3135	1:30.4
1	Hupmobile	0	0	2791.	1:44.7
29	Pope-Hartford	0	0	2720	1:28.7
7	Fiat	0	0	2443	1:31.8
30	Overland	0	0	2429	1:24.3
35	Cadillac	0	0	2375	1:24.6
20	Fiat	0	0	2207	1:36.3
16	Mercedes	0	0	2081	1:49.4
14	Horch	0	0	2051	2:10.3
15	Rochet-Schneider	0	0	....	1:37.8
	Other Cars With Perfect Mechanical Scores				
12	Scania-Vabis	0	6	....	1:43.1
26	Overland	0	6	....	1:30.5
6	Opel	0	7	....	1:28.8
25	Horch	0	10	....	1:39.4
2	Cadillac	0	53	....	1:28.8

Standing of the Leading Cars in Goteborg Hill-Climb

No.	Car	Repairs	Schedule	Formula	Time on Hill
61	N. A. G.	0	0	3589	2:12.4
57	Overland	0	0	2690	1:22.7
63	Hupmobile	0	38	....	1:47.2
58	Presto	3	6	....	1:45.6
52	Hupmobile	4	7	....	1:42.9
51	Overland	14	6	....	1:32.6
45	Maxwell	14	17	....	1:43.5
54	Hupmobile	19	68	....	1:42.1
66	Krit	32	151	....	2:14.5
59	Krit	33	29	....	2:15.2

•Note—Attention is called to the time made by this car on the Kilometer Hill, being much better than that of any other of the 68 cars that competed. It was also one of the only two cars to have a perfect score.

Daimler No. 4 ready to start on the winter reliability run of the Swedish Royal Automobile Club

Overland No. 57, which took second place in the Goteborg hill-climb, making the best time of all the contestants

Cadillac No. 35, which finished the reliability run with a perfect score, ranking tenth in the list

No. 1 Hupmobile, which also had a perfect score in the run, was first of the American cars, ranking sixth

The Magic Motor on Test

Test at A. C. A. Laboratory Shows Good Performance for Sleeve Motor on Open and Closed Throttle

THE A. C. A. has run a test on the Magic motor, which was described in THE AUTOMOBILE of December 19. This motor, it will be remembered, has two crescent-shaped sliding valves in the cylinder wall, driven off the cranshaft by box cams and Coventry chains. The slides extend the whole length of the cylinder and about 2 inches below, terminating in slots for engagement with the actual driving mechanism. The motor is a four-cylinder monobloc casting with a bore of 3.3125 inches and a stroke of 4.75 inches.

On one test the motor ran continuously for a period of two hours at an average speed of 1293 revolutions per minute, developing an average of 23.4 brake horsepower. The total weight of fuel used during this run was 35.6 pounds, an average consumption of 0.76 pound ber brake horsepower hour. The total weight of oil consumed was 0.6 pound, equivalent to 0.66 pint in liquid measure.

Other tests with wide open throttle at various speeds ranging from 124 to 1990 revolutions per minute were made, the motor running for five minutes at each speed. The maximum brake horsepower recorded was 32.8 at 1990 revolutions per minute. The motor was allowed to idle for two or three minutes between most of the five-minute runs.

A second series of five runs were made with the throttle approximately half open.

A third series of runs was made with the electric dynamometer driving the engine (throttle wide) in order to determine the frictional losses. The approximate indicated horsepower was determined by adding to the brake horsepower at the several speeds, the power lost in friction at the same speeds.

The motor is of the four cycle type, having four cylinders of 85 millimeter, 3.346 inch bore. The cylinders are cast en bloc with a common water jacket. The stroke is 120 millimeter, 4.72 inch. The valves are of crescent shape and are placed between the piston and the cylinder wall, there being one inlet valve and one exhaust valve for each cylinder. They are operated by a box cam which imparts a positive motion both in opening and closing. The weight of the motor, including flywheel, carburetor, magneto, inlet, exhaust and water manifolds, is 520 pounds. The weight of pistons and three rings (no wrist pin), 2.2 pounds. Weight of connecting rod, 3.7 pounds. Length of connecting rod, 11.42 inches.

The clearance volume of the motor is 9.75 cubic inches and the piston displacement 41.5 cubic inches. Total piston displacement of four cylinder is 165.9 cubic inches.

A gear pump is employed to lift oil from the sump, whence it is pumped to the main bearings under pressure, and to troughs under the connecting rods in which a constant level is maintained. The big end bearings, valves and pistons are lubricated by splash.

Before any tests were made on the motor the heads of the cylinders were removed and all carbon in the combustion chamber cleaned out. Following these tests, which consumed about one week, the cylinder heads were again removed, and it was found that the cylinder walls below the junk ring and above the piston when the latter is at the top of its stroke, including that portion of the inner wall of the valves which does not at any time come into contact either with the piston or junk ring, were coated with carbon to a thickness of approximately 1-64 of an inch. The same was true of the lower edge of junk rings. The piston heads were clean in the center with some carbon deposit near the edges. The cylinder head was coated with only a very slight deposit, barely enough to completely cover the metal.

The gasoline used during the test was 63.2° degrees Beaumé, equivalent to 0.727 specific gravity. The heating value of the gasoline is taken at 20,490 British terminal units per pound in computing the thermal efficiency.

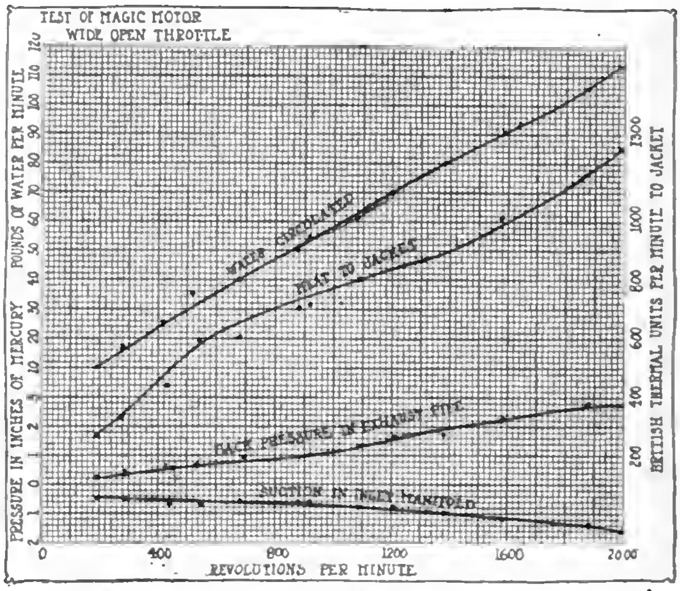


Fig. 2—Water, heat loss, back pressure and intake suction curves taken on Magic motor test

The motor was fitted with a 1 1-4 inch Newcomb carbureter which was set to give maximum power. This initial setting was not changed after starting the tests here recorded. Hot water was circulated through the carbureter jacket in all runs.

The source of ignition was a Berling magneto with spark timing lever set in each run to give maximum brake horsepower.

The motor is designed to use thermo-syphon cooling, but it was found impossible to get sufficient circulation through the long pipes and the Venturi meter used between motor and cooling tank in this test. Hence, a small gear pump was connected directly to the crankshaft and used to assist the circulation during the tests.

The exhaust from the motor was discharged into a short length of pipe to which it was connected by an 8-foot length of 1 1-2 inch flexible tubing to a 2 inch Mondex muffler. The back pressure in the exhaust pipe was measured by means of a mercury manometer connected at a point about 1 foot from the outlet of the exhaust manifold. No smoke was exhausted.

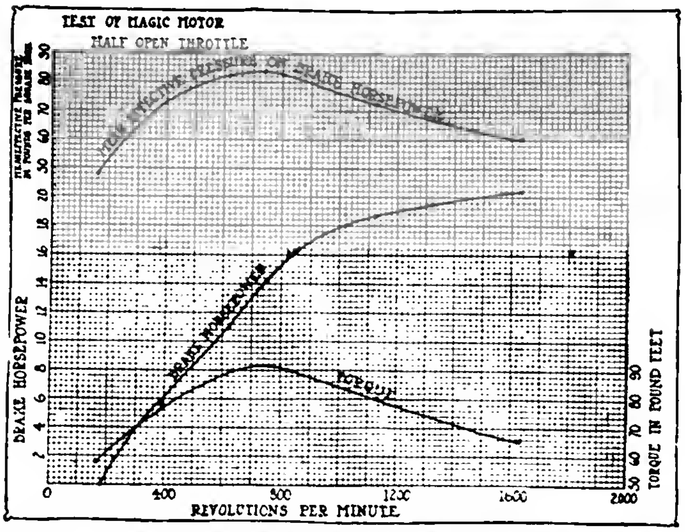


Fig. 1—Curves of mean effective pressure, brake horsepower and torque made from test on Magic motor

Some Methods of Testing Automobile Motors—Makers Are Coming to Realize Value of Scientific Testing

Communication From England on Accumulators As Necessary Evils Predicts Ideal Electric Lighting System

ELIZABETHPORT, N. J.—Editor THE AUTOMOBILE:—As the actual horsepower of an engine is affected by bore, stroke, number of cylinders, compression, form of compression chamber, valve timing, shape and length of gas passages, cooling facilities, location of ignition point and many other features it is very hard to form some empirical formula by which the horsepower can be accurately calculated. Possibly the formula most used is that of the A. L. A. M., namely, $\frac{Nd^2}{2.5}$ assuming a piston speed of 1,000 feet per minute.

While one regrets that there is no complete testing laboratories in the country, we feel sure that the makers are gradually realizing the value of a scientific test. A testing laboratory is to the average engineer very much like medicine, inasmuch as he knows he needs it, but hates very much to take it. The principal part of the laboratory is, of course, the dynamometer, and some of the uses of a reliable machine are carbureter adjustment, valve timing, ignition points and most economical speed of the engine, best lubricant to use and the effect of all various forms of mufflers.

There are two types of dynamometers, namely, transmission and absorption machines. The former is merely a device which registers the actual torque exerted in foot-pounds, but provides no means for creating a brake load, while the latter type not only provides a brake load, but also measures the same. Starting with the first type of braking device used, namely, the Prony brake, various advantages and disadvantages were shown on all makes and types, among them being the fan dynamometer by Franklin, Renard & Tracy, the Reilly hydraulic brake, the Garland electric dynamometer and the modern forms of electric cradle dynamometers.

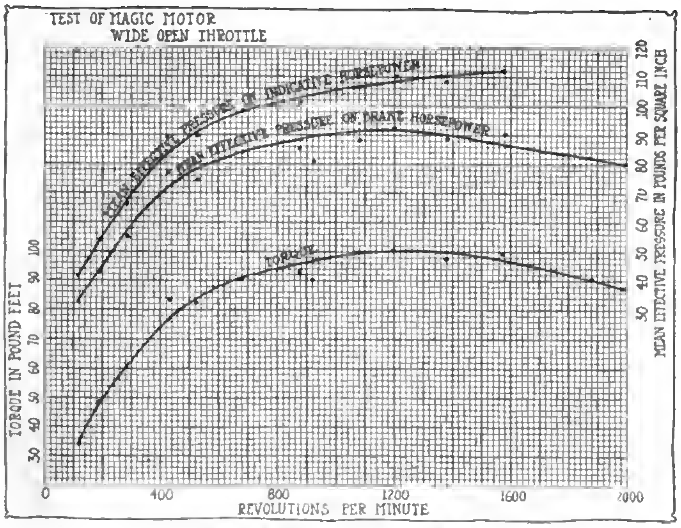


Fig. 3—Curves of mean effective pressure and torque with wide open throttle. Heat and frictional losses may be noted by subtracting brake from indicated horsepower curve.

One of the principal features in connection with the Diehl electric dynamometer system is the method of control. The company provides a control table of mahogany on which is mounted a large automobile steering wheel and three-point rotary switch. Through the steering wheel is supplied a spark and throttle control, the combination forming a standard automobile equipment. One operator can sit at this table and have every feature of the laboratory, that is, as far as horsepower measurements are concerned, under his direct control.

The methods various makers have adopted to test their engine are of interest, especially that of the German company whose factory is on the banks of a river. This concern mounts thirty or forty finished motors side by side on a scow and connects them through their own flexible joints to a line of shafts extending into the water, to each of which is keyed a propeller enabling the engine to be maintained at the most economical speed. Between the flexible shaft and propeller shaft is fixed a torsion transmission dynamometer.—P. P. DEAN.—Diehl Mfg. Co.

Motor Car Electric Lighting

LONDON, ENG.—Editor THE AUTOMOBILE:—The above matter is ever present with most motorists now, and this has been an exceedingly useful winter for testing the real driving light of electric lighting sets.

During my experiments I have found that most generators depend upon large accumulators to help them out when being used at night. Now, it seems to me that no form of electric light dynamo should be purchased by a motor car user unless the output from the dynamo is more than sufficient, when the head and other lamps are alight, to provide all the electricity required, without calling upon the accumulator.

If the accumulator is called upon, it means that if your journey is prolonged, the lights get feebler and feebler, whereas with a proper generator which gives 18 amperes one can have a whole collection of lamps alight and can use a small, and thus a light accumulator, and the accumulator, at the end of a night's run, has more electricity in than when you started.

It is well to remember that accumulators are only a necessary evil, they weigh a lot, they cost a lot. The ideal generator some day will light the lamps without any accumulator; at present our generator lights them through small, light ones—not ideal—but the best yet produced.—S. F. EDGE.—United Motor Industries, Ltd.

To Obtain Gasoline Economy

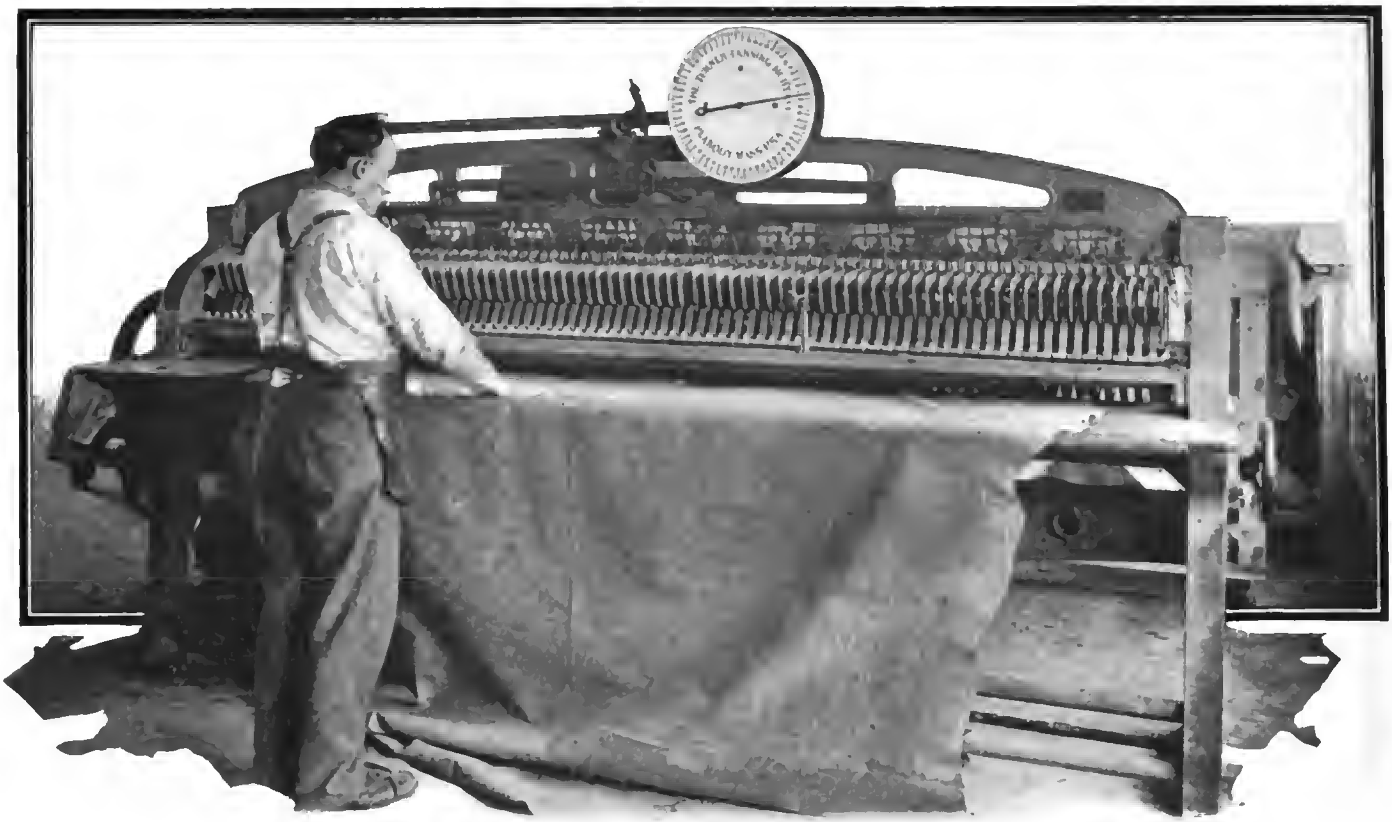
Economical operation with a six-cylinder car, or in fact any car, may be said to be attained when about 14 miles on 1 gallon of gasoline is the average over a fairly long period in the use of that car.

Gasoline economy is but one of the many economies that can and should be worked for on a car. This is one reason why it will never be possible commercially to get the maximum economy of gasoline, as to obtain that maximum, it is necessary to sacrifice a good many other details that lead to a satisfactory car.

We believe that every man selling cars should know the points that are necessary to be understood in their operation in order to obtain fuel economy.—A. HOLMES, H. H. Franklin Mfg. Co.

ROAD RESISTANCE—If a wheel rim with an axle pressure could roll on a surface without any deflection, such a condition would be rolling without resistance. A wheel rim under the pressure of the axle is deflected into the ground and leaves a path. The quantity of work required to make the path of interval length in an interval of time is the measure of work consumed by resistance.

Factory Miscellany



Special machine used for measuring the area of hides employed in upholstering cars in the Studebaker factory at Detroit, Mich.

THE above machine is used in the Studebaker factory at Detroit for measuring the area of the hides used in upholstery work. As the piece of hide passes between the rollers the fingers shown in the illustration rest upon it and are hence raised above the level at which they rest when there is no hide in the instrument. The more fingers that are raised by the hide in passing between the rollers the greater will be the area of the hide. This area is registered on the diaphragm of the recording device mounted above the fingers and directly before the operator. By knowing definitely the area of the hide the trimmers are able to base their calculations in such a way that there is very little of the hide wasted. The machine is large enough to accommodate the largest hides, and, as may be seen in the illustration, can be operated by one man who notes the readings on the dial of the area scale and marks the hide by this reading. The time required for each measurement is 100 per cent. shorter than that of measuring by manual means and the results are more accurate. This machine is made by the Turner Tanning Machinery Co., Peabody, Mass.

ENLARGE Klaxon Plant—The Lovel-McConnell Mfg. Co., Newark, N. J., maker of the Klaxon horn, recently completed extensive additions to its present factory equipment. A new building has been constructed which increases the floor space of the factory about 50 per cent., making an equal increase in the capacity. The new structure is of concrete, two stories in height, with basement, and it is connected with the main building by means of a bridge. It is used exclusively for storage and shipping. The space formerly occupied for these purposes in the main building is now devoted to manufacturing.

Chatham's $40,000 Plant—The Chatham Auto-Wheel Co., Chatham, Ont., is planning the erection of an auto-wheel plant, the estimated cost of which is $40,000.

Metz Builds Factory—The Metz Automobile Co., Waltham, Mass., plans to build a new factory, 200 feet by 200 feet, one story high, and of brick; also a boiler house, 100 feet by 60 feet.

Hendrie Buys Land—The W. C. Hendrie Rubber Co., Denver, Colo., has acquired 5 acres of land at Torrance, near Los Angeles, Cal., and will erect a large rubber manufacturing plant, estimated to cost $100,000.

Steel Wheel Company Building—The Steel Wheel Co., Bethlehem, Pa., is planning to erect a three-story factory on Broad street, that city, for the manufacture of a spring steel wheel for use on automobiles and motor trucks.

Ausman Factory in Chattanooga—The Manufacturers Assn., of Chattanooga, Tenn., is interested in the establishment of a factory to manufacture the Ausman motor truck. It is said that the plant will represent an investment of about $100,000.

Factory for Brazil—Although it was stated that the Goodyear Tire & Rubber Co., of South America, which was incorporated late last year, under the laws of Maine, with an authorized capital of $3,000,000, purposed acquiring or developing rubber plantations in Brazil, it now appears that the establishment of a factory in Rio de Janeiro was one of the objects in view.

Big Plant for Toledo—A new industrial plant, financed by the Perfection Spring Co., of Cleveland, O., but probably with a separate corporate title, and involving a building and equipment investment of many thousands of dollars, will be located in Toledo, O., in the near future. The new plant, like the parent plant at Cleveland, will manufacture automobile springs, and the product will be taken largely by the Willys-Overland Co. A site for the new spring company has been purchased and it will consist of 5 1-2 acres. The price paid for the land was $15,000.

Safe Storm Shield's Addition—The Safe Storm Shield Co., Fremont. O., is planning an addition to its plant in that city.

Weller-Thomas Builds—The Weller-Thomas Co., Zanesville, O., capitalized at $1,000,000, will build a plant to manufacture engines and automobile fire trucks.

Midland Making Alterations—The Midland Motor Co., Moline, Ill., has increased its capital stock from $100,000 to $300,000 and will make extensive improvements to its plant.

Kenyon Starts Addition—The R. L. Kenyon Co., Waukesha, Wis., manufacturing tops, curtains, cushions, etc., has commenced work on additions to cost $15,000 and increase its capacity one-third.

Want S. & M. Tire in Coshocton—A movement is on foot among the business men of Coshocton, O., to have the newly organized S. & M. Rubber Co., manufacturer of automobile tires locate its plant at that place. The promoters of the concern have visited that city and have viewed the old plant of the Premium Stamp Co., which could be easily remodeled into a rubber plant.

Eastern Rubber Secures Site—The Eastern Rubber Co., Toronto, Ont., which was recently organized to manufacture automobile tires, has secured a site of 4 acres and two manufacturing buildings will be erected. One of the buildings will be three stories high, about 250 feet by 72 feet, while the other will be one story, about 200 feet by 72 feet. In addition to these there will be suitable warehouses and a power plant.

Buys Big Factory—J. W. Murray has purchased the buildings and sites at Clay and the Michigan Central, near St. Aubin avenue, Detroit, Mich., and will begin the manufacture there of automobiles fenders and other articles in stamped steel. Machinery is being installed and operations will be begun shortly. The property is valued at $50,000. There are two brick buildings, two stories high and a frame structure on the property, giving a floor space of 22,000 square feet.

Traveler Purchases Building—The Traveler Motor Car Company, recently formed in Detroit, Mich., has purchased a two-story brick building at 1146 Grand River avenue and an adjoining lot with a 40-foot frontage. Plans have been prepared for the erection of a brick structure on the vacant lot and for the remodeling of the present building. The name of the car manufactured by this concern is the Traveler. Several Detroit business men are interested in the company as follows: J. P. Lavigne, W. K. McIntyre and F. W. Barstow.

Sanford in New Quarters—The Sanford Motor Truck Co., Syracuse, N. Y., has just completed a new factory in that city. It is 160 feet on St. Mark's Place, 138 feet on the Erie Canal, and 44 feet on West Fayette street, and is three stories high. The equipment is now practically complete and in a short time the factory will be running at full force. The ground floor will be used as a service station and as a final assembly, testing and shipping department. The second floor is devoted to the drafting room, superintendent's office, machine room and assembling. The third floor is given over to painting, body building and storage of completed trucks. The company has always made a specialty of 1-ton trucks, but now having the factory space necessary will build a 1 1-2-ton size, following the same lines as its 1-ton truck.

Shows, Conventions, Etc.

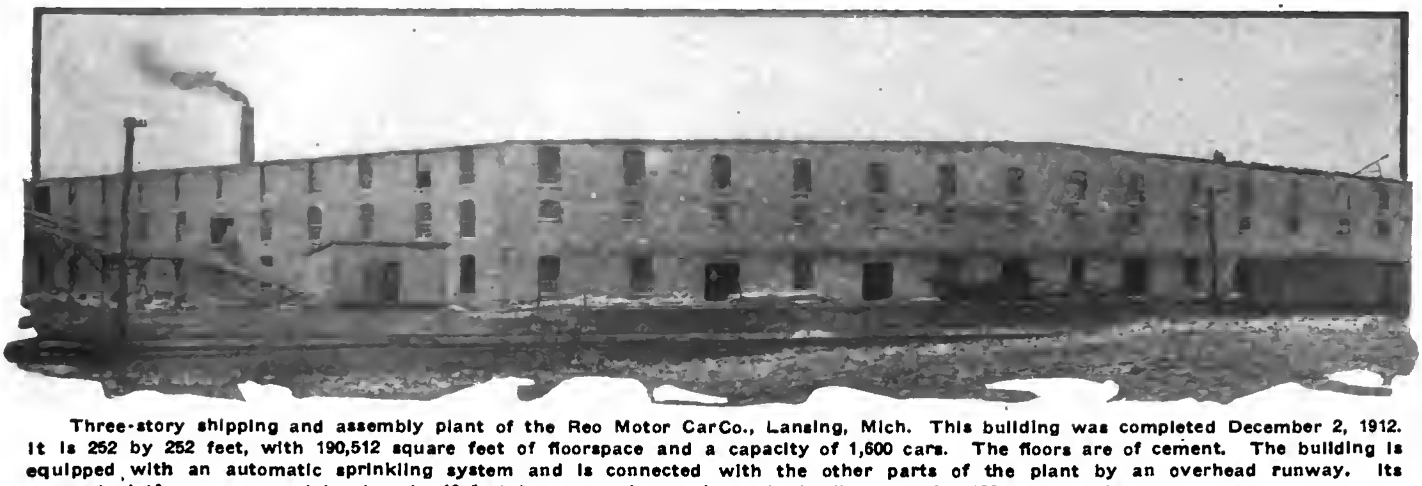
March 17-22	Norfolk, Va., Annual Show, Armory Building, Norfolk Automobile Trade Association, Inc.
March 19-22	Springfield, Ill., Annual Show, Springfield Commercial Association, W. L. Chapin, Mgr.
March 19-26	Boston, Mass., Annual Truck Show.
March 20-24	New Orleans, La., Annual Show, N. O. A. D. A.
March 24-29	Indianapolis, Ind., Annual Automobile Show.
Mar. 27-April 3	Quincy, Ill., Mississippi Valley Automobile Show, H. F. Hofer, Director.
Mar. 31-April 5	Manchester, N. H., Automobile Show, Dealers' Association, J. H. Graham, Manager.
April 1-6	San Francisco, Cal., Motor Truck Show, Coliseum Hall. *Motor Field.*
April 5-19	Pittsburgh, Pa., Annual Show, East Liberty Market House, Dealers' Association.
June 5, 6, 7	Detroit, Mich., Midsummer Meeting of Society of Automobile Engineers.
October	Paris, France, Automobile Show, Grand Palais; 10 days.
November	London, Eng., Annual Automobile Exhibition, Olympia.

Race Meets, Runs, Hill Climbs, Etc.

April 28-30	Chicago, Ill., Commercial Vehicle Demonstration, Chicago Motor Club.
May 5-8	Washington, D. C., Motor Truck Reliability, *Washington Post.*
May 14	New York City, Start of 2-Day Hudson and Catskill Scenic Tour.
May 30	Indianapolis, Ind., 500-Mile Race, Speedway.
July 1	Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Association to the Pacific Coast.
July 1-16	Winnipeg, Man., Motor Plow Competition, Dr. A. W Bell, Manager.
July 8-16	Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager.
July 27-28	Tacoma, Wash., Tacoma Road Races.
Nov. 24	Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 26	Savannah, Ga., Grand Prize Race, Automobile Club of America.

Foreign

March 31	Montevideo, Uruguay, International Competition of Agricultural Motor Vehicles.
April	Barcelona, Spain, International Exhibition.
May	St. Petersburg, Russia, International Automobile Exposition, Building of Michael Maneze, Imperial Automobile Club of Russia.
July 12	Amiens, France, Grand Prix Race.
July 18-26	London, Eng., Imperial Motor Transport Conference.
Sept. 25	Isle of Man, International Stock Car Race.



Three-story shipping and assembly plant of the Reo Motor CarCo., Lansing, Mich. This building was completed December 2, 1912. It is 252 by 252 feet, with 190,512 square feet of floorspace and a capacity of 1,600 cars. The floors are of cement. The building is equipped with an automatic sprinkling system and is connected with the other parts of the plant by an overhead runway. Its covered platform accommodates twenty 40-foot box cars, thus making the loading capacity 120 cars per day.

News of the Week Condensed

American La-France truck equipped with hydraulic transmission hauling a 45-ton load consisting of a frame for the door of the new vaults of the Bank Clearing House in New York City. The frame was placed upon a four-wheel wagon which, empty, weighed 16,400 pounds. The door frame weighed 52,600 pounds. The truck was loaded with five steel plates for the vault which weighed 12,100 pounds. The truck itself weighed 9,000 pounds, so that the total load to be moved was 90,000 pounds

WHITE Buys Philadelphia Land—The White Co., Cleveland, O., has purchased a four-story concrete automobile sales building on North Broad street, Philadelphia, Pa., occupying a lot 53 feet by 200 feet, for $300,000. The structure was formerly occupied by the Packard Motor Car Co., and at present is the home of the United Motors Philadelphia Co. It is reported that the White company will have two additional stores constructed preparatory to removal from its present quarters.

Ohio Punctureless Moves—The Ohio Punctureless Tire Co., Columbus, O., has moved to 205 East Town street.

Tudhope in New Quarters—The Tudhope Motors, Ltd., Vancouver, B. C., is now located in new quarters on Granville street.

Opens New Washington Salesrooms—D. S. Hendrick & Co., Inc., has opened up new salesrooms at 1024 Connecticut avenue, Washington, D. C.

Harper Studebaker Inspector General—H. G. Harper has been made inspector general of the automobile division of the Studebaker Corp., Detroit, Mich.

Maloney Chairman Minnesota Board—J. A. Maloney has been elected chairman of the Minnesota state board of automobile examiners, Minneapolis, Minn.

Philadelphia Swinehart Agency Opened—The Swinehart Tire & Rubber Co., Akron, O., has opened an agency in Philadelphia, Pa., at 726 Main street.

Metallurgique Moves Salesrooms—The Metallurgique Motor Co., Inc., New York City, has removed its showrooms and shop to larger ones at 1876 Broadway.

Black Brothers Continental Distributors—Black Brothers have been appointed distributors for British Columbia, headquarters at Vancouver, B. C., for the Continental tires.

Sherman Elected President—J. M. Sherman has been elected president of the Safe Storm Shield Co., Fremont, O., to fill the vacancy caused by the death of J. F. Gottron.

Mars Erecting Pittsburgh Garage—G. C. Mars, Pittsburgh, Pa., is erecting a two-story brick garage at 4610 Center avenue. The building will be fireproof and is estimated to cost $12,000.

Franklin Agency Building Completed—Cramer and Bennett, recently appointed Franklin dealers, have completed the building of a new salesroom and garage at 220 Sixth street, Waterloo, Ia.

Pierce-Arrow's Brooklyn Building—The Pierce-Arrow Automobile Co. is erecting a four-story 200 feet by 205 feet building on Freeman street, Brooklyn, N. Y. It will cost approximately $300,000.

New Kelly Service Plan—The Kelly-Springfield Motor Truck Co., Springfield, O., recently announced a chain of fourteen factory branches and service stations in the principal centers of the country.

St. Louis Specialty House—A new automobile specialty house is to be opened in St. Louis, Mo. It will be known as the Daughters-King Auto Specialty Co., and will be located in the heart of the automobile row.

Rowan Velvet Shock Absorber Manager—F. J. Rowan, formerly district sales manager of the American underslung in the East, has been appointed sales manager of the Velvet shock-absorbing springs, Boston, Mass.

Form New Company—The United States Auto Lock Co., is to be the name of the new firm that is to begin operations in Findlay, O., soon. The product that is to be manufactured by the new company is a lock for automobiles.

Pacific Tire Company Transferred—The business of the Pacific Rubber Tire Co., Ltd., Vancouver, B. C., agent for Firestone tires, was taken over recently by the Pacific Rubber Tire & Repair Co., Ltd., under new management with A. L. Teetzel as president.

Larger Quarters—The Automobile Exchange, Ltd., London, Eng., has moved to 91 Great Portland street, in order to get larger quarters. With the additional room thus afforded the company is looking for more lines of automobile parts and supplies. It has the agency for several British cars and one of American make.

Motor Buses in Washington—The National Motor Transportation Co., Washington, D. C., has been given a franchise to operate a number of motor buses connecting the northwest section of Washington with the Capitol and the Union Station, via F street and Pennsylvania avenue. The cars to be used will be manufactured by the Commercial Truck Co., Philadelphia, Pa. H. H. Westcott is president.

Attempt Organization Washington Dealers—The organization of an automobile dealers' section of the Retail Merchants' Assn., is being attempted in Washington, D. C. Claude Miller has been made chairman of the automobile section. The prospectus of the association sets forth that the association will endeavor to eliminate friction and petty jealousies, encourage good business practices, cultivate a strong fraternal spirit among its members and protect them against credit losses.

New Agencies Established During the Week

PLEASURE VEHICLES

Place	Car	Agent
Aberdeen, S. Dak.	KisselKar	Aberdeen Auto & Supply Co.
Akron, O.	Hudson	Jones Auto Co.
Austin, Tex.	Oakland	W. G. Bell Motor Co.
Bemidji, Minn.	Oakland	Chas. Knopke.
Boonville, Ind.	Oakland	Auto Service Co.
Canton, O.	Oakland	Edw. Bracher & Bros.
Chicago, Ill.	Studebaker	Arnett Auto Co.
Concordia, Kans.	Sternberg	Foraker M. T. Co.
Cleves, O.	Oakland	Larson & Brightop.
Detroit, Mich.	Oakland	Walker & Hopping.
El Paso, Tex.	R-C-H	R-C-H Sales Co.
Faribault, Minn.	KisselKar	Rio Grande Auto Co.
Fergus Falls, Minn.	KisselKar	Central Auto Co.
Grand Forks, N. D.	KisselKar	H. E. Webber.
Grove City, Pa.	Oakland	V. & V. Auto Co.
Hartford, Conn.	Franklin	H. D. Murray & Son.
Holt, Mo.	Cole	M. J. Bliss.
Indianapolis, Ind.	Oakland	L. H. Riley.
Lancaster, Pa.	King	M. G. Beckner.
Lima, O.	R-C-H	S. K. Landis.
Logan, O.	Oakland	E. A. Bleck.
Miles City, Mont.	Studebaker	H. F. Sims.
Milwaukee, Wis.	KisselKar	Holmes Garage.
Missoula, Mont.	Howard	Oscar Stegeman.
Montreal, Ont.	KisselKar	F. P. Smith.
New Braunfels, Tex.	Metz	O. M. Lefebvre.
Philadelphia, Pa.	Oakland	Gerlich Auto Co.
Poplar Bluff, Mo.	Chsndler	H. S. Block.
Portland, Ore.	Oakland	J. J. Van Eaton.
Portland, Ore.	Jackson	H. E. Hale.
Rapidan, Minn.	Partin	Halliwell & Co.
Redwood Falls, Minn.	R-C-H	G. H. Schendel
Seattle, Wash.	Oakland	C. D. Thompson.
Seattle, Wash.	Cartercar	Washington Cartercar Co.
Seattle, Wash.	Herreshoff	Gerlinger M. C. Co.
Seattle, Wasb.	McFarlan	Gerlinger M. C. Co.
Seattle, Wash.	Pathfinder	Gerlinger M. C. Co.
Seattle, Wash.	Stoddard-Dayton	Gerlinger M. C. Co.
Sewickley, Pa.	Warren	Gerlinger M. C. Co.
Slayton, Minn.	KisselKar	P. H. Harrington.
Spokane, Wash.	Cartercar	Prescott Auto Co.
Spokane, Wash.	Garford	O. J. Olive.
Spokane, Wash.	Mitchell	Mitchell-Lewis & Staver Co.
Spokane, Wash.	Overland	H. J. Olive.
Stanford, Ky.	Oakland	H. C. Carpenter.
Stockton, Wasb.	Mitchell	J. C. Skinner.
Syracuse, N. Y.	Peerless	W. R. Mason.
Tacoma, Wash.	Henderson	H. W. Doherty.
Terry, Mont.	R-C-H	E. W. Lamb.
Vancouver, B. C.	Imperial	Hoffmeinster Bros.
Vesper, Kans.	R-C-H	W. M. Middlekauff.
Virginia City, Mont.	KisselKar	C. H. Buford.
Walhalla, N. Dak.	KisselKar	Geo. W. Delisle.
Warren, Minn.	KisselKar	O. H. Taralveth.
Washington, D. C.	Cutting	Cutting Motor Sales Co.

ELECTRIC VEHICLES

Place	Car	Agent
Walla Walla, Wash.	Baker	City Garage.
Washington, D. C.	Waverley	Waverley Sales Co.

COMMERCIAL VEHICLES

Place	Car	Agent
Baltimore, Md.	Gramm	Cole Sales Co.
Baltimore, Md.	Reo	R. H. Croxton.
Milwaukee, Wis.	Commerce	R. D. Rockstead.
Seattle, Wash.	Federal	Gerlinger M. C. Co.
Seattle, Wash.	Menominee	Gerlinger M. C. Co.
Seattle, Wash.	Standard	Gerlinger M. C. Co.

Opens Garage in Sharon—A garage has been opened on Dook street, Sharon, Pa., by James Wilson.

Pressman and Meeley's Store—H. Pressman and G. G. Meeley have opened a tire store in New York City at 1659 Broadway. Mr. Fairman is manager.

Buys Syracuse Garage—J. W. Lee, of the Overland-Syracuse Co., Syracuse, N. Y., has bought the garage and salesroom formerly occupied by the United Motor Syracuse Co.

Railroad Adopts Motor Car—The Chicago, Milwaukee & St. Paul road will put in operation in the vicinity of the Twin Cities gasoline-electric cars covering 132 miles of road.

New Walpole Tire Manager—I. W. Penniman is now the New England sales manager for the Walpole Tire & Rubber Co., with sales offices at 757 Boyston street, Boston, Mass.

Sewell Cushion Opens Branch—The Sewell Cushion Wheel Co., Detroit, Mich., will shortly open a branch in New York City. W. E. Kretschmar from the factory will be manager.

Kilborn G. M. C. Branch Manager—E. J. Kilborn has been appointed general manager of the General Motor Truck Co.'s branch in Chicago, Ill., with headquarters at 2241 Wabash avenue.

Motordome to be Built—The Pittsburgh, Pa., Motordome Co., composed of local men is planning to build a motordome, the lumber for which is under contract. The site will be chosen in the near future and work begun by April.

Dustin Retail Sales Manager—The American-Marion Sales Co., 1896 Broadway, New York City, distributor of the American underslung and Marion cars has secured the services of L. N. Dustin, in the capacity of retail sales manager.

Large Chicago Garage Opened—What is said to be the largest garage on the west side of Chicago, Ill., was recently opened by the Jackson Boulevard Garage Co. The garage is of fireproof construction, with a storage capacity of forty cars.

Garabrant District Sales Manager—W. W. Garabrant has been appointed district sales manager by the Franklin Automobile Co., Syracuse, N. Y., for the states of Nebraska, Kansas, Missouri and Oklahoma. He will make his headquarters at Kansas City, Mo.

City's Largest Garage—Walter Haefeli has filed for A. R. E. Pinchot, owner, plans for one of the largest automobile garages in New York City. It will be located on the north side of Sixtieth street, east of Columbus avenue, running through the block to the south side of Sixty-first street. It will have a frontage of 18 feet on Sixtieth street and 100 feet on Sixty-first street, being fireproof. The cost has been estimated at $325,000.

Norway as Automobile Market—There is absolutely no demand in Norway for electric automobiles for either pleasure purposes or commercial uses. The market for gasoline automobiles is limited, but better in Christiania than in all the rest of Norway. The number of automobiles registered in Christiania is only about 600, and in all the rest of Norway about 300. Of the 550 or 600 gasoline cars used for pleasure purposes in Norway, it is estimated that about 300 are of American manufacture. There is a good opportunity for the sale of high-priced cars from America.

It is in emergencies that motor vehicles are at their best, and this fact has led many street railway companies to adopt the commercial vehicle for emergency wagons. The G. M. C. electric machine shown in the illustration is used in this capacity by the Nashville Railway & Light Co., Nashville, Tenn., and has shown much greater economy and efficiency than could be obtained with a horse-drawn wagon

Front View of the Mission Concepcion near San Antonio

Starter Company Opens—The Pennypacker Engine Starter Co., recently opened a service station at 2210 South Main street, Los Angeles, Cal.

Alco Ends Trip—The Alco motor truck of John Lucas & Co., Philadelphia, Pa., arrived at Pittsburgh, Pa., on March 22, finishing a 400-mile run.

Latham Manager Frisco Branch—Bert Latham has been appointed manager of the San Francisco, Cal., branch of the Simplex-Mercer Pacific Coast Co.

Baltimore Buys Apparatus—The Lord Baltimore Motor Car Co., Baltimore, Md., sold two trucks to Baltimore city for use in the city fire department.

Edmonton Adds Fire Apparatus—Twelve pieces of modern apparatus will be added to the fire-fighting equipment by the municipality of Edmonton, Alta.

Fleming Joins Studebaker—Treasurer A. R. Erskine of the Studebaker Corp., Detroit, Mich., announces the appointment of C. D. Fleming as assistant to the treasurer.

Alabama Invites All Governors—Alabama will invite every governor in the United States to attend the meeting of the National Good Roads Federation in Birmingham, Ala., April 24.

Michigan Service Station Established—A garage and service station has been established at 3435 Lullow street, West Philadelphia, Pa., by the local branch of the Michigan Motor Car Co.

Anthony Maxwell Comptroller—W. M. Anthony, who represented the receivers of the old U. S. Motors Co., Tarrytown, N. Y., has arrived in Detroit, Mich., where he will join the Maxwell Motor Co., as comptroller.

Phillips Promoted—F. R. Phillips has been promoted to the position of assistant to the vice-president of the International Motor Co., New York City, with headquarters at Broadway and Fifty-seventh street, that city.

Standard Bearing's Indianapolis Office—The Standard Roller Bearing Co., Philadelphia, Pa., has opened an office in Indianapolis, Ind., with L. M. Watkin, Jr., in charge. The office is located in room 1201 State Life Building.

Motometer in Atlanta—The Motometer Co., Inc., New York City, maker of radiator heat and indicators known as Motometers, has appointed the Johnson Gewinner Co., 124 Peach street, Atlanta, Ga., as distributor of its product.

Establishes Clintonville Garage—W. B. Stevens has formed a company with the backing of Clintonville, Wis., business men and has established a garage, repair shop and salesroom. The name of the firm will be the Star Garage Co.

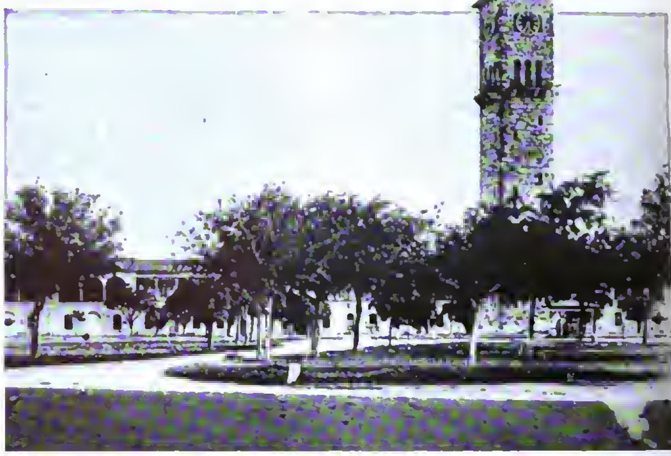
Open Second-Hand Store—R. A. Kloch and John Dietrich have formed the firm of Kloch & Dietrich and have opened a store at 1333 Fourteenth street, N. W., Washington, D. C., for the sale of second-hand cars, and a line of accessories.

Frisco Wrecking House Opened—Pioneering the way in a new industry, the Auto Exhibit and Supply House, an automobile wrecking house of Los Angeles, Cal., has opened its San Francisco quarters at 465 Golden Gate avenue, with J. C. Porter in charge. This firm handles all parts and accessories for every make of automobile.

McLaughlin Makes Appointments—J. W. McLaughlin, California distributor of Dayton trucks, has recently made the following appointments: H. L. Miller has charge of the Los Angeles branch and J. M. Lawrence of San Jose has to take care of the counties of Santa Clara, Monterey, San Mateo and San Cruz, with headquarters at San Jose.

San Antonio's Picturesque Old Missions

¶ One of the prime factors which has led to the construction of splendid automobile roads radiating in all directions from San Antonio and extending to the limits of the Bexar county line, and in some instances through adjoining counties, has been the recognized necessity on the part of the people of San Antonio to provide a means of affording pleasure for the great number of winter tourists who visit there each year. Since the erection of splendid hotels in the city and the creating of other essential requirements that go to make up an attractive resort for pleasure seekers, San Antonio's tourist business has increased enormously. It is rapidly becoming the equal of noted resorts in California and Florida. Many of the winter visitors from the North bring with them their automobiles and obtain keen enjoyment in their daily outings over the system of good roads that has been constructed throughout the



Quadrangle and old stone tower at Fort Houston

Automobile Incorporations

AUTOMOBILES AND PARTS

ASHEVILLE, N. C.—Lyerly Motor Co.; capital, $15,000. Incorporators: D. K. Lyerly, W. K. Lyerly, P. H. Lyerly.

BOSTON, MASS.—Androscoggin Motor Co.; capital, $10,000. Incorporators: Geo. A. Pulsifer, William G. Renwick, Gilbert Hodge, Jr.

BROOKLYN, N. Y.—John Hann Co.; capital, $25,000; to manufacture gasoline engines, machinery, etc., and to operate general machine shop. Incorporators: John Hann, Daniel Douglass, Francis J. Waters.

BROOKLYN, N. Y.—F. & P. Auto Transportation Co.; capital, $70,000; to manufacture and trade in vehicles propelled by gas, electricity, etc. Incorporators: W. O. Goddard, G. A. Logan, F. K. Fairchild.

CONNERSVILLE, IND.—Central Car Co.; capital, $100,000; to manufacture motor-driven and other vehicles. Incorporators: Jos. E. Huston, John W. Burke, R. T. Huston.

CONNERSVILLE, IND.—Howard Motor Car Co.; capital, $10,000; to manufacture automobiles and accessories. Incorporators: Guilford C. Babcock, Harry Tuttle, Clarence L. Millard.

DENVER, COLO.—Washington Motor Car Co.; capital, $300,000. Incorporators, W. F. P. Lofland, W. I. N. Lofland, J. S. Collins, Jr.

DETROIT, MICH.—Detroit Trailer Co.; capital, $5,000; to manufacture automobile trailers and accessories. Incorporators: Stanley R. DuBrie, William H. Turner, A. C. Turner.

DETROIT, MICH.—Tribune Motor Co.; capital, $10,000. Incorporators: L. G. Hupp, Geo. J. Baker.

INDIANAPOLIS, IND.—Fort Wayne Motor Sales Corp.; capital, $10,000. Incorporators: Carl J. Weber, William J. Hess, William H. Bensman, Thomas McConnell, Charles Gale.

LYNN, MASS.—Atlantic Auto Co.; capital, $10,000. Incorporators: Chas. J. Goldman, Wilbert A. Bishop.

NEW YORK CITY.—Latham Phelps Co., Inc.; capital, $50,000; to deal in motor vehicles and engines. Incorporators: Charles H. Latham, Nellie B. Latham, Harry E. Phelps.

PINEVILLE, KY.—Cumberland Motor Co.; capital, $50,000. Incorporators: N. J. Weller, M. J. Moss, A. W. Bryant, John A. Pitman.

PITTSBURGH, PA.—Gibson Motor Car Co.; capital, $3,000,000; to trade and deal in engines and motors and necessary equipment for them. Incorporators: J. H. Mahoney, E. D. Johnson, C. E. Gibson.

SAVANNAH, GA.—Griffith Auto Co.; capital, $10,000. Incorporators: C. M. Griffith, J. H. Brown.

SPRINGFIELD, MASS.—Springfield Buick Co.; capital, $15,000. Incorporators: Charles T. Nelson, David Roberts, Dr. T. F. O'Loughlin.

TRENTON, N. J.—Brocks Garage, Inc.; capital, $100,000; to do a general automobile business. Incorporators: J. L. Brock, H. K. Brock, H. P. Brock.

TROY, O.—Hobart Mfg. Co.; capital, $1,600,000; to manufacture motor-driven machinery of all kinds. Incorporators: H. L. Johnson, W. E. Boyer, E. E. Edgar, W. W. Cope, J. M. Spencer, J. S. Combs.

GARAGES AND ACCESSORIES

ALEXANDRIA, VA.—Imperial Motor Tire Company; capital, $100,000. Incorporators: G. D. Gehaghtly, E. A. Garlock, M. T. Wiggins.

AUGUSTA, GA.—Harbak Auto Heater Company; capital, $300,000. In-

Appeal to Many Automobile Tourists

county and to adjacent towns. The automobile loop highway, as it is termed, which extends almost around the city, is the favorite route for pleasure seekers. There are a number of points of historic interest situated adjacent to the city and upon the routes of these automobile highways.

¶The chain of missions that extends from the city south along the San Antonio River for about 15 miles is an unfailing object of interest to many of the automobilists. Beginning with the Alamo, which is situated upon the beautiful plaza of that name and which is often referred to as the "cradle of Texas liberty," there are splendid streets and roads leading to the next historic edifice, Mission Concepcion, about 3 miles south of the town. A few miles below that is situated Mission San José, and a little further down the river is Mission San Juan. These ancient structures are in a remarkably fine state of preservation, considering that their foundations were laid nearly two centuries ago.

San José Mission, several miles south of San Antonio

The San Juan Mission has an aspect of antiquity

Automobile Incorporations

corporators: C. L. Andrews, L. J. Coleman, R. S. Buzzell, E. M. Hussey, E. M. Leavitt.

CHICAGO, ILL.—Auto Combination Manufacturing Company; capital, $50,000; to manufacture automobile supplies and equipment. Incorporators: H. M. Show, G. W. Nevine, W. J. Liddy.

CHICAGO, ILL.—Logan Square Auto Supply Company; capital, $10,000; to manufacture automobile supplies. Incorporators: Otto E. Schmidt, August J. Schmidt, Martha Perl.

CLEVELAND, O.—Standard Shock Absorber Company; capital, $100,000; to manufacture and deal in shock absorbers and various automobile accessories. Incorporators: C. D. Sward, William Leary, S. A. McGill.

FINDLAY, O.—United States Auto Lock Company; capital, $15,000; to manufacture and deal in combination and other locks and deal in novelties and accessories of all kinds. Incorporators: J. S. Van Tassell, E. B. Brokaw, J. H. Macklin, J. R. Harnahan, George F. Burnap.

INDIANAPOLIS, IND.—Diamond Specialty Company; capital, $40,000; to manufacture metal polishes, cleansing compounds and soaps. Incorporators: John G. Wood, Horace F. Wood, William N. Harding, W. N. Harding.

INDIANAPOLIS, IND.—Pumpelly Battery Company; capital, $20,000. Incorporators: Sidney W. Elston, Harry Murphy, James K. Pumpelly.

NEWARK, N. J.—Automobile Leather Manufacturing Company; capital, $150,000; to manufacture leather of all kinds. Incorporators: W. A. Smith, F. I. Ennis, T. G. Woodruff.

NEW YORK, N. Y.—Approved Auto Specialties Company; capital, $10,000; to deal in automobile accessories. Incorporators: Katherine D. Brandreth, John B. Brandreth, Edward C. Phelps.

NEW YORK CITY.—New York & New Jersey Seaton Wheel Company; capital, $350,000; to manufacture Seaton spring wheel for automobiles. Incorporators: John T. Landis, William C. Mack, William T. Rainey.

RACINE, WIS.—Wisconsin Electric Company; capital, $50,000; to manufacture a line of electrically operated labor saving devices and instruments. Incorporators: Louis H. Hamilton, Chester H. Beach.

STEUBENVILLE, O.—Ohio Valley Rubber Company; capital, $50,000; to manufacture and deal in rubber and mechanical goods of all kinds, including automobile supplies and accessories. Incorporators: C. L. Williams, Howard L. Wickersham, Roy D. Lloyd, Edward L. Parker, John C. Smythe.

SUFFOLK, VA.—Suffolk Garage & Machine Company; capital, $15,000. Incorporators: B. E. Parker, C. C. Clark, G. L. Bower.

UTICA, N. Y.—Divine Tire Company; capital, $225,000; to deal in tires. Incorporators: C. W. Wicks, A. J. Eckert, B. H. Divine.

CHANGES OF NAME AND CAPITAL

CLEVELAND, O.—Chandler Motor Car Company; capital increased from $1,000 to $425,000.

DETROIT, MICH.—Thompson Auto Company; capital increased from $10,000 to $20,000.

KENTON, O.—Kenton Drop Forge & Manufacturing Company; capital increased from $25,000 to $150,000.

LOUISVILLE, KY.—Transit Motor Car Company; change of name to Transit Motor Truck Company.

WABASH, IND.—Service Motor Car Company; capital increased from $125,000 to $250,000.

Garage in San Bernardino—F. T. Hendee has organized the Perkins-Hendee Garage Co., San Bernardino, Cal.

Merrill Manager Veerac—Frank Merrill, chief engineer for the Veerac Motor Co., Anoka, Minn., has been made general manager.

High School Studies Automobiles—The Manual Arts High School of Los Angeles, Cal., has taken up the study of motor cars and parts.

Borovitz Croxton Chief Engineer—Joseph Borovitz has been appointed chief engineer and factory manager of the Croxton Motor Car Co., Washington, Pa.

Gail Hamilton in Charge—Gail Hamilton has been placed in charge of the new department for used cars, opened by the Howard Automobile Co., Los Angeles, Cal.

Burlington Garage Enlarged—The Burlington Automobile Supply Co., of Burlington, Wis., is remodeling its garage and store and will gain considerable more floor space.

Used Car Department Established—The Hawley-King Co., Los Angeles, Cal., has decided to run a used car department in conjunction with the salesroom at 1027 South Olive street.

Federal Tire Agency Moves—The Federal Tire & Rubber Co., Detroit, Mich., has removed to 846 Woodward avenue, where a service station, salesroom and store rooms will be conducted.

Milwaukee County Wants Automobile—The county of Milwaukee, Wis., will soon be in the market for a touring car for the county coroner, to cost not more than $1,200. The purchase will be made in open market without call for bids.

By Way of Correction—Under the heading of New Agencies Established During the Week in the March 13 issue of THE AUTOMOBILE G. M. Redding was given as distributor of the Haynes cars in New York City, which should have read Utica, N. Y.

Fire Apparatus for Oshkosh—The piece of motor fire apparatus recently ordered by the common council of Oshkosh, Wis., and which inaugurates the use of motor equipment for the fire department of Oshkosh, is being built by the Kissell Motor Car Co., Hartford, Wis., at a cost of $3,500.

Mulkern Garage Company Organized—Frank Mulkern, Milwaukee, Wis., has organized the Mulkern Garage Co. The garage has a storage capacity of 100 gasoline and 150 electric cars. It has dimensions of 216 feet by 60 feet and is two stories high. Both floors are obstructed only by four columns.

Towson Installs Fire Trucks—Combination chemical fire engines and hose trucks have been put in service in Towson and Highlandtown, Md., making seven pieces of fire apparatus used by the county fire department. The new apparatus was bought from the American La France Co., Elmira, N. Y., and cost $9,500 each.

Drawback for Reo—The treasury department at Washington, D. C., has made a ruling to the effect that drawback will be allowed under section 25 of the tariff act of 1909, and the regulations promulgated thereunder, on automobiles manufactured by the Reo Motor Car Co., Lansing, Mich., with the use of imported tires. The drawback allowance shall not exceed four tires to each automobile exported. The maker's sworn statement has been filed with the collector of customs at Detroit, Mich.

SPRING WHEEL CONSTRUCTION—In which a special tire is mounted on flanges extending from the inner fixed rim, radially arranged springs between the spokes forming the resilient members.

In this design the outer rim O, having inwardly extending flanges, slides on flanges fitted to the inner rim or felloe I. The driving strain between the two components is taken by cross pins furnished with rollers which slide in radial slots in the flange of the tire. Plungers P pressed outwardly in a radial direction by helical springs are arranged between the spokes; these plungers have stems S and heads H, both bored with passages for the transfer of a lubricant which is supplied from a cylindrical receptacle C. Helical springs force the plungers P outwardly, their heads H bearing against O, around which a tread member is arranged.

No. 1,056,167—to Norman Gratz, Boise, Idaho. Granted March 18, 1913; filed February 6. 1912.

Automobile Wheel and Tire—The tire is a transversely contractible ring governed by pinions operable from outside the tire.

This patent refers to a wheel construction, Fig. 2, in which a rim R is equipped with a contractible, transversely divided ring R1 which encircles it. The opposite ends of the tire ring R1 are provided with inwardly extending brackets, each of which has a transversely threaded hole. A rod has oppositely threaded portions fitted into these holes. A pinion P is secured to the rod, being rotatable therewith; a yoke Y is equipped wih two arms arranged at opposite ends of P and formed with holes in which the rod is rotatably mounted. A second pinion Q meshes with the first-named pinion, being rotatable in the yoke Y.

No. 1,056,591—to William E. Schilling, Kansas City, Mo. Granted March 18, 1913; filed June 12, 1911.

Automobile Engine Starter—Including a flywheel mounted loosely on the crankshaft and capable of being clutched to the same.

Fig. 3 shows the subject-matter of this patent, consisting of a starter mechanism. The latter is composed of a flywheel W journaled on the crankshaft S so as to be rotatable independently of the same and carrying on its rim portion the rotary element R of an electric motor. The crankcase K supports the fixed polepieces F arranged inside the rotatable armature R which is carried by W. It is clear that by energizing the armature R the wheel E is rotated. By engaging the clutch C on the shaft S with the wheel W, the latter is connected to S and the shaft is rotated, starting the automobile engine.

No. 1,056,417—to Percy W. Hodgkinson, Rochester, N. Y. Granted March 18, 1913; filed February 3, 1912.

Automobile Jack Design—Consisting of arms which are operated through a toggle mechanism to lift the wheels.

The jack described in this patent consists of a pair of arms A, each pivoted at one end and so arranged that they engage the automobile axles just inside of its wheels. Links L are pivotally connected with the arms A at a point removed from their free ends, part of the links extending beyond the arms. The links are part of a toggle mechanism, and means M are provided for the purpose of operating the toggle.

No. 1,056,235—to Hosea S. Tuttle, Minneapolis, Minn. Granted March 18, 1913; filed April 3, 1912.

Automobile Horn—Being of the bulb-and-reed type but being operable by means of a pump driven from the flywheel of the motor.

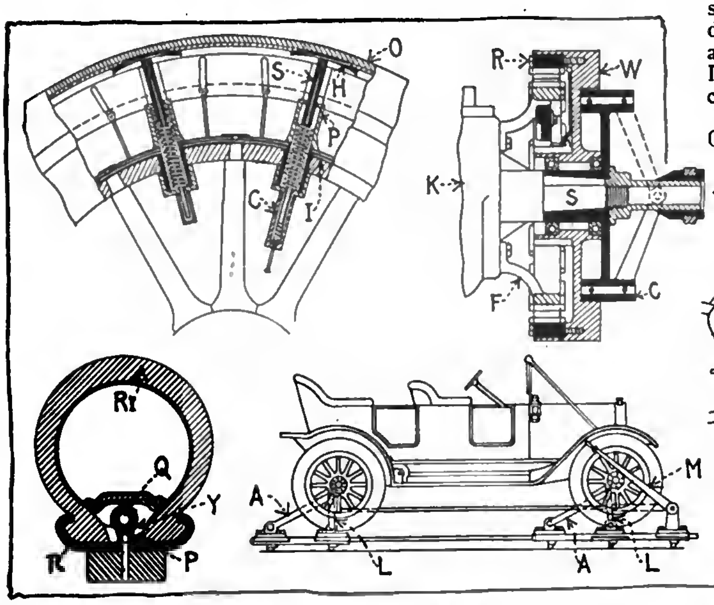
The horn H, Fig. 5, comprises an air bulb, a reed and a pipe connecting these two parts. A pump P is driven by the flywheel W, if brought into frictional engagement with it by suitable means operated by the driver. The pipe Q is so connected to the pump and the first-mentioned pipe, that it conveys air from the former to the latter, through which it is forced into the horn H, sounding the same.

No. 1,056,265—to Amedee Couesnon, Paris, France. Granted March 18, 1913; filed February 7, 1912.

Internal-Combustion Engine—Consisting of a cylinder having two sections of different widths, one of which serves as compression chamber.

This patent refers to an internal-combustion motor design, Fig. 6, which comprises a cylinder formed with a wider diameter at its lower end, to provide a compression chamber, and with a narrower above, to give an explosion space. An exhaust port E is formed in the explosion chamber and a gas inlet port A as well, A being located higher than E. An air passage A1 through which carbureted air is taken into the cylinder is formed in the wider section of the cylinder, which is connected to the upper portion by a passage controlled through a rotary valve V. A differential piston fitting the two cylinder sections is formed with an upper half U and a lower one L, and it is obvious that on each upstroke there is compression in the wider cylinder section and exhausting in the narrow section, while on the downstroke there is a power stroke in the explosion chamber and a suction stroke in the wide-diameter cylinder section. In this way a two-stroke cycle engine is obtained in which crankcase compression is avoided.

No. 1,056,690—To Frederick O. Kilgore, Somerville, Mass. Granted March 18, 1913; filed May 28, 1912.



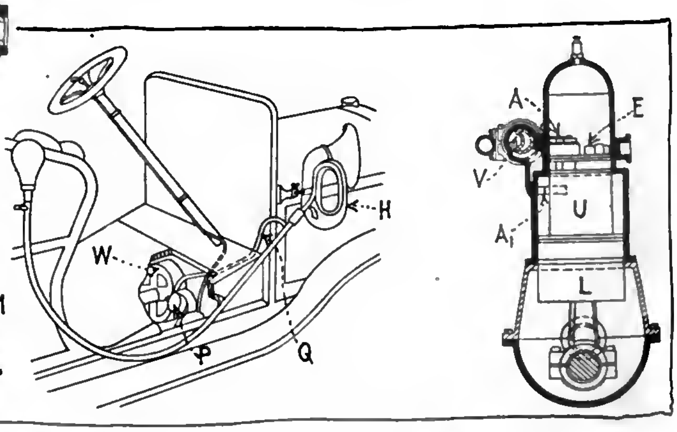


Fig. 1—Gratz cushion-tired wheel. Fig. 2—Schilling contractible-tire wheel. Fig. 3—Hodgkinson electro-mechanical starter. Fig. 4—Tuttle automobile jack. Fig. 5—Couesnon flywheel-operated reed-horn. Fig. 6—Kilgore internal-combustion engine

The AUTOMOBILE

Floods Damage Automobile Centers

Dayton and Indianapolis Bear a Large Portion of the Loss by Fire and Water

¶ *The floods through Ohio and Indiana and the Nebraska tornado have been the first great national disasters since the use of the automobile attained prominence. Besides actually affecting the industry through the submersion of factories making automobiles and accessories and by the great delay of freight passing through the Ohio and Indiana routes, interest has centered on the motor car as an instrument of rescue and a means of increasing the rapidity of repair work. It is still impossible to get reports from isolated districts but estimates have been made that the losses to individual factories are as high as $100,000. In Dayton the losses will come to many times this amount. As it is under martial law now reports from submerged districts are exceedingly difficult to obtain.*

THE big effects of the flood through Ohio and Indiana on the automobile industry are the delays in shipments and the shutting down of plants until repairs and railroads and factories are complete. The actual damage through contact with water is not so serious as the loss in time. Freight passing by way of Toledo has been held up indefinitely. It will probably be 3 weeks before traffic is straightened out.

Two big automobile states, Indiana and Ohio, have suffered severely from the flood which is now beginning to recede. Dayton, O., the home of many factories connected directly to the automobile industry, has suffered most heavily from the devastating flow of water. The Dayton Electrical Laboratories Co. has been reported temporarily crippled. In Akron the Firestone rim factory is partially submerged and the Goodyear company has suffered damages. Several concerns of Dayton making products necessary to the equipment of cars made in other centers, such as Detroit and Indianapolis. have been compelled to stop work until the waters have receded and until the damage caused has been repaired. Thousands of dollars loss will have to be covered by the industry, not only through the actual damage done by the contact of the goods with the water, but through the loss of time on contracts, etc.

Many of the car makers have been compelled to reroute their shipments owing to the fact that washouts have occurred along the railroad lines and entire banks supporting railroad tracks have been carried away. Bridges have been weakened to such an extent that it has been considered unsafe by the railroad engineers to operate trains over the lines affected.

Typical Ohio street scene—The above illustration shows how the water reached far up into the residence section of Columbus, rendering the streets impassable except to automobiles and other vehicles which were capable of traveling through the submerged areas. Many people living in this section of the town are automobile owners who keep their cars in small garages at the back of the house. They were able to get downtown in their cars and to assist their neighbors in getting supplies. The trolley car lines running through this city and in Dayton and other places affected by the water were so crippled that they could not operate and as it was impossible to get through the streets by walking many who could not avail themselves of automobiles were marooned

In Fort Wayne an Ideal motor truck was used to pump water out of a flooded building

Truck transporting a relief boat in Toledo

Car on rescue work. Indianapolis car makers put all available cars at the disposal of the police

It has been exceedingly difficult to secure any definite reports from Ohio. This is especially true of Dayton. In the latter city alone the loss will amount to many hundred thousand dollars. Since martial law has been declared through Dayton and the work of the rescuers engages the attention of every available citizen, no accurate accounts have been taken of detailed damages. The latest news from Dayton appears on page 752.

Unconfirmed reports have reached Toledo regarding Dayton. It is stated that the Maxwell concern was the most heavily hit of the automobile manufacturers. The Maxwell concern is fortunate in having recently made heavy shipments to dealers throughout the country and has therefore not been crippled as badly as would have been the case were this stock all left on hand. Production will be only slightly interrupted in the Maxwell plant. The Speedwell plant, contrary to reports was unharmed.

In Columbus, O., the plant which suffered the most is that of the Columbus Buggy Co., which has been in financial difficulties of late, and is now in the hands of receivers. The buildings connected with this plant are submerged to a depth of 10 feet and the water is receding but slowly. It is fortunate with this plant that the water did not attain a slightly greater depth as the battery and electrical departments would have been flooded and the resulting loss would have been much higher. The Republic Rubber plant, Youngstown, O., was not affected.

The John W. Brown Co., maker of automobile lamps, was another concern to suffer enormous losses. This company has an order on hand for 75,000 lamps for the Ford company.

Slight damage was sustained at the Garford plant, Elyria, O.

While Toledo itself escaped with comparatively small damage, many interests in neighboring towns in which Toledo capital is interested have been hit heavily. Perhaps the greatest instance of this is that of the Turnbull Wagon Works Co., at Defiance, O. This concern manufactures automobile wheels. The damage due to flooding amounted to about $75,000.

One of the biggest factors in the damage done to Toledo dealers is the fact that very few sales may be expected for some time. It is probable that business will be dull in the selling line with Ohio retail concerns dealing in cars and accessories. The value of the automobile in a disaster of this kind have been effectually demonstrated in Toledo. The repair work on the bridges and culverts affected or suspected of weakness has been rushed through quickly, owing to the rapidity with which workmen and supplies have been carried to the critical points. Other benefits have been reaped from the automobile trade in a charitable way. An instance of this is the automobile parade to be given in Toledo and performances in seven theaters made up of amateur actors who are employees of automobile concerns.

Indiana did not suffer as heavily as did Ohio, but the damage throughout this state is severe, nevertheless. Directly affected by the flood were twenty-six car manufacturers, 413 dealers and garages and eight branch salesrooms. In Ohio there are 719 dealers and garages, forty-two car manufacturers and twenty-four salesrooms affected. In Indianapolis three big plants, the Marion, Pathfinder and Marmon, had their lower floors submerged. Other concerns whose lower floors were covered by several feet of water are the H. J. Martin Forging Co., R. J. Irvin & Co., and the Showalter Mfg. Co. None of the garages or salesrooms were affected. The automobile show under the auspices of the Indianapolis Automobile Trade Association was abruptly stopped on Tuesday when 10 feet of water cut off communication. Sunday the show was reopened for the benefit of the flood victims. The factory of the National Motor Vehicle Co., which is on the north side of the city was not damaged in any way by the flood, which will not affect production in any way.

In Indianapolis the water did not reach the center of the town. The salesrooms did not suffer to the extent as did the shops through the factory district of the town. The principal cause of loss in this city is not the direct contact with the water, but the fact that railroad communcation has been paralyzed. The town is short of coal and many of the plants will have to shut down because it is impossible to keep the power houses going. The town coal supply has been reserved for use in residences. It is stated that freight communication between Indianapolis and Connersville will be resumed in the course of a week, and according to reports from the inundated districts it is said that the railroads are offering $1 an hour for labor in rushing the repair work. Connersville has not been affected by the water and all reports to the effect that actual damage has been done have been denied.

The Remy Electric Co., Anderson. Ind., was not seriously affected by the flood. The only damage being loss of time due to the disablement of the municipal power plant. An improvised power plant supplied the deficiency. The Nyberg plant was unscathed.

The waters did not reach the plant of the Warner Gear Co., Muncie, Ind., but the company was obliged to shut down because of lack of city water and power. It is now running shorthanded on account of non-delivery of necessary material, but expects to be running on schedule in a few days.

The Great Western plant at Peru escaped serious damage and the company is already commencing shipments. A small force started work Sunday which will be increased as soon as the men can get back. The Brown Commercial Car Co.'s plant was flooded but no great damage done. The Maxwell plant at Newcastle, Ind., was not damaged at all as was originally reported.

Kokomo, Ind., was cut off from all neighboring towns as far as railroad service is concerned for 2 days. The telegraph and telephone service was also so crippled during the first 2 or 3 days of the high water that they were absolutely unable to cope

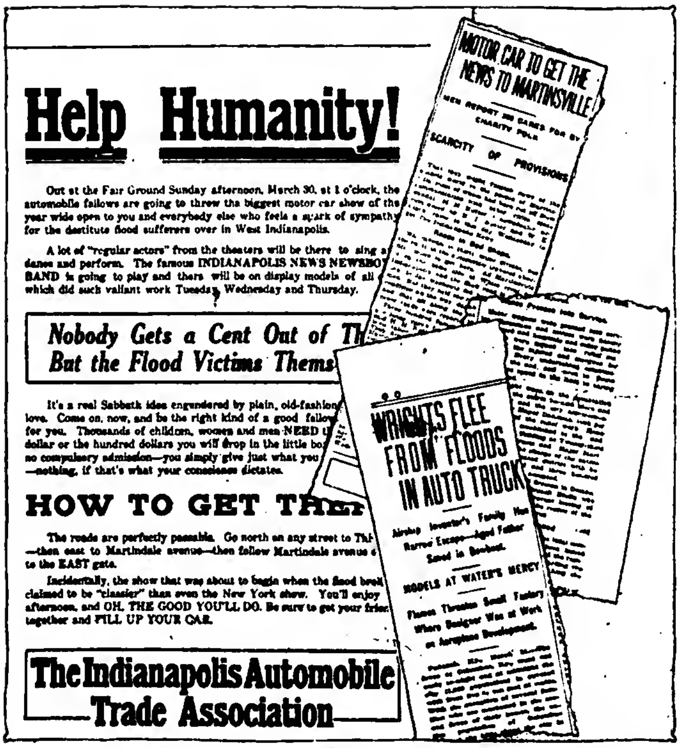
A Lambert tractor drying newspaper building cellar

Omaha cars relieved the situation by hard work

Orr company's store and Omaha electric garage after storm

A fire engine pumped water out of the Delco plant

A car in Dayton getting ready for relief work



The flood gave rise to many adventures and human sympathy was evidenced splendidly in many ways

Speedwell car which did relief work in Dayton at the time of the flood. The car was specially marked so as to insure its unhindered passage

Cellar of Delco plant after the flood which disarranged the parts and material stored therein. The water almost reached to the ceiling

Henderson car carrying boat and policeman to flooded district

with the situation. This cutting off of the city gave rise to many rumors which have since been proven unfounded. The biggest damage to the city was caused by the destruction of about 150 homes which have been so badly damaged as to require extensive repairs. The Apperson Automobile Co. was forced to suspend operations for a few days when its plant was flooded.

Fort Wayne, Ind., has one automobile factory, that of the Ideal Auto Co. This plant stood for a week under 4 feet of water. During this time about thirty complete machines on the lower floor were submerged. A great many small parts in the stockroom were also damaged as a result of contact with the water. Those parts which were not actually destroyed by the water are covered with a coating of slime which will require considerable labor to remove. The estimated damage to the Ideal plant is about $3,000.

South Bend and Mishawaka, two Indiana towns which are noted as automobile centers, the first as the home of the Studebaker Corp. and the second as the site of the Amplex factory, were fortunate enough to escape damage from the floods. Neither of these concerns expects the damage sustained through the inundated districts to affect its output or sales in any manner worthy of comment.

Influence of Disaster at Detroit

While it is still too early to make any specific statements as to the probable loss which the automobile industry in Detroit will suffer as the result of the floods, it is very evident that the vengeance of the elements on the stricken district will be felt to some extent at least, although the majority of the makers are very sanguine.

The suspension of railroad service south from Toledo offers a serious consideration at present, as it will serve to hold up shipments and in some cases will necessitate storing a large number of machines at the factories until traffic is resumed. In other cases the car lots which were to have been shipped through Toledo are being routed elsewhere.

The Ford company so far has not been crippled to any extent by the disaster, according to F. H. Diehl, purchasing agent. The recent tire workers' strike was taken advantage of for stocking up on pneumatics, the Ford supply of these now being very large, sometimes as many as fifteen to eighteen carloads a day having been shipped in at strike time. As for coal, the company has enough for two months of maximum running, while the supply of steel products, frames and so on is correspondingly large.

The Ford company buys from many divergent sources to protect itself against just such tie-ups as these great floods. However, no word has been received from many of the concerns the company buys from in the stricken territory.

N. A. Hawkins, general sales manager of the Ford company, echoes Mr. Diehl's sanguine views, and says that the sales and shipments of cars are not affected any. Those consignments which were to have gone to Ohio and Indiana have been redirected elsewhere. The contemplated schedule of 1,000 cars a

A portable garage and car in Omaha after the tornado

day will not be curtailed in the least. Of course, those shipments already in the Ohio region are not yet heard from, but the loss is up to the railroads, says Mr. Hawkins. The Ford concern could sell its entire output in the East and West and forget about the rest of the country, according to its sales manager.

C. C. Winningham, sales manager of the Hudson Motor Car Co., states that the Dayton Hudson dealer had about six machines, but no word has been received as to their fate. The Hudson company will probably loose some seventy-five sales of cars as a result of the floods. Two carloads of Hudson cars arrived in Dayton the day previous to the outbreak and no trace of them has yet been obtained.

Lee Counselman, Chalmers company, states that he cannot tell how his company is affected until it gets word through. Several sources of its supply are located at Dayton and many forgings are obtained from Fremont, O. Since no mail or other communication has been received, it is, of course, impossible to say what business was on the way.

D. T. Hastings, general manager of the Hupp Motor Car Co., is not so hopeful. He states that his company will be seriously affected by the floods, not only due to the holding up of supplies, but because outgoing shipments for the Southeast which were to have gone through Toledo are held up. The Hupp company has sent out three men to trace shipments. These men are looking up cars shipped from the factory and supplies in transit.

Kentucky automobile factories are not situated near enough to the banks of the Ohio River to feel the effects of the high water. Louisville is about the most important town located on the Kentucky side of the river and in that city none of the garages or salesrooms were damaged.

Tornado Cost Car Owners $300,000

Coming as a forerunner of the heavy floods, the tornado which swept through Nebraska must be connected with it in the minds of those who stop to consider this chain of disasters. A path was literally torn through the city of Omaha, leaving behind it 114 people dead, 1,169 homes wrecked, 6,000 of the residents homeless, and with a loss of $10,000,000 to homes, merchandise and personal property. It did not take in any of the business section of the city, being almost entirely confined to the residential part and but comparatively small damage was done to the automobile interests. The Electric Garage, local dealer for the Baker electric, R. & L. electric and Flanders electric, and the Orr Sales Co., agent for the Packard, both in the same building at Fortieth and Farnum streets, were the only automobile firms to loose anything by the big storm. It is estimated that with the building and the cars that were in the garage at the time, all of which were completely destroyed, the damage to these two firms will not exceed $150,000. Many private garages and cars were destroyed, but at this time no correct estimate can be made. It is safe, however, to say that, all told, automobile owners will have lost $300,000.

Cars and chassis in the debris of an Omaha garage after the tornado had passed (C. N. E.)

In Omaha an automobile was carried 500 feet away from its garage and deposited in a cellar

Omaha tornado capsized a big car (C. N. E.)

Dayton Plants Not Seriously Damaged

DAYTON, O., April 2, *Special Telegram.*—Early reports of the flood declared that the automobile industry in Dayton suffered severely from the inundation but a personal inspection of the plants affected by a representative of THE AUTOMOBILE proves this report to be much exaggerated. The Maxwell suffered the greatest loss in that its three buildings had their lower floors washed out. The two buildings at the Big Four tracks had the offices on the lower floor flooded, together with the finished stock room. There were few cars in the latter room and hence the loss was not very great. The plant on the north side had the lower floor damaged also, but not to an extent great enough to put the plant out of business for more than 2 days. A sign on the Maxwell buildings reads, "Men report to work Monday, March 31.

The plants next hardest hit are those of the Dayton Engineering Laboratories Co. and the Apple Electric Co. The lower floor of both these buildings was flooded almost to the ceiling, but the damage done was more in the nature of damage to the building than to material. In the former plant the Delco starting appliance is manufactured. The lower floor contained the shipping room, offices and part of the assembly department. Few of the big windows were broken and hence little material floated away. The same may be said of the plant of the Apple Electric Co., which is not far from the Delco plant.

Although the flooded area covered most of the city of Dayton, by a strange combination of circumstances the Speedwell Motor Car Co.'s plant was not affected. The water was within two squares of the one-story Speedwell buildings, but did not make its way to the plant. It afforded a place of refuge for hundreds of Daytonians.

The Dayton Mfg. Co., which supplies lamps to a number of makers, suffered little damage. The only definite estimate of damage done was given by A. W. Apple of the Apple Top Co., who gave $2,000 as the extent of the flood's pillage.

Together with manufacturing plants comes the motor car agencies, most of which were situated on Third street, the most affected portion of the city. Here the loss is great for not only were the buildings wiped out, but show cars and stock together with the office records went also.

It is expected that work in the various automobile shops and those connected with the industry will resume operations in a few days. The work of getting the buildings in shape is the least thought of. Work of this sort is going on rapidly. The chief cause for worry lies in the fact that Dayton is without power. However, at the Speedwell plant it is hoped that the gas engines on hand will be able to supply enough power to keep the plant running until the central station is in good shape. The other factories will obtain power from the plant of the National Cash Register Co. and a number of other unaffected shops.

Men are being rushed to Dayton from every part of the United States, so that the work of cleaning up the city will not fall upon the shoulders of those men living in Dayton, who are anxious to get back to work. The only thing that will hamper the industry at Dayton, is the present crippled shipping facilities. At this time the Pennsylvania is the only road operating. All the bridges are down except one concrete affair, so that it remains to be patient until these bridges are reconstructed before any factories supplies may be had or before any shipping can be done.

The Delco plant was in full operation before the flood and the Speedwell and other plants had a great number of orders on hand. Representatives of the factories said that the loss due to non-shipment of cars and parts, would be practically nil.

Much credit, indeed, is due the men in Dayton who are connected with the motor car industry. When the officials of the Speedwell plant heard of the flood they immediately put into service thirty-five finished cars. All that could be gotten from the Stoddard-Dayton plant were sent hurriedly to the stricken people. Even Springfield responded to the call. The work done by the six motor trucks sent by the Kelly-Springfield Company was nothing short of marvelous. These trucks reached Dayton under their own power in time to be of great assistance in carrying people from flooded hospitals to places of safety. Without motor cars the city of Dayton would be practically helpless, for the great majority of the horses were drowned. The 250 cars doing rescue work bore signs reading, "Pass this relief car." As much as 80 miles per day was traversed by each of these cars.

In all, about 200 motor cars were carried away by the flood, the estimated loss to owners being close to a quarter million dollars.

Ohio Loses $1,000,000 in Bridges

COLUMBUS, O., March 31—At the request of James Marker, state highway commissioner, Walter Braun, engineer of Franklin county, has furnished the state a list of bridges lost by the county with an estimate of how much it will take to replace or repair the same. The approximate loss of the county will aggregate $1,000,000 and the legislature expects to pass a law appropriating money for the reconstruction of bridges lost in the flood.

The bridges over the Olentangy destroyed by the flood and the approximate replacement values are: Wilson Bridge, $15,000; Worthington, $30,000; Weisheimer, $20,000; Dodridge, $2,000; Lane avenue, $20,000; King avenue, $20,000; Fifth avenue, $2,000, and waterworks, $5,000.

Those over the Scioto River and their building costs were: Williams, $50,000; Grand View avenue, $25,000; Sandusky street, $15,000; Broad street, $200,000; Mound street, $75,000; Greenlawn avenue, $2,000; Frank road, $30,000; Clickenger road, $30,000, and Shadeville, $15,000.

Those over Alum Creek were: Eberly road, $2,500; Matheny, $2,000; Fark Mills, $5,000; Westerville road, $5,000, and Westerville, $2,000.

Those over Big Darby Creek: Converse, $5,000; High, $3,000; National Road, $12,000; Georgesville, $5,000; Chenoweth Mills, $2,000; McKinley, $3,000, and Harrisburg, $25,000.

Those over Little Walnut: Winchester, $1,800; Burgstresser, $4,000; Harris, $2,000; Seymour, $2,000; Corbett, $4,000 and Hopewell, $10,000.

The total expense of replacing and repairing these bridges aggregate in sum total, $787,500, but with the $50,000 loss to the city through the washing away of the State street bridge and the $150,000 loss through the Town street bridge, this total is increased to $987,500.

One of the vagaries of the flood in Dayton (C. A. P. A.)

Runabout swept 3 miles in current at Dayton, O. (C. A. P. A.)

February Exports Beat 1912 By 68 Cars

WASHINGTON, D. C., April 1—More automobiles were exported from America during February, 1913, than in February, 1912. Last year the number was 2,403, this year it was 2,471, an increase of sixty-eight machines. Last year the 2,403 machines were valued at $2,274,489 and this year the valuation was $2,630,097.

During the 8 months ended February last the number of cars exported was 14,488 valued at $14,852,628, as against 12,347 cars valued at $12,064,383 shipped abroad during the same period of 1912. Exports of parts, not inclinding engines and tires, increased in value from $345,965 in February, 1912, to $444,728 in February last and from $2,426,264 to $2,983,336 during the 8-month period.

Imports of cars decreased in number from seventy-three, valued at $166,048, in February, 1912, to thirty-three, valued at $82,119, in February last and from 717, valued at $1,575,376, to 569, valued at $1,329,345 during the 8-month period.

Exports of automobile engines increased from 954 valued at $113,871, in February, 1912, to 1,428, valued at $243,995, in February last and from 3,484, valued at $417,308, to 6,964, valued at $1,089,907, during the 8-month period.

Finnegan to Continue Thomas Name

BUFFALO, N. Y., April 1—*Special Telegram*—C. A. Finnegan, who recently purchased the entire stock and equipment of the E. R. Thomas Motor Car Co., of this city, has announced his intention of continuing the manufacture and sale of chassis for fire-department vehicles as well as the making of repairs on Thomas cars. This work will be carried on under the name of the E. R. Thomas Motor Car Co. at the plant on Niagara street, in this city. Mr. Finnegan is undecided at the present time as to whether or not he will continue building passenger cars.

50,000,000 Packages in Parcel Post

WASHINGTON, D. C., March 31—Reports submitted to Postmaster General Burleson show that approximately 50,000,000 parcel post packages were handled throughout the postal service during February, which is about 10,000,000 in excess of the number handled during the previous month. These figures are based on the amount of business done at the fifty largest post offices where about one-half of the postal business of the United States is handled. When it is considered that there were 3 more days in January than in February these figures are all the more remarkable. Actual figures for the calendar month, regardless of the number of days, show that the parcel post business at the fifty largest offices increased 25.98 per cent. during February over the previous month.

As in January Chicago exceeds all other cities in the number of parcels handled with a total of 5,167,540, and following in order are New York with 4,102,010; Boston, 1,326,228; Cleveland, 1,226,025; St. Louis, 1,069,305; Philadelphia, 1,046,045; Jersey City, 916,180; Brooklyn, 816,440; Detroit, 766,661, and Cincinnati, 569,285. Cleveland, which ranked sixth in the amount of business done during the month of January, jumps ahead of both St. Louis and Philadelphia in the amount of business done during February, Philadelphia dropping to sixth place. Jersey City, which ranked twelfth in January, is now only about 100,000 behind Philadelphia.

The express companies may protest to the Interstate Commerce Commission on the ground that the parcels post system already threatens decrease in their revenues to the extent of $5,000,000 for the present year. It is said that the operation of the new system has cost these companies 22 to 25 per cent. of their total business in packages during the first 60 days of the year.

Organize to Make Wire Wheels

COLUMBUS, O., March 31—The Frayer-Howard Co., of Columbus, O., has been organized by Lee Frayer, a well-known racing driver of Columbus, and H. S. Howard for the purpose of manufacturing wire wheels for all kinds of automobiles. Several cars in Columbus have been equipped with the wire wheels with good results. The Columbus concern is prepared to equip any car with wire wheels and the plan is to carry a fifth wheel with an inflated tire in order to avoid the delay and trouble in exchanging tires.

The Last of the London Taxicab Strike

After 11 weeks of idleness the London taxicab drivers have resumed work. The proprietors have yielded, and the men are to receive gasoline at the old price of 16 cents per gallon. The offer made by the British Motor Cab Co. to supply the men with gasoline or an equivalent mixture at the rate of 21 cents per gallon, with a guarantee of 23 miles to the gallon was rejected.

FLINT, MICH., April 1—The entire assets of the Randolph Motor Truck Co., Flint, Mich., bankrupt, were sold at auction on March 27 and 28, by order of the United States District Court for the Northern District of Michigan.

There were twelve purchasers in all, the principal buyer being the DeKalb Wagon Co., DeKalb, Ill., which purchased one-half of the assets, including truck parts, complete vehicles and other materials. This principal purchase also included two-thirds of the machinery. E. S. Hunt, manager of the Randolph concern, states that the DeKalb people intend to manufacture motor vehicles of the Randolph type under the trade name New Randolph. All of the DeKalb purchases will be moved to DeKalb, Ill., the present plant at Flint being abandoned, so far as the making of motor vehicles is concerned. The balance of the machinery, shop tools and parts was purchased by supply houses, second-hand dealers and others.

Wrecked fire department trucks, Columbus, O.

Cars in water rushing down Hight street, Hamilton, O. (C. N. E.)

Boston Favors Show

Lease for 1914 Exhibition Signed—Twenty-three Agree To Show—Rubber Strike Off

BOSTON, MASS., March 29—All doubts as to whether or not Boston would have a truck show next year was dispelled today when Manager Chester I. Campbell stated that he had already signed a lease for the building; and furthermore that 23 of the exhibitors this year had put in applications for space already, some of them for a greater area than they occupied this year. At a meeting of the Boston Commercial Vehicle Dealers' Association held yesterday, President J. S. Hathaway stated that plans had been made to open the truck show on Tuesday evening next year and finish it up on Saturday night instead of running it over into a second week with a Sunday intervening, as was done the past two years. It will be possible to open earlier because the owners of Mechanics' Building have arranged to build an additional runway on the rear of the building, that will be of steel and much wider than the present one. The old runway will be retained and the pleasure cars will be rushed out on one while the trucks are being received on the other and in this way an entire day at least will be saved. If it were possible to work on Sunday the show could open Monday night, but the 24 hours of the Sabbath are sacred here.

To get an expression of opinion from some of the big exhibitors the representative of THE AUTOMOBILE visited the spaces on the closing day of the show. He questioned the exhibitors as to whether the show had been successful enough to warrant their taking space next year in view of the fact that Chicago and New York had discarded truck shows. The sentiment in favor of exhibiting again was practically unanimous.

Views of the Boston Dealers

Norman Halliday, manager of the truck department for Alvin T. Fuller, Boston agent of the Packard, said: "We sold several trucks, but more than that, we got in touch with people that will keep our sales department busy for the next 4 months developing the business. From the Packard viewpoint. I consider the show a success."

The White was one of the biggest exhibitors, and J. S. Hathaway, Boston branch manager, said: "It was most successful from our sales standpoint. This was due to the fact that this was a real selling show and we had a variety somewhat larger than some of the other exhibitors. Next season, with the show held within a week, it will be much better. Walter White went back to the factory delighted with the results here."

Frank Crockett, truck manager of the Boston branch of the Locomobile, said: "In view of the fact that this was the first time we presented a complete truck the results were satisfactory. We had people come in and leave their names, requesting information relative to our product, so that we now have more than 60 people to work on. That represents many people whom we would have to search out and locate, and some of them we never would have found, perhaps. We shall exhibit again."

A. P. Underhill, the Knox representative, said: "We had eight men at the show constantly, and at times we had to secure three and four more to answer the inquiries and give the information asked about our line. We secured some sales that we were working on and some that were really new. It was successful for us. Next year we shall be in the show."

J. S. McKinney, of the Peerless truck department, said: "We sold at least one truck every day, and some days more. They were not all sales that resulted from the show alone, but by exhibiting our product we could give purchasers a chance to make comparisons. This resulted favorably for us and we have asked for space next year."

J. W. Maguire, of the Pierce-Arrow, said: "Our worm-gear drive has been in operation long enough to give prospective customers some real statistics, and when they saw what we exhibited and it was of the tonnage capacity wanted we were able to close up some sales. People are not buying big trucks like other things, but comparatively speaking, it was a satisfactory show for us."

George M. Hudson, of the Alco, said: "We sold some trucks, but I believe that if the show were held earlier in the year, say in January, right after the New York show, the results would be better. Perhaps a fall show might be considered a better proposition. However, we are satisfied with the results and shall exhibit next year. The new plan will be a great help."

L. E. Harmon, manager of the Myer Abrams Company, handling the Lauth Juergens line, said: "Our answer is that we have not only asked for space next year, but have requested the two additional spaces beside us to get almost an entire aisle. W. S. Diller, sales manager from the factory, left us last night with contracts carrying deposits for trucks, the deposits alone totaling $10,500. Eight trucks were sold to new people, and four others were practically closed with, all of whom came to us. Other sales were made to people we had worked up previously."

P. S. Altman, of the Kelly-Springfield, was not one of the enthusiasts. He said: "The show had a bad break going into a second week, with Sunday intervening and this lessened the interest. It ties up too many trucks at a time when they might be sold."

E. A. Gilmore, who has the Federal and Standard said: "We found that the show was a success. If some of the others had advertised their product, or used their advertising along concerted lines I think they would have done better. This is no criticism of their efforts. But we found people locating us as a result of knowing that our firm was the same one that handled the Chalmers product. We sold several Federal trucks and a few Standards, the latter being new with us."

C. P. Rockwell, the Rambler branch manager, exhibiting the Jeffrey said: "I was surprised at the attention the Jeffrey attracted. It was inspected by lots of people and it received favorable comment on its construction. We expect to sell a lot of them."

The Mercury from Chicago was so well thought of that agencies were closed up the first day. W. A. Zimmerman from the factory said: "We got in touch with a number of individuals and now we are working on some of the corporations. We can trace a number of our sales this year to the fact that we exhibited a year ago, and so we shall be here again, but with much more room. This was a very successful show."

L. B. Johns, of the G. M. C., was satisfied with the show from his point of view: "Producing both electrics and gasoline vehicles we are in a position to give a purchaser what he wants without having to knock another product, which sometimes happens in the trade. We had no trouble in interesting a number of people."

Fred H. Lucas, of the Pope Hartford, said: "Many people do not realize that within a few miles of Boston there are fifty-four cities and towns with a population running above 10,000 people; that good roads connect all these places; that the per capita wealth is greater in this section than elsewhere, and that ours is a manufacturing community built up by natural water power, so that the factories are not going to move away and leave behind such valuable assets for competitors. So in the life of trade they need trucks and it is up to us dealers to sell them. We have no complaint to make about our success."

These comments tell the story of the future of the truck show in Boston. And being the only one of National importance it will attract more exhibitors undoubtedly.

Rubber Strike Declared Off

AKRON, O., March 30—*Special Telegram*—At a meeting of Industrial Workers of the World leaders here tonight attended by 200, the strike in the rubber factories was declared off. No concessions were gained by the strikers and the I. W. W.

Automobile Securities Quotations

As a consequence of the disaster in Ohio and Indiana, a number of securities declined during the week, so that the general tone of the market was not clear. Conditions in the tire industry are normal, so far as the strike is concerned, but the flood naturally had some influence on this industry, too. Nevertheless, Firestone jumped 20 points, while Goodrich advanced but 1; Goodyear common dropped 25 and Swinehart 5 points. Rubber Goods Mfg. likewise fell 4. and Fisk 5. U. S. Rubber advanced slightly.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	150	165
Ajax-Grieb Rubber Co., pfd	..	..	95	100
Aluminum Castings, pfd	..	..	95	100
American Locomotive Co., com	38½	39½	37¼	38½
American Locomotive Co., pfd	108½	109½	105	106
Chalmers Motor Company, com	..	..	120	135
Chalmers Motor Company, pfd	..	..	100	102½
Consolidated Rubber Tire Co., com	11	18	15	20
Consolidated Rubber Tire Co., pfd	20	40	..	79
Firestone Tire & Rubber Co., com	234	236	285	295
Firestone Tire & Rubber Co., pfd	108	110	103	106
Fisk Rubber Co., com	..	..	..	..
Fisk Rubber Co., pfd	..	..	98	102
Garford Company, preferred	..	..	90	100
General Motors Company, com	30	30½	29½	30½
General Motors Company, pfd	76	76½	76	77½
B. F. Goodrich Company, com	..	..	32½	33
B. F. Goodrich Company, pfd	..	..	94	95½
Goodyear Tire & Rubber Co., com	397	400	335	345
Goodyear Tire & Rubber Co., pfd	108	110	100	102
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	5	10
International Motor Co., pfd	..	..	35	45
Lozier Motor Company	..	..	..	25
Miller Rubber Company	..	..	178	182
Packard Motor Company	104	107	98	102
Peerless Motor Company	..	..	115	130
Pope Manufacturing Co., com	38	40	18	22
Pope Manufacturing Co., pfd	78	80	55	60
Reo Motor Truck Company	8	10	11½	12½
Reo Motor Car Company	23	25	20½	21½
Rubber Goods Mfg. Co., pfd	100	105	100	105
Studebaker Company, com	..	..	29¾	30
Studebaker Company, pfd	..	..	90	93
Swinehart Tire Company	..	..	90	100
U. S. Motor Co., com	..	..	..	8
U. S. Motor Co., 1st pfd	..	..	..	65
U. S. Motor Co., 2nd pfd	..	..	..	30
U. S. Rubber Co., com	53½	55	63¼	63¾
U. S. Rubber Co., 1st pfd	114	114½	106¾	107
White Company, preferred	..	..	100	108
Willys-Overland Co., com	..	..	57	64
Willys-Overland Co., pfd	..	..	90	98

retired defeated in every way. All Akron rubber factories are now in full operation. The stories sent out by I. W. W. correspondents that Akron's rubber factories had been wiped out by floods are without foundation. Only one factory suffered any damage by flood, and that was the Goodyear. The loss of this company will be trifling, the only damage done being the flooding of basement and drowning of fires in the engine rooms. The plant is now doing business as usual. No damage to accessory plants, garages, tire plants or salesrooms occurred, although water from the bursting of a dam at a reservoir south of the city swept through the canal leading down through the city.

DETROIT, MICH., April 2—*Special Telegram*—The Kelsey Wheel Co. is now getting its factory in readiness for the production of wire wheels. The actual turning out of these types will not be possible before July 1, however. These wheels will be constructed under the concern's own designs and will be made to use Booth demountable rims exclusively.

Triumvirate to Manage Olds

LANSING, MICH., April 1—A committee of three will in the future direct the affairs of the Olds Motor Works, due to the recent resignation of general manager O. C. Hutchinson. This advisory body will consist of Sales Manager J. V. Hall, Factory Manager E. B. Linden and Comptroller D. F. Edwards. The Olds plant is located in this city and is one of the General Motors group.

Market Changes of the Week

Few changes took place in last week's markets. In the metal market, steel was again the most important change. A rise of $1.18 occurred due to an increase of deliveries. Bessemer and open-hearth steels remained constant at $29.00 a ton. Electrolytic refined copper and Lake were held slightly higher. The market yesterday ruled firm on the basis of $.15 1-4 for electrolytic and $.15 1-4 for Lake, due to an increase of sales, and there is every indication that the consumption for March will be large. This, coupled with the very heavy exports and the better foreign markets, sounds good for continued firmness and perhaps higher prices. Lead remained unchanged at $4.35 per 100 pounds. There was an absence of new developments in the linseed oil situation, so far as the local market was concerned, prices ranging from $.47 to $.48. In the petroleum markets both the oils from the Kansas and Pennsylvania wells remained constant at $.88 and $2.50 respectively. Lard oil rose $.01 on Thursday, closing at $.94.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.....	.07⅝	.07⅝	.07⅝	.07⅝	.07⅝	.07⅝	....
Beams & Channels, per 100 lbs......	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton......	29.00	29.00	29.00	29.00	29.00	29.00	....
Copper, Elec., lb..	.14¾	.15	.15	.15	.15⅛	.15¼	+ .00½
Copper, Lake, lb..	.14⅞	.15	.15	.15	.15⅛	.15¼	+ .00⅜
Cottonseed Oil, bbl.	6.47	6.50	6.55	6.60	6.70	6.73	+ .26
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil, Menhaden, Brown..	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 gals.......	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime...	.93	.94	.94	.94	.94	.94	+ .01
Lead, 100 lbs....	4.35	4.35	4.35	4.35	4.35	4.35	....
Linseed Oil.......	.47	.47	.47	.47	.47	.47	....
Open-Hearth Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Petroleum, bbl., Kansas crude...	.88	.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa., crude.....	2.50	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	....
Silk, raw Italy...	....	4.30	....	....	4.30	....	....
Silk, raw Japan...	....	3.67½	....	....	3.70	....	+ .02½
Sulphuric Acid, 60 Baumé	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb.......	47.00	48.00	47.15	47.15	48.00	48.18	+1.18
Tire Scrap.......	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	....

Goodrich Cuts Prices

Cheap Rubber and Automatic Production Means Are Reasons —Other Companies May Follow

NEW YORK CITY, April 1—More or less consternation was precipitated in tire circles throughout the country when the Goodrich-Diamond organization announced a cut of approximately 5 per cent. on casings and inner tubes for the entire country. This cut to the consumer is best indicated on a 34 by 4-inch Goodrich tire which heretofore has listed to the consumer at $31.80, but under the new list will retail at $29.80.

Already several of the other companies have met this reduction. No official statement has been issued by the United States Tire Co., but several of its metropolitan dealers have been informed that they have met the cut, so that with this company the dealers' list in force until April 1 now becomes the list price to the consumer.

The Goodyear company has announced that it has also revised its prices to meet the new schedule.

No official announcement has been made by the Fisk company further than that a revision of its prices is promised.

No statements have been issued by the Firestone, Michelin, Republic, Ajax, and other concerns, although many of the dealers are of the opinion that practically all of the companies will revise their prices to meet the new schedule set by the Diamond-Goodrich organization. Where cuts have been made they have taken effect April 1.

The Kelly-Springfield Tire Co. will maintain its old price schedule.

The Michelin Tire Co. has not decided as yet what action it will take with respect to the price question, as Mr. Michelin, the head of the firm, is abroad.

The Empire Tire Co. on April 1 made a 5 per cent. reduction in the prices of its standard tubes and its round casings while the Red and Peerless tubes as well as the gray non-skid and red casings remain at their old prices. The Pennsylvania Rubber Co. has so far made no change in price and no definite plans have been formulated.

It is difficult to discover just why this price reduction has occurred. Several reasons are advanced. One is the cheap price of rubber, which is now quoted at 88 cents. Another reason is the more general use of automatic machines for manufacturing tire casings, whereby all of the fabric is laid and stretched by machinery. The Goodrich-Diamond Company has had one complete plant equipped with such machinery in operation for several months. It is stated in tire circles that a reduction in cost of manufacture of approximately 25 cents per casing is obtained by the use of these machines.

The new scale of prices will not affect the tire dealer, who, in many cases will receive standard commissions, which, to the preferred dealer, are 10 per cent. plus 7 1-2 per cent. with an additional 5 per cent. for cash. The regular dealer will continue to receive his 10 per cent. with an additional 5 per cent. for cash.

Size	Smooth	Bailey	Master	Tubes
30 x 2.5	$10.35	$11.10	.....	$2.45
30 x 3	12.25	13.35	.....	2.90
32 x 3	13.10	14.20	.....	3.10
34 x 3	13.85	15.05	.....	3.30
36 x 3	14.75	16.00	.....	3.45
32 x 4	27.85	29.95	$33.00	5.30
34 x 4	29.80	31.80	35.00	5.65
34 x 4.5	37.75	40.30	44.35	7.00
34 x 5	46.50	49.65	54.60	8.20
35 x 4	30.75	32.80	36.10	5.75
35 x 4.5	38.98	41.45	45.60	7.15
35 x 5	47.90	51.05	56.10	8.45
36 x 4	31.75	33.85	37.20	5.95
36 x 4.5	40.05	42.55	46.85	7.35
36 x 5	49.20	52.35	57.55	8.60
36 x 5.5	57.40	61.20	67.30	9.80

Maxwell Sells Factories Not To Be Operated

Five Plants Being Disposed of—Ford Enjoins International League—Argyll Wins From Knight

DETROIT, MICH., April 1—Walter E. Flanders, president and general manager of the Maxwell Motor Co., has made it definitely known to the trade that the Maxwell company does not intend to operate all of the eleven plants which were acquired by the purchase of the United States Motor Co.'s assets. The factories total 2,684,648 square feet of floor space and consist of the following: Flanders Motor Co., Brush Runabout Co., Alden-Sampson Co., Briscoe Mfg. Co., all of Detroit; the Providence Engineering Works, Providence, R. I.; the Maxwell-Briscoe Co., at Tarrytown, N. Y., and at Auburn, R. I.; the Briscoe Mfg. Co., Newark, N. J.; the two Stoddard-Dayton Co. factories at Dayton, O.; the Courier Motor Co., also at Dayton, O.; and the Columbia Motor Co., Hartford, Conn.

The Providence plant has been sold, while the original Maxwell plants at Tarrytown, N. Y., and Auburn, R. I., the Newark Briscoe factory and the Courier are also to be disposed of, according to the present plan. These are in high-priced land districts and this would make too high the purchases of land required for necessary factory extensions. Further, they are deemed too far from headquarters, and workmen's accommodations are inadequate.

One model only will be made in each of the plants which will be retained. In the former Flanders factory, the six-cylinder Maxwell model will be constructed exclusively, under the designation 50-6. The plants at Dayton will be devoted to the making of the larger four-cylinder type, model 35. Reorganization was progressing rapidly at these Dayton plants when the flood disasters swooped down upon the city, and they will of course be handicapped for the present. It is next to impossible to get any definite word yet as to how they fared. At the Brush and Sampson establishments the new four-cylinder low-priced model 25 will be made.

Statement on Flanders Mfg. Co.

DETROIT, MICH., April 1—The Detroit Trust Co., receiver for the Flanders Mfg. Co., Pontiac and Chelsea, has issued a statement showing the progress made to date in winding up the affairs of the concern. The statement says that it is practically impossible to estimate at this time the amount which may be realized for creditors and stockholders, although so far $246,700 has been liberated.

Appraisal of the properties at Pontiac and Chelsea shows that the assets at Pontiac amount to $[illegible] and Chelsea, $586,182. Preferred creditors received $[illegible] so far, leaving $230,000, which will be paid this month to creditors whose claims have been allowed. The period fixed by the court for filing sworn statements of claims terminated March 20, and on that date such claims aggregated $1,[illegible].265.58. This total was made up by the claims of [illegible] creditors and there are 257 more whose charges amounted to about $15,000 and who filed no proof of what was due them. The liabilities on March 20 amounted to $936,708.17.

For some time after the court appointed a receiver several parts of the two plants were continued in operation, but this activity has stopped. The Flanders Mfg. Co. has no connection with the Flanders Motor Car Co., recently absorbed by the Maxwell Motor Co., Inc.

Ford Enjoins International League

BUFFALO, N. Y., March 31—In United States District Court last week Judge Hazel issued a preliminary injunction restraining the International Automobile League of Buffalo from advertising or offering for sale automobiles made by the Ford Motor Co., of Detroit, Mich. In the original bill of complaint filed from the Detroit manufacturers it was alleged that the International Automobile League had offered and advertised Ford cars at less than the prices charged by the factory for those cars. Losses estimated at $100,000 are alleged to have been sustained by the plaintiff motor car makers The Detroit company claims the local concern sought members at $10 a head claiming to be able to secure Ford cars at a discount. Other defendants in the action are John H. Tranter, Alfred C. Bidwell, William Preiss and John C. Hurley, all of Buffalo.

KINGSTON, N. Y., March 31—A. B. Cordner has been elected president of the Vaughan Motor Car Co., which has been organized to continue in this city the manufacture of the automobile designed by Guy Vaughan. F. E. Moskovics is vice-president and general manager; E. S. Partridge, vice-president and sales manager, and H. W. Johns, secretary and treasurer. The Vaughan car is to be a moderate-priced six-cylinder when it reappears on the market.

Evans Company to Build Trucks

PITTSBURGH, PA., March 31—The Evans Motor Car Co. took out its charter yesterday with a capital stock of $50,000. The incorporators are Everett Philpot, George Anthony, C. C. Woodcock, Howell Brandon, R. H. Evans and A. P. Foster. Mr. Evans stated that $40,000 of the amount had already been subscribed. The company expects to increase the capital stock to $200,000, according to Mr. Evans. The stock will not be offered to the public for sale.

Rochester-Mais Co. to Build Trucks

ROCHESTER, IND., March 31—A company to be known as the Rochester-Mais Commercial Car Co. has been organized for the purpose of building 1,500 and 2,500-pound trucks in this city and plans are being made for a factory building. The directors of the company are: A. C. Davisson, J. M. Ott, R. P. True, Earl Miller and J. M. Mais. All cars built will be of the internal-gear type. The cars will be designed by John A. Mais, who is a younger brother of A. F. Mais, formerly of the Mais Motor Truck Co. and now with the Studebaker Corp.

Argyll Wins Non-Poppet Suit

LONDON, ENG., March 24—The decision in the Knight-Argyll case, in which the American inventor, Charles Y. Knight, sued the Scotch concern for infringement of engine patents, has been handed down and is against Knight & Kilbourne. The case will be carried up to the House of Lords, where the Americans anticipate a more favorable decision, inasmuch as in similar cases in other countries they have been successful in the higher courts.

A. A. A. Adopts Blue Books as Official

NEW YORK CITY, April 1—Arrangements were completed today whereby the American Automobile Association has entered into an arrangement extending over a period of years with The Automobile Blue Book Publishing Company, whereby the Blue Book Road Guides become the official touring books of the association. Under this arrangement the title of the books will be "The Official Automobile Blue Book."

For 1913 there are six volumes of these official road guides with a possibility of a seventh being brought out later in the season. Volumes 1 and 4 will be on the market in a couple of

A. A. A. To Fight Increase in Registration Fees

weeks, and the remaining volumes 2 weeks later. All of the volumes contain many thousands of miles of new road guide information as compared with the 1912 volumes. In one volume alone over 20,000 miles of additional route information is incorporated.

All of the route information in these volumes is obtained by Blue Book cars which traverse the entire country and obtain first-handed the road information.

S. A. E. and N. A. A. M. on Gasoline

New York City, April 2—After doing some preliminary work in investigating the fuel situation the committee of the National Association of Automobile Manufacturers decided to turn over the technical work to a committee of experts from the Society of Automobile Engineers. The expenses of the investigation are to be covered by the N. A. A. M. and it is to follow along two lines. First, the broad commercial proposition of providing an ample supply of fuel at a fair price and second the technical aspect in getting definite information as to the best methods of handling the fuels now on the market and in the investigation of possible substitutes. The first part of the work will be carried on by the N. A. A. M. division of the committee composed of Al. Reeves, A. L. Pope and R. D. Chapin. The technical work will be done by C. P. Grimes, E. E. Sweet and N. B. Pope. The use of carbureting devices for low grade fuels will probably be made a special study by the technical committee.

New York City, April 2—The hearings of rim makers before the pleasure car wheel division of the standards committee of the Society of Automobile Engineers was continued today under the direction of Chairman Henry Souther, who conducted the first hearing in Cleveland, March 12. This committee is aiming at discovering how far the S. A. E. can go in the matter of standardizing quick detachable rims and also demountable rims for passenger cars.

There was a general feeling at today's hearing that lightness is one of the objects to be aimed at in rim construction to take Q. D. tires, and also where the demountable rim is featured. Practically all present agreed with the chairman in that automobile engineers were today demanding lightening of these parts, and further that the present universal rim to take a straight-side tire is 10 pounds more or less heavier than the clincher type of quick detachable rim. One of the questions discussed was: "Would it be possible to eliminate the straight-side tire, which would, of course, eliminate the necessity for the universal type of quick detachable rim?" This would be a difficult problem, as at present one-half the output of several tire factories consists of this type of tire. It was finally decided to submit the question to the Clincher Automobile Tire Manufacturers' Association, which association is composed of several of the tire makers. This organization will be asked to report at the earliest moment.

The possibilities of reducing weight in Q. D. rims was discussed under the head of using better materials for the locking rings, alloy steels being suggested instead of the present steel.

David Fergusson of the Pierce Company addressed a letter to the committee recommending that some standard for bursting pressure on locking rings be set by the association. He cited figures from tests he had made showing the different pressures at which these locking parts gave way. The rim makers agreed that there was little trouble from this score, and where such occurred it was often due to incorrect fastening or to too great pressure, which could be traced to the more general use of power pumps for tire inflation. No definite action was taken on the question.

The feeling was general among some of the automobile engineers that it would be better not to aim at combining the clincher type of quick detachable with the universal, because of the additional weight it calls for, the suggestion being that quick detachable rings be either of clincher design or a straight-edge type, but not a combination of the two.

Association To Urge Campaign Against Unjust Legislation — Favors Reduction of Fees to Actual Cost

New York City, April 1—The American Automobile Association went on record today as being unalterably opposed to any increase in state registrations of motor cars and that the fees be limited to the actual cost of registration. This action, taken at the regular monthly meeting of the executive board, sounds the campaign cry of the parent association and which will undoubtedly be taken up by the two-score or more state organizations affiliated with it. Today's action took the form of a resolution which will be forwarded to all of the state bodies, and a resolution that has been prompted by the various bills introduced in several States.

The board also accepted the proposals of Minneapolis and St. Paul for this year's national tour, which will be run from the Twin Cities to Glacier Park by a route that the Minnesota motorists are mapping out. A committee of seven was appointed to look into the work with Dr. C. E. Dutton, Minneapolis, chairman, and Asa Paine, of the same city, vice-chairman. The tour will undoubtedly take place in July. Three trophies will be contested for, the new National Trophy to the winning touring car, the Anderson trophy to the winning runabout and the Glidden trophy to the winning team representing a club or other organization.

N. A. A. M. to Fight Truck Measures

New York City, April 2.—The National Association of Automobile Manufacturers held its monthly meeting to-day, at which the executive committee accepted the resignations of its former members, Alfred Reeves and S. D. Waldon and elected J. N. Gunn and Alvin Macaulay in their places. Arthur Benjamin, of the American Locomotive Co., was elected a member in the place of Harry Houpt, whose position as general sales manager of the company he has assumed recently.

The executive board named a committee consisting of R. D. Chapin, W. A. Metzger and S. A. Miles to confer with the officers of the American Automobile Association and of the Pennsylvania Motor Federation with regard to the threatened legislation in Pennsylvania inimical to automobiles.

May 7 was fixed as the date of the next monthly meeting at which the final steps for the practical opening of the Automobile Chamber of Commerce, the recently announced combination of the N. A. A. M. and the Automobile Board of Trade, will be considered.

The members present at the meeting were: W. A. Metzger, J. T. Davis, Jr., Walter White, Charles Clifton, H. H. Joy, Hugh Chalmers, A. L. Pope, L. H. Kettridge, R. D. Chapin, W. C. Leland, G. W. Bennett and J. N. Gunn.

Bill for Motor Vehicle Commission

Albany, N. Y., April 1—Senator Loren H. White, chairman of Senate committee on internal affairs, has introduced a bill in the state legislature authorizing Governor Sulzer to appoint a commission of three members to consult with similar commissions from Maine, Vermont, New Hampshire, Massachusetts. Rhode Island, Connecticut, New Jersey, Pennsylvania, Delaware and Maryland with a view to uniform automobile laws defining motor vehicles, the use and speed of automobiles and uniform license and registration fees. The commissioners are to serve without pay, but get an appropriation of $3,000 to pay expenses.

New York City, April 1—The Motor Truck Club, of this city, is taking up with Police Commissioner Rhinelander Waldo the subject of the field of manufacturers' licenses in New York City. The club proposes to have a stop put to this molestation.

Metropolitan S. A. E. Hears Two Papers

Care and Maintenance of Storage Batteries and Light Weight Reciprocating Parts for Motors Furnish Material for Animated Discussion

NEW YORK CITY, March 28.—Two papers were discussed at an interesting session of the Metropolitan section of the Society of Automobile Engineers held here last night. The first was a paper by Charles Countcil Munson, Splitdorf Magneto Co., on Batteries, Their Care and Maintenance. The second paper was by Morris Machol, vice-president Hydraulic Truck Sales Co., on Light Weight Reciprocating Parts for motors dealing chiefly with magnelium, a metal composed of aluminum and magnesium.

Chairman Anglada announced that the foreign engineers are expected to arrive in New York, Monday morning, May 26. They will make their headquarters at the Hotel McAlpin and will be entertained Monday and Tuesday by the Metropolitan Section of the S. A. E. A committee has been appointed as follows: Messrs. Kennedy, Chase, Brown, Dean, Dow, Swetland, Wilson, Pope, Slade, Anglada. They leave at 9:40 Wednesday a. m. by special train for the West. Their itinerary will include Pittsburgh, Indianapolis, Detroit, Cleveland, Buffalo, Hartford, New Haven, etc. It is expected that the Metropolitan S. A. E. members will aid in entertaining them Monday evening, and on Tuesday there will be an automobile tour around the city, to the Long Island Speedway, and to some industrial plants in the city.

Several Battery Men Present

The first paper, while given over in a large degree to an elementary study of the dry and storage battery, was sufficiently advanced and indicative of modern practice to provoke an interesting discussion among the five or six members of competing batteries concerns who were present. Taking up the definition of the electric terms employed in battery practice, the author of the paper passed rapidly on through the construction of the dry battery, outlining the customary method of employing a zinc cup which performs the double rôle of container and negative pole. Lining the zinc cup is a series of blotting paper layers and placed in the center of the zinc cup is an upright carbon forming the positive electrode. The electrolyte consists of manganese dioxide and sal ammoniac. The capacity of each of these dry cells is in the neighborhood of 1.25 volts and 35 amperes.

Turning to the storage battery, Mr. Munson stated that he wished to call attention to the fallacy of employing the hydraulic parallel for storage batteries. He said it is wrong to assume the battery to be equivalent to a tank on an elevation because its action is more in the nature of restorative rather than the refilling action called to mind by comparing it to a tank. The electric current is passed through the battery to restore it to its charged condition and not to fill the battery with that current.

There are two types of storage battery. The alkaline and the acid. The Edison is an example of the alkaline type. The other batteries upon the market are of the acid type. Touching on the early experiments, Mr. Munson briefly stated the experiences of Planté in 1859 and 1860 when he placed two lead plates in a sulphuric acid solution and passed a current through this rude cell by connecting the positive wire to one plate and the negative wire to the other. After numerous discharges a brown coating appeared on the positive plate and a gray coating on the negative, forming the familiar surfaces known to present batteries. Since that time we have considerably shortened the process of securing the brown and gray coatings. The coating in the positive plate is what is commonly known now as red lead and in the negative plate lead oxide.

Passing on through the actual construction work of the battery we come to the question of capacity. The capacity of a battery depends on the character, porosity and distribution of the plates, quality and quantity of the electrolyte and its arrangement governing its diffusion and its rate of discharge.

At the meeting last night the chief interest centered on the storage battery used for lighting and starting purposes. The demand of quick discharge made in the latter class of batteries has presented a problem so new to the battery manufacturer that he has not as yet found the solution of the problem. The rate of discharge depends upon the plate area subjected to the electrolyte. It is evident that in a given cell a greater area will be secured by the use of a large number of thin plates rather than a smaller number of thick plates. This is one of the chief features of the starting battery. As explained by Mr. Munson, a starting battery can be readily used for ignition and lighting purposes where the amperage is small and at the same time stand ready to give the quick discharge necessitated by the cranking motor. On the other hand, an ignition or lighting battery would not be suitable for starting purposes, owing to the fact that insufficient area is presented to the electrolyte to furnish the large quantity of current used by the cranking motor in starting against the compression of the automobile engine.

A representative starting cell has six positive and seven negative plates measuring 3-16 inch through and 5¾ inches in length. The internal resistance of such a cell is about .005 ohm. The electrolyte in the storage battery should be at least .5 inch above the top of the plate. Although .25 inch is sufficient in an ignition battery, it will not suffice for the starting battery.

The care of the battery was dwelt upon at length by Mr. Munson, who suggested that the Society of Automobile Engineers should bring out a data sheet for the care and maintenance of storage batteries. He stated that 90 per cent. of the complaints registered against storage batteries during the past year were due to the fact that the car owner neglected the battery, either through carelessness or ignorance. The following points were particularly emphasized in his instructions on battery care:

Some Points on Battery Care

1.—Vents must be kept free or the cell will explode due to the formation of gases under pressure.

2.—Battery must be cleaned frequently and terminals greased to avoid the composition by contact with acid spray.

3.—Battery should be stored away when not in use after having been put through one of the many processes recommended by battery manufacturers.

4.—Water should be added from time to time and not electrolyte.

Discussion was then called for by Chairman Anglada. Some of the principal points of which are brought out in the following:

MR. SLAWSON—What is the difference in plates for batteries intended for lighting and those for starting?

MR. PRATT—A battery that can be used for starting can be used for lighting and ignition, but it does not work the other way; namely, a battery for ignition or lighting may not be satisfactory for starting. A starting battery calls for a very high discharge rate.

MR. NIGHTINGALE—Regarding thickness of plates, the thick plate is used with the ignition battery because the discharge rate is relatively low, and you can discharge every atom of oxide in the plates. In a starting battery it is directly opposite, and a very thin plate is used which may be called upon to discharge at the rate of 150 amperes 6 volts for 4 or 5 seconds. You consequently need plates that will give a high surface discharge, and there will not be any need of a thick plate, as the inside of such a plate could not be used at this rapid discharge rate.

The effect of sulphation and short-circuiting by placing a pair of pliers across the terminals would be very bad, and an explosion would follow, as the oxygen and hydrogen would be exploded by the spark. Sulphation and plate buckling is a relatively slow process. You can discharge a plate below 1.85 volts, in fact to zero, and do it many times, without serious injury, but the longer you do it the greater the damage.

The battery business is becoming very important; one company has already signed for 100,000 batteries for 1914, another company for 40,000, and others for large numbers. Manufacturers should go into the subject of battery equipment to a greater extent.

Chairman Anglada—What is the life of a battery used in combined lighting, starting and ignition service?

Mr. Pratt—This is entirely up to the user of the car. There is very little trouble if the battery is looked after, but so frequently the owner fails to add distilled water when necessary, and does not read his instruction book. The plates should be well covered with water, some battery makers reqiring .25 inch above the tops, others .5 inch, and some others 1.25 inches. Only pure water should be added. It is generally a mistake to add acid to the battery because there is little danger of it evaporating or losing in volume if the cell is properly made. The matter of batteries is largely a question of practical instruction books to owners. The instructions should be brief and explicit and not long technical explanations. Batteries should be placed in an accessible position, and the instruction book should be carried in a part of the car where it is certain to come before the driver's attention. Poor wiring of many cars is responsible for several battery troubles, and a better system of conduits should be used.

Mr. Smith—The Edison Company has not yet developed a battery intended for starting purposes, but will sooner or later. The company at present has a gasoline car operating with an Edison starting battery and during the last 8 months it has given good service. The Edison lighting battery is guaranteed for 5 years and discharging to zero does not hurt it and overcharging does not damage it. There should be a distinction made in instructions issued for lead and alkaline batteries. What suits one does not suit the other. If the S. A. E. is to take up the question of standardizing certain battery features and promulgating instructions for battery care there should be separate instructions for these types of batteries.

Chairman Anglada—Do battery makers prefer to manufacture batteries for starting, ignition and lighting with 24 or 6-volt discharge rate?

Mr. Pratt—This question should be settled by the car and self-starter makers. The 24-volt battery, with the same kilowatt capacity as the 6-volt battery, will cost more to manufacture. The quest resolves iself into one of dollars and cents. The trend to-day is toward 6-volt systems.

Q. What has the Automobile Club of America done relative to standardizing ignition batteries?

Mr. McMurtry—Nothing definite. One of the worst difficulties with ignition and starting batteries to-day is their inaccessibility and the lack of attention they receive, due, not infrequently, to car makers who fail to impress on the buyer the necessity of giving the battery frequent attention, and also the failure of makers of dynamo charging outfits to impress on buyers the necessity of battery attention. The battery-charging problem is a comprehensive one. Take a passenger car in the summertime traveling practically all day on the highways and with little night travel. There is little drain on the battery for lighting and much time for charging. Contrast this with the same chassis with its limousine body for winter use. Little driving is done during the day, and frequently it stands in front of the theater, hotel or club for 6 or 7 hours in the evening with the lights burning. Because of this wide difference in service dynamos should have different charging rates which could be adjusted to meet these conditions.

Mr. Munson—Much battery trouble has been due to chauffeurs and others using wrong sizes of wire when making repairs in the wiring system.

Mr. Sturgis—We should try and standardize the discharge rate of batteries. How many square inches of battery plate surface are needed to give a current of 1-ampere discharge for 10 hours? This should be standardized. Is it not conceded that 20 to 25 square inches of plate are needed for such a discharge? If so, a plate 4 by 5 inches has a surface area of 40 square inches, and would approximately give such a discharge for 20 hours. I think the most important work the S. A. E. could do would be to adopt a standard discharge rate. Adopt one for lighting batteries which might approximate 10 hours; one for starting batteries which might be 1 hour, and another for ignition batteries.

Mr. Nightingale—One of the most important things that battery makers should look after is the standardizing of battery boxes.

Use of Magnelium for Pistons

After a short recess had been taken, the meeting was called to order for the reading and discussion of the second paper on Light-Weight Reciprocating Parts for Automobile Motors by Mr. Machol. The metal magnelium was recommended by the author of the paper for use in pistons and connecting-rods. A chart made at Cornell University to show the value of magnelium as a bearing metal was shown to indicate that in this respect the requirements of a piston were fully met in a manner which promised superiority to cast iron in this respect. The temperatures at which the coefficients of friction were determined were so low that they did not furnish an indication of what would occur in this direction when the metal was subjected to the high temperatures of combustion.

Mr. Machol dwelt on the high conductivity of the metal as compared to that of cast iron. He mentioned this high conductivity as off-setting the highest specific heat of the metal. The result was that the dome of the piston was cooler than with the cast-iron piston because the heat was rapidly carried away from the dome down to the walls or skirt of the piston.

Owing to the fact that the specific gravity of the metal is one-third of that of cast iron and since the same pattern may be used in the casting work, the weight of the reciprocating parts could be reduced 66 per cent. This gave a higher possible velocity of the motor, since one of the limitations upon speed is the inertia of the reciprocating parts.

Mr. Machol also suggested the use of magnelium for connecting-rod purposes and stated that out of three motors fitted with these, one was unsatisfactory and the other two are giving perfect satisfaction. The section of the connecting-rod is in the form of a Maltese cross and not of the common I-beam type. It was stated that in this light outfit it would be possible to do very well with two big end bearing cap bolts because the strains put upon the car retainers would be so small that there would be no fear of fracture. It was pointed out that while magnelium is stronger than cast iron, its elastic limit is but one-third that of the alloy steel used in the manufacture of connecting-rods.

Discussion on this paper brought out the facts that experiments at the laboratory at the A. C. A. on a two-cycle motor showed that the deflector plate on top of the piston was burned away, owing to the fact that the heat is not carried away by sufficient rapidity. Mr. Machol stated that the concern using this motor had since poured out the deflector plate and fitted it with ribs and was now having entire satisfaction with these pistons. It was a matter of carrying the heat down to the skirt of the piston with sufficient rapidity to keep the deflector plate below the melting temperature of the magnelium.

Fuel Prices Affect Car Market

¶ *From a discussion before the American Society of Mechanical Engineers by William T. Magruder, Professor of Mechanical Engineering at Ohio State University.*

The smaller proportionate number of motor cars used in England as compared with this country is doubtless due to the relative prices of suitable fuel. I was informed that there are 150,000 motor cars in Great Britain for a population of 50,000,000 people, or about three cars per 1,000 of inhabitants. In this country almost 1,000,000 motor cars were registered in 1912, to say nothing of the motorcycles, motor boats and other users of oil-power; or one car for each 100 of the inhabitants of the United States, and that the ratio of cars to people in this country is three and one-third times as large as in Great Britain. If there were the same proportionate number of cars used in Great Britain and on the Continent, for which I have no accurate figures, as in America, the price of fuel in Europe would be still greater than it is. But to this large number of motor-car engines must be added more than 1,000,000 gasoline engines used for farm work and in motor boats in this country. Taking the average horsepower of the motor cars to be 25 and of the motor boats and farm engines to be 10, 35,000,000 horsepower of gasoline engines are immediately available for the practical generation of power in this country. Suppose they used as a minimum at rated load .75 pound or 1 pint of gasoline per horsepower per hour for 1 hour of use they would generate 35,000,000 horsepower and require 4,500,000 gallons of gasoline at an estimated cost of $700,000. The total annual supply of American gasoline is estimated to be 1,500,000,000 gallons, and that would last only 333 hours. If every gasoline engine were run at its rated load each day, the annual distillation of gasoline in this country would be sufficient to permit them to be operated for only 1 hour per day, or 333 hours per year. In other words, our present annual output of gasoline is sufficient to operate continually at their rated load only 5 per cent. of the gasoline engines now sold and in operation.

It is probable that some other fuel than gasoline must come into use for oil engines and that this fuel will be kerosene. When the vast amount of kerosene that is now on the market is realized, 3,000,000,000 gallons being distilled annually, it seems certain that kerosene oil will come into very great and general use in the next few years as a fuel for motors.

Non-Poppet Motors Influence Poppet Types

Poppet valve designers seek silence and positive action of newer type

Part I

By E. P. Batzell

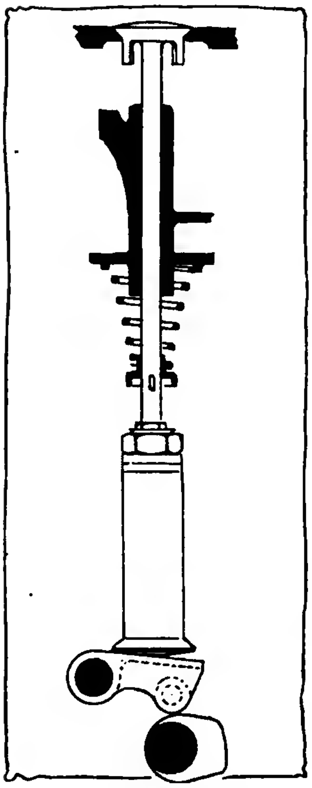


Fig. 1—Novel design of Adler valve

THE advent of the non-poppet valve motor could not fail to be of some influence on the development of poppet-valve type. It is perfectly natural that the older type should make visible efforts to restrain the success of its competitor by following it in some of the approved features. These imitations and improvements are absolutely essential for the purpose of attracting the attention of the public and its goodwill. Otherwise even the mere attraction of a novelty is apt to direct a big majority of the buying public towards the non-poppet valve motors in all those classes of cars, where there is sharp competition between the two types. On the other hand, improvements in poppet valves, in the details where they are surpassed by the non-poppet type, will appeal to those who prefer a better motor of the old type to a new one which may eventually lead the field, but the supremacy of which is not quite decided as yet.

The present situation develops into a more or less sharp contest for supremacy between the two motor types, which though of recent origin already has been of great benefit to the buying public, inasmuch as to it are offered all the competitive improvements brought out on either side.

The advantages over poppet valves generally attributed to the non-poppet valve motors at the time of their appearance are: silence of the valve mechanism; positive character of valve operation, resulting in better motor performance at high speed.

Certain groups of non-poppet valve motors have also demonstrated the following specific advantages over the average poppet-valve motor.

Practically complete absence of wear in those valve parts on which is based the permanent tight closing of the cylinders. Therefore less care is required to avoid leaks in the latter, the leaks being forthcoming only independent from the valve mechanism.

Neat, clean construction of the exterior making a motor of attractive appearance, catching to the public eye.

Big power development per cylinder volume, the power rising steadily up to very high motor speed.

Great endurance, equivalent to absence of trouble, and efficiency.

Simplicity of construction as seen in the limited number of parts in the valve mechanism, etc.

Against this the poppet-valve motor can show only advantages the very existence of which is more or less doubtful. These are: cheaper manufacture, less weight and the fact that the older valve is more universally known and understood, thus facilitating repair and service work.

At present considerable attention is being concentrated on the making of a silent poppet-valve mechanism. The investigation of improvements developed for this purpose is best carried out point by point in respect to the different sources of noise.

These sources of noise are to be found in the valve striking its seat; the valve tappet striking the valve stem or the lifting cam after having left it for some reason or other; worn tappet guides; noisy camshaft driving gears, etc.

The non-poppet valve motors, of course, also require some driving means, such as gears and the like, which too are apt to become noisy in time. But there is considerable difference in the action of the valve mechanism of the two types, the gear being a special source of noise in the poppet-valve motor.

The drive of non-poppet valves is often uninterrupted and uniform, or in those cases when it is of intermittent character the change of the driving speed and direction occurs gradually without causing perceptible jerks and shocks in the whole mechanism, including the gears themselves. On the other hand, at each revolution the motion of the cam in lifting a poppet valve passes through a point when the reactive action of the valve spring tends to drive this cam ahead of its regular motion. Thus the camshaft gear receives an impulse from the valve spring for an instant making it the driving member of the gear train. Depending on the spring effort, the mass of the camshaft and gears, the duration of the period occurring when the drive is reversed, which in its turn depends on the speed of the motor and the number and spacing of cams, it is possible to meet that condition when the forward motion of the camshaft gear is sufficient to take up the backlash between its teeth and those of the actual driving member. This will bring into a more or less abrupt contact the respective tooth sides which are opposite to the working ones. The subsequent effort upon the camshaft to lift the next following valve will again turn the camshaft gear into the driven one.

Prevention of Gear Noise

Such a fast alteration of efforts upon the gears and of their contact surfaces will result in a very pronounced gear chatter unless the clearance between the gear teeth is made and remains very small. *This particular kind of gear noise is entirely foreign to non-poppet valve mechanisms. Moreover, the explained reason of this noise also prevents the possibility of an entirely silent camshaft drive, even with spiral or herringbone teeth, inasmuch as these are not free from backlash.*

After the appearance of the non-poppet valve motor with its more or less silent valve drive, increased efforts have been applied to eliminate the above gear noise in the poppet-valve motors, using various methods.

In one of these an attempt is made to decrease the swinging motion of the camshaft and its gear by increasing their mass and also by offsetting the valve tappet from the camshaft center line towards the oncoming cam. The camshaft gears were provided with lead fillers for the purpose of increasing their mass and also to dampen their ringing sound. The idea of another very interesting construction used on some foreign cars is illustrated in Fig. 1. Here the camshaft gear is made in two parts, one of which is mounted solidly upon the camshaft and actually serves for driving it. The other part is also provided with teeth of the same diameter and pitch as the first one, but it is centered free upon the camshaft and also meshes with the driving gear. Springs are mounted inside of these two gear parts which tend to separate them from each other in the direction of their rotation. By this means continuous contact is maintained between the active tooth surfaces of the driving gear and the one fastened to the camshaft. At the same time the free side of the driving gear teeth are also kept in contact with the free gear part by the spring action, thus eliminating completely any possibility of backlash, except by compressing the gear springs. It is not necessary to have the latter of great strength to make them resist properly the driving action of the valve spring. This construction has given satisfactory results in practice, although it adds some complication to the valve-driving mechanism.

The use of silent chains for camshaft drives has been advanced by the non-poppet valve motor, and a number of poppet-valve motors are also built that way now. This drive method is still gaining popularity, although it is not free from disadvantages. It is not even perfect in the matter of silence, which is the chief reason attributed to its displacing the camshaft gears, but the nature of the chain noise is entirely different from that of the gears. *The silent chain has a tendency to vibrate, especially when the center distance between the chain pulleys is great and the motor runs at high speed. The stretching of the chain increasing its slack acts the same way. This chain vibration causes a very disagreeable rumble, as against the ringing noise of gears.*

Vibration in Chain Drive

The rotation of the poppet-valve camshaft, which is not perfectly even, as formerly explained, can have bad results upon the chain drive, particularly when the vibrations of the camshaft are synchronized with those of the chain. At those moments the chain noise is much increased, and, besides, there is danger of the chain breaking. The proof that the chain noise is chiefly a matter of synchronized vibrations can be readily seen in the fact that it is present only at certain motor speeds, regardless of the vehicle being in motion or standing still. And it is also generally possible to reduce the running noise after it has become quite loud by speeding the motor up beyond the range of resonance or by slowing it down. By further increase of the motor speed one strikes another range of synchronized vibrations, indicated by the reappearance of the rumble, whereas in the intermediate zones the motor runs comparatively quiet. It should be anticipated that further practical evolution of the chain drive will be marked by the introduction of some damper construction which would eliminate the possibility of synchronized vibrations there.

Passing on to the quieting of the poppet valve proper and its lifting mechanism, it must be admitted that very little advancement has been made in forcing the valve head to come to its seat in a silent manner. The writer is familiar only with the Adler valve construction, Fig. 2, which could lay claims to have accomplished this very desirable feature. It will be noticed in the illustration that the valve head below the common conical seat surface is provided with a cylindrical part which fits more or less tightly into the opening of the valve port machined in the motor cylinder casting. The valve itself is in continuous motion during most of the time, its conical face resting on the seat in the cylinder casting only for a short period at the time of the explosion.

For a large part of the compression and explosion strokes when the conical part of the valve head is not seated in the cylinder, the fit of the circular valve head extension into the valve port opening is solely relied upon to keep the cylinder tight. This it is claimed to accomplish satisfactorily. The actual valve opening begins when the circular head is lifted above the edge of its port, at which moment this head still remains guided in the latter by some projected portions of it. The shapes of contact surfaces between the cam, the rocker arm and the valve tappet can be made very favorable for a good character of valve opening. The valve closes the cylinder when the edge of the cylindrical portion meets the walls of the inclosing port opening, and there remains comparatively long compression period during which the conical portion of the valve head is brought down upon the seat. The length of this available period enables the valve parts to be shaped so that the lowering of the valve is carried out in a very gradual manner, leaving no audible sound of the contact between the valve and the seat.

Silence by Valve Setting

The gradual prolonged valve lifting and setting is feasible also with the ordinary poppet valves when roller or roller-shaped valve tappets are used. But this period of gradual lifting and setting has a limit and can only be prolonged in the poppet-valve motor at a sacrifice of the valve opening efficiency.

Silent valve setting becomes imperative when the motor is desired to run quietly at all speeds.

At low motor speed the average rate of valve closing velocity is slow enough not to cause noise.

At a certain higher motor speed the force of the valve return spring begins to be inadequate to preserve the valve and its tappet in continuous contact with the lifting cam, the latter speeding away from the return motion of the valve and tappet.

This leaves the valve free to strike its seat with full force of its spring and of its own inertia in addition. The extent of the sound thus created cannot be limited by the inclosing cylinder walls and water-jacket. It is plainly heard outside. Such noise is best realized by comparing it to the single sound of a stuck valve when released.

Strong valve springs and light valve parts help to reduce, at a high motor speed, the extent of the noise at the valve seat, and, by the way, that also between the cam and tappet. On the other hand, any arising cause which restricts the free return motion of the valve parts is apt to make conditions worse in respect to this noise.

These are practically the only points considered by the majority of motor manufacturers with the object of eliminating valve seat noise, the Adler construction being an exception. The steps taken prove to be far from giving complete satisfaction, and there is no doubt that the non-poppet valve motor can be an easy victor in this particular respect should there be made no further improvement in the poppet valves.

(To be continued.)

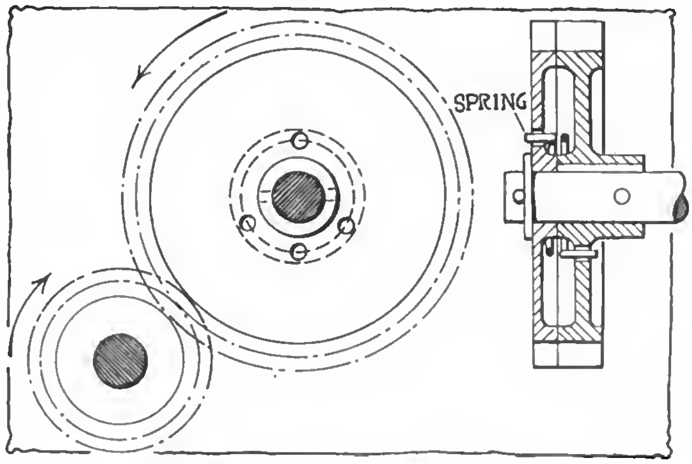


Fig. 2—Camshaft gear in two spring separated parts for silent action

Banking a Hairpin Turn on Road Race Circuit for Spectacular Speed, Either With or Without Saving of Tire Strains—Devices Looking to the Avoidance of Special Motor-Starter Equipment—Balkan Trade News—Impervious Cloths Coming

BANKED Turn for French Road Race—Emulating the American practice of adding to the spectacular interest of a long-distance road race by banking sharp turns, so as to enable drivers to take them without slowing up, the sport committee of the Automobile Club of France has decided to have one such banked turn for the *Grand Prix* race to be run over the Picardie circuit on July 12. The banked stretch will be constructed at Longueau, so as to connect the Noyon and the Montdidier roads which here fork into one another and which form portions of the circuit. The radius of the turn will be made 50 meters. No other details seem to have been definitely decided, but the calculation of a suitable construction has been entrusted to the laboratory engineer of the club, and the latter has made known how he will figure the angle of the bank so as to make the turn safe at any speed which may be considered the maximum allowable. From his example, as given below, it may perhaps be inferred that 60 kilometers per hour is considered a sufficiently high speed at a hairpin turn for engaging the interest of spectators.

On this occasion it is brought to the public's attention by another French engineer and publicist that the nature of a race, in conjunction with the science involved in the proposition, calls for something more than the mere determination of one angle for the bank, as the slope should probably not be rectilinear but either hollow or convex. On bicycle and motorcycle tracks it is convex, as in Fig. 1, while on the Brooklands track it is hollow, as in Fig. 2. In one case the angle decreases from the foot of the bank toward its top, and, as the transition from the larger to the smaller angle is gradual, the slope becomes curved. In the other case the angle increases, and a car driven near the outer edge of the curve is enabled to speed up more, without upsetting or skewing, than one driven along the infield line.

The track is made convex for the cycles because the radius of turns is short while the track is broad. This makes a large difference of radius for the outside and the inside of the curve and, as the centrifugal force which causes skewing and upsetting is in inverse proportion to the length of the radius, for a given speed, it is necessary to bank the sharper inside curve more steeply than the outside one in order to give all the cycles an equal chance for speed.

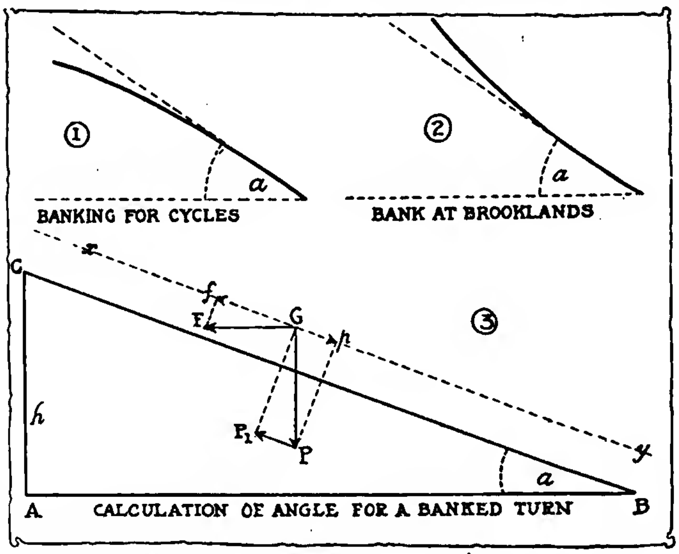
Other considerations prevail for automobiles. They are always raced "with the clock" (so far as the circuit as a whole is concerned, though not at every individual turn) and are usually started at intervals. Unlike the cycles, they are vehicles which are in stable equilibrium, and it is one of the merits required in their design and construction that they shall be able to hold the road at high speed, even on an unbanked road. The assistance given them by banking the road is not vital; in fact, if overdone, it detracts from the technical interest in the results. But it is essential to the racing interest that one vehicle is not prevented from passing another at a sharp turn by developing higher speed at such a juncture. Also, according to the rules of road and race alike, the speedier vehicle must pass to the left of the slower one. To enable it to do so, on a turn to the right—which is the kind largely in the majority when a closed circuit is followed "with the clock"—the outside of the road, where the faster vehicle must pass, if at all, must be banked high enough to allow the superior spurt. This consideration overbalances that due to the width of the road and makes a slightly hollow banking the preferred construction. And this shape of the roadbed has another effect, according to the authority quoted. It causes a vehicle to turn sidewise on the road immediately, if it throws a tire at the turn.

[Similar reasoning would speak for a convex banking at left turns, and as the whole matter of banking for a road race is a compromise, the mathematical accuracy of which becomes nullified through conflict of the things which the racing men must consider—such as that of selecting tires suitable for the average road surfacing of the circuit as well as for that of the banked turn or turns—a plain rectilinear banking should scarcely be unacceptable for a speedway.—ED.]

The club's engineer finds the angle of the bank in the following manner:

He assumes that the object is to connect the two roads by a banked curve following the arc of a circle whose radius is 50 meters; that the width of the road is 8 meters; that the weight of the vehicles is uniformly 1500 kilograms, everything up [though this item is immaterial in his calculation], and that the center of gravity is at a uniform height in these vehicles.

Fig. 3 shows the elements entering in the calculation, the line AB representing the width l of the normal horizontal road, CB the slope of the bank, a its angle of inclination to the horizontal and h the height to which the road is raised at the exterior edge of the turn. G is the center of gravity of the vehicle. The avowed object is to enable a vehicle to pass around this curved road at a certain high speed without having the centrifugal



Figs. 1, 2 and 3—Practice and theory of banked road turns force, acting at G, capable of displacing G along the line *yx* which is drawn parallel with the banked road surface through G. The only element resisting this displacement is the friction acting against lateral displacement at the ground contacts of the four wheels; the co-efficient of this friction is denoted f. It is known in practice to vary from 0.1 to 0.6 according to the tires and the road surface, and a middle value of 0.2 is assumed for it on the supposition that the banked surface is concreted and provided with rills.

The forces acting at G are P, the weight of the vehicle, and F, the centrifugal force, and F can be expressed, according to a recognized formula as equal to $\frac{PV^2}{gR}$, or mass multiplied by the square of the speed, divided by the radius of the curve (g being the divisor 31—our 32.16—by which mass is determined from P).

To find how these forces, acting at a right angle to one another can act upon G in the line *yx*, which is the line in which movement can take place, they are projected upon this line. The projection of P (represented in the line GP) is p, which equals: P sin. a, as appears from Fig. 3. Similarly F has a projection f on *yx* equalling F cos. a. These two forces are opposed and the force F_1 which causes skewing is therefore f minus p.

$$F_1 = f - p = \frac{PV^2 \cos. a}{gR} - P \sin. a.$$

The skewing will not take place so long as F_1 is smaller than F_2, the latter being the amount of lateral friction resulting from that portion P_1 of the weight P which may be considered as pressing vertically upon the banked surface.

The expression for F_2 is, as appears from Fig. 3: $F_2 = fP_1 = fP \cos. a$.

The condition for the stability of G under the forces which work upon it laterally is that F_1 is smaller than F_2, or, in the equivalent terms for these values:

$$\frac{PV^2 \cos. a}{gR} - P \sin. a < f P \cos. a.$$

To simplify, divide on both sides by cos. a:

$$\frac{PV^2}{gR} - P\text{tg.}\, a < fP.$$

Eliminating the common factor P, there is obtained a value for tg. a:

$$\text{tg.}\, a = \frac{V^2}{gR} - f,$$

which is the smallest value tg. a can have, since with this value F_1 and F_2 are equal.

The height h of the embankment is l tg.a, and the smallest value for this height is thus:

$$h = l\, \text{tg.} a = \frac{lV^2}{gR} - lf.$$

[In this demonstration it does not seem entirely obvious why the numerical value of f, being graphically, as in Fig. 3, the projection upon *yx* of the centrifugal force acting horizontally upon the center of gravity G, may be taken as an equivalent of the coefficient of friction. The contention seems to be that f has precisely this value because the force it represents is that portion of the centrifugal force which would have to be resisted through the lateral road friction, if p did not intervene, acting in the opposite direction, and because it holds a fixed relation to the weight of the vehicle, being derived from the centrifugal force which in turn is derived from the vehicle weight. Readers with mathematical energy to spare for this problem might perhaps throw more light upon this element in the calculation.—ED.]

By applying the assumed numerical values for l, V and R to the formula for h and taking 0.2 as an acceptable value for f, as above referred to, one gets:

$$h = \left(\frac{8}{9.81} \times \frac{16.5^2}{50}\right) - (8 \times 0.2) = 2.84 \text{ meters},$$

in which 16.5 stands for the speed in meters per second corresponding approximately to 60 kilometers per hour.

If the banking were to be made so high as to provide safety without reliance upon the lateral friction of the tires with the ground, f should be taken as O, and by inserting this value in the preceding formula, it is found that the height of the bank in that case should be 4.44 meters, or more than one-half of the width of the road.

When banking of this kind is contemplated—and it has the advantage that the throwing of tires at the turn is made less likely to occur—and the calculation is made for a certain width of the road and a certain maximum speed, so that l and V become constants, the formula for h can be simplified to:

$h = \frac{K}{R}$, in which K is the constant $\frac{lV^2}{g}$, figured out in advance.

It is clear that the banking should begin where the curve joins the flat and straight road, and theoretically it should begin abruptly, since the radius passes abruptly from infinite to R. The width of the road permits, however, a gradual transition from a straight course to a turn of the prescribed radius, and the height of the bank may, in accordance with this fact, be decreased gradually from h to O from the point where the turn begins—and from where it ends—for some distance upon the straight road. [To give all vehicles which might be disputing each other the turn an equal chance to continue at maximum speed without departing from their relative places in the width of the road, the turn should thus really be laid out as a hyperbola or as a circular turn connected to the stretches by hyperbolic approaches, the latter banked down to the vanishing point. —ED.]—From *L'Auto*, March 5.

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RATIONAL Compression Relief—With the usual compression relief cock the inconvenience is experienced that a considerable portion of the force developed by an explosion—in cranking for a start—is wasted, and as the explosions caused by cranking with the compression cock open are naturally weak anyway, the start is not effected until after a number of turns; namely, as soon as finally the hard labor put into the work and the succession of weak explosions have produced a sufficiently favorable condition for accomplishing the send-off.

An improvement in this respect has been devised by Mr. Galaine of France, previously known as the inventor of a muffler which adds to the power of a motor instead of diminishing it. His compression relief cock is shown in Fig. 4, giving first a general view of the little device and in the subjoined figures the positions of its piston valve C during (1) the suction stroke, (2) the compression stroke and (3) the explosion stroke. The valve D, whose upper and lower faces E and F are ground to a plane valve-fit prevents admixture of outside air with the charge drawn from the carbureter. Compression raises this disk until the lateral port of the bore H in the lower valve stem G is uncovered, affording the desired relief. An explosion, on the other hand, with its greater speed and force, drives the valve disk D up against the roof of the piston chamber, thereby obviating any notable loss of power in the driving of the motor pistons. The

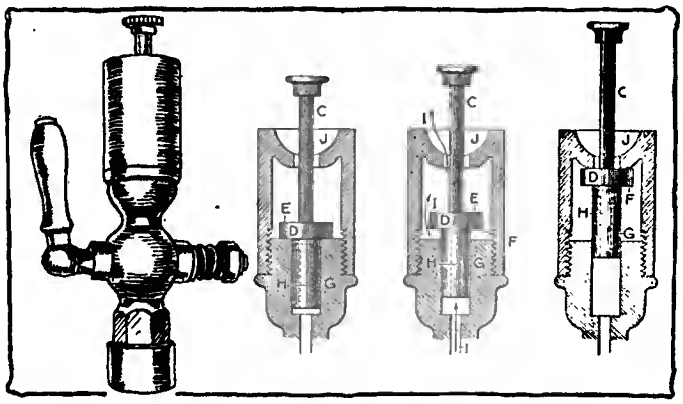

Fig. 4—Improved compression relief device to ease motor-starting

cup J admits of squirting a little gasoline into the combustion chamber before cranking.

The practice of facilitating cranking by opening the compression cock has not been very generally followed, just because what was gained in the reduction of the physical effort was lost in the resulting uncertainty of the start [and because it is inconvenient with 4-cylinder motors]. The Galaine device, by remedying this condition, is intended to make special motor-starting devices of a more complicated nature more or less superfluous. It is especially adapted for sleeve-valve motors, says the reporter, because no decompression can be effected in these by adjustment of the camshaft.—From *Omnia*, March 15.

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THE Malivert Injector—This device is in the same class as the compression relief device mentioned in another paragraph, in so far as it is intended to make more elaborate motor-starters unnecessary. It has the advantage of being applied as an auxiliary to the carbureter, so that only one device is needed for a four-cylinder motor. Its purpose is to make sure of a rich mixture with the feeble suction produced by cranking of a motor. The tube A, Fig. 5, is connected to the drain of the carbureter under the nozzle, and a hole is made in the induction manifold for the connection with tube H which ends in a needle valve acting as a vaporizer of the fuel discharged through it. The whole apparatus is secured to the float chamber by means of a strap-clasp or similar means. A spring holds the piston of the device down to the bottom of the cylinder unless it is pulled up by means of the cable running over a pulley to the driver. Slightly below the bottom of the piston in its highest position an opening in the cylinder wall connects by channel D with the tube A and thereby with the nozzle of the carbureter, and this has the effect that, when the piston is allowed to descend, the first action is that the nozzle is made to overflow, as if the carbureter were primed. Screw E and nut F regulate this action. As the piston descends further, the gasoline mixture which has been drawn into the cylinder of the device by the raising of its piston is pushed out through valve G and tube H into the induction manifold and is sucked from there into the cylinders in addition to the charge drawn from the carbureter in the normal manner. It is stated that the use of the device makes it a certainty that a cold motor will be started at least at the fifth turn of the crank, and the priming of the carbureter, as done by the device, makes it sure that rich mixtures will be continued long enough to warm the motor, so that it will continue to run with the normal fuel feed from the carbureter. The operation involves thus only one pull upon the cable.—From *La Vie Automobile*, March 15.

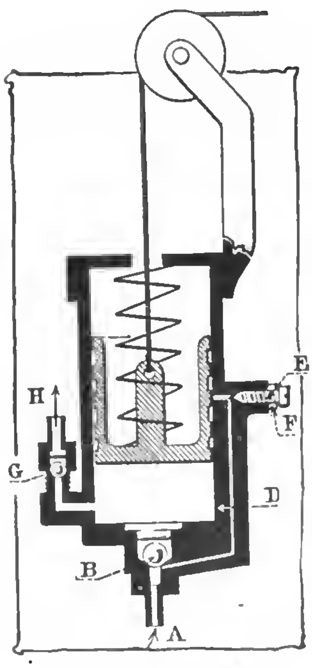

Fig. 5—New fuel injector

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MATERIALS for Carriage Upholstery.—A number of developments have taken place in the manufacture of textiles from artificial thread which may prove of interest to the motor car builder. A process by which jute is turned into artificial silk is at present under examination in the German patent office. By means of form of yeast and the addition of glycerine, on which the yeast spores feed, the fiber of the jute is freed from all resinous substance and is rendered extraordinarily fine, smooth and flexible, and the price of the fabric woven from this material can be made very low as compared with silk. It is not stated positively that the principal fault of ordinary jute, which is that of becoming brittle under the influence of air, light and moisture, has been removed, but the material may at all events be available for drapings and upholstery of close vehicles.

A wider utility for automobile purposes is foreshadowed in a recent patented British invention, according to which a silk-like material is made from threads of spun glass, each of which threads is only one-thirtieth as thick as an ordinary human hair and scarcely visible to the naked eye. By the action of chemicals, this thread is made firmer and stronger than any other artificial silk, and the cost of producing material woven from it is said to be only about 30 to 35 cents per kilogram, as compared with $1.50 to $1.75 for the artificial silks made from cellulose. The most promising quality of the new material is however that it is incombustible and very resistant to moisture, acids, alcohol and oils as well as easily cleaned.—From *Kunststoffe*, March 1.

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TRADE with the Balkan States—According to a recently published report, Germany sold in 1911 to the Balkan states about twice as many motor vehicles as in 1910. The sales were distributed as follows: To Roumania, 647 passenger cars, to Servia, 79, to Bulgaria, 34, to Greece, 10, to Turkey, 82 passenger cars and 260 motor trucks. [Some discrepancies between the scheduled figures and those mentioned in the text of the report casts a doubt over the accuracy of both, however.]

In Turkey, the bulk of the trade is in the hands of England; Austria following and then Germany. America gained a foothold just before the war broke out, and a lively competition with "cheap American cars" is anticipated when, after the war is over, the expected modernization of the Balkans sets in. Americans have fortified their commercial position greatly by shrewd preparatory moves. Thus the founding of the Robert College at Rumeli-Hissar, an "excellently conducted commercial school," is benefiting them greatly; also the organization of the Ottoman-American Development Co. and of the American Chamber of Commerce at Constantinople, which was founded in March, 1911, and already counts 450 members located in all of the more important Turkish cities.

France leads in exports to Roumania, sharply followed by Italy, the sales running mostly to cheap and light cars. Lately the Americans are also invading this market. England supports her trade here by the establishment of repair shops.

Bulgaria has practically no roads, and automobiles are scarcely used for pleasure purposes at all. Just before the beginning of the war, however, American manufacturers sold a number of small cars for stage lines connecting the interior with the seaports of Varna, Baltschik and Kavarna, and these became very popular. When it was decided to enlarge this traffic the demand turned to larger cars, and the orders for these were placed in Germany.—From *Allgemeine Automobil-Zeitung*, February 28.

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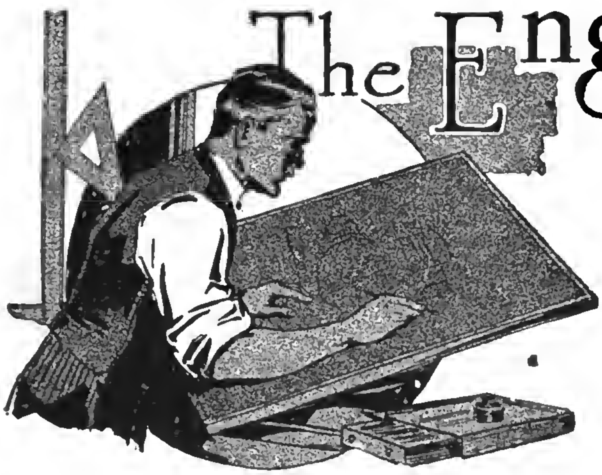
Storage Batteries to Oust Magnetos—It is prophesied by the owner-editor of *La Pratique Automobile* (Feb. 25), that the magneto, which chased the small storage battery from the ignition equipment of automobiles, will disappear from the market in a few years, and that the storage battery will be reinstated as a spark-producer. The prediction is of course based upon the great popularity of electric lighting for cars, which in turn was the result of the perfecting of the tungsten incandescent filament. The need of a generator to supply the electric light current, of a battery for equalizing it and the opportunity for employing the same force for the starting of the motor are considered an irresistible combination compelling the use of the same equipment to furnish the ignition current, and consequently making the magneto superfluous. That the generator can keep the battery constantly charged, while formerly no such facility was at hand (in France), is considered as affording a further guarantee that the change will come about as predicted.

The Engineers' Forum



Horsepower As Basis For Tax Discussed

Relation Between S. A. E. Rating and Legitimate Speed Is Considered by Leading Automobile Engineers

Fault Is Said To Be With Lawmakers, Not with the Horsepower Formula

Vincent Considers Tax on Power Unfair
Not in Accord with Laws, Porter Claims
Education of Legislators Needed—St. John
S. A. E. Formula Very Fair, Says Bohn

WITH reference to the article "Cars Taxed on Unused Horsepower," printed in THE AUTOMOBILE of March 27, a number of leading automobile engineers have communicated with this office and have expressed their opinions which bring out many new details and in a general way agree with the argument of the above-mentioned article. The trouble, it seems to be admitted generally, lies with the law rather than with the formula. The communications follow:

DETROIT, MICH.—Editor THE AUTOMOBILE:—Taking the horsepower of a motor as a basis for taxation is a rather unfair proposition to the owner paying the taxes, unless the taxes are low per horsepower. The power of a gasoline motor increases as the speed increases, up to certain limits. These limits, however, are reached at speeds ranging from 1,600 to 2,000 revolutions per minute. A motor which pulls 67.5 horsepower at 1,600 revolutions per minute will not pull more than approximately 39 horsepower at 750 revolutions per minute.

The A. L. A. M. horsepower rating is based on a piston speed of 1,000 feet per minute, with the bore of the cylinder taken as one of the factors. Considering the stroke of the motors in use to be approximately 5.5 inches, it is necessary to attain 1,200 revolutions per minute to reach 1,000 feet of piston speed per minute. With the standard gear ratio of 3.5 to 1 in the rear axle, a car would attain a speed of 37.5 miles per hour when the motor had reached a speed of 1,200 revolutions per minute. As this speed would be largely in excess of the law controlling speed limits, it hardly seems fair to base taxation on this speed.

Assuming that the law will allow an operator to drive 20 miles per hour in districts in which he is paying motor taxes, the speed of his motor will be but 640 revolutions per minute, or, approximately 35 per cent. of the speed at which it probably pulls its maximum power, and also a speed of but 53 per cent. of that required to reach the A. L. A. M. rating.

Of course, the average automobile will never average 20 miles per hour through districts where motor taxation is in vogue, or, in other words, in cities. I doubt if the average of a motor car in Chicago or New York would be in excess of 8 to 12 miles per hour, or an average motor speed of but 320 revolutions per minute. This would be less than 27 per cent. of that required to reach the A. L. A. M. rating. So that a 40-horsepower motor based on A. L. A. M. rating would not average over 11 horsepower in city use and could not reach 40 horsepower without attaining a speed of 37.5 miles per hour. There are conditions, however, in which the motor, in service in the city, will show considerably more power than this average of 11. These conditions arise when accelerating and using the gears of the transmission, for instance, in first and second speed. It is safe to assume that the car will never travel faster than 15 miles per hour in second speed, which, with an average gear ratio in the rear axle of 3.5 and an average of 6.3 as a total for second speed ratio, would give a motor speed of but 835 revolutions per minute. With these conditions and with a stroke of 5.5 inches, we have less than 70 per cent. of the A. L. A. M. rating, and must also consider that acceleration in second speed is very brief and not of frequent occurrence.

Allowing the Government to assume an average of 20 miles per hour instead of an average of 10, for the use of the car on the city streets, we still only have 53 per cent. of the speed required to reach the A. L. A. M. rating. I would, therefore, be of the opinion that if the motorist concedes twice the average speed at which he is really using the car for a basis of taxation, it certainly should be fair to the Government and this would make a basis of approximately 50 per cent. of the A. L. A. M. rating for horsepower.

The formula for calculating A. L. A. M. horsepower is as follows: The square of the cylinder diameter multiplied by the number of cylinders divided by 2.5.

The advent of the six-cylinder motor has certainly relieved some of the wear and tear on the city streets, owing to the smoothness with which it turns the wheels. An uneven effort to turn the rear wheels without doubt causes more slippage and hence more destruction to the street than does an effort of continued smoothness. There is little doubt but that a six-cylinder motor is easier on tires than a four-cylinder, and, if it is easier on tires, it must be easier on the pavement. The production of six-cylinders in proportion to four-cylinders is largely on the increase, and any taxes for repair of streets should be on the decline rather than on the increase.—J. G. VINCENT, Packard Motor Car Co.

Automobile Taxes High Enough

TRENTON, N. J.—Editor THE AUTOMOBILE:—To my mind the horsepower proposition is very clear, and an explanation pertaining to the difference between the actual power developed on brake test, and the power developed on the road is easily given. The rating so far as the secretaries of state go is plenty high enough.

I mean by this that the speed laws of the different states holding a car to the maximum of 25 to 30 miles an hour and less in cities and towns, necessarily keeps down the revolutions per minute of a motor to such an extent that the development of more horsepower than the rating, or even as much as the rating, is impossible. The fact that the published power curves and statements of the different manufacturers show an exact power development, should not and cannot in any way affect the action of the secretaries of state unless they permit by law speed that would permit this power to be developed.

I believe that if this matter was put in the proper light that a reduction of the horsepower rating is absolutely in order instead of an increase.

It seems to me that it could be conclusively proven that a speed limit of 30 or 40 miles per hour would not permit the development of anything like the S. A. E. rating of the different motors for the simple reason that it does not take that amount of power to propel any vehicle I know of at that rate of speed.

If an increase in the rating is proposed, it seems to me that the question above will have to be answered for the simple reason that a raise in the horsepower rating would practically mean permission to the licensed one to operate a motor developing the power specified in his license, since the license has to do only with the use of the road and does not in any way imply or demand any superior knowledge necessary for the operation of motors of different sizes.

It would, of course, be possible to raise the percentage of taxation per horsepower, but I believe the raise in horsepower rating would not be in accord with the laws as enacted and enforced.—Fenley R. Porter, Mercer Automobile Co.

Richmond, Ind.—Editor The Automobile:—The question of horsepower as applied generally to various types of power-producing appliances is, in the writer's judgment, one sadly in need of revision. The term horsepower doubtless originated far back in the early days of steam engine development and was used for the purpose of designating some idea of the energy capable of being delivered by a mechanical device, as compared with the energy which could be delivered by the well-known draft horse. Unfortunately the comparison is sadly misleading, as every engineer knows that an automobile engine rated at 40 or 50 horsepower does not in any sense represent the power equal to that delivered by so many draft horse. This is the unfortunate feature concerning the point touched upon in your communication.

If our state secretaries and lawmakers in general could be educated along this line and brought to a full realization of the real meaning of the term horsepower, much would be accomplished in a preliminary way to offset the tendency of such officials to raise the rating. In short, the old, time-honored method of power rating is and always has been inadequate, unsatisfactory and misleading and the writer would suggest the use of the word unit, one unit to equal some number of foot-pounds.

The writer's experience with long-stroke motors has proven conclusively that the power of the motor does not increase in proportion to the added length of stroke, and this point should be made clear to our state secretaries, who are doubtless of the opinion that it does and that the addition to the stroke was made wholly for this one purpose.—C. R. St. John, M. E., Westcott Motor Car Co.

Maximum Power Output No Basis

Detroit, Mich.—Editor The Automobile:—Referring to the S. A. E. horsepower rating, wish to say that in my opinion a change in the S. A. E. formula or a new formula is quite necessary. It is true that the S. A. E. rating is very conservative, especially for dynamometer work. However, as the results obtained from an explosive motor in a chassis are quite different from those obtained from a block test, due to the atmospheric conditions and other conditions beyond the control of the operator, it is quite reasonable to assume that the horsepower delivered by the average motor in actual use, and at various speeds, is a close approximation to the S. A. E. rating. If we were to assume that every driver of an automobile were an expert in the handling of explosive motors, the average condition would be radically different. In my opinion it would be rather unfair to base taxation upon maximum results which are possible under certain conditions.

It is quite true that nearly every motor and automobile manufacturer already has, or is planning to adopt what is known as the "long-stroke" motor. Some of these manufacturers have in the past produced motors having a bore in excess of the stroke, from which excellent results were obtained so far as actual performance and power delivered were concerned, and it is true that such motors can be commercially built weighing less per horsepower than a great many of the later so-called "long-stroke" motors.

I really believe it will be a mistake to alter the S. A. E. formula, as in my opinion it is very fair. It is quite common practice, when conducting block tests, to indicate in the report of such tests the horsepower of the motor according to the S. A. E. formula; also to indicate the horsepower nominally delivered on the block, which in nearly every case is in excess of the S. A. E. rating, but, as before stated, the power delivered by the motor in actual service in all probability very seldom exceeds to any great extent the S. A. E. rating.—G. G. Bohn, Hudson Motor Car Co.

Necessity of Rich Fuel Mixtures

Branford, Conn.—Editor The Automobile:—In reading the discussions of the subject of carburetion which have recently appeared in your columns, one is forcibly impressed by the divergence of the views therein expressed.

Coupled with the statement that a rich mixture is necessary for a quick get-away, we are told that this means a waste of fuel. from unconsumed gases, at ordinary road speeds.

Excessive air at high speeds is said to give cylinder pressures endangering present construction, in the face of repeated statements that maximum power is secured from a mixture containing less than the theoretical amount of air necessary for perfect combustion.

Carbonic oxide, CO, in the exhaust is shown to demonstrate a definite heat loss and yet the antagonists of exhaust gas analysis quote erratic results and even enviable mileage with large percentages of CO present.

Chemists demonstrate that 14.94 pounds of air are necessary for the perfect combustion of 1 pound of gasoline vapor, but the consensus of opinion leans toward an excess of fuel for maximum power.

The intake manifold is cited as a necessary evil, while, on the other hand, glass construction has shown that vaporization is completed only in the manifold.

The plea is made for some method of filling the vacuum behind the pistons, in other words, increasing the volumetric efficiency on open throttle, while in the same discussion the statement is made that the velocity in the intake manifold "is from 300 to 400 feet per second," equivalent, in itself, to a direct loss of volumetric efficiency of from 5 to 9 per cent.

Finally, the most sweeping disagreement is reached in the statement that "the American public will not accept a carbureter that gives a uniform mixture under all conditions, but demands a quick get-away, economical running and a powerful mixture at maximum speed." This assertion closely follows a statement in the same discussion that "The rate of flame propagation in a gaseous mixture, other things being equal, is near its maximum at a 12 to 1 ratio. The rate decreases with departure from this value in either direction."

How can these statements by the same author be reconciled? Maximum rate of flame propagation means maximum pressure. Maximum pressure means maximum power output. Why then should the mixture entering the cylinders of an automobile engine be subjected to change? Not for speed, certainly, for the ideal mixture is the quickest burning. Not for power, for it gives the maximum explosion pressure. Not for starting, for it is the most easily inflammable.

The operator of a stationary gas engine, using, let us say, city gas, does not change the setting of his gas valves except to meet variations in the composition of the gas itself, or to compensate for barometric changes. Why should any greater variation of charge be necessary in the automobile engine?

Consideration of this question, in all its varied aspects, involves prolonged discussion, but it is possible that one phase of the subject has been underestimated which, when carefully considered, will help to reconcile many, in fact, most, of the conflicting arguments.

The process of carburetion consists of two equally important factors:

First: Quantitative mixture of liquid fuel and air.

Second: *Complete* vaporization of the liquid and *complete* absorption of the vapor by the air.

Claims for the first of these primary functions are better substantiated in the advertisements than on the road, but rarely does one note even recognition of the second, but none the less important function. Occasionally, to be sure, one hears the claim for "dry gas," but this feature has been largely obscured by the numerous attempts to perfect the chemical composition of the mixture under varying conditions.

As a result a large portion of the charge from the average carbureter consists of gasoline spray, or mist, carried in suspension in rapidly-moving air columns. Under these conditions necessary physical contact of the oxygen with the fuel molecules is impossible, so that the fuel is but partially consumed, resulting in large percentages of CO in the exhaust and, very probably, in utterly untouched fuel when the exhaust valve opens.

Consider, too, how much greater is the density of the *liquid* gasoline than that of its *vapor*, and, remembering that some portion of the fuel from the average carbureter reaches the cylinder in a liquid state, even if minutely subdivided, it is readily seen why a greater proportion of fuel than is theoretically necessary has come to be considered the most effective.

This feature of carburetion is perhaps best illustrated in starting a cold engine. Let us assume that the carbureter is delivering a mixture of, say, one part of gasoline to fourteen parts of air (by weight). When the engine is cranked, owing to the low temperatures present, only a small portion of the fuel atomized becomes a gas. The remainder is speedily released from mechanical suspension in the relatively slow-moving air column, and is promptly deposited on all interior surfaces, so that the gaseous mixture reaching the cylinders is far too lean to be inflammable. Increasing the amount of gasoline by priming increases the total amount of fuel *gas* present in the charge by an amount dependent largely upon whether the priming charge be atomized or not, or whether it be volatilized by the heat of compression from the act of cranking. In any event it is solely the *gaseous* charge within the combustion chamber of a cold engine, that produces the first explosion.

More Gaseous Mixture in Cylinder

The necessity, as explained above, for a temporary excess of fuel does not disapprove the efficacy of a definite mixture, but does emphasize the importance of complete vaporization.

The range of mixture quantity required by the average automobile engine, taking into account the relative volumetric efficiencies at low and high speeds, is usually not less than from one to twenty. That is, the velocity of the mixture in the intake manifold is twenty times as great at maximum speed, with throttle wide, as it is at idling speed, with throttle closed. How can it be expected that one-twentieth the maximum velocity will carry in suspension the same weight of atomized fuel? This alone, although it is by no means the only factor, explains why it is that excess air is demanded at high speeds. The greater attrition of the rapidly moving air, passing surfaces wetted with unvaporized fuel, assists in vaporization, so that the *real gas content* of the mixture within the cylinder is, at least temporarily, greater than before and demands the additional supply of air which it requires.

Non-homogeneity of the mixture has been called upon to explain various erratic results, both in exhaust gas analysis and in actual engine performance. How can a mixture of atomized liquid particles, depending for their suspension upon widely varying velocities of the medium in which they are suspended, form a homogeneous mixture with a gas? On the other hand, what greater homogeneity can be secured from the diffusion of two gases and what more feasible method of promoting diffusion obtains than in the tortuous pasage from the carbureter to the combustion chamber?

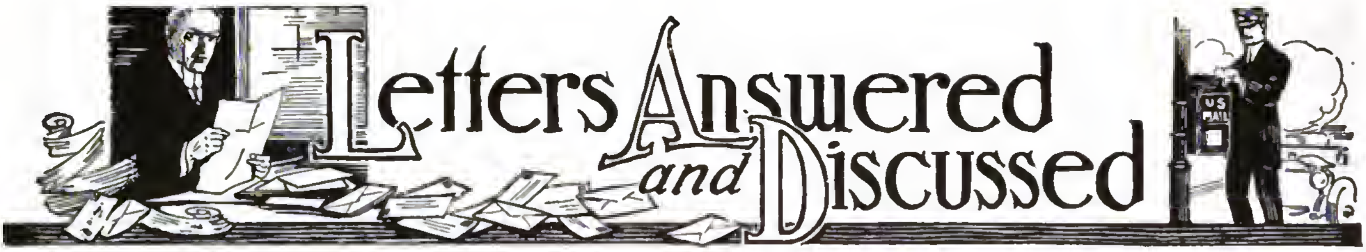
It is beside my present purpose to amplify the many and complex details of the foregoing suggestions, or to propose at this time means for their ultimate accomplishment, but, instead, to reconcile, if possible, on some common grounds, the conflicting opinions of the trained observers as expressed in your columns. Without some such common grounds little progress may be expected in the advancement of carburetion toward the dignity of a science. Enough good work has been done to indicate efficient design, but to accomplish this no aspect of the subject must be neglected.—Arthur B. Browne, Consulting Engineer.

Measurements No Problem—Duryea

Saginaw, Mich.—Editor The Automobile:—The inch system was in use in most parts of the world before the metric was foisted upon us and most mechanics can measure by either system without particular difficulty. A man having a metric micrometer can give the metric measurements of a piece made in inches just as perfectly as he could if it was made to metric size, and the maker of that part, although using inch measurements regularly, can fill the order just as exactly by the use of a metric micrometer. The present arrangement, therefore, presents no serious difficulty. We have tire makers who are supplying tires in metric sizes as well as in inch sizes, and the thing to be desired is not a common method of measurement, but the use of common sizes. It would be just as disadvantageous to a Brazilian to get a vehicle having an odd-size tire measured metrically as to get the same odd-size tire measured in inches; but it does make a big difference to the maker if he must for some fool reason, probably a legal one, change his machinery and his standards to meet the imaginary advantage. If you aim at the end you claim then it seems to me you will get this by standards of sizes rather than standards of measuring means.

The Crane Co., of Chicago, has been advocating metric measurements for modern pipe sizes. This would leave all tools, fittings, etc., just the same as they are at present, but their sizes would be expressed in a mouthful of metric mush instead of in our short, handy, simple English. I can see no gain in such a proposed change.

I have tried to look at this matter from the standpoint of practicability. I carry a tape line having metric marks on one side and inch marks on the other, and I find it much more convenient to use the large inches instead of the small centimeters and to use divisions into halves, quarters and eighths instead of into halves and tenths. I think that others find the same, and that in no place has the metric system driven out the inch measurements, except where the law enforced the change, and that the change there was a disadvantage rather than an advantage. It is easy to theorize on these matters, but theories cost money, and what we want is practical results. Our American makers had much better spend the money they would spend in making such a change in advertising in foreign countries where they can create a market for their goods whether made in inches or meters, and in their foreign catalogues published in foreign languages they can not only give inch measurements, which being stated in Arabic numerals are easy to read, but they can give equivalent metric measurements which will fully remove the objection you mention.—Charles E. Duryea.—Duryea Motor Co.



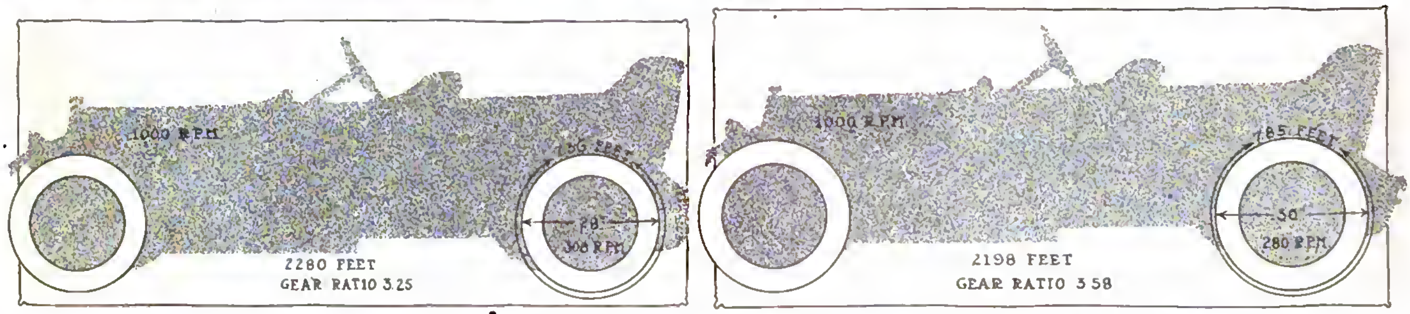


Fig. 1—Comparison of two cars, showing what each would do with the same motor running at the same speed but through a different gear ratio and through different size tires. At the end of 1,000 motor revolutions one car will have traveled 2,280 feet, while the other will have gone 2,198

Two-In-One Brake Pedal Suggested—How Show Spaces Are Chosen—Oversize Tires Discussed—Effect of Gear Ratio on Pulling Power—Different Size Tires on Rear Wheels—Thermo-Syphon Circulation—Tire Pressure

Suggests Divided Brake Pedal

EDITOR THE AUTOMOBILE:—In the March 13 issue, in a reply to R. R. Saulpaugh's differential query, you state, "In turning a corner more power is exerted for the outside rear wheel." It seems to me, that this would bear a discussion. Suppose we had a car of 60-inch tread making a right angle turn of a radius of 25 feet, the inner wheel would travel a distance of 39.2 feet, the outer wheel 43.1, 3.9 feet farther, roughly speaking 10 per cent. farther. Now if we had a pair of balances with 10 pounds in each pan and the scales were lifted by the central support, both weights would sum up evenly but now if we wanted 1 pan to lift .1 faster than the other, we would have to shift the central support toward the slower moving pan, or else add weight to it. The added weight would vary according to the weights in the pan, and the speed at which they were lifted. If we had a turning power of 100 pounds on the differential 50 pounds would be distributed to each rear wheel by the compensating wheels of the differentials, the speed turning a corner varies .1 the leverage, or 10 pounds, 5 pounds added to the inner rear wheel, make 55 and 5 taken from the outer reduces it to 45 pounds, or in other words (the front wheels being at an angle to the line of the rear wheel, the force of the inner rear wheel is delivered crosswise of the front wheels) there is 10 pounds of the engine force being exerted to make the front wheels skid, causing an increased wear of tires. Now if we had a divided brake pedal so that a small side shift of the foot would brake either rear wheel as desired, a braking strain of 10 pounds on the inner wheel would prevent the inner wheel from pushing this much force against the ground and the car would go around on an even keel, or a slight increase of brakes would make a slight drag on the inner wheel and assist in pulling the front end around. This would be a great advantage on a car but I suppose the makers will not add it until users get wise to it and demand it. It would be a great thing on a bad road where one rear wheel slips into a mud hole and spins around; slightly braking it, would give the other wheel a chance to pull out. A racing car so equipped could turn a corner with higher speed and greater safety making a great gain in time.

Brandenville, Pa. JOS. MUNDEN

Lots Drawn for Show Spaces

Editor THE AUTOMOBILE:—What plan is followed in allotting space to different car manufacturers at the New York and Chicago shows? It seems there would be much rivalry for the choice of positions.

Oakland, Ia. F. W. P.

—Show spaces are allotted by a double system of drawing which cannot help but be fair. The manufacturers are first classified according to output. They are divided into definite classes in this manner and then the buildings in which the show is to be held are divided so that the most prominent floors are given to the first class, the next prominent to the second class, etc. These floors are divided into spaces. If there are 100 in the first class, 100 numbers are put in one hat and 100 names put in another hat. Simultaneously a number and a name are drawn from these two hats by different people and this determines the order of choice. For instance if the name Packard were drawn from the hat at the same time as the number 6, Packard would have sixth choice. In this way each of the members of each class secure their spaces

Merits of Oversize Tires

Editor THE AUTOMOBILE:—I have a 1911 Cadillac equipped with 34-4 tires. Oversize tires have been recommended. Would you advise using them, as my car is rather heavy I read something once about oversize tires giving some trouble as the item inferred that they were more difficult to fit. Is this so; what is the reason for it? I have heard that an oversize tire would not keep its seat. but that it tends to creep.

If a 34-4 tire costs $40 and an oversize $52, it seems to me that one-quarter extra mileage would be required out of the higher-priced shoe to give equal returns on the investment. This would mean about 3,750 miles on an oversize against a straight 3,000 on a 34-4. Is the larger shoe likely to run that much longer without showing any more wear than the smaller shoe? If the increased cost of the inner tube is considered it seems to me that an oversize would have to make 4,000 miles to give equal service. I should welcome a discussion on this matter, as I had about made up my mind to change to larger shoes. Yet I want to look before I leap.

New York City. J. D. Martin.

—Experts of the tire world have unqualifiedly recommended the oversize tire for cars which seem to be too heavy and which cause a too rapid deterioration of the shoe. On the face of it, this appears to be true, but there is another side to the question. A close examination of the shoe should be made to determine whether it is wearing out through cutting or through the actual wearing away of the surface of the tread. In and around New York City where the automobilist not infrequently encounters glass-strewn streets, which occur so unexpectedly that he is compelled to run over a large section of fractured milk bottle or other glass, nails, tacks, etc., it will be found that the majority of tires wear not through the grinding off of the surface, but through large cuts which cannot be repaired or numerous small cuts which allow moisture to penetrate and rot the fabric or sand to distort the casing and to rip the tread from the body of the tire.

In New England, on the other hand, where the tourist finds that most of the running is confined to country roads of the dirt variety, the chances are much more in favor of the tire having worn in the regular manner; that is, by the wearing off of the tread.

Now it is a certainty that a large tire will cut just as quickly and will deteriorate just as rapidly as will one of the small size. Therefore if your tires are discarded on account of cuts it would not seem to be economical to use the larger shoe.

Assuming that your tire wears from the surface, the oversize tire will be more economical. In the first place, blowouts will be cut down 100 per cent., hence inner tubes will last longer. In the second place, what applies to a beam in a building also applies to a tire. If a beam be used which will just support a given weight, that beam will have to be renewed many times sooner than would be a beam which had a margin of safety of exceptional amount. Or, again, consider the parallel with an engine bearing: a bearing which is of just sufficient size to carry the load put upon it by the crankshaft safely will have to be renewed three times as compared to a bearing which has a factor of safety of 60 or 70 per cent. The load at which a tire is capable increases rapidly with the diameter of the tire, hence you are giving yourself an enormous factor of safety by using the oversized tire.

The entire situation may be summed up by stating that if your tires are actually wearing out and not being cut to pieces you will find it more economical to use the oversize.

Pulling Power Through Gear Ratio

Editor The Automobile:—Will you kindly advise me which car has the greater pulling qualities, one with a gear ratio of 3.25 to 1 with 28-inch wheels or one with gear ratio of 3.58 to 1 with 30-inch wheels.

Calcite, Col. C. P. Hinds.

—Your question may be best answered by a study of the accompanying diagram, Fig. 2. Assume that the motor develops a given horsepower of 1000 revolutions per minute. Taking the first case which you mention, that in which the gear ratio is 3.25:1 and the wheels 28 inches in diameter, it will be noted that at this engine speed the rear wheel is revolving at the rate of 308 complete revolutions per minute. A wheel whose diameter is 28 inches covers 7.36 inches, neglecting slip, in one revolution. In 308 revolutions it will have gone 2,280 feet.

Bearing the above figures in mind, consider the second instance with the same motor developing the same power at 1,000 revolutions per minute with the gear ratio of 3.58:1 and the rear wheel turning at the rate of 280 revolutions per minute, the distance traversed by the rear wheel would be 2,198 feet. The circumference of the 30-inch wheel measures 7.85 feet.

It is evident that the car first mentioned would be traveling faster for any given motor speed, but the second car, being geared lower, would be able to take a correspondingly steeper hill without a change of gear. For each revolution of the motor the car first considered would travel 2.28 feet against the 2.20 feet of the second car. Or it would gain .08 feet per motor revolution. Assuming the first car to be traveling 30 miles an hour, the second car would be traveling 32.4 miles an hour. In this same ratio as the speeds the amount of resistance will be found to vary inversely. If a stretch of sand interposed just sufficient resistance to cause the first car to change gears, the second car would be able to pass through it with an 8 per cent. margin of strength.

Automobile Companies Maintain Schools

Editor The Automobile:—What automobile companies have schools of instruction such as that of the Cadillac company and how is admission to such schools secured?

Six Mile Run, Pa. Oscar Davis.

—The Cadillac company maintains a school which is unique in that it trains engineers to be employed by the Cadillac concern and pays them a nominal wage during this time. The requirements for entrance are merely upon recommendation of some recognized authority. The payment at the school is just sufficient to maintain the living expenses of the students while there. Other large concerns, as Pierce, Packard, etc., have schools of instruction in driving for the owners of the cars. Packard maintains a school for its own employees. A local agent or branch manager can recommend a man for the school with the understanding that he shall be trained in the manufacture of the automobile and also secure a training in the selling end of the business.

Different Tires on Rear Wheels

Editor The Automobile:—Is it possible in case of an emergency to run with a 36-inch tire on one of the rear wheels and a 37-inch tire on the other? Would the differential overcome this difference of tire size? Do you think the difference would be noticed by anyone riding in the car? I have been told that this would be hard on the motor and rest of car. Is this true?

La Crosse, Wis. A. Werner.

—It is very possible in case of emergency to run with a 37-inch tire on one wheel and a 36-inch tire on the other. What would happen is set forth diagrammatically in Fig. 2. While one wheel is making 1.07 revolutions the other would be revolving 1.05 times. The amount of power absorbed by each wheel would be directly proportional to the effort it was exerting in driving the car. This effort is proportional to two things, first, the work carried by the wheel, and, second, the peripheral speed of the wheel. The weight carried by each of the wheels would be so nearly the same that for all practical purposes we may consider it equal. It is evident that in proceeding a distance of 9.69 feet while carrying a weight W against a coefficient of tractive effort T, 9.69 WT foot-pounds of work will have been accomplished. During this time the other wheel will have 9.42 WT' foot-pounds of work. Assuming the factors T and T' to be equal it is evident that the work done by each wheel will be

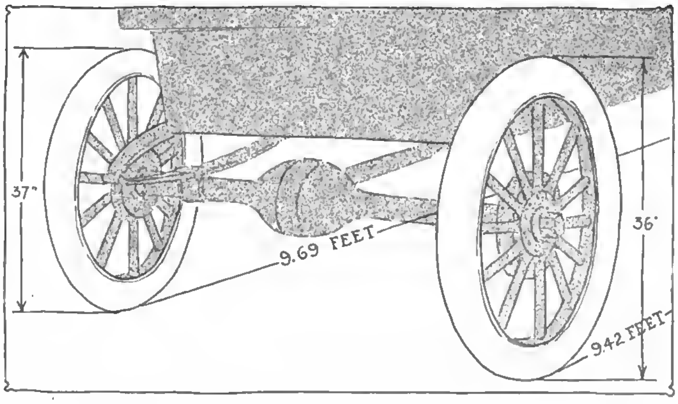


Fig. 2—Diagram showing the travel per revolution and the effect on the car of different size tires on the rear wheels

exactly proportional to the factors 9.69 and 9.42. The action of the differential in allowing one wheel to turn more rapidly than the other would not harm it or the car in any way as that is the exact purpose for which the differential is intended, namely, to permit different peripheral speed for each of the rear wheels. The only detrimental feature that you would have to work against would be the unsymmetrical appearance of the car and the fact that one tire, the smaller, would probably wear much more rapidly than the other.

Circulating System on Overland

Editor THE AUTOMOBILE:—Should the water in an Overland 21 fail to circulate under all conditions, say, 10 degrees above zero or colder, if not frozen up? At the service stations they say this will happen if the lower half of the radiator is not covered to protect the motor without its being frozen or clogged otherwise.

Lorain, O. J. A. K.

—The water is circulated in an Overland car by the thermo-syphon process. The water in the jackets surrounding the cylinders becomes heated by the temperature of combustion and in the same manner as the water in a pot tends to circulate, the warmer water has a tendency to rise. If you will observe the action of the water placed on the stove, you will note that as soon as the temperature rises there is a tendency for the water at the bottom of the pot to rise to the top being displaced by the cooler water above. It is the same in the thermo-syphon system of cooling. The water-jackets, manifolds and radiator are filled with water. When the temperature of the water in the jackets rises sufficiently for it to become much lighter than the water above it in the outlet manifold it tends to rise to this manifold and to be displaced by the water which enters from the intake manifold. A natural current is thus set up which becomes more rapid as the water becomes warmer and when a high temperature is reached the water in the jackets is often converted into low-pressure steam which accelerates the thermo-syphon system to a marked degree.

When the water in the bottom of the radiator becomes intensely cold it tends to form a break in the system for the following reason: It will be noted in Fig. 5, which is a diagrammatic view of the Overland system, that the water flowing from the radiator to the cylinders must first rise through a small section of pipe P. When the water is exceptionally cold it is evident that it would take considerable pressure for the water above to force this through, but owing to climatic conditions the water in the radiator may be chilled so rapidly that it is unable to displace the pocket below the pipe P. For this reason the lower section of the radiator should be covered in cold weather. After a time the water surrounding the jackets would become so hot that the pressure of the steam formed would be sufficient to blow the water in the pocket up into the jackets. In an extreme case the pressure in the jackets would hold the water from entering either at the inlet or outlet, but this would only be likely to happen in case the system was clogged and had not been given proper care. As a general rule, it may be stated that the water would circulate even if the radiator were left uncovered, but that this circulation would not be as efficient as if the radiator were covered.

It must be remembered that the effect of keeping the radiator covered in a thermo-syphon system is much different than when keeping the radiator covered in a pump circulating system. In the latter the water is circulated at a uniform rate regardless of the outside temperature. The amount that the water is cooled in passing through the radiator depends to a large extent on temperature of the outside atmosphere. When the water is cooled sufficiently in warm weather it is evident that it will be cooled more than enough in cold weather. The gasoline motor works most efficiently at high temperatures. The reason for this is that the heat which would be thrown off through the cooling water at low radiator temperatures is converted into useful work at higher radiator temperature. The water surrounding the jacket in a pump circulated system attains very nearly the same temperature in winter or summer. But when the radiator cools it to a marked degree it is necessary that energy in the form of heat be lost when raising the water to the fixed jacket temperature. For this reason the cold motor is inefficient and it means an actual saving in the money spent for fuel for the owner to protect the radiator in cold weather. At extremely low temperature it is not only necessary to cover the radiator, but also to spread the covering over the entire bonnet.

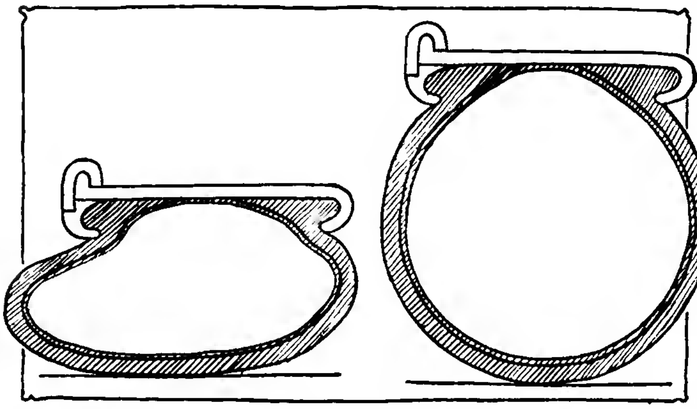


Fig. 3—Showing how the weight of the car on a deflated tire decreases the internal volume

Pressure Due to Car Weight

Editor THE AUTOMOBILE:—Is the pressure or strain on a tire, that is pumped up to ordinary pressure, relieved to any extent by removing the weight of the body from it? As long as a tire is kept up to ordinaray pressure, does jacking it off the floor relieve the strain on it to any extent? Is it any easier to pump a tire with the wheel jacked up than it is with the weight of the car on the tire? If there is any difference what causes it?

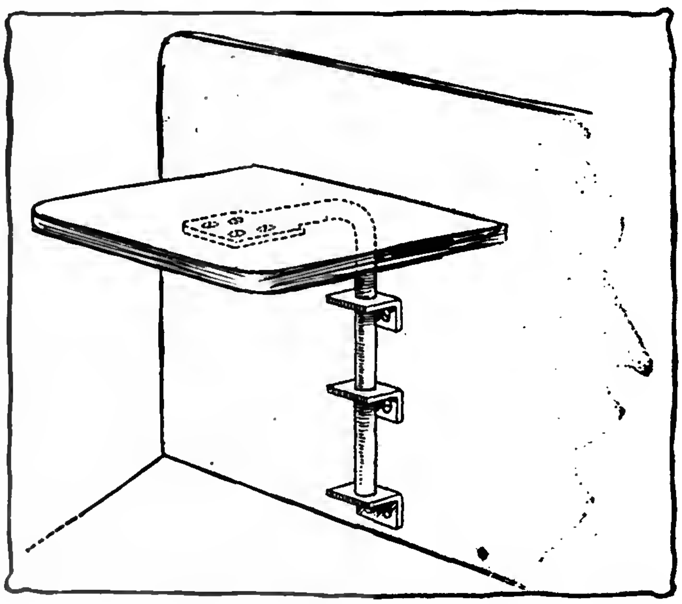


Fig. 4—Method of attaching removable home-made seat for child. Bracket is tapered or stepped

Rochester, N. Y. M. B.

—The pressure in a tire is greater when the car rests upon it than when a car is jacked up. If you take a rubber ball filled with air and stand upon it the pressure in that rubber ball will be greater than if you held the ball in your hand without squeezing it. This latter instance is parallel to that of a car in which the tires are relieved of the weight. If you have a given quantity of air, the smaller the volume in which you put that air the greater the pressure which will be exerted by the air. In the tire there is a definite amount of air. The pressure of this air varies inversely with the volume it occupies. When the tire is round the air is at its maximum volume and hence its minimum pressure. When the weight of the car is on the tire it is no longer round and the volume is redneed as illustrated in Fig. 3. Therefore, the pressure in the tire is greater when it carries the weight of the car.

If there were any doubt upon the above statements it would be removed by the following thought: The pressure exerted by the air must carry the weight of the car. If it did not the car would rest flat upon the ground and not upon a cushion of air. The weight of the car flattens a tire until the pressure within that tire becomes high enough to carry the weight of the car and no more. The more air that is in the tire the less the volume within the tire has to be decreased to bring the pressure to the amount necessary to hold the car. Hence the more air that is in a tire the less it will flatten out under the weight of the car. Jacking up the car relieves the total pressure within the four tires to the amount of the weight of the car. Since it is

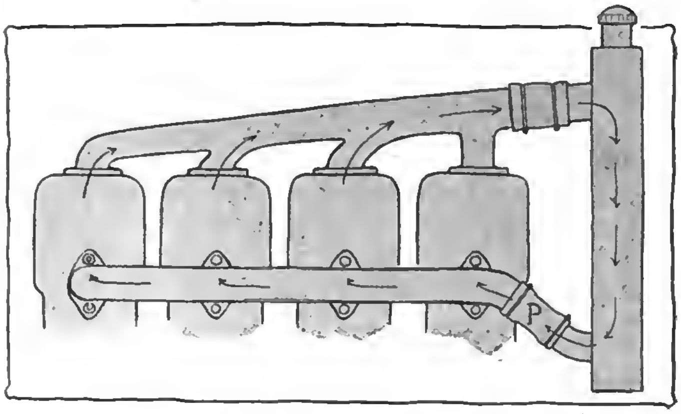


Fig. 5—Diagram of the thermo-syphon system used on the Overland car—Water circulated without aid of pump

harder to pump against a higher pressure than a lower one it is harder to pump the tire when it is resting upon the ground than when it is jacked up; provided that the pressure is only raised to such an amount that the tire will be at the desired pressure with the car resting upon the ground.

Few Pressed Gears Used

Editor The Automobile:—Having overheard a discussion a short time ago relative to the difference between a cut gear and a pressed gear, I am writing to get some information of your opinion of same. I am at a loss to know just what a pressed gear is, and would appreciate your opinion which is more efficient of the two gears and also your definition of the pressed gear.

Philadelphia, Pa. H. C. H.

—By pressed gears you doubtless refer to gears made by die-casting or drop-forging processes. A few of these gears are made by scattered concerns but many of these are gradually dropping the manufacture as it is of course impossible to make them as accurately or as well as by the cutting process generally used. If made in large quanities for light work such as in hand ice cream freezers, etc., they are sufficiently accurate and can be made very cheaply. They cannot compete with the regular machine-made gear.

Child's Seat in Runabout

Editor The Automobile:—I have a Buick runabout Model 30 and I want to get a seat suitable for a child, same to be placed in front of the passenger. Do you know of any manufacturer from whom I could get this seat?

St. John, N. B. A. L. F.

—Supplementary seats are manufactured by the following concerns:

Amesbury Brass & Foundry Co., Amesbury, Mass.
C. A. Buffington & Co., Berkshire, N. Y.

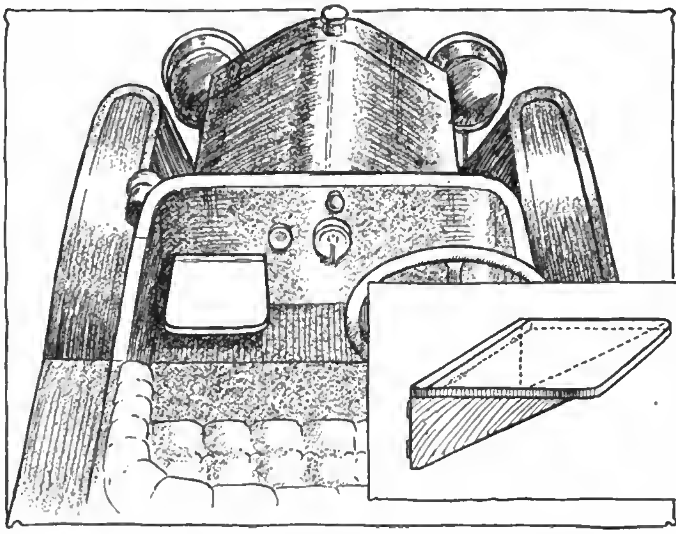


Fig. 6—Small folding seat used for a child—Can be made at home and with good wood is sightly

Empire Gear & Top Co., 207 W. 22d St., Philadelphia, Pa.
Eureka Seat Co., 407 Rhode Island Ave., Buffalo, N. Y.
Glendale Mfg. Co., 152 W. 34th St., New York, N. Y.
Hill Mfg. Co., 28 Fuller St., Buffalo, N. Y.
Hodge & Graves Co., Amesbury, Mass.
Hume Carriage Co., 1000 Commonwealth Ave., Boston, Mass.
C. P. Kimball & Co., 39th St. and Michigan Ave., Chicago, Ill.
McKinnon Dash Co., 252 Amherst St., Buffalo, N. Y.
Metal Stamping Co., 13th St. and Boulevard, Long Island City, N. Y.
Polson Mfg. Co., 27 Chenango St., Buffalo, N. Y.

You can if you desire, make your own seat. Two methods are suggested in Figs. 4 and 6. If the weight of the child is not excessive this will serve your purpose about as well as a supplementary seat made by a regular manufacturer. The first method consists of a fold down seat which is fastened to the dash in the manner shown in Fig. 6, with a hinged bracket and also a hinge in the seat; when the seat, it is simply folded up and the brackets swung into place. When not desired it takes up practically no room and if made of walnut or mahogany or covered with leather it will present a very neat appearance. The seat could also be made on a permanent bracket as shown in Fig. 4 and then when required could simply be inserted into the socket clamped on the dash. Where the weight of the child is excessive it would be better to have some sort of seat in which the weight was carried by the floor rather than by the dash.

Timing of Exhaust Valves

Editor The Automobile:—Please tell me the timing of exhaust valves of American Napier runabout of the Niche type made in the year 1905. The valves have no adjustments and are worn down so badly I want to draw them out a little as I do not seem to be getting as much power as I should. The inlet valves are of the automatic three-in-one type.

—The exhaust valve opens about 7 degrees before lower dead center and closes from 0 to 5 degrees after upper dead center.

Morristown, N. J. Harry Ford.

Please Sign Your Inquiries

[The editor of this department is in receipt of several letters signed Reader, Subscriber and by initials. No attention will be paid to anonymous or unsigned letters; readers who wish to make use of these columns must sign their letters as an evidence of good faith. No names will be published if the writer of the inquiry or communication does not wish the name to appear. It is only necessary to state this in your letter. Other letters which have not been deemed of sufficient general interest to publish in these columns have arrived without the sender's address so that it is impossible to answer them by mail. We are delighted to have our subscribers use these columns and most cordially invite correspondence, insisting only on the rules just mentioned.—Editor.]

The Lozier Light Six

Type 77 Has Unit Power Plant of 36 Horsepower—Electric Starting and Lighting Features

Cylinders in Threes—Left Steer and Center Control—Valves Have Cast Iron Heads and Steel Stems

ALTHOUGH adhering to many of the former Lozier characteristics, the light six, or type 77, is radically different in many respects. Principal among the changes is the motor. Like the big car, the light six, which, by the way, is so called to distinguish it from a little six, has a unit power plant. But its cylinders are of the L-head type, cast in blocks of three.

The new type motor develops 50 horsepower, although its cylinder dimensions of 3.625 by 5.5 inches are responsible for the rating of 36 horsepower. This bore and stroke give a true long-stroke motor, the ratio being 1.52.

Inlet and exhaust valves are on the right, the design of the manifolds being such that there is a separate connection to each cylinder, as shown in the motor view, Fig. 5. Cover plates completely inclose valve springs and stems to the exclusion of all foreign matter. Valves are made with cast-iron heads and carbon-steel stems, the two parts being fused together. The idea of this construction is that valves so constructed show a tendency toward uniformity of wear and less liability of pitting.

Taper Valve Springs

Valve lifters are of rocker form, the Lozier engineers believing this type to be somewhat quieter than the ordinary straight-lifting type. Valve stems are provided with check nuts which make for easy adjustment. The springs are tapered and constructed from tempered steel wire. The reason advanced for the use of taper springs being that they permit of truer valve seating than do straight springs and prevent uneven valve stem wear.

The crankshaft construction is also new to Lozier design. There are three main plain bearings and three throws. It is a drop-forging, the flywheel flange being integral.

Pistons of gun iron are fitted with four rings, three above the wristpin and one below. The rings are of the concentric design, the lower one acting as an oil ring to prevent the lubricant from working up into the combustion chamber. Oil grooves are cut in the piston faces to aid in the even distribution of the cylinder oil.

The camshaft, a view of which is shown herewith, Fig. 1, is a heat-treated drop forging, cams being forged integral with the shaft. It is easily removable through the front of the crankcase. Timing gears are helically cut.

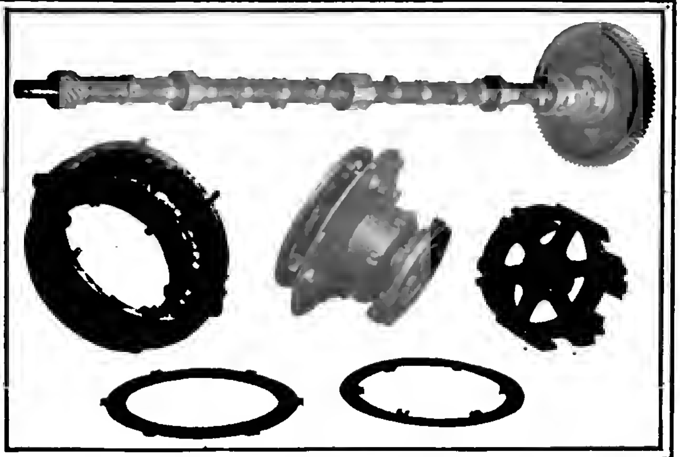


Fig. 1—Camshaft and clutch details of Lozier light six

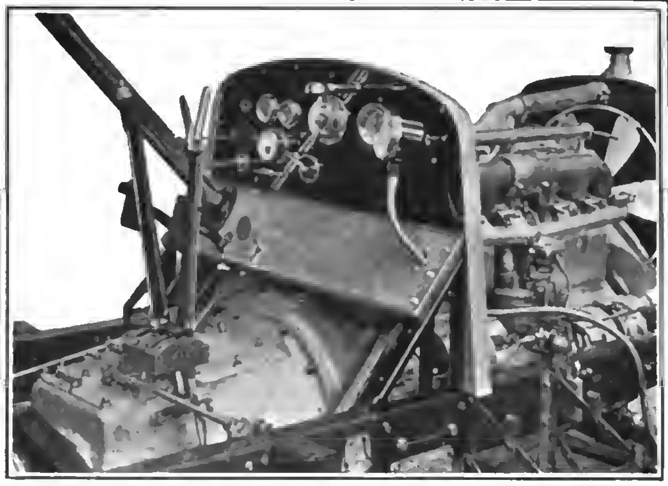


Fig. 2—Dashboard and unit power plant of latest Lozier

The crankcase construction is worthy of special note. Cylinders are bolted to a rectangular base of aluminum which forms the upper half of the crankcase and which fills up the entire space between the motor and the side-frame members, affording a mounting for magneto, lighting generator, etc.

Lubrication of the motor is by a combination system making use of a force-feed-splash-gravity arrangement. A gear-driven oil pump, located in the rear of the engine base forces the oil from the oil sump to the main crankshaft bearings, the main lead from this pump passing to a dash gauge and thence to the point of circulation. Leads run from this main passage to the crankshaft bearings, the surplus oil flowing by gravity down into the individual troughs under the connecting-rods. The caps of the connecting-rods are provided with small integral dippers which plunge into these troughs as they revolve, splashing the lubricant in the conventional way up into the cylinders. lubricating the connecting-rod bearings, piston and cylinder walls. In thus flowing back the oil is drained through a series of fine-mesh screens. Leads from the main oil passage beyond the sight feed also carry the lubricant to the camshaft bearings, magneto, pump and front end gears. It is stated that a gallon of oil is sufficient to cover from 400 to 450 miles under ordinary conditions.

The radiator is of the horizontal, square-tube type, with tubes 3 1-2 inches deep, affording an unusually large radiating surface. The cooling fan has a diameter of 18 inches, and located conventionally between cylinders and radiator, is driven by a canvas belt .25 inch in width.

A Bosch high-tension magneto in connection with the dual system, the other source of ignition being a storage battery, is used on the new type 77. One set of spark-plugs is used, being inserted directly over the inlet valve. The magneto is placed on the left side of the engine base just back of the pump, its shaft being driven by an extension of the pump shaft.

Automatic Gasoline Tank Pressure

As on the larger car, the gasoline tank is suspended at the rear of the frame. It has a capacity of 20 gallons and fuel is fed from it by pressure, the air being supplied automatically by a positive-plunger pump arranged in one of the valve lifters. The pressure is regulated by a blow-off valve at the top of the check valve mechanism on the side of the lifter. An auxiliary hand pump is provided on the footboard of the car. A pressure gauge on the dash indicates the pressure in the tank, while another gauge fitted to the tank shows the amount of fuel contained.

The new car is equipped with a Gray & Davis electric starting and lighting system. It is entirely independent of the ignition system. The lighting generator and the motor which is used for starting are entirely separate units, both being located on the right side of the engine, as shown in the illustration. The generator is placed just back of the fan driving pulley and is gear driven by means of an extension of the fan driving shaft. The generator produces at the rate of 12 amperes when the car is traveling at a speed of 15 miles an hour. This speed is about that maintained in ordinary city driving and is sufficient to keep the battery fully charged at all times. The battery has a capacity of 120 ampere-hours and its voltage is 6.

Operation of Starter

The starting motor gear meshes with teeth cut in the periphery of the flywheel on performing its starting duty, the starter pedal being located in the floorboard.

A slight pressure on the pedal permits a small amount of current to pass through the armature of the starting motor, turning it very slowly and at the same time connecting the motor gear with the flywheel. When the starter pedal has been pressed down to its extreme position a switch is thrown, thus sending the full current from the battery to the electric motor turning the crankshaft over at about 100 revolutions a minute. When the engine starts under its own power the starter pedal is released, springs then sliding the starter pinion out of mesh and breaking the connection between storage battery and motor.

The multiple-disk clutch is somewhat different from that of the other Lozier product in that alternate disks are fitted with cork inserts.

The transmission gearset is selective, three speeds forward and reverse, direct on third and when furnished in standard designs has a ratio of 3.75 to 1 on high. Following is the reduction for the different speeds:

First	9.97 to 1
Second	6.07 to 1
Third	3.75 to 1

The rear axle receives its power through a substantial shaft which is entirely inclosed in a torque tube, as in former Lozier construction. The front end of the torque tube bolts to a cross-member of the frame through a substantial spider. A new feature of this construction is the swiveling of this cross-piece at either end where it joins the side rails of the frame. This freedom of movement allows for differences in the relative height of the frame and the rear axle to the housing of which the torque tube bolts through a flange. Unevenness of road surface raising one wheel higher than the other and thus bringing the rear axle out of its normal plane is allowed through a moving connection at the rear of the spider where it joins the torque tube proper. The tube is braced by rods which run diagonally from its front end to the axle.

The differential gears are cut from alloy steel as are the beveled driving gears and pinion. They are fitted with adjustable thrust bearings so that a perfect relation may be maintained between the two driving gears. The axle is of the floating type. The front axle is a drop forging of I-beam construction. The road clearance under the front axle, which is the minimum of the chassis, is 9.3 inches.

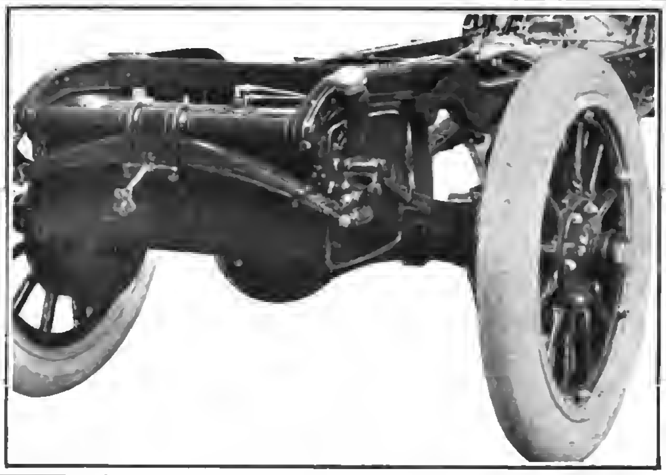


Fig. 3—Rear springs and suspension of gasoline tank

Former spring suspension obtains on the new six, in that half-elliptics are used in front and a platform system in the rear. Each rear spring is half-elliptic, the two side springs being mounted outside the frame.

Brakes are all internal expanding, 16 inches in diameter. The two brakes, foot and emergency, are placed side by side and operate on the same drum. The shoes are faced with a combination woven-wire and asbestos band .25 inch thick.

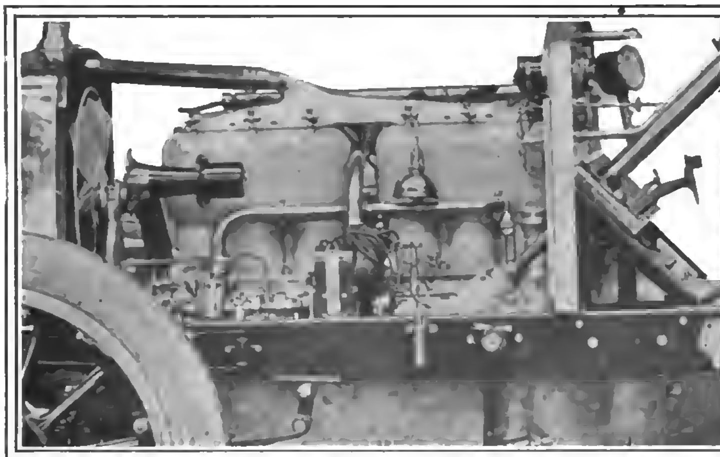
The wheels are fitted with demountable and quick detachable rims, carrying 35 by 4.5-inch tires all around. All wheels are mounted on annular ball bearings.

Turns in 38-foot Circle

The Lozier company places its steering wheel on the left, while the brake lever and change-gear lever are in the center. The car requires a circle of 38 feet in diameter in which to turn.

All bodies are mounted on the standard chassis. The types are five in number and include the Montclair model five-passenger touring car, the Fairmount two-passenger roadster, the Metropolitan five-passenger fully inclosed limousine, the Coronado six-passenger, semi-four-door limousine and the Touraine three-passenger coupé.

Running boards are entirely clear, the spare tires being carried in the rear, while tool boxes are fitted in specially designed aluminum compartments in the aprons between the running boards and the frames. The windshield in the open models is specially designed for the car and forms a part of the body.



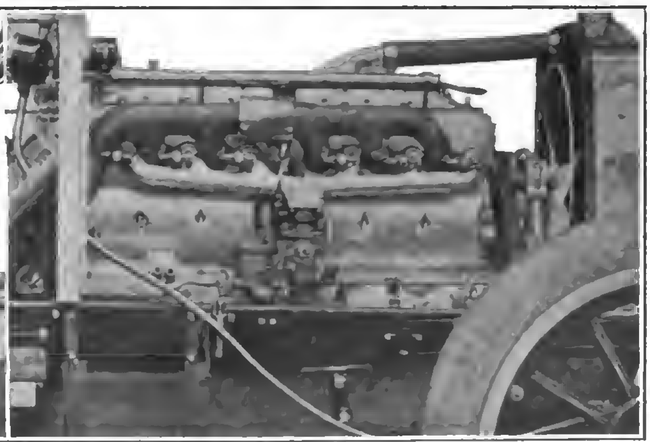


Fig. 4—Left side of motor, showing pump connection Fig. 5—Arrangement of manifolds on right side

The AUTOMOBILE

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Car Builders and Batteries

BATTERY makers have just cause for complaint against a great many car manufacturers. It is true that in the main the cars of today have been perfected to a wonderful degree, but there are still a great many details which are not given the attention they deserve by the men who build the car. One of these, and a very important one, is the storage battery.

Every car builder should furnish the purchasers of his product with instructions on the care of the storage battery which comes with the car. These instructions should be brief and very simple. It does not require a twenty-page booklet to impart the necessary information.

Every car builder should see that the battery is readily accessible. Too often it is placed under a seat or mounted under the car in such a way that it may not be reached without getting under the car. Every car owner should be instructed to inspect his battery regularly and provision should be made for facilitating such inspection.

It has been stated that practically 95 per cent. of electric self-starter troubles are due to the owners' ignorance regarding the care of the battery. From this it may be seen that it is up to the car manufacturer to remedy this condition of affairs.

The practice of giving demonstrations of the power of self-starters by running the car on the starter should be vigorously discouraged by both makers and dealers. It imposes an excessive strain on the starting mechanism and also impairs the battery.

Adequate Lubrication

SEVERAL comprehensive tests of gasoline motors made within the last 2 years in Germany, France and England have demonstrated the necessity for additional lubrication during continued operations at full loads when the size of the motor exceeds a certain limit.

Some of the comprehensive tests made by Dr. Riedler in his German laboratory have gone far to demonstrate that when a motor has a bore exceeding 85 millimeters it is necessary to furnish additional lubrication to that regularly given when the motor is working continuously at its full load or with a possible overload.

On the other hand, Dr. Riedler's reports have shown that with motors under this size not only is this additional lubrication unnecessary but that the motor efficiency per volume of displacement is greater. His tests demonstrated that there is a continual increase in efficiency from the fuel consumed as the motor size is reduced from 100 millimeters to 80 or lower.

Dr. Riedler's results are highly interesting in view of the present tendency towards smaller motors on the American market, and also because of the longer strokes being used. There is a rapidly developing feeling in America that smaller motors will serve for our present-day cars, a fact, to an extent, due to improved roads as compared with 4 or 5 years ago.

European makers are busily engaged for 1914 on improvements in lubrication of the motor, and in nearly every case efforts are being expended to regulate the oil flow in accordance with the work done, and to increase the oil flow in a high ratio as the speed of the motor increases. To do this the foreigner is increasing his pressures slightly over that of 1913, and is more and more getting away from splash lubrication and using only pressure.

A good example of the necessity of extra lubrication for motors operating at continued high speeds was found in the most successful racing cars in Europe a year ago, when the pressure feed to the bearings was more than ten times that used on stock passenger cars. With this vastly increased lubrication there was a perceptible looseness in the fittings of the bearings, these being so loose in the crankshaft and connecting-rods as to cause pounding if used for regular passenger-car service.

Most interesting results could be looked for by officially testing some of our larger motors on continuous high-speed work at the Indianapolis Speedway, where it would be possible to keep a constant over-load for long periods. The results of such tests, if covering a well-graduated series of motor sizes, would be most valuable, and it is to be hoped that some of our makers can be induced to co-operate in such a test.

Lubrication is yet far from perfection. Our present systems are generally adequate for normal road use in which rarely over 50 per cent. of our S. A. E. horsepower ratings is utilized in propelling the car on the highway within the legal speed limit, but as soon as special service is called for, extra provisions have to be made for lubrication.

Improved lubrication is necessary for another reason, namely, the introduction of block motors and also the present progress towards longer stroke types.

Motor Spirit Increases Horsepower

Comparative Test of 40-Horsepower Tractor Engine Shows 10 Per Cent. Increase in Power Developed on New Fuel—No Adjustments Necessary in Changing Over From Gasoline

DEVIL'S LAKE, N. D., March 28—Motor Spirit in a test made here recently proved that it would increase the power of a tractor engine by 10 per cent. over that obtained when gasoline is used as fuel. In a Case two-cylinder tractor engine rated by the factory at 40 horsepower, Motor Spirit developed 46.23 horsepower on the brake, while on gasoline, only 41.93 horsepower could be realized.

These tests were made March 13, by the Case School of Power Farming, with G. B. Gunlogson, M.E., as engineer in charge, assisted by representatives of the Standard Oil Co. and the Case company. The object of the tests was to determine the relative thermal value of Motor Spirit as compared with gasoline as fuel for internal combustion engines; to determine the relative maximum power of gasoline engines using Motor Spirit and gasoline; to determine the relative consumption of both fuels, to determine the changes and adjustments necessary in gasoline motors and carbureters for Motor Spirits and the flexibility in power and speed and the ease of starting the motor with Motor Spirit as compared with gasoline. Also, it was intended to discover the effect of the new fuel on the engine in the matter of heating, preignition, carbonization and fouling of the spark plugs.

A two-cylinder opposed Case tractor rated at 40 horsepower, with a normal speed of 450 revolutions per minute was used. This engine is equipped with a Rayfield model R T carbureter, and as the engine is opposed, the manifolds necessarily are unusually long. No provision was made to heat the intake air or the fuel before it was passed into the cylinders so that the best of results were not obtained owing to the cold weather which prevailed at the time of the tests.

Conditions therefore, were not ideal and this fact may have affected the comparative quantities of the test. This difference, however, can only be slight and would rather effect the showing of the engine than the object of the test. The fuels used in the test were Motor Spirit of about 52 degrees Beaumé gravity and ordinary commercial gasoline of 58 degrees gravity.

No Alterations Necessary

No adjustments were made in the motor in changing from one fuel to the other and the only necessary adjusting on the Rayfield carbureter was in raising needle valves slightly—about one and three-quarter turns and increasing the lift of the needle.

The results of the tests follow:

On Gasoline

Test No.	R.P.M.	B.H.P.	Time, Minutes
1	487	42.31	10
2	481	42.10	12
3	466	41.37	15
Av.	478	41.93	12

On Motor Spirit

Test No.	R.P.M.	B.H.P.	Time, Minutes
1	491	46.48	15
2	491	45.60	15
3	473	46.60	12
Av.	485	46.23	14

Greater power for Motor Spirit as compared with gasoline, 10 per cent.

The engine behaved in every way as well when Motor Spirit was used as fuel; there was no noticeable difference in the running of the engine with the change in fuel after carbureter adjustments were made, except a slight amount of gray smoke from exhaust only occasionally. The [illegible] motor with the different fuels was [illegible] difference was slight, and owing to the [illegible] be ascertained with any degree of certainty

It was found that the cold weather affected [illegible] engine in this respect. The engine when [illegible] well on both fuels but a cold engine which [illegible] outside over night had to be primed with high [illegible]

This also was the practice when the ordinary [illegible] in the same engine, so little effort was made [illegible] engine on Motor Spirits. No difference in the [illegible] the cooling water was perceptible with the change of [illegible] temperature was not ascertained accurately for [illegible] did not exceed 180 deg. Fahrenheit.

There was no knock or preignition at any time [illegible] fuel. The spark-plugs were removed after the first two [illegible] gasoline and also after the two tests on Motor Spirit were [illegible] and it was found that slightly more carbon had accumulated [illegible] the plugs during the tests with Motor Spirit. This was [illegible] form of soft soot and was almost imperceptible after these [illegible] tests.

The economy tests were not made at this time but will be made at Grand Forks, N. D., in a few weeks and very extensive economy tests will be made at that time.

Oil Trade Competition Growing

NEW YORK CITY, March 28—An address by G. D. Chamberlin, counsel for the National Petroleum Association, read before the German Reichstag in connection with the illuminating-gas bill before that house, gives some interesting information on the present status of the petroleum industry.

According to the address, the entire refining capacity of plants operated by the former oil trust amounts to no more than 80,000,000 barrels a year, while the independent refineries have a capacity of over 63,000,000. The latter number 125. The ratio between Standard and Independent oil refineries is, at present, according to the above figures, 56 and 44 per cent., respectively. In 1904 the ratio was 85 to 15, and as in 1911 the total number of refining plants was almost twice that of 1905, it becomes obvious that during that period they have grown 600 per cent.

The entire oil consumption in Germany for the purpose of illumination is about 6,000,000 barrels a year and of this 5,000,000 are imported from the United States. As soon as the bill now under consideration in the Reichstag was formulated, the independent refineries were informed of the opportunity of breaking into the German market and an inquiry was made as to the possibility of supplying the above-outlined oil demand of the Empire. The result is that the independent producers are now able to supply to Germany 5,400,000 barrels a year, which could probably be made to suffice the demand.

The address, in an appendix, shows that during 1911 the world production of crude oil was 345,512,185 barrels of 42 gallons, an increase of 24,712,041 barrels over the previous year. Of the total production, 63.80 per cent. or 220,449,391 barrels were produced in the United States and 19.16 per cent. or 66,183,691 barrels in Russia, while no other country contributed as much as 5 per cent. of the total, although there were about another dozen oil-producing countries.

Upper—Majola car in the recent Tour de France on the road between Nice and Avignon. The illustration gives an idea of some of the scenery along the route followed by the tour

Lower—Duray driving his Metallurgique along the road between Nice and Avignon, a short distance from the scene depicted above

Nine Cars Are Perfect in Tour de France

Seven Others Finished 2,880-Mile Run with Penalizations—Remaining Twelve Fail to Finish

¶ *The entrants finishing with perfect scores are: Buick; Aries; Corre La Licorne; Anasagasti (two cars); Metallurgique; Barré; Majola, and Pierron. An Alcyon lost 2 points, a Hurtu and a Bozier each lost 3 points, and an Aries, a Corre La Licorne, S. C. A. P. and Pierron finished with 4 points penalization. The trip was made in 15 days, including 12 running days and 3 days of exhibition at important centers.*

PARIS, FRANCE, March 18—Out of twenty-eight cars to start in the Tour de France 2,680 miles sealed bonnet reliability test, nine came home with clean scores, seven finished with penalizations and twelve fell by the roadside. The clean scorers are Buick, Aries, Corre La Licorne Anasagasti (two machines), Metallurgique, Barré, Majola, Pierron. In addition, an Alcyon finished with the loss of 2 points, a Hurtu and a Bozier with 3 points each, and Aries, Corre La Licorne, S. C. A. P. and Pierron with 4 points each.

This competition was a new one for France. The organizers wished to prove that a modern light car with a chassis price not exceeding $1,600 could make a complete circle around France, taking in the Alps and the Pyrenees, with no more attention than 10 minutes each morning for oiling and slight adjustments. For this purpose all the essential parts of the cars were permanently sealed, the loss of one of these seals entailing disqualification, and the toe boards, underpan, bonnet and radiator filler cap had seals which could be broken every morning for 10 minutes only. If these seals were touched during the run, points were lost, the penalty being 2 points for a radiator filler cap, 3 for toe boards and under pan, and 4 for the bonnet.

The trip had to be made in 15 days, this including 12 running days, when the mileage varied from 190 to 254, and 3 days given up to public exhibitions in important centers. These exhibitions gave the drivers a rest and enabled the salesmen who accompanied the tour to convince the natives of the value of their product. The same advantage does not appear to have been taken of the commercial possibilities as a year ago. On the last occasion several of the chiefs went on the trip on private cars and got into touch with all the agents en route, stirring up enthusiasm among them and among prospective purchasers. This was not done to the same extent this year, and it was of course impossible for the drivers to make any attempt to see agents or customers.

The tour failed to reveal any serious mechanical defects in the competing cars. Many of the withdrawals were due to reckless driving. The competition called for an average speed of 19 miles an hour on each daily run. In every case there was a desire to be first into controls, some of the drivers maintaining an average of 30 miles an hour for runs of 250 miles. On the first day a Rolling and an Optima were eliminated. Albert Guyot had to lift the bonnet of his Pierron and lost 4 points. An Aries lost 4 points and a Bozier 3 points on the second day. In this latter case it was declared that the toe board seals had broken accidentally, but this protest was not allowed.

Among those who went out were Barriaux, the Alcyon race driver, with a reported bent front axle, and his team-mate Louis Wagner, who failed to give any news of himself. An Aries claimed an encounter with a cow; a Ponette an encounter with a stone wall. Repusseau's Anasagasti, a South American car built in Paris, lost its radiator fan in the Pyrenees, thus causing overheating. A Barré claimed that both rear tires burst on a bend and a companion machine preferred a close acquaintance with a stone wall. On the last stage, when only 20 miles from home, Riviere, who had driven his Metallurgique hard from the beginning, was held up with rear axle troubles, a mishap which was officially put down to a leaky gasoline tank. This machine had possessed a clean score up to this point.

No complete team succeeded in getting through the trials without the loss of a unit. Buick and Majola started with only one car and got that one through without the loss of points. While at Nice the Buick was backed into by another competitor, but this did not prevent it finishing in good shape, despite its bent front axle.

One of the weakest points of the car equipments appeared to be the provision for baggage. In nearly all cases there were only two men aboard, thus leaving the whole of the rear compartment free for personal belongings and spare parts. Not a single car had a sufficient oil supply to undertake the long daily runs without renewal. In consequence fillers were brought up through the bonnets or reserve tanks were fitted on the dashboards, thus making it possible to renew the supply without lifting the bonnet. The regulations stipulated that the cars should be standard models, but this was not rigidly enforced. One of the firms, for instance, took out the standard motor and put in a specialist's high-efficiency 3-liter model.

The following is the list of machines finishing with clean scores:

Car	Driver	Cylinders	Bore	Stroke
Aries	Vandenhorn	4	2.9	5.5
Corre La Licorne	Collomb	4	2.9	5.9
Anasagasti	Brown	4	3.1	5.5
Anasagasti	D'Avary	4	3.1	5.5
Metallurgique	Duray	4	3.1	5.1
Barré	Revaud	4	3.1	5.5
Majola	Doutre	4	2.6	3.9
Pierron	Delaunay	4	3.5	5.1
Buick	Drouillet	4	3.7	3.7

1,000 Miles in 6 Days in Quaker Run

PHILADELPHIA, PA., March 29—Approximately 1,000 miles were covered during the past 6 days by the Multiplex car in the 30-day sealed bonnet test being conducted by the Automobile Club of Philadelphia. Unusually heavy going was encountered throughout the week, frequent heavy rains converting the roads into quagmires and necessitating slow running, with a consequent decrease in the total mileage.

The following routes were covered:

Saturday—Philadelphia to New York hy way of Bristol, Trenton, Princeton, Plainfield, Newark, and retnrning via Elizaheth, New Brunswick, Princeton, Columbus, Burlington and Camden.

Sunday—Philadelphia to Lancaster via Paoli, West Chester, Downingtown, Coatesville, Gap, Lehman; returning, Mechanicsburg, Blue Bell, Morgantown, Conestoga, Downingtown, Philadelphia.

Monday—Philadelphia to Mays Landing and return hy way of Camden, Gibbstown, Pedricktown, Pennsville, Salem, Quinton, Shiloh, Bridgeton, Millville, Malaga, Mays Landing.

Tuesday—Philadelphia to Bethlehem, through Easton, Pa., over to Phillipsburg, N. J., back to Washington, Schooley's Mountain, Chester, Bedminster; returning, Somerville, Princeton, Trenton, Langhorne, Bustleton, Philadelphia. The original intention to go to the Water Gap from Phillipsburg on this day had to be abandoned owing to wretched road conditions above Belvidere.

Wednesday—Philadelphia to Camden, Hammonton, Pleasant Mills, New Gretna, Absecon, Egg Harbor, Mays Landing; returning, Hammonton, Indian Mills, Medford, Mount Holly, Columbia, Burlington to Palmyra and back to Camden.

Thursday—Owing to heavy rain, day's work was confined to a short spin to Trenton, N. J., and return.

PHILADELPHIA, PA., March 29—On Saturday, May 3, the Quaker City Motor Club will conduct its annual spring sociability run to Atlantic City, N. J., and return. The event will be of the same nature as last year's, except that the gasoline economy test will be omitted, prizes to be distributed under the rules governing secret time schedule runs.

Washington Truck Run Sanctioned—The Washington, D. C., Post motor truck reliability run, which is to be held May 5, 6, 7 and 8, has been sanctioned by the American Automobile Association.

Upper—The Alcyon car which finished with a perfect score on the road between Nice and Avignon in the recent Tour de France, showing the way the rock has been cut to make room for the road
Lower—Competition was close at some points on the road between Nice and Avignon and some of the cars were bunched

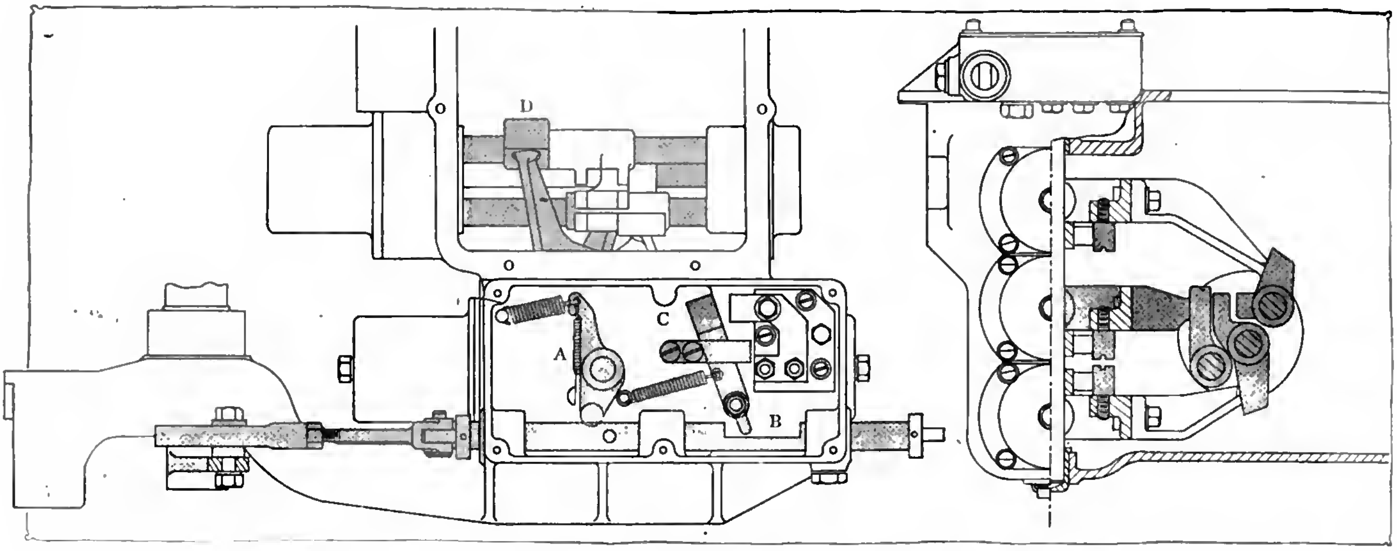


Fig. 1—Plan and end views of Vulcan electric gearshift now fitted to the S. G. V. cars as regular equipment

Vulcan Electric Gearshift

S.G.V. Car Adds New Control to Stock Cars—Solenoid Coils Used to Make Speed Changes

Electric Control Adds 46 Pounds to Car Weight—Exerts Pull of 150 Pounds at 17 Amperes

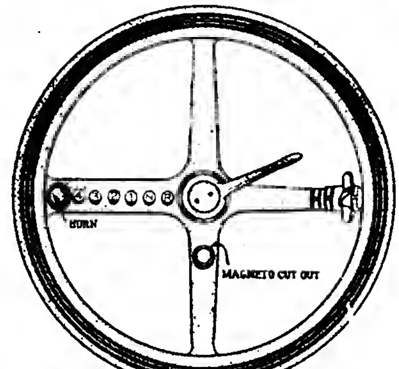


Fig. 2—Appearance of the steering wheel when control buttons are located in the spider. On demonstrator model buttons are arranged in circle on metal box

IT requires half the usual time to shift gears with the Vulcan electric control as now applied to the S. G. V. car. A system of buttons on the steering wheel and a slightly added length of clutch pedal throw compose the system as far as the driver of the car is concerned. It is merely necessary to touch a button corresponding to the speed at which it is desired to travel, press down the clutch pedal and let it back and the shift is made.

An idea of the appearance of the steering wheel with the device attached is given in Fig. 2. The buttons are numbered corresponding to the speeds which they control. If the fourth speed button is pushed down, the clutch thrown out and then re-engaged, the car will be in fourth speed. If the driver is traveling through traffic on third speed, he can set the second speed button and be ready at any moment by a simple motion of the clutch pedal to be in second speed. Or conversely, when traveling through traffic on second, and having the third speed button pressed down, a shift to third may he made instantaneously and without lifting the hands from the steering wheel.

It is impossible to strip the gears with this system because the clutch must be fully disengaged before the gears begin to move. The gears are always in neutral before the shift is made. This is accomplished by a positive mechanical action which is a part of the pedal motion in disengaging the clutch.

No two speeds can be engaged at once because each speed is governed independently of any other and an interlocking device provides that no two buttons can be down at the same time. If the second speed button is set and the driver changes his mind and decides that his next shift will be into fourth, he merely presses the fourth speed button and the second speed button returns to its normal position. Pressing the button marked Neutral, leaves all the buttons up.

The secret of this control is a system of solenoid coils. There are five of these coils, one for each forward speed and one for reverse. Two switches are interposed in the line between the battery and the solenoids, first, a knife switch which is controlled by the clutch pedal and second, the push button switch operated from the steering wheel. The knife switch controls all the changes while the push button switch only controls the particular solenoid belonging to the speed which it is intended to engage.

A study of the clutch pedal arrangement shown in Fig. 3 will disclose the fact that the pedal moves through a link L, for the first part of its motion and during the rest of its movement, picks up the link and pulls it along with it. The first part of the pedal throw has only to do with the clutch. The clutch may be slipped in ordinary driving in the usual manner. The movement after the clutch has picked up the link operates the knife switch sending the current through the solenoid coil and pulling a plunger against a magnet with a force of 150 pounds. This force is transmitted through an arm to the gear shifter fork and the speed change is made.

In the sectional elevation given in Fig. 3, the solenoid coils are seen. These are labelled first, second, third, fourth and reverse speeds in the drawing. The plungers are shown in neutral position. When the button is pressed and the knife switch thrown in a 12-volt current is passed through the coils surrounding the plungers and they are drawn against the magnets. The pull of 150 pounds is enough to shift the gears instantaneously and without any sign of clash. Since the gears cannot be shifted until the pedal has traversed sufficient distance to fully disengage the clutch, there is no danger of stripping the gears through meshing while the clutch is still engaged.

The box containing the switches and solenoid coils is mounted on the side of the gearbox. An idea of the method of arrangement may be seen in Fig. 1. The left view in this illustration is a diagram looking down on the shifter mechanism. The pedal and switch shaft B, may be seen along with the knife blade switch C, and the neutral camshaft lever A. The function of

Tate Electro Vaporizer

Electrically Heated Spray Into Intake Manifold Insures Easy Starting From Cold with Heavy Fuel

Device is Wired to Lighting Battery and is Only in Action for a Few Seconds When Starting Up

FOREMOST among the subjects engaging the attention of automobilists at the present time is that which, with perhaps an undue show of concern, has become known as the fuel problem. The gradual introduction of the heavier kinds of fuel is inevitable, and there is a disposition among many to imagine, among other things, increased trouble in connection with engine starting, as the result.

There is little ground for such anxiety, in spite of the faet that the carbureter as made at present will need further evolution to enable it to deal with a heavier grade of spirit. The possibilities of kerosene have stimulated action on the part of carbureter designers and there is doubtless a great deal of experiment in this direction, much of it quietly conducted, going on throughout the country at the present moment.

A primary need in the vaporization of heavy fuel so as to permit easy starting is the addition of heat. Without it the efficiency of all the various engine cranking devices on the market will be greatly diminished. This heat is only necessary at the start. Once warmed up, vaporization of even as heavy a mixture as 50 per cent. gasoline with 50 per cent. kerosene presents no insuperable difficulties to the carbureter.

With the widespread adoption of electricity on the modern automobile, the Tate Electro Vaporizer illustrated herewith, designed to meet the above requirements is of interest. This device consists essentially of a flange-shaped container to be inserted between the carbureter and the intake manifold, provided with a number of jets through which the fuel after heating by means of electricity, is sprayed into the manifold passages. The supply of gasoline to these jets is governed by an electro-magnetic valve incorporated in the device and operated by a switch on the dash.

A sectional plan and elevation of the vaporizer is shown in the accompanying illustration. It will be seen that the flange-shaped body F, which is made of a non-metallic substance, is drilled to coincide with the gas passage and bolt holes of the carbureter flange, the annular groove G being formed into a closed chamber by the insertion of a tight fitting brass tube through which a number of fine holes, J, are drilled around the diameter. A resistance coil, C, is arranged within the groove and connected to external terminals, from which wires lead to a magnetic valve and thence to the battery and switch.

The valve normally remains elosed by the action of a light spring bearing on the needle. Current passing around the coil of the magnet lifts the needle through the magnetic attraction of a light iron armature fitted to its lower end. The device is connected to the main gasoline supply at S.

In the operation of the vaporizer the dashboard switch is first elosed allowing current to flow simultaneously around the valve coil and the heating coil C. The valve then opens, admitting the fuel to the channel and in contact with the heating element, where it vaporizes, and on cranking the engine is ejected through the holes J. The spray mixing with the air drawn into the manifold results in a rich explosive mixture entering the engine. After starting up, the dashboard switch is opened, throwing the vaporizer out of action.

It will be noticed that the device is extremely easy to fit, occupying small space and requiring only slightly longer flange bolts. No special battery is required as a current of 5 amperes at 6 volts is sufficient to operate and this is easily available for the short periods necessary by attachment to the ordinary 3-cell lighting battery. The makers state that with the current above mentioned a period of 6 seconds is all that is necessary to fill the intake manifold with a hot gasoline vapor.

This vaporizer is being marketed by the United Motor Equipment Co., Chicago.

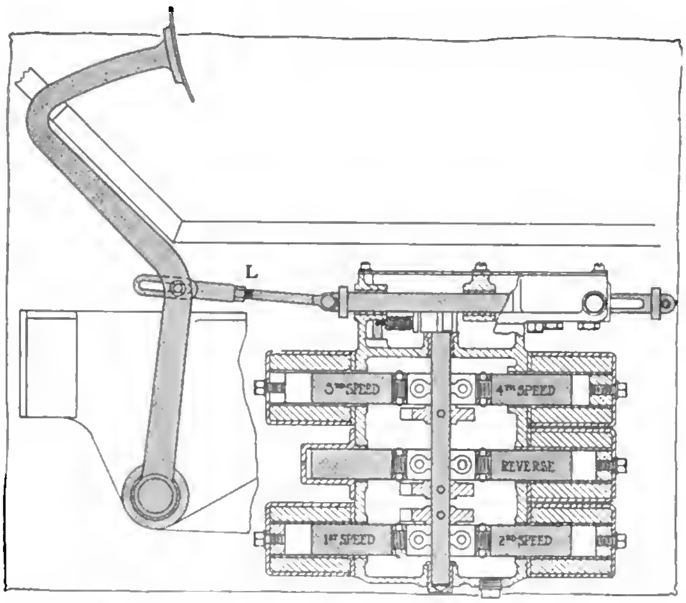
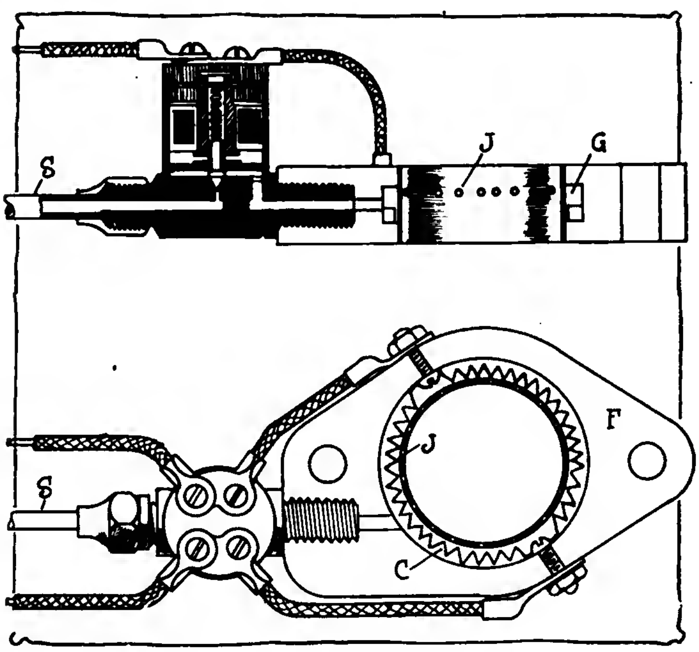


Fig. 3—Sectional elevation through Vulcan electric gearshift, showing Solenoids

the eamshaft which extends across the control box between the solenoids, Fig. 3, is to positively pull the gears back to neutral between shifts.

The current required to make the shift is 17 amperes, and the S. G. V. company figures that 300 shifts can be made with less current than it takes to start the car once and that the added weight to the car is but 46 pounds when the entire electric control system is considered. This includes lighting and starting. The buttons on the steering wheel are arranged on the demonstrator model on a circular box instead of in the steering wheel spider as shown in Fig. 2.



Sectional views of Tate Electro Vaporizer

Gearsets Show Conservative Design

Selective Sliding-Gear Varieties Maintain Lead, Although Designs with Gears in Mesh Are Always Numerous—Four-Speed Types Offered by Most Makers

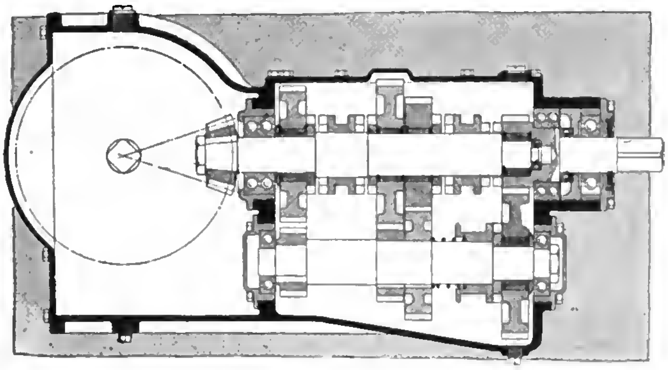


Fig. 1—Cotta model ECA. The gears are always in mesh

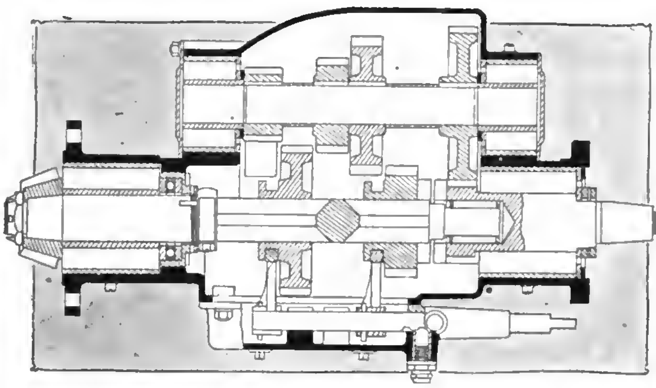


Fig. 2—A Covert sliding-gear type for commercial cars

MANUFACTURERS who make a specialty of producing gearsets for the automobile builder show little or no change in the design or construction of their products over the preceding year other than an occasional detail refinement. In fact, the gearset unit is now looked upon as practically standard, the majority of the types being of the sliding, selective style with a layshaft carried at the side of or below the main shaft. There are, however, several constructions in which the gears are constantly in mesh, dogs or jaw clutches being shifted in place of the gears.

Refinements, if any, have generally consisted in the strengthening of such parts as the shifting forks; changing the composition of some of the steels or other materials used in the constructions; mounting the shafts on other types of bearings; widening the gear faces; changing from splined to squared shafts, or vice versa; or in making other small differences, each of which, in itself, is of small consequence, though in the mind of the designing engineer of enough importance to increase of efficiency to merit its incorporation.

A résumé of the types offered by some of these specialists is given.

Brown-Lipe

The Brown-Lipe Gear Company, Syracuse, N. Y., manufactures gearsets for use in connection with the crankcase as a unit power plant construction, or for mounting on the frame apart from the crankcase. In Fig. 3, model 35 is shown, which is designed for use as a unit with the motor, the clutch and flywheel being seen mounted in connection with it. The design here seen has three forward speeds and reverse of the selective type. The shafts are both mounted on Timken roller bearings which are carried in removable cages in the ends of the gearcase. The sliding gearshaft is squared, its forward end being also carried on a Timken bearing. At the rear where it passes through the gearcase this shaft is provided with an adjustable packing ring which prevents oil leakage from the case. The lubricant is put into the gearcase through a large hole tapped at the top, while a plug at the bottom rear end of the case allows it to be drained when necessary. The ratios of the change gears in this design are 1.76 to 1 for the medium speed, 3.36 to 1 for the low and 4.32 to 1 for reverse. The Brown-Lipe gearsets are also mounted on annular ball bearings if so specified.

Cotta

In the gearset designs manufactured by the Cotta Transmission Company, Rockford, Ill., all gears are always in mesh, the individual clutch system being employed. In their standard forms, these outfits are furnished either for trucks having jackshafts and chains to the rear axles, for light commercial vehicles or for pleasure cars having shaft drive to the rear axles. In the Cotta construction, on the face of each of the speed change gears, which are mounted on roller bearings, there is a set of jaw clutches. On the driven shaft are two corresponding double sliding clutches, by means of which any one of the speed change gears may be locked to the shaft. On high speed the driving and driven shafts are locked together and the clutch on the counter shaft is disengaged. The drive is then direct and the counter shaft and all main shaft gears are idle. When the sliding clutch is returned from direct to neutral position the countershaft clutch automatically drops back into mesh.

The type of Cotta gearset shown in Fig. 1 is known as model ECA for jackshaft construction for trucks having a capacity of from 3 to 5 tons. The gears have a face width of 1.5 inch, the pitch of the transmission gears being 4.5 to 6; while that of the differential gears is 3.5. Gear ratios are 2 to 1 for intermediate, 4 to 1 for low and 4.125 to 1 for reverse. The reduction at the differential is 3.07 to 1. The same gear ratios are employed with the shaft drive types.

Several slight changes have been incorporated in Cotta construction. The gears were formerly mounted on plain bearings: they are now carried on roller bearings. The shifting forks have been shortened and made heavier. The ends of these forks are now provided with rollers where they are in contact with the clutch shoulders, having formerly been plain ends.

Covert

Covert gearsets are made for commercial vehicles ranging from the small 1,000-pound delivery wagon up to the 7-ton truck, as well as for pleasure cars from 20 to 50 horsepower. These are manufactured by the Covert Motor Vehicle Company, Lockport, N. Y., and are designed for use in unit with the rear axle, as well as for jackshaft truck constructions. Fig. 2 gives an idea of the general design of a typical Covert type. The shaft on which the sliding gears are mounted is squared, while all shafts are mounted on Hyatt roller bearings in the usual constructions, although several models are made in which the shafts are carried on annulars. In either case, the thrust load on the shaft connecting with the differential gears is taken by a thrust ball bearing, as seen in the drawing, Fig. 2. The shifting rod is carried at the side, being provided with the conventional ratchet arrangement for locating the various shifting positions. Oil packing rings prevent the escape of the lubricant from the housing. The gears are all of nickel steel which is carbonized, heat-treated and ground to fit the shafts and receive the bearings. The shafts are also of nickel steel, hardened and ground. Covert gearcases are of compact design and made of light malleable iron castings. They are provided with substantial flanges for bolting to the rear axle housing at the rear end and for attaching to the torque tube at the forward end. The portions leading to the flanges are webbed, making the construction very strong.

Detroit Gear and Machine Company

Although this Detroit concern makes the majority of its gearsets according to special specifications furnished by each of its customers, it also makes several standard types designed by its own engineers. A typical outfit for unit power plant constructions is shown in Fig. 5. This is a three-speed, selective, sliding-gear design, which may be said to be conventional in most respects, conforming to the latest engineering dictates. It is a center control type. The shafts are all carried on annular ball bearings, the main shafts being mounted on large single-row bearings, while double-row bearings carry the layshaft. A ball-thrust bearing is placed at the forward end of the propeller shaft connection. This shaft also is provided with a packing ring where it passes through the gearcase at the rear. The gears are of nickel steel and have .875-inch faces, the pitches being 6 to 8. The speed ratios are, for intermediate 1.875 to 1; for low 3.2 to 1; and for reverse 3.9 to 1. The sliding gear shaft is provided with four splines instead of being squared, as were the other types already considered. The usual cover plates and oil filling and drain plugs are provided.

Driggs-Seabury

The Driggs-Seabury Ordnance Corp., Sharon, Pa. produces a full line of standard gearsets for commercial vehicles. These being truck outfits, have the differential and bevel gears in combination with the change-speed gears for jackshaft designs. They are made in sizes ranging from the type for the 1-ton job to the 7-ton outfit. They all have three forward speeds and reverse, except the largest size, which has four forward speeds. The maker claims extreme simplicity of construction and accessibility for these gearsets. The gears are of large diameter, carried on splined shafts. These parts are of alloy steel.

Three-point suspension is a feature of the Driggs-Seabury units, the forward end of the gearcase providing a bearing for a universal trunnion which is swung from a cross-member. Jackshafts and housings are furnished to meet the requirements of the customer, they not being standard parts as yet. The several speeds of the gearset are controlled selectively by shifting rods assembled as a unit in a separate housing bolted to the right-hand side of the case, the removal of which allows the gear to be withdrawn at any time without disassembling the shifter box. The gearcase is provided with oil-filling and drain plugs, while oil packing rings surround the shafts entering and leaving.

Fuller

The Fuller & Sons Manufacturing Company, formerly the Michigan Automobile Company, Ltd., Kalamazoo, Mich., is now manufacturing its 30 to 40 horsepower, three-speed, selective, model T gearset in large quantities for automobile builders. This conforms to the general dictates of present engineering practice. The countershaft and the mainshaft are of large size, the main bearings being Hyatt roller types. The large idler gear runs on a solid roller bearing, while a double roller bearing carries the main shaft stub end. The case is of aluminum alloy while all gears and shafts are made of chrome-nickel steel. A variety of control sets is offered for both center and side control, while cases for either left or right drive in several styles are to be had. The Fuller concern also carries two models of planetary transmissions ranging from 6 to 12 and from 12 to 25 horsepower. These are designed for either chain or shaft drive.

Lefever

In the automobile line, the Lefever Arms Company, Syracuse, N. Y., manufactures selective-type gearsets and jackshafts for commercial cars from 12 to 40 horsepower; planetary gearsets and jackshafts from 12 to 40 horsepower; selective gearsets for pleasure vehicles up to 45 horsepower; and change gear levers.

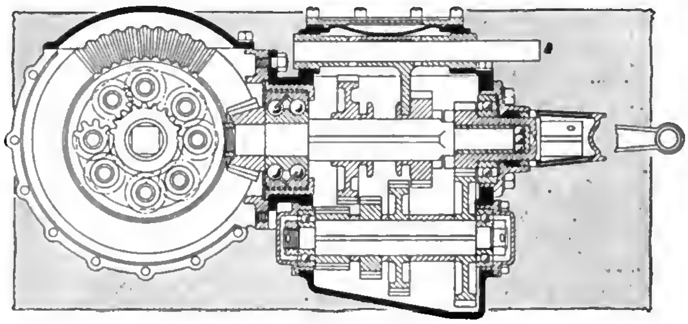


Fig. 4—Lefever gearset for trucks up to 40 horsepower

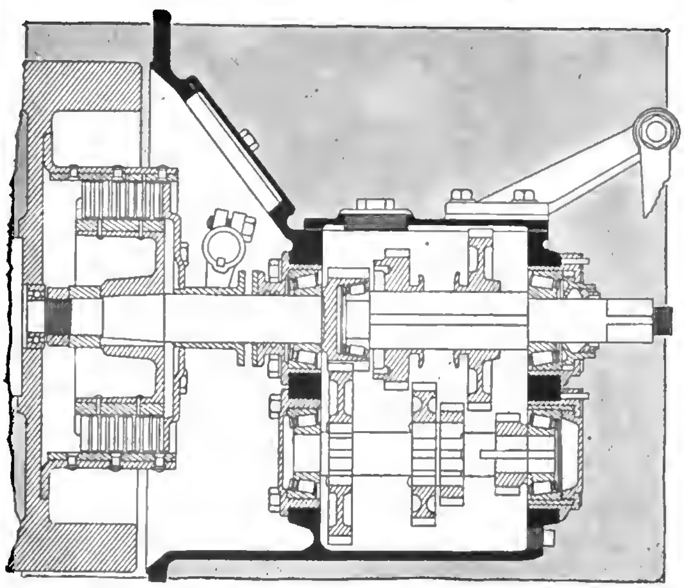


Fig. 3—Brown-Lipe model 35 unit power plant gearset

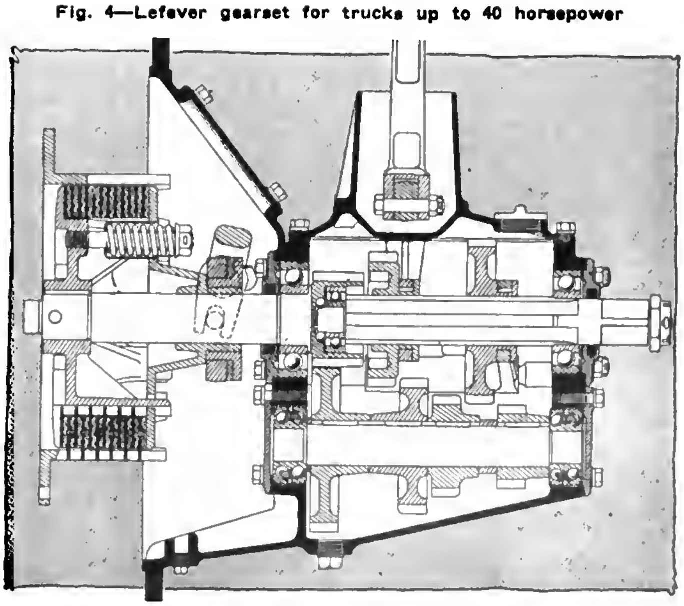


Fig. 5—Detroit Gear and Machine Co.'s unit design

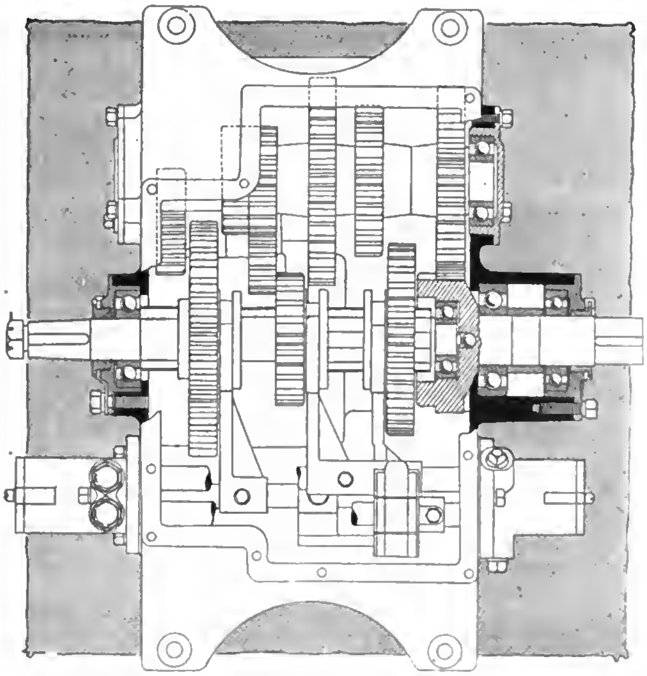


Fig. 6—Warner-Toledo four-speed type, direct on third

A typical design is the model 20, a sectional side view of which is given in Fig. 4. This model is for large trucks. This year sees no changes in the design of the Lefever products. Referring to Fig. 4, the gearcase bolts through a flange to the differential housing in the usual way. The shafts are mounted on annular ball bearings, a double-row bearing carrying the rear end of the mainshaft. A thrust ball bearing is placed at its forward end. At this end there is also a large packing ring preventing the leakage of oil from the case. The shafts carrying the gears are squared, the main sliding shaft being 1.1875-inch and the layshaft 1 inch square. All gears are made of 3.5 per cent. nickel steel, heat-treated. A feature of the Lefever gearsets is their compactness. They are provided with either single or two-rod control. The former allows application to any standard make of car, the only lever attachment being at the side of the frame, or the center, as the case may be. The Lefever planetary types are interchangeable with selective gearsets on the same jackshaft, the flange connections being standard.

Muncie

Practically all types of gearsets are numbered among the products of the Muncie Gear Works, Muncie, Ind., the pleasure car line including three- and four-speed types for mounting in unit with the motor and for placing amidships of the chassis apart from the power plant. In the commercial vehicle list are found selective, sliding gear types and planetary designs for assembling in unit with the jackshaft or for separate installation. All types of sliding gear constructions have ball bearings to carry the shafts, the heavier styles containing double-row ball bearings. Considering model T 64, which is a four-speed design, the speed reduction on first is 2.75 to 1; on second 1.56 to 1; and on fourth, .83 to 1. The third speed is the direct drive, the fourth having a 20 per cent. increase over direct. Another four-speed type is furnished, having direct on fourth, the ratios being: first, 3.6 to 1; second, 2.07 to 1; third, 1.32 to 1; reverse, 3.9 to 1.

In all designs suitable packing rings are provided where the shafts enter or emerge from the case, preventing oil leakage. Shafts are splined usually with four splines. Suitable cover plates for oil insertion and for inspection and adjustment are provided.

Warner-Toledo

The Warner Manufacturing Company, Toledo, O., announces that it is making a very complete line of three- and four-speed sliding gearsets arranged for sub-frame, unit power plant and rear axle constructions. The two latest gearsets of the Warner make are models 134 and 154. Both have four forward speeds, the former providing direct drive on third speed, and the latter giving the direct on fourth. Model 134 is shown in Fig. 6. The general description of both is the same. The housing of .28-inch aluminum has either four supporting arms for fixing to the sub-frame, or it is arranged for attachment to the crankcase of the motor. The gears have .875-inch faces and are of heat-treated alloy steel. They have very large diameters, the distance between the main and countershafts being 5 inches. These gears have a 14.5-inch pressure angle and have a 5 pitch. This angle gives a smooth rolling action tending to silence, it is said. The mainshaft has a diameter of 2 inches, while the layshaft is 1 1-2 inches in diameter. These are carried on annular ball bearings and the countershaft is splined for the gear sliding. Adjustable packing rings prevent oil leakage, and the shifting yoke rods are fitted with locating plungers.

The Warner company specially recommends these gearsets for heavy touring cars with motors up to 60 horsepower, although they are also suitable for the ordinary car. The gear ratios are well-proportioned, being determined by the results of considerable investigation on the part of the company's engineers.

Warner-Muncie

Every kind of selective, sliding gear type of gearset is manufactured for the trade by the Warner Gear Company, Muncie, Ind. That is, they are provided for unit power plants; for separate mounting on a subframe or on the chassis amidships; for rear axle unit constructions; for truck installations in connection with jackshafts. Model T-21 which is a type for 35 to 45 horsepower cars and has three forward speeds, is shown sectionally in Fig. 7. This is a typical Warner pleasure car construction for unit power plant application, the multiple-disk clutch in its separate compartment also being shown. The shafts are carried on Timken roller bearings, while the usual cover plates, oil plugs and oil packing rings are to be found. The sliding gearshaft is provided with four splines. The gears of this model are 1 inch in face width and their pitch is 5. They are made of an alloy steel, heat-treated and ground, and are automatically locked in and out of mesh. The layshaft in this design is carried below the mainshaft and not at the side as is the case with some of the designs which we have seen.

Although Timken bearings are shown in the construction herewith, the Warner concern furnishes its gearsets mounted on ball bearings if so ordered. It does not list planetary types of gearing, but states that it is in a position to manufacture this type of transmission as designed by its own engineers or according to approved designs of others on order.

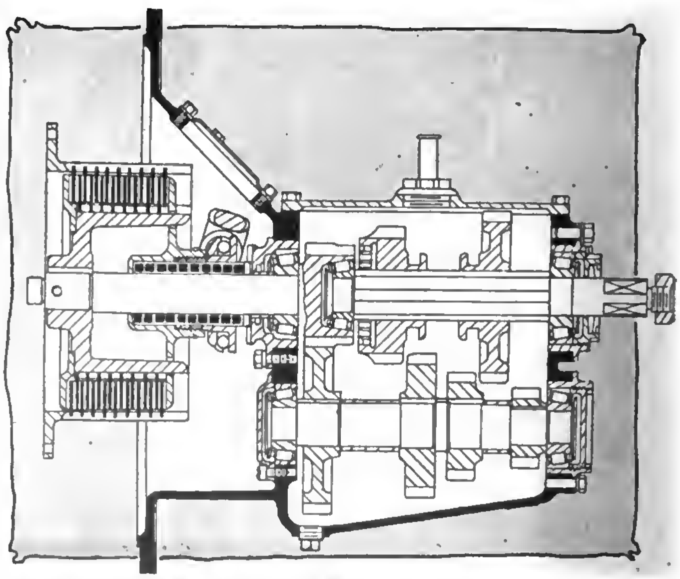


Fig. 7—Warner-Muncie model T-21 unit-with-motor type

Mondex – Magic Gearset

Single Pinion on Pivoted Shaft Transmits Drive to Stepped Internal Gear

A CHANGE speed transmission that represents a radical departure from ordinary practice is the Magic gearset, incorporated in the Mondex-Magic car, represented in this country by the Aristos Co., New York.

In this gearset the power is transmitted at all speeds through a single pinion which meshes with a special conical gear member connected to the forward end of the propeller shaft. This pinion, P, Fig. 2, is formed in one piece with the rear portion of a driving shaft S which connects to the clutch by a universal of the ordinary type. The shaft carries, just in front of the pinion, a sliding block J having ball bearings, which forms a means of moving the shaft end radially across the guide plate G. By doing so the pinion may be brought into mesh with any one of a series of internal toothed rings cut in the driven member C. The stepwise arrangement of these teeth is shown in Fig. 1. They are cut conically, that is, the common center of generation of all four rings is at a point corresponding with the universal at the forward end of the driving shaft. The high gear is obtained by inserting the driving pinion in the center gear ring where it acts as a jaw clutch. This forms a direct drive, as shown at A, Fig. 2. The low-gear position is shown at B.

The operating mechanism is not included in the illustrations, but this consists simply of the transverse shaft of the hand lever passing through the side of the gear casing at F, and having on its inner end a lever which engages with the sliding block J. A stud projecting from the under surface of the block into guideways and notches in the plate G makes it impossible to bring the teeth in mesh other than by a sliding movement.

Reverse is obtained by moving over the shaft until the driving pinion is in engagement with the intermediate pinion R, and then inserting both into the main gear member. This is accomplished by means of a lip L on the block which is brought up against a flange on the intermediate shaft, locking the two together. It will be observed that on all forward speeds the reversing pinion is standing idle, being held out of action by a light spring inside the bearing.

The driving pinion is kept in mesh by a spring surrounding the rear half of the driving shaft. The latter is really in two pieces, the forward portion, that connected to the universal being solid, while the part forming one with the pinion is tubular. A sliding keyed joint connects the two.

The conical gear member C is also in two pieces, but this is purely for constructional convenience. One ring contains the toothed racks for the first and second speeds, the third and high-gear teeth being cut in the other.

A short shaft, running in a plain bearing contained in a rearward extension of the gearbox, carries the gear wheel C, and transmits the power to the propeller shaft.

For operating this gearset a hand lever of the ordinary type is used, but the gate is much simpler, consisting of a series of regular steps for the four speeds and reverse. The rear edge of the gate represents the neutral position. By pulling the lever straight back, no matter what speed gear had been in mesh, neutral is secured.

Although, theoretically, some objection might be raised at the angularity of the driving shaft when in its low-speed positions, actual practice on the road, one car fitted with this gear having been tested over 18,000 miles, shows that this detail has less bearing on the efficiency than would be supposed. Efficiency with this method of drive is obtained by great accuracy in the cutting of the teeth and by the use of as long a driving shaft as is permissible. In the particular gearset illustrated the length of the shaft is such that the greatest angularity, which occurs on low speed, is the comparatively low figure of 4:30.

Bolt-on inspection covers are fitted to the gearcase and the forward extension which contains the driving shaft. The whole forms a single unit and is supported in the chassis on the three-point principle.

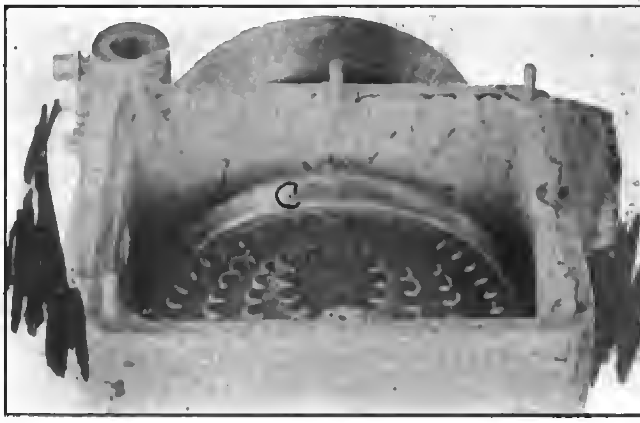


Fig. 1—Front view of the driven member, showing the four internal tooth rings which mesh with the driving pinion

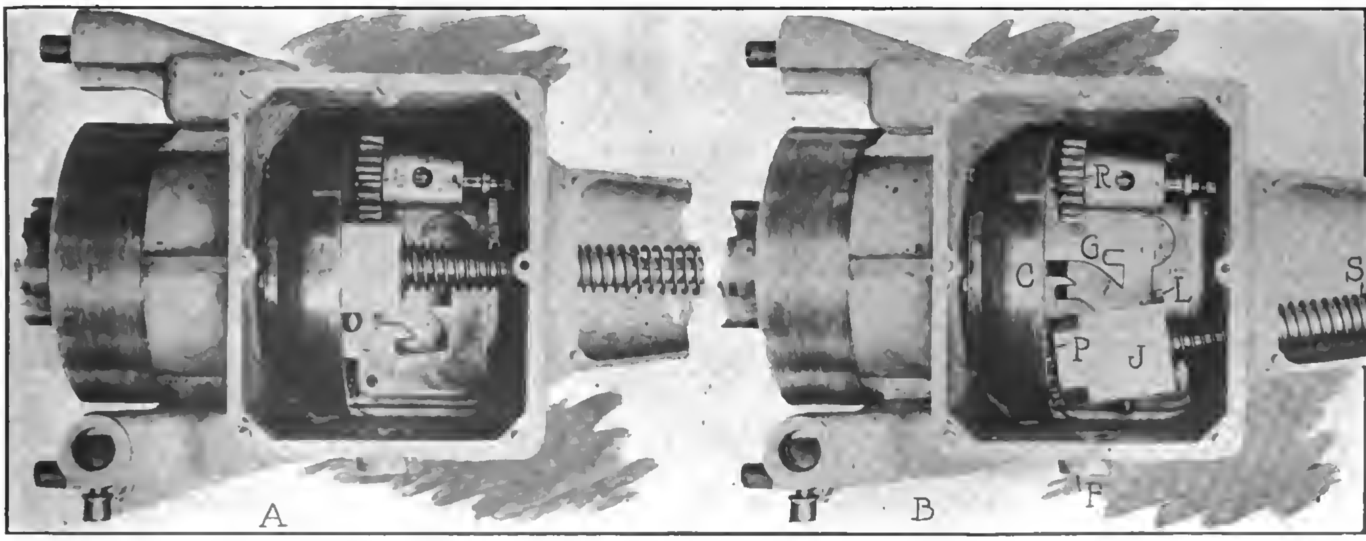
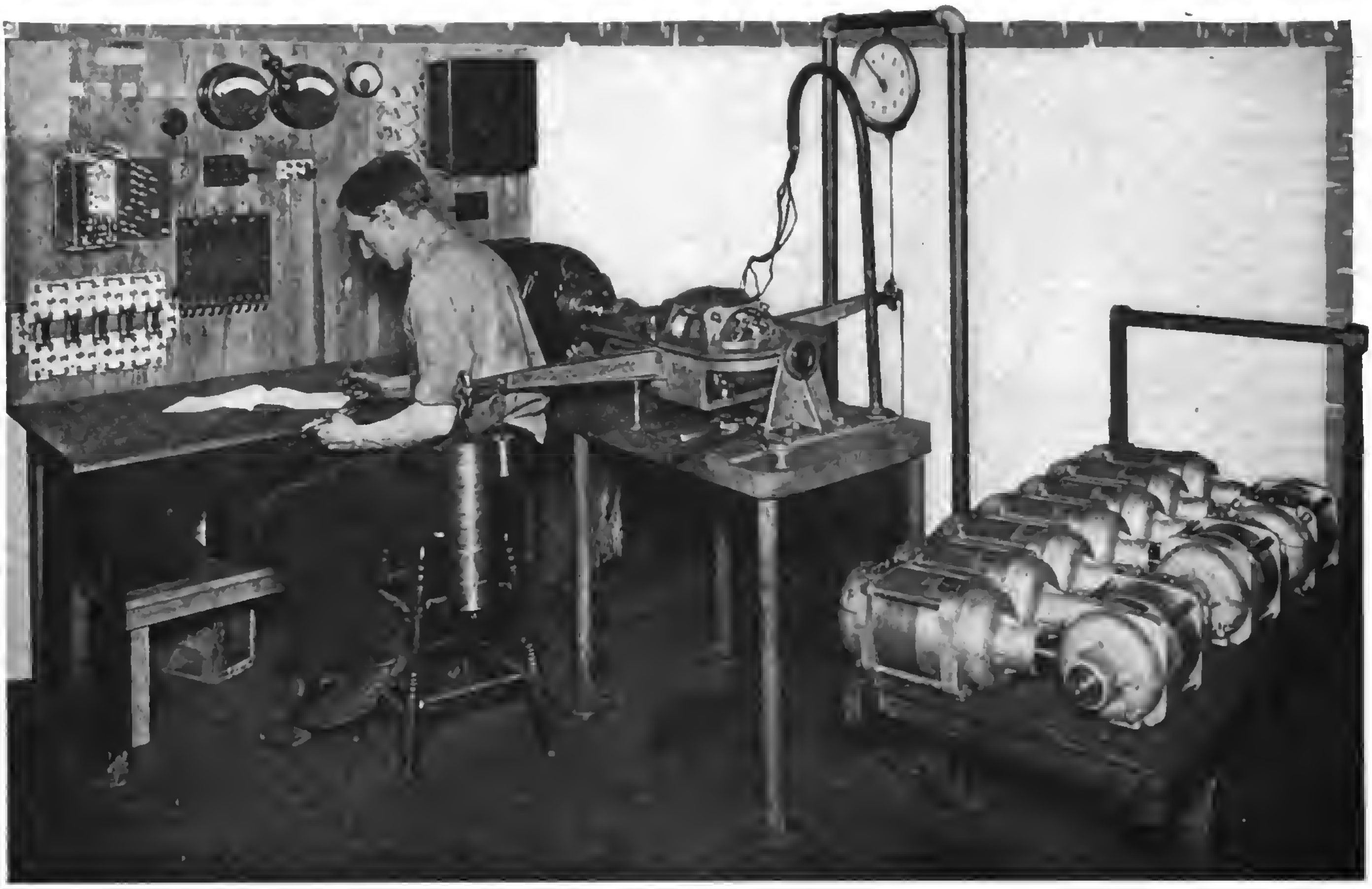


Fig. 2—The Mondex-Magic transmission in high and low speed positions. In high the drive is direct

Factory Miscellany



Testing apparatus used to determine the efficiency of the Aplco starting and lighting system in the factory at Dayton, O.

THE illustration herewith shows the testing device used in determining the efficiency of the Aplco starting and lighting apparatus, at the plant of the Apple Electric Co., Dayton, O. The apparatus is a small dynamometer upon which the output of the motor is registered. If the torque exerted by the electric cranking motor falls below the standard required for the size of the motor it is rejected. As a motor the motor-generator used by the Aplco system must develop a capacity 200 per cent. greater than that required to turn over the automobile motor to which it is to be fitted. When used as a generator the motor-generator must develop sufficient current to light a full set of lamps and maintain the current in a storage battery at a speed corresponding to 12 miles an hour of the car. The performance of each instrument is noted and a record kept corresponding to the number of the instrument. It takes only one man to operate the testing outfit, and as may be noted, he sits at a table, operates the switches on the torque lever and notes down the readings at different speeds and under different loads. This gives a complete record of the performance of each instrument. These records can be filed and a complete check on the instruments in service maintained.

SALT LAKE Wants Truck Factory—If the plans and hopes of certain citizens of Salt Lake City, Utah, are carried out, the Utah state capital will have an automobile factory in the near future, representing an investment of $1,000,000 or more. The intention is to start a plant for the manufacture of motor trucks, suitable for mining work, for which there is a big market in Utah and the neighboring states.

Winton Increases Wages—The Winton Motor Car Co., Cleveland, O., has recently voluntarily increased the wages of its employees 10 per cent.

Mohawk Buys Stein Plant—The Mohawk Rubber Co. has been organized at Akron, O., and has bought the Stein Double Cushion Tire Co. plant and machinery for $350,000.

Evans Builds—The Evans Motor Car Co., Nashville, Tenn., which is being organized by R. H. Evans, has secured an 8-acre site 6 miles from Nashville and will erect a three-story building, 250 by 300 feet. The company will have $200,000 capitalization, and the plant will cost $60.000.

Ford's Los Angeles Plant—Bids for the construction of a five-story reinforced-concrete factory building to be built in Seattle, Wash., by the Ford Motor Car Co., Detroit, Mich., and to cost in the neighborhood of $250.000, will be called for within the next 30 days by the N. W. representative, H. P. Rice. It will be located at the south end of Lake Union.

Duff Plant Moved—The Duff Mfg. Co., manufacturer of the Barrett lifting jacks, has moved into its new plant and general office building located on Preble avenue, N. S., Pittsburgh, Pa. The new plant comprising approximately 68,000 square feet of area is located on a 5-acre site. The company is also planning the erection of plant in Chicago, Ill., and expects to have this factory in operation by next fall. A Canadian plant will be equipped this summer to be in operation by the early fall of 1913. The Canadian plant will be located at Windsor or Hamilton, Ont.

Big Los Angeles Plant—Plans are being prepared for the factory to be established on the 30-acre site in Wilmington, Cal., for the Los Angeles Motor Truck Mfg. Co. It is the intention to erect five reinforced-concrete buildings. The plant complete will cost, it is estimated, more than $300,000. The main factory building will be two stories, 60 by 300 feet; assembling building, one story, 120 by 200 feet; finishing building, one story, 80 by 280 feet; administration building, two stories, 40 feet by 60 feet, and power house, one story, 60 by 60 feet. Offices of the company have been opened in the Los Angeles, Cal., Investment building.

Ford's Kansas City Addition—The Ford Motor Co., Detroit, Mich., will increase the capacity of its assembling plant at Kansas City, Mo., and add equipment.

Land Deeded to Goodrich—Seventeen acres of land at St. Catharines, Ont., have been deeded to the B. F. Goodrich Co., Akron, O., for a Canadian tire factory, which it is said will employ a thousand men.

National Rubber Purchases Land—The National Rubber Co., Alliance, O., recently organized, has authorized the purchase of land and asked for the submitting of bids for the construction of the new plant.

Swinehart Awards Contracts—The Swinehart Tire & Rubber Co., Akron, O., has awarded contracts for the addition of a three-story building to its main plant at Akron, O. The new structure will be 100 by 70 feet.

Ford's New Plant—The Ford Motor Car Co., Detroit, Mich., is planning the erection of a new plant which is to be six blocks long and three stories high. Three million barrels of cement will be employed in its construction.

New Heat-Treating Building—The Weston-Mott Co., Flint, Mich., manufacturer of automobile axles, is planning the erection of a new heat-treating building. The plans call for a one-story building 75 by 325 feet of saw-tooth design.

Lock Plant in Findlay—A new manufacturing project has matured in Findlay, O., with the incorporation of the United States Automobile Lock Co., with $15,000 capital. The company will manufacture a new type of automobile locking device.

Motor Truck Corporation Builds—The Motor Truck Mfg. Corp., Mount Vernon, N. Y., has been incorporated with a capital stock of $150,000 to manufacture and deal in motors, engines, etc., and will establish a plant at that city in the near future.

To Enlarge Plant—Bids have been given by the Cole Motor Car Co., Indianapolis, Ind., for a $150,000 addition to the present plant. The new addition will be L shape, four stories high, built along modern lines. When finished the advertising force will move to the new plant.

Work on New Departure Plant—Work is now well under way in the Hartford, Conn., plant of the New Departure Mfg. Co., which was formerly occupied by the Whitlock Coil Pipe Co. The local plant will be utilized for the production of shaft hangers thus relieving the main works where automobile bearings are featured.

Building Permit to Swinehart—A permit was recently applied for by the Swinehart Rubber Co., Akron, O., for a three-story building, to be erected at Howard and North streets. This structure will be erected at a cost of $20,000 and will be occupied for tire building. The new plant will be 60 by 102 feet.

The Automobile Calendar

Shows, Conventions, Etc.

Mar. 27-April 3....Quincy, Ill., Mississippi Valley Automobile Show, H. F. Hofer, Director.
Mar. 31-April 5....Manchester, N. H., Automobile Show, Dealers' Association, J. H. Graham, Manager.
April..............San Antonio, Tex., Annual Show, San Antonio Motor Car Show Co.
April 1-6.........San Francisco, Cal., Motor Truck Show, Coliseum Hall, *Motor Field.*
April 5-19.........Pittsburgh, Pa., Annual Show, East Liberty Market House, Dealers' Association.
June 5, 6, 7.......Detroit, Mich., Midsummer Meeting of Society of Automobile Engineers.
October............Paris, France, Automobile Show, Grand Palais; 10 days.
November.........London, Eng., Annual Automobile Exhibition, Olympia.

Race Meets, Runs, Hill Climbs, Etc.

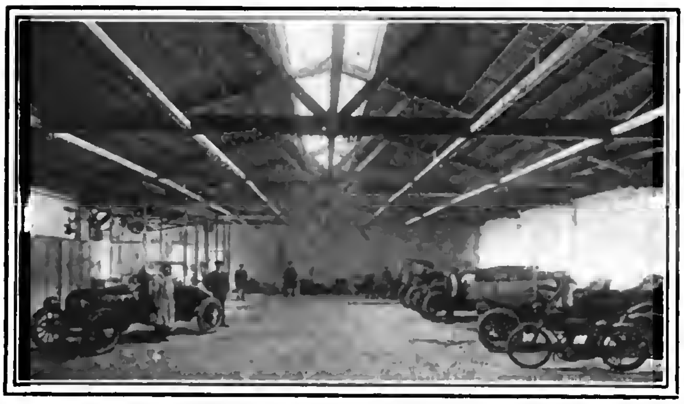
April 28-30........Chicago, Ill., Commercial Vehicle Demonstration, Chicago Motor Club.
May 5-8...........Washington, D. C., Motor Truck Reliability, *Washington Post.*
May 14............New York City, Start of 2-Day Hudson and Catskill Scenic Tour.
May 30...........Indianapolis, Ind., 500-Mile Race, Speedway.
June 25-28.........Chicago, Ill., Non-Motor-Stop Reliability, Chicago to Boston, Chicago Automobile Club.
July 1............Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Association to the Pacific Coast.
July 1-16.........Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.
July 4-6...........Tacoma, Wash., Road Race, Montemara Festa Automobile Committee.
July 8-16.........Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager.
July 27-28.........Tacoma, Wash., Tacoma Road Races.
Nov. 24...........Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 27...........Savannah, Ga., Grand Prize Race, Automobile Club of America.

Foreign

April ....Barcelona, Spain, International Exhibition.
May ....St. Petersburg, Russia, International Automobile Exposition, Building of Michael Maneze, Imperial Automobile Club of Russia.
July 12...........Amiens, France, Grand Prix Race.
July 18-26.........London, Eng., Imperial Motor Transport Conference.
Sept. 25...........Isle of Man, International Stock Car Race.

Part of the wrapping-room at the factory of the Goodyear Tire & Rubber Co., Akron, Ohio. In this room the tires are put through a wrapping process before going to the vulcanizer for their first cure

Streets are wide and cars are numerous in Los Angeles, Cal. The above illustration shows part of the Los Angeles automobile row



View of the interior of the new garage adjoining the salesroom of the Buxton & Childs Auto Co., Los Angeles, Cal., distributors of the Moon

TRUCK Replaces Twenty-One Wagons—A gasoline motor truck and trailers have been shipped to the Wilbert mine near Arco, in the mountains north of Pocatello, Ida., to take the place of twenty-one wagons and twenty-one drivers in the transportation of ore from the mine to the railroad station.

Limbach Tribune's Engineer—H. C. Limbach has been made chief engineer at the Tribune Motor Co.'s plant, Detroit, Mich.

Central Adds New Agency—The Central Tire Co., Philadelphia, Pa., has opened an additional supply agency at 136 North Broad street.

Coronet Takes Service Recorder—The Coronet Mfg. Co., Cleveland, O., has taken the agency for the Service Travel Recorder Co., that city.

Bryte to Handle Allen Wrenches—A. Bryte, of San Francisco, Cal., has taken the distributing agency for Allen wrenches on the Pacific Coast.

Schwab Speedwell Branch Manager—F. N. Schwab has been appointed branch manager of the Speedwell Motor Car Co., Dayton, O., in Chicago, Ill.

Tarlton Sells Garage Interest—P. E. Tarlton has sold his interest in the Tarlton-Porter Garage, Kenton, O., to C. B. Porter, who will conduct the business in the future.

Bricker Production Manager—M. L. Bricker, formerly superintendent of the Briggs-Detroiter Co., Detroit, Mich., has been advanced to the post of production manager.

Symonds in New Quarters—The Symonds Motor Car Co., 1228 So. Flower street, Los Angeles, Cal., opened its new headquarters. This firm represents the Marion car.

Times Square Company Buys—The Times Square Auto Co., New York City, has purchased the site at 56th street and Broadway, formerly occupied for years by Wyckoff, Church & Partridge.

Indianapolis Branch for S. R. B.—The Standard Roller Bearing Co., of Philadelphia, Pa., has opened a branch at Indianapolis, Ind., at 1201 State Life Bldg. L. M. Watkin, Jr., will be in charge.

Davis Plans New Garage—Rex Davis, automobile dealer of Theresa, N. Y., and agent in that town for the Ford car, plans to construct a new garage on the Getman House property, that city, this summer.

Blake with International Motor—K. M. Blake has resigned as manager of the Boston, Mass., branch of the Locomobile Company of America, Bridgeport, Conn., to become the New York sales manager for the International Motor Co.

Babcock Joins Enterprise Metal—H. L. Babcock, formerly with the H. H. Franklin Mfg. Co., Syracuse, N. Y., has become Western representative of the Enterprise Metal Co., of Syracuse. He will make his headquarters at 305 Ford building, Detroit, Mich.

Chandler Opens Cleveland Offices—The Chandler Motor Co., has opened temporary offices in the Swetland building in Cleveland, O. Sales Manager Emise says a factory site has been secured in Cleveland and that production will be in full swing by July 1.

Columbus Wants More Equipment—It is proposed to purchase a new combination ambulance and patrol wagon for the use of the police department of the city of Columbus, O. It is also urged that automobiles be purchased for the use of the detective department.

Moline Sales Force Meets—The Moline Automobile Co., East Moline, Ill., recently started a series of meetings representing all of its branch managers as well as the field force representing the factory. A full day was put in in discussion of the car in detail at the plant. Addresses were made by C. H. VanDervoort and R. W. Phelps.

New Agencies Established During the Week

PLEASURE VEHICLES

Place	Car	Agent
Akron, O.	Hudson	City Auto Sales Co.
Baltimore, Md.	Pullman	Shaffer Mfg. Co.
Baltimore, Md.	Stanley	Cook & Fletcher
Birmingham, Ala.	Stevens-Duryea	C. L. Brown
Carthage, N. Y.	Ford	Wilna Machine Co.
Denver, Colo.	Franklin	Mathewson Auto Co.
Erie, Pa.	Franklin	John Griffith
Eugene, Ore.	Michigan	F. G. Berger
Hamilton, O.	Hudson	Weiser & Hood
Hamilton, O.	Mitchell	Central Motor Co.
Hamilton, O.	Oakland	Weiser & Hood
Hamilton, O.	R. C. H.	Weiser & Hood
Hartford, Conn.	Krit	R. M. Spencer
Hartford, Conn.	Metz	Lewis M. Camp
Hornell, N. Y.	Maxwell	Geo. Elsenheimer
Logan, O.	Ford	Gage Auto Co.
Logan, O.	Hudson	Gage Auto Co.
Logan, O.	Overland	Gage Auto Co.
Philadelphia, Pa.	Auburn	Philadelphia Motor Sales Co.
Portland, Me.	Luverne	George Lovejoy
Syracuse, N. Y.	Pathfinder	T. A. Read Co.
Tacoma, Wash.	Metz	Hilton & Donaldson

COMMERCIAL VEHICLES

Place	Car	Agent
Auburn, Me.	Stewart	E. L. Jordon
Calgary, Alberta	Stewart	Lougheed & Webster
Galveston, Tex.	Stewart	Christianson Co.
Glens Falls, N. Y.	Stewart	Empire Automobile Co.
Hamilton, O.	Indian	Weiser & Hood
Jamestown, N. Y.	Stewart	J. E. White
New Orleans, La.	Stewart	M. Zilbermann
Niagara Falls, N. Y.	Stewart	Power City Auto Co.
Poughkeepsie, N. Y.	Stewart	John Van Benschoten
Saskatoon, Sask.	Stewart	George H. Hack
Seattle, Wash.	Stewart	W. H. Heinzerling
Syracuse, N. Y.	Stewart	Syracuse Garage
Syracuse, N. Y.	Alco	F. H. Edwards
Washington, D. C.	International	H. B. Leary, Jr.

Newark Purchases More Apparatus—Newark, N. J., has purchased three Palmer-Singer light six roadsters for its fire department.

Eames Standard Electric Manager—Hayden Eames has been appointed general manager of the Standard Electric Co., Jackson, Mich.

Bornstein with Premier—H. D. Bornstein has joined the Premier Motor Car Co., and will assist in the advertising and publicity work.

Takes L. & M. Tire Agency—The W. W. Price automobile repair works has taken on the agency of the L. & M. tires in Carrolton, O.

Smith Motz Tire Manager—The Motz Tire and Rubber Co., Akron, O., has engaged J. G. Smith as manager of its New York City branch.

New Fire-Fighting Apparatus—An automobile hook and ladder truck, costing $5,100, has been added to the Paris, Tex., fire department, making three motor machines now in service.

New Garage Owners—The Swalm Hardware Co., Pottsville, Pa., is about concluding negotiations for the purchase of the Youse garage, that city.

Middletown Wants Three Trucks—The fire department and council of Middletown, Pa., are considering the purchase of three automobile hose trucks.

Interborough Orders G. V. Trucks—The New York Railways Co., New York City, has ordered twenty-five electric trucks from the General Vehicle Co., that city.

Dustin Retail Sales Manager—The American-Marion Sales Co., 1896 Broadway, New York City, has secured the services of Lee N. Dustin in the capacity of retail sales manager.

Pope's Providence Service Station—The Pope-Hartford Automobile Co. has leased a new building, two stories high, 50 by 100 feet, in Providence, R. I., and will use it for a service station.

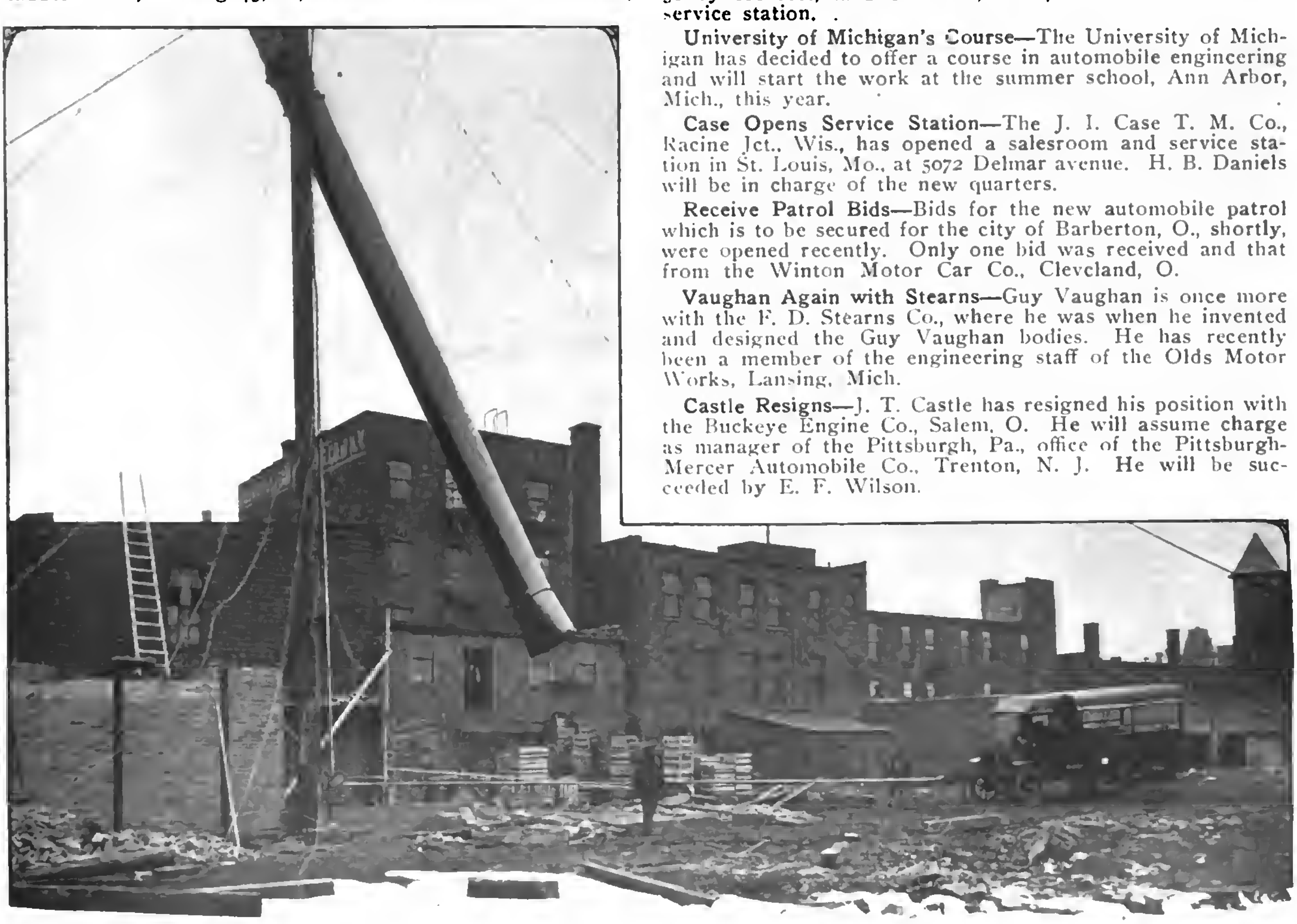
University of Michigan's Course—The University of Michigan has decided to offer a course in automobile engineering and will start the work at the summer school, Ann Arbor, Mich., this year.

Case Opens Service Station—The J. I. Case T. M. Co., Racine Jct., Wis., has opened a salesroom and service station in St. Louis, Mo., at 5072 Delmar avenue. H. B. Daniels will be in charge of the new quarters.

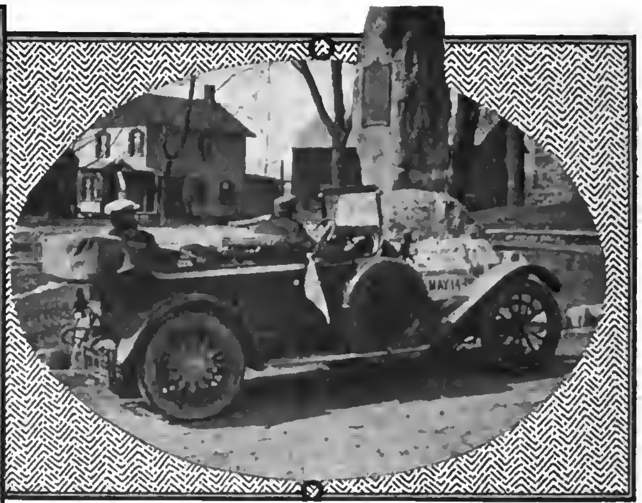
Receive Patrol Bids—Bids for the new automobile patrol which is to be secured for the city of Barberton, O., shortly, were opened recently. Only one bid was received and that from the Winton Motor Car Co., Cleveland, O.

Vaughan Again with Stearns—Guy Vaughan is once more with the F. D. Stearns Co., where he was when he invented and designed the Guy Vaughan bodies. He has recently been a member of the engineering staff of the Olds Motor Works, Lansing, Mich.

Castle Resigns—J. T. Castle has resigned his position with the Buckeye Engine Co., Salem, O. He will assume charge as manager of the Pittsburgh, Pa., office of the Pittsburgh-Mercer Automobile Co., Trenton, N. J. He will be succeeded by E. F. Wilson.



Showing one of the many duties to which a motor truck may be subjected. A White 3-ton truck utilized to hoist an 80-foot sheet-iron smoke stack into its cradle, 12 feet above the ground



The West Hudson and Catskill endurance, reliability, hill-climb and fuel economy test gives promise of being exceedingly interesting. It is planned to run the test, which will be conducted by "Senator" W. J. Morgan, on May 14-15. The accompanying illustrations depict the pathfinding car, an Alco six, at various points on the route which has been selected for the run. The one shown above at the left is from a photograph taken half way up the mountain between Palenville and Haynes Falls, N. Y. That at the right was taken at the monument at New Paltz.

Bennett with Abbott-Detroit—A. L. Bennett has become sales manager for the Abbott-Detroit Co., New York City.

Kelly Oakland Factory Manager—W. D. Kelly has been appointed factory manager of the Oakland Motor Car Co., Pontiac, Mich.

Stoddard Garage Addition—The Stoddard Motor Car Co. will erect a two-story addition, 60 by 50 feet, to its garage at Springfield, Mass.

Cole Agent Moves—The G. R. Cowie Co., Washington, D. C., has removed from 1317 H street, N. W., to 2121 Fourteenth street, N. W.

Skinner Portland Ford Manager—H. C. Skinner, from Houston, Tex., is now manager of the Portland, Ore., branch of the Ford Motor Car Co.

Plugit Tire Agency Established—Sub-agents for the Plugit liquid tire filler have been established throughout the state of Maryland by the Baltimore representatives, Gauer and Blaycock.

Atkinson Pacific Manager—Robert Atkinson, for some time past associated with J. W. Leavitt & Co., of Portland, Ore., has resigned and will act as manager of the Pacific Car Co., in Seattle, Wash.

La Grande's Fire Equipment—La Grande, Ore., though a city of the small class, has recently motorized its fire department, $8,000 being spent by this eastern Oregon city in the purchase of an automobile.

Bieler Branch Sales Manager—The Carl Spoerer's Son Co., Baltimore, Md., has appointed O. R. Bieler to take charge of the sales end of the Bosch products for which the Spoerer company is the local representative.

Adds Accessory Department—D. S. Hendrick Co., Inc., agent for the Abbott-Detroit, Franklin and Stewart truck, at 1024 Connecticut avenue, has added an accessory department. It will be under the management of W. Elkins Reed.

Hart Stewart-Warner Manager—T. M. Hart has recently been appointed manager of the Portland, Ore., branch of the Stewart-Warner Speedometer Co. He was formerly manager for the company in Los Angeles, Cal. He will be located at 57 No. Broadway.

Moran Executive Engineer—G. R. Moran, formerly chief engineer for Barthel, Daly and Miller, and later executive engineer in charge of the Detroit, Mich., office of the New Departure Mfg. Co., has taken a similar position with the Suspension Roller Bearing Co., Sandusky, O.

New Garage in Birmingham—Loveman, Joseph and Loeb have let a contract for the erection of a new garage at Avenue C and Twenty-first street, Birmingham, Ala. The building will be modern in every way and will be the largest structure, it is claimed, especially designed for automobiles in that city.

Another Railroad Adopts Automobile—Official notice of the adoption of motor-car service on the Chicago, Peoria and St. Louis Railroad has been given out. According to this notice four of these cars have been purchased by the company and two of them will be put into service in the near future.

General Motors Leases Building—The General Motors Truck Co., Detroit, Mich., has secured a long lease on a piece of property in the heart of automobile row and a building to be used as a salesroom and garage will be erected in the next 90 days. The building will be one story and will cost to build about $20,000.

Will Share Display Expenses—Owing to the increasing use of automobiles in the interior towns of Louisiana, New Orleans dealers are planning to share expenses in a display of cars at a number of points. Accessory dealers also will join the movement. An effort is being made to get special rates on the railroads for the transportation of the cars intended for exhibit purposes only.

University's Extension Course—The university extension division of the University of Wisconsin, Madison, Wis., has made another innovation by establishing an extension course in the operation and management of motor cars and trucks. The first class has been formed at Sheboygan, where E. M. Gorrow of Oshkosh, Wis., instructor in the extension division, is imparting knowledge and instruction relative to motors. Other classes are being established in Superior, La Crosse, Martinette, Wausau and other principal cities. The departure in extension work by the University of Wisconsin is attracting wide and favorable attention.

Automobile Incorporations

AUTOMOBILES AND PARTS

Accident, Md.—Motor Car Sales Co.; capital, $25,000; to manufacture, sell and deal in all kinds of engines, vehicles, etc. Incorporators: Newton Gies, G. N. Emory, C. C. Frederick.

Buffalo, N. Y.—Ivey Motor Truck Co., Inc.; capital, $10,000. Incorporators: Chas. A. Ivey, A. L. Rusling, Frank G. Heller.

Nashville, Tenn.—Evans Motor Car Co.; capital, $200,000. Incorporator: R. H. Evans.

New York City—Greater New York Motor Co.; capital, $10,000. Incorporators: Samuel Marusi, Samuel Feldman, Cæsar Pianisani.

New York City—General Auto Trucking Co., Inc.; capital, $25,000. Incorporators: George W. Freeman, Albert A. Benedise, Thomas G. Gannon.

New York City—Motor Coach Co.; capital, $500,000; to manufacture autos, motor car hearses and burial coaches. Incorporators: Sam Richenthal, Elbert R. Benyunes, Herman Miller.

New York City—Service Motor Truck Co. of N. Y.; capital, $7,500. Incorporators: Charles H. Roman, Elias T. Silverstein, Peter L. Stickney.

New York City—Signal Motor Truck Co., Inc.; capital, $350,000. Incorporators: F. C. Canfield, J. S. Coates, W. C. Floyd-Jones.

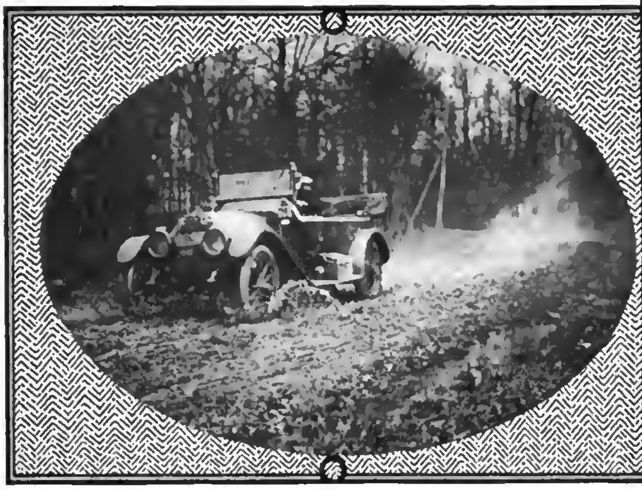
Schenectady, N. Y.—Schenectady Auto-Car Co.; capital, $10,000. Incorporators: Emmet Fisher, A. Langaneuer, L. Buonfiglio.

Steubenville, O.—National Wave Motor Co.; capital, $1,000,000; to manufacture wave and water motors.

Ayer, Mass.—Robert Murphy's Sons Co.; capital, $30,000; garage. Incorporators: John R. Murphy, William Murphy, Robert F. Murphy.

Columbus, O.—Motor Owners' Supply Co.; capital, $40,000; to handle a complete line of automobile accessories and supplies. Incorporators: Geo. A. Archer, W. G. Fisher, James W. Carroll.

Columbus, O.—F. & H. Wire Co.; capital, $25,000; to manufacture and deal in wire wheels for automobiles and accessories of all kinds. Incor-




Two more views of the pathfinding car on the West Hudson and Catskill endurance run. The above illustrations show the extremely muddy state at the present time of some of the roads in the region to be traversed by the tour. By the middle of May, when the run is scheduled to be held, these roads will probably be in excellent condition. Naturally, the scenic attractions will constitute one of the greatest features of the trip, the route to be followed winding up steep grades into some of the most picturesque parts of the Catskills and down into the quaint old, villages filled with legendary interest. The pictures shown above were taken between New Paltz and Newburgh, New York.

Byrne CarterCar Manager—C. J. Byrne has been made manager of the CarterCar Co., Minneapolis, Minn.

Minneapolis Buys Patrol—The Minneapolis, Minn., police department has bought a Winton Six car for use of the detectives and the chief of police.

Critchley President I. A. E.—J. S. Critchley has been elected president of the Institution of Automobile Engineers, London, Eng., for the session 1013-14.

Auto Supply Leases Stores—The Auto Supply Co., Beloit. Wis., has leased the stores at 422-426 State street, Beloit, and will at once establish a large accessory and tire store.

St. Cloud Buys Saurer—The city of St. Cloud, Minn., has bought from the Twin City Motor Co. a Saurer motor sprinkling truck. The machine carries a 1,200-gallon tank.

New Twin City Garage—The Twin City Auto & Tire Co., Marinette, Wis., has purchased three lots on Hall avenue, that city, and will erect a new garage and sales building to cost about $25,000.

Superior Joins A. A. A.—The Superior, Wis., Automobile Club, which has been in existence for five years, has voluntarily voted to join the Wisconsin State Automobile Association and thereby the A. A. A.

Engineers Open Legal Bureau—The Automobile Engineers, St. Paul, Minn., will open a legal bureau and an exchange by which employers may get reliable chauffeurs. A branch is to be established in Minneapolis.

P. O. Tests Automobile—The Montclair, N. J., post office is testing the plan of using an automobile for collection and delivery of parcel post packages. The automobile may be adopted permanently for the parcel post service.

Diemann Granted Garage Permit—William Diemann, 725 Greenfield avenue, Milwaukee, Wis., has been granted a permit to build a garage and salesroom at that location to cost $10,000. No agency lines have been decided upon as yet.

Oil Company Plans Warehouse—The Viscosity Oil Co., Chicago, Ill., which is owned principally by the Travers interests of Beloit, Wis., is planning the establishment of a large warehouse and station at Durand, Wis., to supply the northwestern states.

I. A. E. Trip to U. S.—Up to the present some twenty members of the Institution of Automobile Engineers have definitely intimated their intention to take part in the trip to the United States, but it is anticipated that this number will be doubled before the sailing date arrives. The date for leaving London is May 17.

Goodrich Opens Minneapolis Quarters—The B. F. Goodrich Co., Akron, O., has opened its new quarters in the recently completed Glenwood-Inglewood building, Minneapolis, Minn., utilizing two floors and the basement, each 50 by 150 feet. A balcony is swung over the first floor. The company is making the first showing of the $500 clay model of the factory buildings.

Few Red Sea Coast Automobiles—There are sixteen automobiles in Aden, of which number six motor buses are practically useless. There is one 3 1-2-ton French motor truck. Only two of these cars are American, but one owner proposes to introduce six Fords as public vehicles, and has ordered two. All cars in Aden have been brought there since 1910, and many are second-hand. Only two or three are sold annually.

Changes in Locomobile Company—G. H. Bryan has assumed the duties of assistant advertising manager of the Locomobile Company of America, Bridgeport, Conn. W. H. Davis, Jr., formerly advertising manager of the Stoddard-Dayton Automobile Co., has been placed in charge of truck advertising. A. A. Stewart has joined the service department. F. P. Crockett has been appointed sales manager of the truck division of the Boston, Mass., branch.

Chance for Agency—A report from an American consular officer states that a firm in a Latin-American country, which has been acting as agent for a German automobile manufacturer, claims to have sold over 200 cars in less than two years. This firm now wishes to obtain the representation of a low-priced American car and asks to be put in touch with manufacturers, from whom it desires prices, terms, etc., with catalogs and prices of repair parts. Bank references are furnished and correspondence should be in Spanish. Those interested will please answer through the Bureau of Foreign and Domestic Commerce, Washington, D. C., File No. 10,600.

Automobile Incorporations

porators: L. S. Frayer, Chas. G. Howard, S. K. Wissinger, Chas. S. Hamilton, E. R. Sharp, Jr.

Islip, N. Y.—Brightwaters Garage, Inc.; capital, $1,000. Incorporators: Russell M. Fanning, William H. Corwin, Stewart L. Fanning.

Jacksonville, Fla.—Seminole Rubber Co.; capital, $1,000,000; to manufacture tires and otber automobile accessories. Incorporators: Geo. F. Hardy, Geo. H. Lutz, J. J. Weyer.

New York City—Henscbel Tire & Rubber Co.; capital, $10,000; to manufacture tires for autos. Incorporators: Rudolph Henschel, Anna Henschel, William A. Wollman.

New York City—Hoffman Taxi Cab Co.; capital, $5,000. Incorporators: Richard J. Cruice, Andrew J. Finnerty, Geo. B. Jenkins.

New York City—Mohawk Rubber Co. of N. Y.; capital, $10,000; to deal in tires and rubber goods. Incorporators: Morris E. Mason, Chas. W. McLaughlin, Milton Dammann.

New York City—Peerless Tire Co.; capital, $15,000; to deal in auto tires and tubes. Incorporators: Michael Schiavone, Geo. P. Calenda, Louis Schiavone.

Pittsburg, Pa.—Auto Vulcanizer & Specialty Co.; capital. $5,000. Incorporators: Alfred Dickson, H. W. Graib, Frank L. Stern.

CHANGES OF CAPITAL AND NAME

Cincinnati, O.—Leyman-Buick Co.; capital increased from $50,000 to $100,000.

Columbus, O.—Quiggle Auto Co.; capital decreased from $10,000 to $2,000.

Detroit, Mich.—Lozier Motor Co.; capital increased from $3,000,000 to $5,000,000.

Fremont, O.—Safe Storm Front Co.; capital increased from $35,000 to $100,000.

Philadelphia, Pa.—Standard Gas & Electric Power Co.; change of name to Vulcan Motor Devices Co.

EMERGENCY Automobile Tire—Consisting of a sheet-metal shell, the ends of which are held together by a bolt screwing into threaded openings of the caps which form the ends.

The emergency tire described in this patent consists of a shell made of sheet steel which is wound spirally as seen in Fig. 1. The shell S has left and right threads at its ends and caps C are applied over these threads to reinforce the shell ends. A cable K extends all through the tire and the cable ends are operatively connected with the caps C, holding thec aps tightly in place on the shell ends. The caps are formed with internally threaded members extending into the inside of the tire and a left and right threaded bolt engages these threads, connecting the two shell ends and permitting of tightening or loosening them.

No. 1,057,388—to Frank L. Bigsby, Kirksville, Mo. Granted March 25, 1913; filed October 3, 1911.

Shock Absorber—Including two heads and friction disks between them.

The shock absorber Fig. 2 includes two hollow, abutting heads, each of which has a radially-extending arm and one of which supports a ratchet wheel rotatable in it independently of the head itself. The head carries a pawl which engages the ratchet, permitting its rotation in one direction only; this pawl is disengaged from the ratchet if the latter is moved in the opposite direction. From the center of the ratchet wheel extends a barrel which has radially projecting lugs and is journaled in the opposed head; the latter is formed with radially-disposed notches on its inside face. A number of friction disks are arranged in frictional engagement with each other between the two heads and alternate disks have teeth engaging respectively with the barrel and the notches in the head.

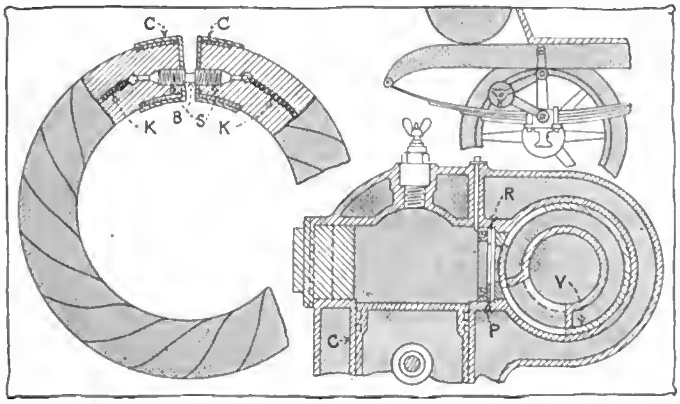


Fig. 1—Bigsby emergency tire. Fig. 2—Bohm shcck absorber. Fig. 3—Tartrais valve packing

No. 1,057,030—to Andrew Bohm, Morristown, N. J. Granted March 25, 1913; filed October 21, 1911.

Rotary Valve Packing—Consisting of a threaded ring in the cylinder wall, a packing ring and a washer between them.

The subject matter of this patent is a packing for a rotary valve, Fig. 3, which consists of a threaded ring R which is screwed into the cylinder wall opposite to an opening which communicates with the rotary valve V provided for admitting and exhausting the cylinder gases. A packing ring P is in contact with the valve V and a washer is in place between the two rings, means being provided for stopping the opening.

No. 1,057,297—to Eugene Henri Tartrais, Montmorency, France. Granted March 25, 1913; filed June 15, 1912.

Automobile Lifting Jack—Consisting of a vertical web formed with a stop for engaging the axle support.

The jack described in this patent, Fig. 4, consists of a body which is formed of a flanged base portion B and a vertical, segmental web W. The latter extends along the longitudinal middle of the base and has a stop on its upper edge. An axle support which consists of a bar B1 pivoted at P to the body and provided with a device adapted to engage the stop serves for raising the automobile and holding its elevated position.

No. 1,057,315—to William T. Adams, Cornith, Miss. Granted March 25, 1913; filed April 3, 1912.

Automobile Tire—Comprising a fabric ring held together by a binder.

The tire described in this patent and shown in Fig. 5 consists of a hard, compact ring R; the latter is composed of transverse, radially arranged plies of woven fabric which are compressed circumferentially, radially and transversely of the ring. The plies of the ring have their threads arranged diagonally to form a wearing surface of thread ends. The plies are held assembled and compressed by a binder B.

No. 1,056,976—to Bradford H. Divine, Utica, N. Y. Granted March 25, 1913; filed March 6, 1911.

Shock Absorber Construction—Being of the friction-disk type.

The shock absorber, Fig. 6, consists of two outer disks, an inner disk of smaller diameter than the outer disks and lever L carrying these disks. A friction member is arranged between one of the outer disks and the opposed face of the inner disk and is provided with a surface which frictionally engages the inner disk; it is formed with a ring outside of the periphery of the inner disk, and another friction element is in place between the ring and the second outer disk. A third friction element contained inside the ring has surfaces co-acting with the second mentioned friction element and one with the inner disk. The three friction elements have contact surfaces spaced different distances apart. One of the levers is movable into successive contact with these surfaces.

No. 1,057,292—to Charles N. Sowden, Guantanamo, Cuba. Granted March 25, 1913; filed June 12, 1912.

Trunnion Radiator Suspension—Ball trunnions resting on cap plates supported by the frame form the suspension.

The subject-matter of this patent is a radiator support for automobiles which consists of ball trunnions attached to opposite sides of the radiator. Two-part cap plates are removably secured to the trunnions and have internal surfaces which conform to them. They have cylindrical external surfaces and fixed brackets on the side frames which have cylindrical bearings inclosing the cap plates and permitting limited longitudinal sliding movement.

No. 1,056,874—to James E. Woodbridge, Bridgehampton, N. Y., assignor to F.I.A.T., Poughkeepsie, N. Y. Granted March 25, 1913; filed June 28, 1907.

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By Way of Correction—In the March 27, 1913, issue of THE AUTOMOBILE by mistake Joseph Borovitz was announced as being appointed chief engineer and factory manager of the Croxton Motor Car Co., Washington, Pa. He has not been engaged by the company.

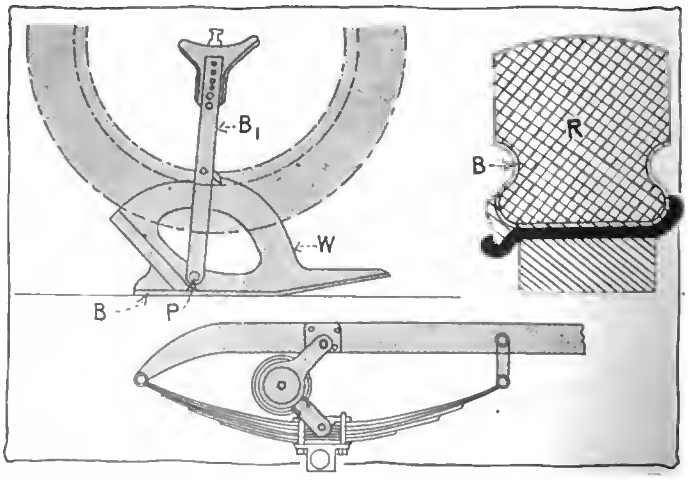


Fig. 4—Adams automobile back. Fig. 5—Divine automobile tire. Fig. 6—Sowden shock absorber

The AUTOMOBILE

NEW YORK, APRIL 10, 1913

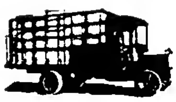
In this issue the
Maxwell Motor Company
publishes an announcement
that is fraught with
more of interest and
concern to Dealers than
any similar announcement
that has been made in
several years past.

PRICE TEN CENTS

Vol. XXVIII New York—Thursday, April 10, 1913—Chicago No. 15

The Automobile

Front view of the largest automobile factory in the world. The plant of the Ford Motor Car Co., Detroit, Mich.



Detroit

The City Built by the Automobile Industry

By L. V. Spencer

DETROIT is the world's automobile center. Its machines have been shipped to every port and have penetrated to every nook and corner of the earth where automobiles are permitted to go. spreading the motor car fame of America's "City of the Straits" broadcast.

Whenever the world thinks of the automobile, it thinks of Detroit. If Mr. Dealer in Naples or Hamburg or Vienna is thinking of taking on a line of motor vehicles, he writes Detroit.

With an estimated production this year of nearly 400,000 machines, valued at close to $500,000,000, Detroit enters the fourteenth year of its active automobile history as the heart of the motor vehicle industry, the growth of which is unparalleled in the annals of the industrial world.

In a decade it has overtopped all of the other healthy industries of the city. Just as Pittsburgh centers the steel industry, as Chicago is noted for its great packing houses, as Marseilles is world-famed for its silk industries, so Detroit is the pulse of an industry which 20 years ago was looked upon as a joke.

Though originally possessing no greater advantages than half a dozen other American cities, Detroit today offers greater inducements perhaps than any other community for the location of factories dependent upon the automobile industry. Here are located parts and accessory plants of all descriptions, in addition to the many automobile factories, and the very concentration of all these different phases naturally means a steady increase from year to year. The automobile maker who intends to assemble his product need no worry about freight rates, or delays in transportation for getting his products to his own plant. It is only necessary to transport them from their places of manufacture, perhaps a distance of a few city blocks or a few miles.

Detroit's automobile manufacturing history dates back to about the year 1899, when the industry assumed the form of a commercial enterprise, although Henry Ford, and R. E. Olds, developed horseless carriages which would actually run before that date. The Detroit Board of Commerce records show that in September, 1899, the Olds Motor Works commenced operations in Detroit with a capital of $500,000, which was then sufficient for the company's activities in that city as well as in Lansing.

Meantime, Henry Ford continued to work with his car, experimenting and inventing and later building a small plant in the suburbs. June 27, 1903, his company was incorporated. The present great Ford plant is the largest in the world.

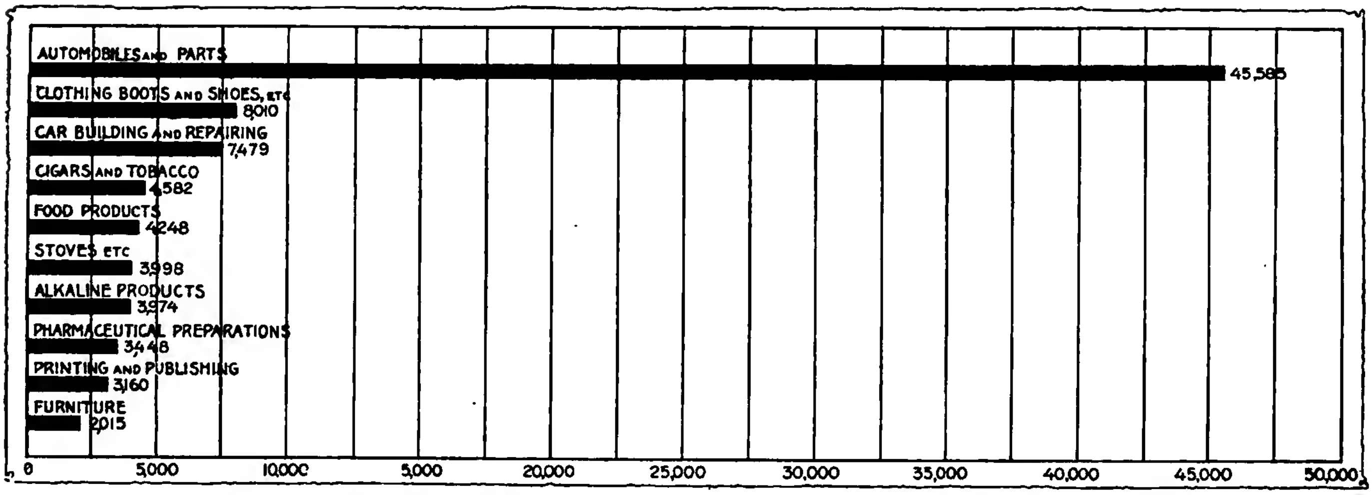
But these early concerns—if they can be called "early" when not yet 15 years old—were soon followed by others.

In 1901 the Cadillac company was launched with a $300,000 capital; and 2 years later, in 1903, the Packard commenced operations with $500,000 capital.

During the year following no fewer than twelve concerns were recorded, and in 1905 ten more took out incorporation papers. None of these twenty-two was ever firmly established and within a few years they were either absorbed by laterly formed companies or were forced to go out of business. Their products were not sufficiently practical to give the public confidence in them and the freak stage had not yet been passed.

In 1909 the Chalmers-Detroit Co., which is now the Chalmers Motor Co., and the De Luxe, since absorbed by the Studebaker Corp., were formed. In 1910 the Regal and the Brush were born. The latter has recently been absorbed by the newly-formed Maxwell Motor Co.

The Detroit automobile industry plans to manufacture cars to a value this year which will exceed the total assessed valuation of the City of Detroit for 1912. The estimated value of the production of cars reaches the stupendous figure of $462,180,000,



Employees of some of Detroit's leading industries in 1911 as compiled by the State Labor Commissioner

while the total assessed city valuation for the fiscal year 1912 to 1913 amounts to $456,816,100.

The accompanying table showing Detroit's annual production of cars from 1905 to the present is of particular interest.

During those 9 years the increase has been almost unbelievable to the average person, but to the Detroiter it is looked upon as the natural course of events. **Any one of a dozen single factories today is manufacturing more complete machines than the entire city industry produced during 1905.**

But the product has practically doubled within the last year, more machines being built here alone than were produced in the rest of the country in 1912, according to the factories' own statements, which bid fair to be lived up to in nearly every case. These figures for the present year are composed largely of passenger cars, although the other classes are fairly well represented:

	1912	1913
Gasoline pleasure cars	185,560	367,450
Gasoline commercials	4,310	12,875
Electric pleasure cars	1,870	3,675
Electric commercials	510	1,150
Totals	192,250	385,150

One big factor in this great passenger car showing is the tremendous production of the Ford plant, which will this year turn out 200,000 complete machines on a schedule soon to be raised to 1,000 cars per day, yet, all classes of vehicles reveal a largely increased production over 1912, the commercial class showing the greatest gain of any and putting the city unmistakably in the lead in the production of business cars, as well as passenger types, as the following percentages will bring out:

	Per cent.
Gasoline commercial car increase over 1912	198.6
Electric commercial car increase over 1912	125.0
Gasoline pleasure car increase over 1912	98.3
Electric pleasure car increase over 1912	96.6

Yet it should not be considered that Detroit has no lines of activity save those connected with the making of motor vehicles. Bearing on this phase of the question the accompanying table, showing the value of Michigan's products as compared with the same lines of endeavor for Detroit alone are of interest.

The automobile industry leads by a comfortable margin, as shown by the census reports, but it is not Detroit's only means of salvation. Brass and bronze products, foundry and machine shop products, tobacco manufactures and so on total high in the millions, and in their respective lines have more than put Detroit "on the map."

In its thirty-three automobile factories now operating, Detroit employs 48,450 wage earners, as compared with 30,863 for 1911.

These figures are exclusive of the parts and accessory manufacturing plants. The increase in number of men so employed has grown in 9 years from 2,000 to near the 50,000 mark.

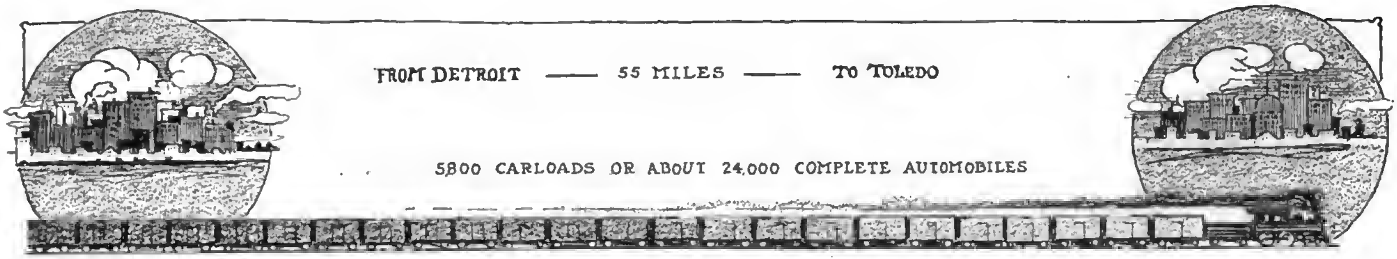
On paper this great army of wage earners does not seem nearly so large as it actually is. When it is considered that there are more men in Detroit employed in making automobiles alone than the entire population of such cities as Allentown, Pa., Berkeley, Cal., Davenport, Iowa, Macon, Ga., and Cambridge, England, the significance of industrial Detroit is perhaps better brought home to the average person. The figures extending over 9 years are given below:

1904	2,034
1905	4,500
1906 (estimate)	6,000
1907 (estimate)	7,600
1908	8,430
1909	16,000
1910	27,200
1911	30,863
1912	48,450

There is a constant demand for automobile workers in Detroit. The above are typical advertisements

Adding to the great number in the automobile plants, the many thousands employed in the accessory and parts making concerns, the 1913 daily average total reaches 72,675 as against 45.585 for 1911.

The number of automobile, automobile parts and accessory plants in 1911 reached ninety-four, while at the present time the industry concentrated in Detroit is inclusive of 158 plants making exclusively automobiles or products pertaining to them. Of course, if the many concerns making such parts as screws, nuts and bolts, which are used in the motor car but which nevertheless are demanded in other constructions as well, are in-



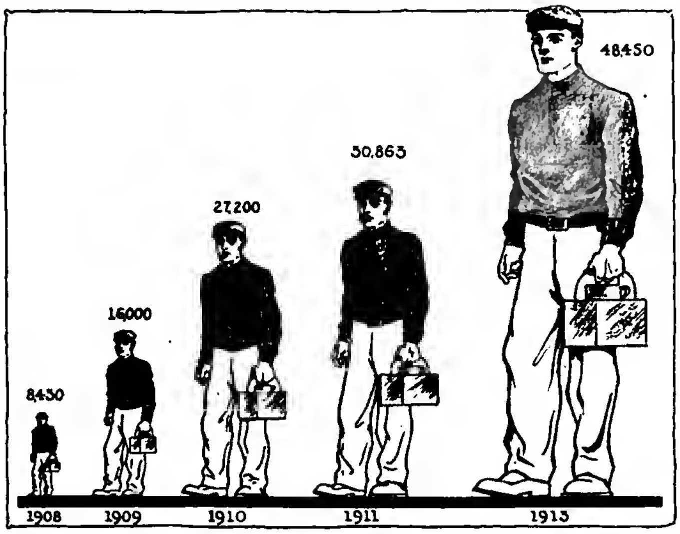
The carload shipments of automobiles from Detroit during February, if made into a single train would reach from that city to Toledo, O.

cluded, the total number of plants would be still further increased.

Since 1910 the automobile factories of Detroit have undergone numerous changes and many of the names once well known are no longer in the automobile roster.

In 1911 there were 2,126 factories in the city and at the present time this has increased to 2,450. The total employed male wage earners in the city during 1911 was 97,056, while in 1913 the number approximates 110,000.

With these figures before us, the exact status of Detroit's leading industry is easily determined. Let us consider the following tabulation, which summarizes the factory figures just given:



The number of wage earners in Detroit automobile factories (exclusive of parts and accessory makers) has increased six-fold in the last 5 years. The above illustration graphically depicts the phenomenal increase which marked each succeeding year

Automobiles and parts	45,585
Clothing, boots and shoes, etc.	8,010
Car building and repairing	7,479
Cigars and tobacco	4,582
Food products	4,248
Stoves, heating apparatus	3,998
Soda ash, alkaline products	3,974
Pharmaceutical preparations	3,448

This table, which shows several of Detroit's leading industries, reveals the fact that each of a half dozen motor car factories employs more men than do some of the other complete industries of the city. The clothing and boots and shoes contingent does not reach the number in the Ford factory alone by some 6,000 men, while the number employed in either the Packard shops, in the Cadillac, or in the Studebaker plants, is in excess of the entire cigars and tobacco following. Yet Detroit is regarded as the "Tampa of the North," so far as the manufacture of smoking materials is concerned, as may be seen by the high standing of that industry in the table given above.

	1911	1913
Wage earners in all automobile parts and accessory plants	45,585	72,675
Number of automobile, parts and accessory plants	94	158
Proportion of motor car industry wage earners to total Detroit population	8.4%	12.8%
Total number of factories	2,126	2,450
Total wage earners in all factories	97,056	110,000
Proportion of automobile parts and accessory plants to total number of factories in the city	4.42%	6.45%
Proportion of wage earners in automobile industry to total wage earners of the city	50%	66%

It will be seen that the proportion of motor car wage earners to Detroit's total population during 1911 was only 8.4 per cent., while in 1913 it has increased to 12.8 per cent., an increase of 4.4 per cent., which is a remarkable gain for a single industry in 2 years.

Comparing the city's wage earners as a whole with those affiliated with the automobile industry, we find that 1911 showed 50 per cent. of the total number of wage earners to be in the automobile class. This year the increase has been 16 per cent. But comparison of the total number of automobile and parts and accessory plants with the aggregate number of factories in the city shows the very small percentage of 4.42 in 1911, while at the present time only 6.45 per cent. of the total number of establishments are in the automobile class. Thus, although the number of factories is small in comparison with the whole, each one of these employs a large number of men and brings the total motor industry wage earners to the head of the list following:

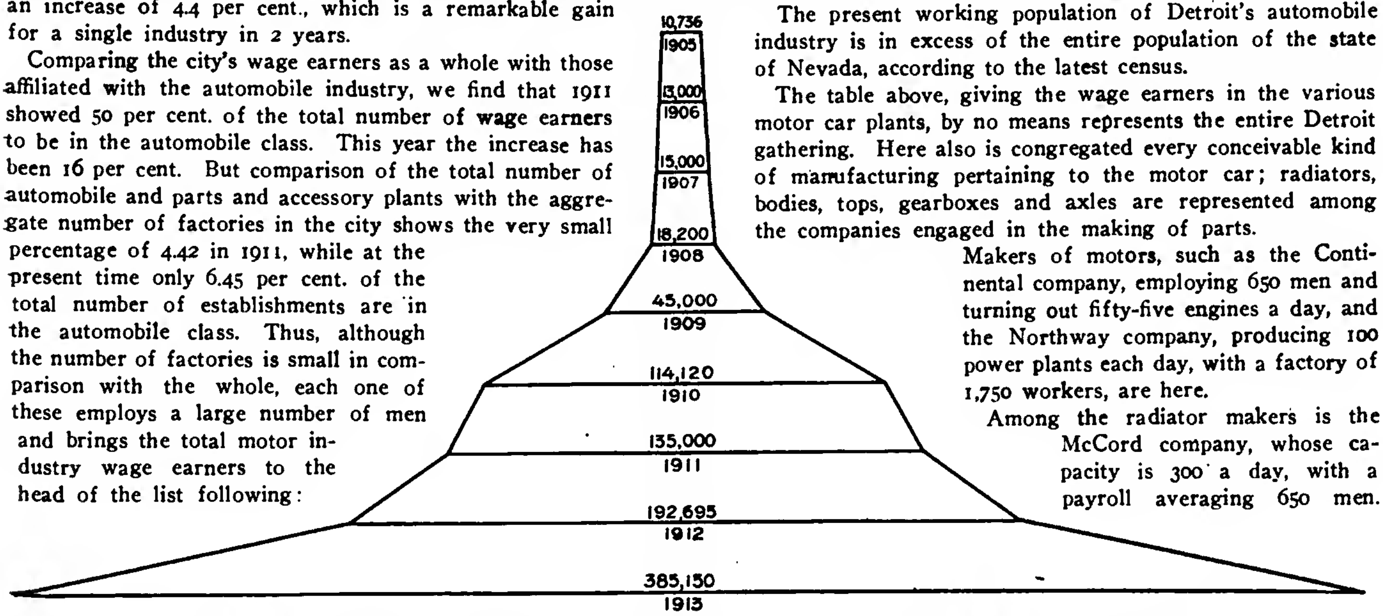
A table showing the number of wage earners in each of the city's automobile plants in 1911 and at the present time is given below. It reveals to the skeptical the difficulty of Detroit's municipal problem of housing thousands of working men close to their places of occupation, which are spread over the entire city and mostly in the outlying districts. No one section may be regarded as the automobile center of the city, for many of the factories are from 4 to 10 miles apart.

The present working population of Detroit's automobile industry is in excess of the entire population of the state of Nevada, according to the latest census.

The table above, giving the wage earners in the various motor car plants, by no means represents the entire Detroit gathering. Here also is congregated every conceivable kind of manufacturing pertaining to the motor car; radiators, bodies, tops, gearboxes and axles are represented among the companies engaged in the making of parts.

Makers of motors, such as the Continental company, employing 650 men and turning out fifty-five engines a day, and the Northway company, producing 100 power plants each day, with a factory of 1,750 workers, are here.

Among the radiator makers is the McCord company, whose capacity is 300 a day, with a payroll averaging 650 men.



The ever-expanding funnel of Detroit's automobile production, showing the increase from year to year

Three examples of modern automobile factory construction to be seen in Detroit. The buildings, besides being large and spread out over a considerable area, are designed to afford plenty of light and air for the workmen

Among the axle contingent is the Timken company, producing 125,000 axles a year and employing 150 men. It is said to be the largest axle factory in the world, having 250,000 square feet of floor-space.

Looking further, we find the Hayes Mfg. Co., retaining 1,100 workers and producing 15,000 to 20,000 automobile bodies a year; the Jeffery-DeWitt company, with its 140 men, turns out 1,500,000 complete spark-plugs a year. It produces 14,000 porcelains each week.

The Holley Bros. company will this year produce 250,000 carbureters on a daily schedule of 1,000 instruments, with an average payroll of 250 men.

Then there is the Disco company, which will turn out 30,000 electric starting devices this year, and which employs 100 men, and the Hyatt Roller Bearing Co., with a force of 1,000 men, turning out over 2,000,000 of its type of bearings.

While the parts and accessory makers are not all on this enormous scale, they are all thriving and each is adding to Detroit's ever increasing production. This year these plants are 125 strong.

With this great production the Detroit industry is face to face with a serious problem—that of securing sufficient automobile freight cars for the transportation of its many machines. Indeed, the freight car situation has been considered of so serious a nature that the Traffic Bureau of the National Association of Automobile Manufacturers has seen fit to open an office in Detroit, in order to better cope with the problem at first hand. Likewise, the Detroit Chamber of Commerce has a similar bureau for the aiding of shippers.

During January, 5,000 carloads of automobiles left the city, while during February this number was increased to 5,800. Before the season is well advanced these figures will be much larger. Each freight car carries from one to eight machines, depending on the size. Considering all makes shipped, it seems probable that the average number of automobiles per freight car runs about four, hence the shipments of machines for the first 2 months of the year have reached the enormous total of about 43,200. February's carloads, if arranged in a single train would have a length of approximately 55 miles, equal to the distance from Detroit to Toledo.

Obviously, with such enormous outgoings of freight cars, it is a very serious matter to insure the return of all of these when empty. Shippers of other classes of goods can make use of the automobile cars as well as they can any other type of box car, while the automobile maker must necessarily use only specially constructed cars which will admit machines through the doors. This handicap has been greatly felt within the last year or so.

But Detroit realizes the need for protecting its automobile factories so far as it is in its power, and through the good offices of the Associated Traffic Bureau and the Traffic Departments of the Board of Commerce it is coping with the situation as best it can.

Last year, Detroit makers were forced to resort to a number of schemes for storing their cars pending shipment. It would have meant many thousands of dollars to have held up the production of cars during the busy season and hence the manufacturers went merrily on while shipping was many times practically at a standstill. Motor cars were stored wherever space was available, the Cadillac company, as a case in point, having sometimes as many as fifty completed automobiles outside its warehouse at one time. Other plants resorted to the use of temporary shelters, such as sheds and tents.

It is probable that this year will see many like instances, although the factories have nearly all increased their floor-space in order to take care of such emergencies.

Table Showing Detroit's Annual Production of Cars and Valuation of Same, Based on Average List Price

Year	Cars Built	Value
1905	10,736	$12,883,200
1906	13,000	15,600,000
1907	15,000	18,000,000
1908	18,200	22,600,000
1909	45,000	54,300,000
1910	114,120	134,587,000
1911	135,000	162,000,000
1912	192,695	231,234,000
1913	385,150	462,180,000

The makers realize the importance of making every freight car count, for at the present time a real famine in rolling stock is predicted for April and May here.

The Studebaker Corporation has just made an investment of over $60,000 for facilities for thus loading its machines. The switch tracks back of its plants are 20 feet above the level of the factory yard and the new loading platform is merely a massive shelf, two city blocks long, with elevators.

Another aspect of Detroit's great position in the industry is brought out by its exports which, though going to all parts of the world, are principally to Canada, England, South Africa and New Zealand. During January and February of this year, Canada bought 267 Detroit cars, valued at $387,231; England purchased 122; South Africa 80, and New Zealand, 30. The table shows the principal exports for the first 2 months of the year:

	No.	Value
Canada	267	$387,231
England	122	134,353
South Africa	80	105,096
New Zealand	30	34,804

Yet, it is not all motor cars which find markets abroad, for the Detroit parts and accessory makers also do a good business with the foreigners; nor is the passenger car alone exported, commercial vehicles having a fairly good sale so far this year. During January and February, passenger cars valued at over $500,000 were sent abroad, while next comes the miscellaneous parts, which aggregated $385,000. The table follows:

	No.	Value
Commercial cars	38	$37,979
Passenger cars	522	652,486
Tires	...	22,859
Engines	1,085	96,334
Other parts	...	385,385
Total value		$1,195,043

Figures Showing the Value of Michigan's Principal Products, as Compared with Detroit Alone. The Automobile Industry Leads. These Figures Are from the Last Census Reports

	Detroit	Rest of the State
Automobiles and their parts	$59,356,000	$37,115,000
Boots and shoes	2,744,000	2,512,000
Brass and bronze products	12,297,000	1,593,000
Canning and preserving	1,568,000	3,403,000
Confectionery	1,136,000	1,808,000
Copper, tin and sheet iron products	3,534,000	1,395,000
Electrical machinery	1,148,000	1,179,000
Foundry and machine shop products	18,296,000	27,103,000
Fur goods	1,738,000	546,000
Iron and steel, steel works and rolling mills	2,297,000	373,000
Leather goods	1,396,000	1,164,000
Liquors, malt	4,942,000	4,898,000
Patent medicines and druggist preparations	11,558,000	1,917,000
Printing and publishing	7,291,000	10,057,000
Slaughtering and meat packing	12,850,000	565,000
Stoves and furnaces	5,676,000	4,547,000
Tobacco manufacturers	12,773,000	3,406,000

With these figures as a basis for estimate for the entire year, 1913 looks to be a record breaker for export business and it should reach $30,000,000 for the value of Detroit-made automobiles alone. From a total of $82,000 worth of machines during 1903, in 10 years Detroit has succeeded in convincing the world of the merit of its machines, yearly increasing its exports at a tremendous rate. This is forcibly brought out below:

1903	$82,933
1904	162,529
1905	255,597
1906	269,554
1907	422,101
1908	399,010
1909	699,706
1910	2,106,615
1911	3,864,994
1912 (estimated)	19,500,000
1913 (estimated)	30,000,000

The present average value of the exported car is, for the commercial class $1,000, and for the passenger type, $1,250, showing that our market abroad is for just the type of medium-priced vehicle on which Detroit's fame is largely based.

Last year the foreign market for American cars reached the stupendous figure of $30,000,000 and of this amount about 65 per

Two more examples of the type of buildings erected and occupied by the automobile manufacturing companies of Detroit. The illustrations furnish a very good idea of the magnitude of the plants, which turn out more automobiles than all the factories of Europe combined

An avenue at the Packard factory during the noon hour. Here 6,700 men are employed to build 4,500 automobiles and trucks

Double-decking shipments by the Studebaker loading crews

cent. was paid to makers of Detroit, proving that cars made here have withstood the test of foreign roads and foreign conditions.

An interesting feature of the financial side of Detroit's invasion of the foreign low-priced car market is furnished by the Commercial Manager of the First National Bank of Detroit. "The first question of the shipper entering the foreign export trade," he says, "will be invariably, 'How am I to be paid for my goods?' "

"If the foreign buyer has remitted the cost of the car when placing his order the procedure is the same as for home sales, as all he has to do is to ship the car consigning it to the buyer. If, however, the cars are to be paid for on arrival, the service of

Noontime at the Ford factory, which is working on a schedule of nearly 1,000 cars a day. There are over 14,000 men on the payroll

a bank having its own correspondents abroad is required and it is a part of that bank's function to collect the drafts made against these shipments. Such drafts supported by the necessary shipping documents may be discounted by the bank as are domestic drafts.

"In other cases, the buyer abroad arranges for a bank credit which authorizes the Detroit shipper to draw under specified terms a draft with shipping documents attached for the exact invoice amount in a foreign currency. Such drafts are readily salable and can be bought by the bank operating a foreign department so that the shipper receives the exact invoice amount for his goods on the day they leave his factory.

"These credits are generally established in pounds sterling and have become quite popular with Detroit shippers. An exporter operating under such credit is relieved from the responsibility ordinarily attached to his direct drafts upon the consignee, so that an arrangement of this kind is a most desirable one."

A review of Detroit's position in the industry would be incomplete without a few references to the greatest of all the world's automobile factories, the Ford plant. It is difficult for the average person outside of Detroit to realize that this single factory will manufacture this year 200,000 complete machines, yet it is a fact, the minimum schedule calling for 150,000 cars with a reserve of 50,000, which from all indications now will all be needed to supply the demand.

WAGE EARNERS IN DETROIT AUTOMOBILE FACTORIES

Abbott	430	450
Anderson	390	600
Briggs-Detroiter	....	250
Brush	720	(See Note A)
Cadillac	5,400	6,000
Chalmers	2,350	2,700
Chevrolet	24	275
Commerce	....	35
Federal	60	100
Flanders (Everitt-Metzger)	806	(See Note A)
Ford	3,500	14,500
Grabowsky	325	....
Herreshoff	40	110
Hudson	675	1,150
Hupp	600	3,000
Keeton	....	200
King	40	125
Krit	340	275
Lozier	640	900
Maxwell	....	(See Note A)
Packard	6,200	6,700
Paige	100	350
Poss	20	....
R-C-H	600	520
Regal	350	600
Sampson (Alden) Co.	450	(See Note A)
Studebaker (EMF)	6,350	7,900
Warren	200	225
Add for unnamed, etc	253	1,385
	30,863	48,450

Note A—The Flanders, Brush and Sampson plants, which are subsidiaries of the Maxwell Motor Co., are now operating, but we are not at liberty to give their present number of employees. The total of the Maxwell wage earners in Detroit, however, is included in the miscellaneous figure at the bottom of the list.

And yet, the Ford plant, though many times larger than any of its neighbors, is only one of the thirty-three within the boundaries of the city.

No one will dispute the great influence which the mammoth industry has had on the city's growth. Its population in 10 years has increased nearly 150,000 and its building has gradually risen until it is today among the leaders in total annual building cost figures. The table below, showing building statistics for sixteen cities during the last year, serves to indicate Detroit's position. It has surpassed St. Louis, Cleveland, Washington, Kansas City, Pittsburgh, Buffalo and many other cities of its size.

San Francisco	$20,915,000
Boston	19,287,000
DETROIT	19,014,000
St. Louis	18,613,000
Cleveland	16,994,000
Washington	16,562,000
Minneapolis	13,735,000
Kansas City	13,274,000
Milwaukee	12,465,000
Pittsburgh	12,300,000
Cincinnati	11,808,000
Buffalo	10,335,000
Baltimore	8,991,000
St. Paul	8,915,000
Denver	6,086,000
New Orleans	3,157,000

It has been said in some quarters that Detroit's banks are too intimately related to its automobile industry and that should the industry fail, it would carry with it many millions of dollars in the banks. Surprising as it may seem, the average Detroit bank carries only about 25 per cent. of business chargeable to the automobile industry, directly or indirectly. The city's many lines of activity contribute greatly to its resources and it is incorrect to believe that a municipality which today ranks ninth in banking activities, having grown from a position near the bottom of the list, would be so tied up with any one line of activity that a general failure of that line would carry with it all the financial intesets of that city. Still, the automobile industry has done more toward the rise of the city than any other.

Detroit has risen to its present position on a firm foundation and is here to stay. It has come to be one of the great industrial communities of America and is destined for a greater future. Conservative estimates give it a population of 1,000,000 in 1925, and, granting a proportionate growth in other respects, the city's future has no black cloud to mar its bright prospects.

The Studebaker shipping organization, like that of nearly every other Detroit automobile plant, cultivates efficiency. The illustration shows an hydraulic elevator lifting cars from the factory yard to the loading level. Car can be brought to the platform regardless of the position of trains on the sidings. The shipping equipment of the company represents an investment of $60,000. The switch tracks back of the plants are 20 feet above the level of the factory and the new loading platform is a massive shelf as long as two city blocks, with railroad sidings

Upper right—Hudson cars stored in tents owing to lack of storage space. Bottom—Cadillac cars parked in front of the company's warehouse for the same reason

Tariff To Cut Duty on Chassis and Parts

Wilson-Underwood Schedule Proposes Reduction of 15 Per Cent. on Chassis and 25 Per Cent. on Finished Parts—Duty on Complete Cars To Remain 45 Per Cent.

The Old and the New Schedules

Article	Payne	Underwood
Automobiles, finished	45%	45%
Automobile bodies	45%	45%
Automobile chassis	45%	30%
Finished parts except tires	45%	20%
Axles and parts	¾c. lb.	10%
Chains	3c. lb.	24%
Cylindrical tanks	30%	20%
Flexible tubing	30%	20%
Bolts, blanks, nuts, washers	1⅛c. lb.	15%
Spiral nut locks and washers	¾c. lb.	35%
Files and file blanks, rasps	25-77c. doz.	25%
Rivets*	45%	20%
Bearings and parts	45%	35%
Rough forgings, iron and steel	30%	15%
Machined tools	30%	5%
Misc. articles, Fe, Cu, Ni, Zn, Al or other metals, n. spec.	45%	25%
Tar-oil spreader for roads	30%	Free
Nails	.4 to ¾c. lb.	Free
Welded tubes, from corr. or plate	2c. lb.	20%
Other iron and steel tubing	30%	20%
Lap and butt welded, seamed and joined iron and steel tu. and pipe	1 to 2c. lb.	20%
Iron ore	15c. ton	Free
Iron, pigs, kentledge, spiegeleisen	$2.50 ton	8%
Wrought and cast scrap iron and steel	$1 ton**	8%
Ferromanganese	$2.50 ton	15%
Ferrosilicon	$5 ton to 20%	15%
Iron in stages between pigs and bars, except castings, muck bars, bar iron, square iron, rolled or hammered	.3c. lb.	8%
Round iron in coils, roads, bars or shaped, rolled or hammered	.6c. lb.	8%
Hoop or band iron and steel, mfd.	.3c. lb.	Free
Iron and steel plates and sheets	1.2c. lb.	20%
Steel ingots and similar shapes	7-40c. lb. to 20%	10%
Iron or steel-made abrasives	1c. lb.	30%
Steel and wire rods	.6c. lb.	10%
Cast iron pipe	.25c. lb.	2%
Iron castings, advanced but not finished	.2c. lb. plus .7c. lb.	10%
Malleable castings	.7c. lb.	10%
Lead-bearing ores of all kinds	1.5c. lb. on lead in it	.5c. lb. on lead in ore
Lead dross, lead bullion, base bullion, old refuse run into bars and blocks fit only for remaking	2.125c. lb.	25%
Zinc-bearing ores, all kinds	Free if less than 10% Zn.; if more, .25 to 1c. per lb. zinc	10%
Zinc metal	1.625c. lb.	10%
Zinc in sheets	1.75c. lb.	10%
Zinc, old and worn out	1c. lb.	10%
Aluminum	7c. to 3c. lb. plus 25%	25%
Castor oil	35c. gal.	15c. gal.
Litharge	2.5c. lb.	25%
Zinc, white, oxide	1c. lb.	10%
Paints, colors, pigments	30%	15%
Pumice	.25c. lb.	5%
Mica, trimmed only	5c. lb. plus 20%	30%
Mica and mica products	10c. lb. plus 20%	30%
Electrodes, brushes	30%	25%
Grindstones	$1.75 ton	$1.50 ton
Guttapercha, India rubber and products	35%	10%

*Includes rivets for studding tires.
**Includes only material ready for re-manufacturing.

WASHINGTON, D. C., April 8—Under the new Wilson-Underwood tariff bill introduced today many reductions are made in automobiles and automobile parts, as well as in raw materials that go into the makeup of cars. On chassis imported the present duty of 45 per cent. *ad valorem* is cut to 30 per cent. but complete cars made up of chassis and body remain at the 45 per cent. mark.

On finished parts going into the makeup of a car the reduction is still greater, being from 45 per cent. to 20 per cent.

On ball and roller bearings the tariff is cut from 45 to 25 per cent., almost as much as on finished parts.

Other reductions include axles and parts, chains, rough forgings, malleable castings, steel ingots, iron in stages between ingots and bars, iron ore, welded tubes, flexible tubing, cylindrical tanks, and a score or more of other articles as enumerated in the schedule herewith in which the tariff under the new Underwood proposed plan is in one column and the present tariff under the Payne schedule in the other.

What the attitude of the American car and parts makers will be to the proposed reductions cannot be stated at this time but if telegraphic expressions can be taken as a criterion, the present outlook is not considered seriously. Henry B. Joy, president of the Packard company and chairman of the Tariff Committee of the National Association of Automobile Manufacturers, expresses himself as follows on the new schedule:

"It is impossible in so short a time for me to formulate any serious and intelligent opinion as to the effect of the new Wilson tariff bill in detail. Any person must know that when the fence is taken down the cattle and hogs will get into the corn field. Just so the greater imports will take place under reduced tariffs in very many lines of industry. How serious this will be time can only prove. It is a self-evident principle that when materials are purchased from abroad American employment and production in those articles is to that extent so much curtailed."

Col. Charles Clifton, member of the tariff committee, has expressed himself by saying: "Too early to give anything definite regarding the working of proposed tariff, I am satisfied, however, that the American automobile industry is here to stay."

James Couzens of the Ford company, says: "Do not believe reduction in tariff on automobiles or any of the parts entering therein will materially, if at all, affect the industry. At present details are too limited to speak accurately, but on the surface we have no opposition to make to any of the new schedules."

R. D. Chapin, of the Hudson company, expresses himself to the effect that: "From the information so far at hand I can see no detrimental effect to the automobile industry in the proposed tariff reduction."

Detroit Makers Show Little Concern

DETROIT, MICH., April 8—*Special Telegram*—There appears to be very little concern among the Detroit manufacturers of automobiles as to the contemplated reduction of import duties on automobiles and other products used by the motor car industry. While it is yet quite early for any of the heads of the industry here to formulate any conclusive opinions as to the effects of the new Wilson tariff bill, it is the consensus of opinion of the half dozen prominent makers interviewed today that the proposed reductions would make little or no difference to the industry as a whole.

Imported products used today in automobiles are less than 1 per cent. as compared with those obtained from domestic sources. The greatest percentage of parts imported are ball bearings, which probably amount to from a half to two-thirds of the number used in American cars.

The makers in this country are very much better equipped to make moderate priced and cheap cars than are the Europeans and hence very material tariff reductions would have little or no effect in this direction. However, this would not hold true in other industries, which are not so well equipped for cheap production, such as woolen goods manufacturers, and so on. The reductions will have no appreciable effect upon car cost, although raw metals, such as aluminum, nickel, antimony, lead and so forth would be imported at slightly less cost than under the present tariff schedules. However, the importations of these products by automobile manufacturers are in the minority as compared with those obtained here at home.

Opinions of Other Makers and Importers

A. L. Riker, of the Locomobile company takes a slightly different view of the proposed tariff, and states: "I greatly fear that if this bill reducing the duty on chassis from 45 to 30 per cent. and on finished parts from 45 to 20 per cent. goes through, it will have a disastrous effect on the American automobile industry, for it will permit foreign chassis to be imported at a lower cost than the American manufacturer can produce them; and as proof of this, the American manufacturers have submitted statistics to the Senate Finance Committee showing that if the duty were so reduced it would be difficult for the American market to compete with the European market."

The views of importers of complete cars are best expressed in the brief which they presented before the Ways and Means Committee some months ago, asking for reductions on chassis and parts. The present reduction in tariff would mean considerable to the purchaser of an imported car. In some cases it would amount to one-half of the difference between 45 per cent. and 30 per cent., in other words, 7.5 per cent. ad valorem.

Mr. Hoey, of the Benz interests, says: "That reducing the duty on a chassis from 45 to 30 per cent. would cause a material reduction of prices. A 36-horsepower model now costing $5,600 would probably be reduced to $5,000. Similarly with commercial motor vehicles, a truck listing at $6,000 would probably be reduced to $5,300 and other trucks, chassis, selling at $5,250, could be cut to $4,500."

Henry N. Allen of the Metallurgique interests, is authority for the statement that: "With the present practice of importing complete cars from France, the prices on his cars would not be influenced. There is a possibility of a French body builder opening a factory in this country, which would permit the chassis to be imported and bodies built in this country under which arrangement there could be a reduction of $500 in the selling price of a $6,500 car."

The attitude of the importer of foreign automobiles is expressed in the brief submitted by E. Lascaris on behalf of the Automobile Importers' Alliance at the hearing on January 10, before the Committee of Ways and Means. In this brief it was suggested that the duty of 45 per cent. on finished automobiles was prohibitive and no longer necessary. This view was supported by the fact that whereas 781 cars were imported up to December 1, 21,700 cars were exported.

In the importers' brief, protest was made against the classification of the automobile as a luxury. The product of the fourth largest industry of the country is used as a matter of necessity by doctors, farmers and the world at large.

The importers were of the opinion that a duty of 25 per cent. would be more fair to all concerned than the present 45 per cent. At the suggested rate the importers pledge themselves to import 3,000 cars at an approximate value of $6,810,000. On this amount the duties would be $1,702,500. At the present rate of duty the value of the parts imported is 15 per cent. of the value of the total import but with the reduction asked the increase in parts imported would raise the revenue from parts alone $255,000.

As far as reduction in price to the consumer is concerned, if the Underwood schedule went into effect, Mr. Lascaris stated in his brief that the average price for the year of 1912 of the foreign car is $2,275, and the average price of the exported American article $1,000. The average selling price of the foreign vehicle in America is $4,500. The average selling price of the American vehicle is $3,000. The difference represents the duty and freight, 50 per cent.

Views of the Parts and Accessory Makers

To the importers of ball and roller bearings the proposed cut in tariff from 45 to 35 per cent. is disappointing as they had requested a reduction to 25 per cent. or possibly 20. The importation of ball bearings for use in motor cars is an important item, and the briefs filed before the Committee of Ways and Means at Washington show that approximately 75 per cent. of the ball bearings used in American cars are imported, but 25 per cent. being of home manufacture. The brief further states that approximately 80 per cent. of the ball bearings manufactured in Germany are exported to America. The figures show that during 1912 anti-friction bearings were imported to the gross value of $1,508,939 which, on the 45 per cent. schedule paid a duty of $679,022.55. To this sum freight to the extent of $75,446.95 has to be added, giving a grand total for the year of $2,263,408.50, as the gross value of foreign ball bearings included duty and freight when landed here.

This brief further shows the steady increase which has been made in the importation of anti-friction bearings within the last few years. The figures for custom receipts are: 1908, $57,000; 1909, $193,000; 1910, $597,000; 1911 $487,000; 1912, $679,022.55.

The brief presented by the ball bearing importers further states: "Steel balls and ball bearings are imported from Germany Italy, France, Sweden, Switzerland, and England, and if the tariff on steel balls and ball bearings is reduced to 25 cents, it is evident that competition will compel the importers of these goods to give the benefit of this reduction to the user."

The representatives of American bearings in their petitions to the Ways and Means Committee stated that: "American labor costs two to two and one-half times that of foreign labor in this branch of the metal industry, and further the foreign product comes into fair competition with us, and that only 2 1-2 per cent. of this product is represented in the cost of an automobile, hence there is no reason for disturbing the present duty of 45 per cent."

The Rhineland Machine Works, represented by J. W. Blackford, when asked what would be the practical reduction of the duty on bearings from 45 to 35 per cent., stated that if the manufacturer of cars received the larger share of the benefit accruing from such a reduction he had every reason to be satisfied; and that the company felt it was itself also entitled to a margin of the profit caused by a reduction.

Louis Marburg, of Marburg Bros., estimated that the actual wholesale price reduction which will be caused by a 45 to 35 per cent. cut of the duty would be about 5 per cent. of the present wholesale price to manufacturers.

The R. I. V. company was of the same opinion with regard to a wholesale price reduction.

J. H. Lehman, of the J. H. Lehman Mfg. Co., stated that in the case of his company, if the tariff were actually reduced, the manufacturer would get the full benefit of the reduction, whatever it makes.

A prominent importer stated that the reduction to the car manufacturer will amount to from 5 to 7 per cent. of the present price, if the proposed reduction of duty to 35 per cent. goes through.

To Build Church Cars

CHICAGO, April 9—Formation of a $1,000,000 corporation to be known as the Church Motor Car Co., recently incorporated in Delaware, has just been announced to manufacture pleasure cars and trucks using the Church pneumatic system automatic motor, which has been developed by the Automatic Motor & Engineering Co., Chicago.

The incorporators of the new Delaware corporation are: A. G. Latter, W. J. Malony and N. P. Coffin. Manufacture of cars in quantities will commence in Chicago immediately, and it is expected to have the first model on the street by the middle of May and deliveries will commence, according to present plans, by September 1. Efforts are being made to obtain a factory site in Detroit, and the permanent plant will be established in that city, the Chicago factory being only temporary.

The car will be radically different from existing types so far as power plant is concerned, as it will employ the pneumatic motor and transmission system developed by Edmund S. Church. This involves a pneumatic clutch which takes the place of both clutch and gearset and also is automatic in that the ratio of engine speed to car speed varies automatically with the load. The system at the same time provides for pressure fuel injection pneumatic starter and tire inflater and pneumatic tire jacks. It it stated that the engine handles not only gasoline but kerosene and even crude oil as fuel. The motor is four cylinders, 3 1-2 inches bore and 5 inches stroke, and rated by the maker at 90 horsepower. The car will appear in three models of 132 inches wheelbase and the bill includes a touring car, roadster and speedster. It is to be sold at about $2,500.

United Rim Co. Dissolves

AKRON, O., April 8—The United Rim Co., of this city, held a formal meeting Friday and decided to dissolve. R. B. Beebe, its sales manager, was appointed trustee to wind up the company's affairs as soon as possible, which will be not later than June 1. The United Rim Co. is a holding company owning the rim patents of Goodyear, Goodrich, Morgan & Wright, Hartford, G. & J., Diamond and Continental.

Truck Industry Grows 200 Per Cent.

Estimated Production for 1913 Is 51,586—Total Value of Vehicles Made Estimated at $98,288,872—There Are About 280 Gasoline Vehicle Manufacturers and Thirty-Two Electric Vehicle Makers

NEW YORK CITY, April 9—Surprisingly rapid growth by the commercial vehicle industry is indicated by reports of production received from manufacturing companies during February and March, 1913, by the National Association of Automobile Manufacturers. The results of this second census of the industry by the association are given in detail in a statistical report just issued to the trade and are compared with the results of the previous census to show the increases in output and the fluctuations in average prices from year to year.

The total output of commercial vehicles of all kinds and types reported for the year 1912 by 170 companies was 21,939, as compared with a total of 10,655 reported for the year 1911 by eighty-five companies, and 10,374 reported for all preceding years combined up to the end of 1910 by the same eighty-five companies. It is believed these companies represented about 75 per cent. of the total production of the country, while the 170 companies reporting for 1912 and 1913 probably represent about 90 per cent. of the total output.

The estimated production for the year 1913 is 51,586 vehicles.

The figures given show that each year's output closely approximates the total output of all preceding years combined, thus:

Reported output prior to 1911	10,374 + 25%	=	12,968
Reported output during 1911	10,655 + 25%	=	13,319
			26,287
Reported output during 1912	21,939 + 10%	=	24,133
			50,420
Estimated output during 1913	51,586 + 10%	=	56,744

This is a rate of growth of approximately 200 per cent. annually.

The total value of the vehicles reported made in 1912 was $42,942,828, and of the estimated reported production in 1913 $98,288,872. These figures compare with an aggregate value of $22,292,321 for the vehicles produced in 1911 and of $20,485,231 for all vehicles manufactured prior to the end of 1910.

With the exception of a dozen or fifteen companies, all of those that failed to send in reports are relatively new companies that produced few or no vehicles last year or are older companies whose individual output probably did not reach fifty vehicles in any case.

Index of Industry's Growth

The data furnished in the reports provide a valuable index of the growth and trend of the motor truck industry. Some makers may be disappointed in their expectations for the present year, but on the whole the estimates of production for 1913 are believed to be fairly conservative, as nothing was to be gained by any manufacturer in exaggerating his figures, because the census was a secret one in which names of companies were not to be attached to the reports.

Although 280 gasoline vehicle manufacturers and thirty-two electric vehicle makers are listed in one of the leading automobile directories, the association has been unable to elicit replies to communications of any nature from about 40 per cent. of them, from which it is assumed that they are not very active or important.

Reports received from the 170 companies are classified as follows: Gasoline vehicle makers, 140; electric, twenty; mixed system, three; gasoline fire apparatus, seven; tricars, three; tractors, two; steam, one. The gas-electric vehicles and the tractors are made by the electric and gas vehicle makers.

Analysis of the reports shows that the largest and most rapid increases in numbers have been made in the 1,000, 1,500, 3,000, 4,000, 6,000 and 10,000-pound capacities in gasoline vehicles and in the 1,000, 2,000, 4,000 and 7,000-pound sizes in electric vehicles.

There has been a notable tendency to change models, particularly among the gasoline vehicle makers. Taking account only of companies making full reports for both years, 1912 and 1913, it is found that thirty-five models have been dropped by the gas car makers and forty-four new models added, while the electric vehicle makers have dropped twelve models and added five. The changes are most pronounced in the 2,500, 3,000, 5,000, 7,000, 8,000 and 12,000-pound sizes in gasoline vehicles and in the 1,500, 2,000, 3,000 and 7,000-pound capacities in electrics.

The mean average price of all the commercial vehicles produced in 1912 was $1,957.37; that of the gasoline cars, $1,868.95, and of the electric vehicles, $2,465.18. In 1911 the average value of all gas trucks sold appeared from the records to be $2,079.16 and for all preceding years combined was $1,955.70, while in 1911

Automobile Securities Quotations

The rubber quotations still maintain the fluctuating qualities exhibited during the last few weeks. Goodrich has jumped 5 points and Goodyear has fallen off the same amount. The other rubber quotations have been fairly steady, Ajax-Grieb being at the same figure as last week. The other quotations will be found to be fairly strong as may be expected from the fact that the reports of flood disasters have proven for the most part greatly exaggerated.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	150	165
Ajax-Grieb Rubber Co., pfd	..	..	94	99
Aluminum Castings, pfd	..	..	98	100
American Locomotive Co., com	39	39½	37	37¾
American Locomotive Co., pfd	106	106½	103	106
Chalmers Motor Company, com	..	..	130	140
Chalmers Motor Company, pfd	..	..	98	102
Consolidated Rubber Tire Co., com	11	17	19½	23
Consolidated Rubber Tire Co., pfd	20	40	60	75
Firestone Tire & Rubber Co., com	234	236	272	280
Firestone Tire & Rubber Co., pfd	108	110	104	106
Fisk Rubber Co., com	..	..	..	..
Fisk Rubber Co., pfd	..	..	95	102
Garford Company, preferred	..	..	99	100½
General Motors Company, com	30	31	30¼	33
General Motors Company, pfd	78	79	77¼	80
B. F. Goodrich Company, com	..	..	37½	38
B. F. Goodrich Company, pfd	..	..	97	100½
Goodyear Tire & Rubber Co., com	397	400	330	340
Goodyear Tire & Rubber Co., pfd	108	110	100	101½
Hayes Manufacturing Co	..	..	..	90
International Motor Co., com	..	..	5	10
International Motor Co., pfd	..	..	30	40
Lozier Motor Company	..	..	..	20
Maxwell Motor Company, com	..	..	5	10
Maxwell Motor Company, 1st pfd	..	..	50	70
Maxwell Motor Company, 2nd pfd	..	..	20	35
Miller Rubber Company	..	..	176	180
Packard Motor Company	104	107	98	102
Peerless Motor Company, com	..	..	35	45
Peerless Motor Company, pfd	..	..	95	100
Pope Manufacturing Co., com	37	40	17	22
Pope Manufacturing Co., pfd	78	80	54	57
Reo Motor Truck Company	8	10	11¾	12¼
Reo Motor Car Company	23	25	21	22
Rubber Goods Mfg. Co., pfd	100	105	100	105
Studebaker Company, com	..	..	30	33
Studebaker Company, pfd	..	..	90½	92½
Swinehart Tire Company	..	..	92	95
U. S. Rubber Co., com	56	57	66½	66¼
U. S. Rubber Co., 1st pfd	114	115	108	108½
White Company, preferred	..	..	107½	109
Willys-Overland Co., com	..	..	64	69
Willys-Overland Co., pfd	..	..	92	98
Portage Rubber Co., com	..	..	38	42
Portage Rubber Co., pfd	..	..	90	94

the average price of all electrics reported was $2,759.66, and for all preceding years was $3,369.72.

Fluctuations in prices of the various sizes of both gas and electric vehicles over a period of years show that the price of the 1,500, 3,000, 4,000, 8,000 and 10,000-pound sizes of gas vehicles have decreased materially, while the prices of the 2,000 and 6,000-pound sizes have increased notably. In electric vehicles the average prices of the 1,000, 2,000, 4,000, 8,000 and 10,000-pound sizes have been reduced while in the 1,500, 3,000, 7,000 and 11,000-pound sizes they have increased.

Output and Valuation of Different Classes of Commercial Vehicles

Reported by 170 companies in February and March, 1913.

	1912		1913	
	No. Cars	Aggregate Value	No. Cars	Aggregate Value
Gasoline vehicles	20,052	$37,474,308	44,245	$83,073,200
Same, value estimated*	100	162,357	1,775	2,620,847
Fire apparatus	140	843,900	232	1,422,250
Same, value estimated*	135	813,760	260	1,595,200
Gasoline tricars	58	23,610	1,500	662,500
Gasoline tractors	42	122,500	800	2,125,000
Electric vehicles	1,351	3,330,568	2,736	6,627,750
Mixed systems	59	163,800	25	108,125
Steam vehicles	2	8,025	13	54,000
Totals	21,939	$42,942,828	51,586	$98,288,872

NOTE—Production reported with no values given; values calculated on average prices of other vehicles of same kind and capacity.

Output of Commercial Vehicles Compared by Years

	Reported by 85 companies:		Reported by 117 companies:	
	Sold prior to 1911	Sold in 1911	Made in 1912	Output for 1913
Gas vehicles	10,230	10,451	20,528	48,867
Electric vehicles	144	204	1,351	2,736

Average Prices of Commercial Vehicles Compared by Years

	Prior to 1911	During 1911	During 1912	For 1913
Gas vehicles	$1,955.70	$2,079.16	$1,868.95	$1,877.57
Electric vehicles	3,369.72	2,759.66	2,465.18	2,422.44

No More National Truck Shows

NEW YORK CITY, April 7—The executive committees of the N. A. A. M. and Automobile Board of Trade at their meeting on April 3 reached the decision that no more truck shows were to be held in New York and Chicago hereafter. This action has been foreshadowed ever since the closing of the shows in these two cities this year, and now has become definite.

Incidentally, the two bodies decided that it would he of advantage to hold one large pleasure car show instead of two, and it was decided to exhibit all the automobiles, during a 1-week show, in the Grand Central Palace, where plenty of space is available, while the Madison Square Garden has proved more and more inadequate during the last few shows.

While in previous years the ground floor and two stories of the Palace were used for automobile exhibitions, for 1913 three additional floors will be devoted to this purpose, giving a total of six floors. Each of these has 55,000 square feet, making a total of 330,000 square feet. If necessary, even more space could be provided. The Palace has ample elevator facilities so that the show will be as easy to view as if all the cars were stationed on one or two floors.

Automobile Blue Book Sues A. C. A.

NEW YORK CITY, April 7—The Automobile Blue Book Publishing Co. has filed suit, in the District Court of the United States. Southern District of New York, against the Automobile Club of America, alleging infringement by the latter of the copyright granted on various editions of the several volumes of the Blue Book.

The hill of complaint tends to show that the Tour Book of the Automobile Cluh of America, published in recent years, and, according to the Blue Book, to he published again in 1913, utilizes the information gathered laboriously by the editors of the Blue Book and compiled in this publication. It it claimed that the information thus collected and published has been rearranged and put in a new guise.

After lining up the preliminary evidence, the bill of complaint prays for a perpetual injunction restraining the A. C. A. from publishing and selling the Tour Book, the sale of which, it is claimed, actually injures the business of the Automobile Blue Book.

Third Motor Spirit Plant

Another Refinery for New Fuel Added to Standard Oil Plant at Neodesha, Kansas

CHICAGO, ILL., April 5—A third refinery for production of Motor Spirit, the new fuel, will be in operation by the first of next year. This refinery will be an addition to the present oil refining plant of the Standard Oil Co. at Neodesha, Kan. The addition, including the stills for the production of the new fuel, will represent an outlay of about $200,000. Motor spirit will be distilled by the Burton process of pressure distillation under royalties from the Standard Oil Co. of Indiana.

Two other refineries are producing the new fuel, one at Whiting, Ind. and the other at Alton, Ill. At the Whiting plant about $2,000,000 worth of apparatus has been installed to produce and handle motor spirit. The production of this plant is about 50,000 gallons of motor spirit daily and that of the Alton plant is about 10,000 gallons daily. The production of both plants is being increased as rapidly as new stills can be put in commission.

Brown Co. Sues 35 Per Cent.

NEW YORK CITY, April 9—The Brown Co., Syracuse, N. Y., has filed suit in the U. S. District Court, Southern District of New York, against the Thirty-five Per Cent. Automobile Supply Co., claiming that the latter are infringing upon patent No. 43,241 granted on November 5, 1912, to Carley Gould Weld, assignor to the Brown company. The subject-matter of the patent is an engine-driven tire pump of the spark-plug type.

Market Changes of the Week

This week's markets were noted for their steadiness, few changes taking place. Scrap rubber rose $.00 1-8 on Saturday, calling at $.10. It remains in a firm position. Stocks abroad are light and strength there is reflected here. Cottonseed oil fluctuated throughout the week its highest price being $6.85 a barrel, and the closing $6.70, with no change. There has been some falling off in the consuming demand, according to all accounts, especially with lard showing a weaker tendency. The movement of petroleum into consuming channels continues liberal and the market here retains a firm tone. Both petroleums remained constant, Kansas at $.88 and Pennsylvania at $2.50 per barrel. There was an absence of new developments in the fish oil markets. The trading was generally limited to jobbing quantities. Gasoline remains firm at $.22 1-4. Tin this week fluctuated but managed to close at $48.00, experiencing no change, an unusual event. Electrolytic and Lake coppers both rose, the first $.00 1-4 and the second $.00 1-8. The lead market is quiet and slightly easier, spot and nearby shipment commanding $4.35 at the 100-pound rate. Raw Italian silk rose again $.05, closing at $4.35.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.	.07⅝	.07⅝	.07⅝	.07⅝	.07⅝	.07⅝	....
Beams & Channels, per 100 lbs.	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Copper, Elec., lb.	.15⅛	.15¼	.15⅜	.15⅜	.15⅜	.15⅜	+.00¼
Copper, Lake, lb.	.15¼	.15¼	.15⅜	.15⅜	.15⅜	.15⅜	+.00⅛
Cottonseed Oil, bbl.	6.70	6.70	6.85	6.78	6.79	6.70	....
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil, Menhaden, Brown	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 gals.	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime	.94	.94	.94	.94	.94	.94	....
Lead, 100 lbs.	4.35	4.35	4.35	4.35	4.35	4.35	....
Linseed Oil	.47	.47	.47	.47	.47	.47	....
Open-Hearth Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Petroleum, bbl., Kansas crude	.88	.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa., crude	2.50	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	....
Silk, raw Italy	....	4.30	....	....	....	4.35	+.05
Silk, raw Japan	....	3.70	....	....	....	3.70	....
Sulphuric Acid, 60 Baumé	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb.	48.00	47.60	47.65	47.75	47.80	48.00	....
Tire Scrap	.09⅞	.09⅞	.09⅞	.09⅞	.10	.10	+.00⅛

Non-Poppet Motors Influence Poppet Types

Springs between valve stem and cam silence poppet valve action

Part II

By E. P. Batzell

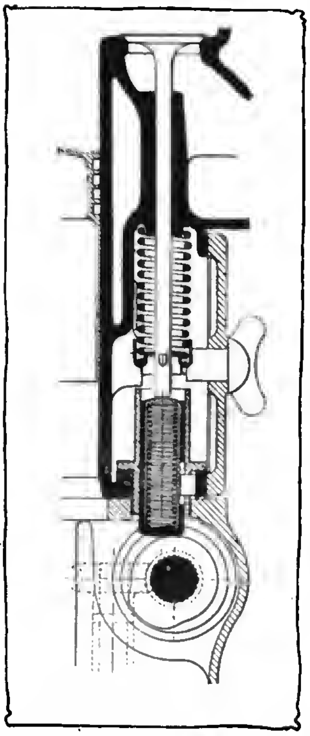


Fig. 3—Telescopic valve tappet on Germain motor

A GREAT deal more of attention is being paid nowadays towards the silencing of the noise arising from the valve tappet striking the valve stem when starting to lift it, and also the noise of the valve tappet striking the lifting cam, which takes place when this tappet does not follow the cam at all times. The first of these noises exists even at the slowest motor speed, unless special silencing means are employed. The other, that between cam and tappet, generally appears only at fairly high motor speed, when the strength of the valve spring is not sufficient to keep the lifted parts in constant contact with the cam.

Neither of the two sources of noise mentioned was objected to until the advent of the Knight sleeve valve engine. They were accepted as more or less unavoidable features of the high speed automobile motor. Motor building practice of that time indicates this, inasmuch as then there were in use valve and tappet clearances of .010 inch to .0156 inch. The tappet mechanism at the valve stem end was fully exposed, no particular attention being given to make extra light valve lifting parts and springs of ample strength, all of which is rendered worse in the matter of noise by the simultaneous employment in some instances of cam shapes especially adopted for quick valve lifting and closing.

In comparison with the above the present conditions show a marked decrease of the heavier roller type of valve tappets. For the sake of silence the most frequently encountered valve and tappet clearances amount only to a few thousandths of an inch, for instance .004 inch and as low as .002 inch. The valve tappet ends striking the valve stem are sometimes covered with a semi-elastic material to prevent a metal to metal contact. Almost in all cases the valve and tappet mechanism is inclosed, either by a single cover for a number of valves or by individual caps for each valve. The weight of valve parts, their motion and the valve spring strength are being carefully regulated in accordance with the anticipated motor performance. The silencing means mentioned are most often found in practice because they involve no radical changes in the motor construction. At the same time they are not fully accomplishing the results desired, as they give a silent valve system only for a certain range of motor speed and also only a temporary one.

Although the methods of attaining silence so far mentioned have produced satisfactory results at ordinary speeds it is noticeable that considerable noise is still generated when running fast. Small tappet clearance and valve covers are not sufficient to bring the poppet valve motor into competition with the non-poppet valve type in the matter of silence. A continuous quiet contact between valve stem and tappet at very high motor speeds may be obtained by using extra strong valve springs, but this is not practical on account of increased liability of spring breakage, besides much wear in the cam and in the whole valve lifting mechanism.

Various means have been adopted to reduce the sound made by the tappet striking the valve stem. In Fig. 3 is shown such an arrangement of the Germain motor. Here the tappet is composed of two parts telescoped one into the other and spread from each other by an inside spring, which is made considerably weaker than the valve spring. Thus the upper tappet part by action of the internal spring is forced against the valve stem end, remaining in constant contact with it. The minor variations arising in the valve mechanism length, to take care of which the valve and tappet clearance is provided in the ordinary motor, in this construction are taken up by the deflection of the same internal spring, the actual tappet clearance being inside and at the bottom of the external tappet part. In this location the clearance can be filled with oil, which will help to muffle the noise of contact between the two parts, the noise also being less audible because the actual contact takes place inside the mechanism.

Constructional Accuracy Necessary

A construction of this sort can serve its purpose well when the parts are accurately made. It gives a quiet valve action when the clearance in the tappet parts is small, which, however, it is difficult to maintain for a long time, because one part hammers out the other. Hardening on the inside improves matters, but it affects the shape of the parts, which are preferably thin. Grinding after the hardening will restore their shape, but this is a difficult operation on the inside surface of the outer tappet part. Hardening makes it also probable that minor defects in the material and its treatment in time are liable to bring forth cracks in the thin parts due to the constant pounding. As a whole, this construction requires considerable attention in manufacture, as well as in its maintenance, at the same time giving but a slight advantage over the ordinary arrangement, when small tappet clearances and valve covers are used. In another Germain construction the interior of the tappet parts is filled with felt in place of the spring.

Among other details on which depends the noisy or silent action of poppet valves the actual amount of valve lift is important. The greater the distance through which the valve is made to travel the greater the inertia to be overcome at the turning points of the reciprocating motion with a resulting increase in the noise when the cam strikes the valve stem. And where the cam is not immediately under the valve stem but is situated at one side, acting through a rocker, there is an opportunity for further development of objectionable noise according as to whether the cam lift, considered apart from the actual valve lift, is great or small.

Attempts have been made to gain the advantages of a small lift cam simultaneously retaining a larger valve lift and the desired timing, by using a tappet lifting rocker anchored as shown at R, Fig. 4, whereby the cam lift is multiplied at the tappet end of the rocker. A cam constructed for a small lift offers the following advantages: It is more easily shaped in accordance with the requirements of an efficient valve opening, the maximum size of which can be reached through less degrees of the rotating cam motion. With the rocker arm equipped with a roller for following the cam it is possible to give the valve a very gradual initial lift, also letting it down to its seat in the same manner, this without any material sacrifice in the character of the valve opening. Of course such a valve lifting has to be accelerated more during another portion of the period, requiring heavier valve springs for the same degree of quietness. The smaller cam obviously permits also a more compact cylinder and crankcase construction, less distance being required between the crank and camshafts to make their parts clear each other properly, which is particularly important with the popular long stroke motors. The valves are thus brought nearer towards the cylinder which gives a better, more efficient and lighter construction all around.

Rocker Arms Re-introduced

It is noticeable that quite a number of modern motors again are being equipped with valve lifting rocker arms, which were used very extensively in the early days of the automobile industry, but which were discarded later on. No doubt some purposes are well served by them, although with added complication, and with more parts in the valve mechanism that are liable to wear out and cause noisy action. Only very careful execution of the rocker arm mechanism can warrant their reintroduction for the purpose of making a more silent valve action.

One of the most interesting constructions for a poppet valve lifting mechanism is the Chenard and Walcker arrangement represented at B, Fig. 4. It serves as an example illustrating the extreme of measures taken thus far towards silencing the poppet valve action. In fact, this construction in connection with one permitting a quiet closing of the valves, like the Adler previously described, should form a combination giving about the most silent results that can be expected.

The camshaft C, in the Chenard and Walcker motor, is inclosed in a compartment separate from the crank case, to which compartment oil is supplied positively through a bottom opening from a by-pass of the main oil feeding line. Thus the camshaft compartment is filled with oil to some height above the cam and above the lower end of the valve tappet, the oversupply of oil flowing back into the crankcase through another opening provided at the proper oil level. The valve lifting mechanism includes a rocker arm A riding on the cam, but acting upon the valve tappet through an intermediate flat spring S, the latter being secured to the rocker itself and bearing against the lower end of the tappet, which it lifts into constant contact with the valve stem. Consequently, in the whole mechanism there are no clearances between the component parts, which would have to be passed through before the parts are in working contact. No noise could be generated here as in instances when the parts strike one another. However, the arrangement of the rocker arm, its spring and the valve tappet offers sufficient clearance in their motion, so that the variable length in the valve parts can be taken care of in the space between the rocker and the spring. The relative motion of these latter parts is merely a rolling one during most of the time when the valve is to be lifted. And even when this rolling motion becomes a straight lifting one, just before the valve leaves its seat, there is an oil film present between the rocker surface and that of the spring, which cushions their contact in the absence of the rolling motion.

The whole construction affords a silent valve lifting action and at the same time it reveals only remote possibility for such wear in it, which in time would result in noise audible outside. The valve tappet has also very little side thrust to bear, except that caused by the slight angularity of the rocker spring against the tappet, and by the eventually not exactly central and parallel relative motion of this tappet and of the valve stem. The latter cause for side thrust is not a defect of construction, but would follow from wear in the guides or uneven tension of the valve spring. The possibility of harmful wear is greatly reduced in this construction by the following means: The supply of oil to the lower end of the tappet should provide ample lubrication of the tappet guiding bushing, which, moreover, cannot be pounded out, as it is frequently done in the case of common poppet valve motors, because the side thrust is slight. The tappet lifting rocker arm is pivoted with a long leverage reducing the motion in its pivot pin, and the latter is also submerged in oil.

Surfaces Require Hardening

The greatest amount of real sliding motion in this construction occurs between the cam and its following rocker part, but proper hardening of their surfaces will render the wear negligible, especially in the presence of an excess of lubrication. Even when the contact surfaces of these parts would wear off somewhat this will not be followed by noise, inasmuch as the character of their relative motions remains practically unchanged. Also the continuous contact between all mechanism parts is interrupted, due to the action of the flat spring. Some noise would be apt to arise if improper treatment of the parts, or uneven distribution of their material, should leave soft spots on the cam and rocker of the sort that can be pounded out into depressions in the even surface, thus giving great irregularities in the lifting or settling motion of the valve parts. Otherwise it is only up to the strength of the valve and the rocker springs to preserve these parts in continuous contact at high motor speed.

The Chenard and Walcker motor is built with comparatively large cams, the camshaft proper being in size equal to the size of crank pins in the two-bearing crankshaft. This, together with the housing of the camshaft, adds considerably to the width of the crankcase. However, the valves are with advantage kept close to the cylinders, which is rendered possible by offsetting them from the line of the camshaft, at the same time without altering the regularity of their motion, which is transmitted through the rocker. The large clearance available between the rocker and its spring permits the construction of cams of an easy shape. At the same time they can be made so that the maximum valve opening after being reached remains constant for some duration of the suction stroke, giving a condition very favorable for a good cylinder filling at high speeds. The same applies also to the cam and rocker construction, Fig. 4, this also serving as an example where a good valve opening is obtained with small cams.

(To be concluded)

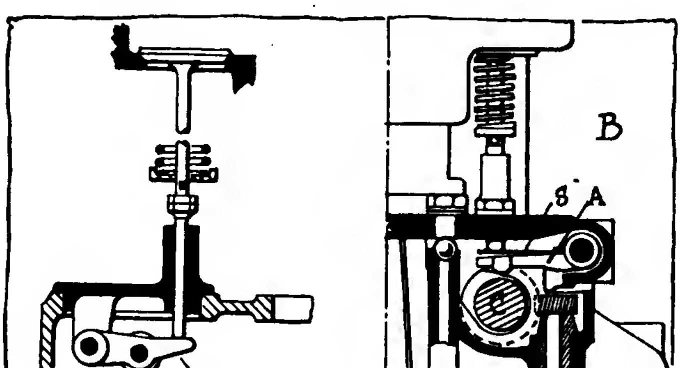


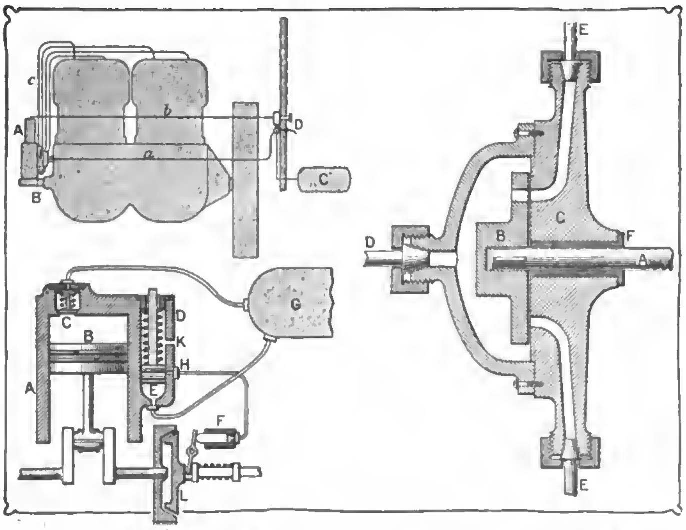
Fig. 4.—Method of valve operation in which the lifting action is multiplied by rocker arm. B, Chenard Walcker construction, showing introduction of flat spring between rocker and valve stem

Compressed-Air Motor-Starters Found Least Cumbersome and Sufficiently Reliable By French Builders, Economy Also Considered—Pre-Ignition and Its Avoidance —Some Examples of Cast-Steel Truck Wheel Construction—German Crisis

AIR Preferred for Starters in France—Given the choice of starting an automobile motor either by means of a special explosive charge, such as one formed from acetylene gas or by a forcible injection of gasoline vapor, or by an electric motor or by a compressed-air motor, the French market is developing a preference for the latter form of auxiliary device. The reasons are set forth briefly by D. Renaud. The objection to a gasoline vapor charge is that it is difficult to regulate it so as to have it unfailingly ignitable, and while acetylene detonates easily, does not condense in a cold motor and [any mixture from 3 to 65 per cent. being explosible—Ed.], an overdose of this gas may cause a much more violent explosion than is desirable. When ignition fails, it is necessary to go through the process of cleaning the cylinders of the poor mixtures before trying to introduce new and better ones, and this process is more laborious than starting by cranking. With regard to the electric starting equipments it is mentioned that the effort required for starting a motor amounts to about 60 per cent. of the power developed by the motor when it is in operation at a comparable angular speed of the crankshaft, and that an electric equipment powerful enough to overcome such a resistance must be so large that it becomes an encumbrance and impracticable for the average owner of a car otherwise mechanically operated. [The author knows of course that much may be said against these objections and for the systems which he rejects, but apparently he means to suggest that the viewpoints mentioned by him should be decisive in a general judgment on the subject.—Ed.]

Among the compressed-air devices, some act directly on the motor shaft, and others send the air to the cylinders to act upon the pistons, one after another, until the motor is running normally.

The first of these types does not depend upon finding the motor pistons in a certain position to start with and is represented in the Barbey self-starter which is used on Delaunay-Belleville cars and consists in a four-cylinder air motor mounted in front of the gasoline motor and arranged to be clutched to the motor shaft. It receives compressed air from a tank on the dash when the motor is to be started and, on the other hand, is driven by the gasoline motor when the tank must be refilled.



Figs 1, 2 and 3—Mechanics of compressed-air motor-starters

On account of the smaller equipment involved, greater interest attaches to the second type. It is based on the ascertained fact that a gasoline motor in good order always comes to rest with all of the four pistons at the same height and that one of them therefore always is in the position of a half-finished power stroke. If air is sent to the cylinder where the piston is in this position, it will thus act upon this piston exactly as the gas explosion acts during normal operation, and in order to effect a start safely it is only necessary to arrange a distributer device which will send air first to the cylinder which is found in the position referred to and successively to the other cylinders in the order in which they get into the same position. As soon as the speed imparted to the crankshaft is sufficient to draw an ignitable charge into one of the cylinders and to effect the compression of the same, the start is bound to follow, and the moment an explosion occurs from which the pressure is greater than that of the air, the automatic valves in the distributer cease to admit air.

All the apparatus necessary for assuring this result comprises a special distributer device connected to the different cylinders by tubes of small diameter, a special automatic intake valve for the compressed air in each of the cylinder heads and an air-tank connected to the distributer. The compressed air is usually produced by means of a small pump actuated at the driver's option from one of the gear shafts, and it is usually sent first into a small reserve tank. The general arrangement is shown in Fig. 1, in which A is the air-tank, B the distributer, C the reserve tank, D the control organs, *a* tubes from the reserve, *b* tubes to the reserve and *c* tubes to the cylinders. The distributer is the only organ presenting features not familiar from other mechanical devices. It must be so built as to avoid air leaks when it is feeding the cylinders and to avoid friction when it is not operating. Fig. 3 shows one such arrangement. A is a half-speed shaft driven from the crankshaft, B a rotary slide valve keyed to rotate with A but capable of a small longitudinal displacement on the shaft, C the distributer-disk forming one side of the air-collector in which air is received through the valve D from the air tank, E the air conduits to the cylinders, F the bushing in which shaft A turns. The air pressure holds the ground face of the rotary slide valve tightly against the distributer-disk C, as soon as air is admitted. The hole in the slide valve can be made large enough—in the form of a curved slot—to make sure that air will reach one of the cylinders when first admitted, even if the pistons are not found strictly midway between centers, and thereafter the slide valve is rotated and takes care of the successive distribution to the four cylinders. When the start is effected and the air supply is cut off, the slide valve is detached from the face of the distributer and revolves without friction This device need only be from 2 1-2 to 4 inches in diameter.

A somewhat different distributer is used in Delahaye fire engine motors and has so far proved itself reliable. It was designed and made by Letombe and Aucoc and is shown in Fig. 4. It forms a feature in a general arrangement like that represented in Fig. 1. This distributer has four piston valves D placed 90 degrees apart around a cam disk B keyed upon the camshaft of the motor. The space at the outer ends of the pistons is in constant communication with an annular space C in which the compressed air is received by way of R, and from which four conduits M lead to the cylinders. When air is admitted, all the pistons are pressed against the cam-disk, but only the one opposite to the notch *b* in this disk can be displaced toward the center of the device, thereby uncovering the corresponding air conduit to one of the cylinders. When the air pressure ceases, the pistons also cease to press against the cam disk and the device revolves without appreciable friction.

The intake valve for the air which must be provided in each of the motor cylinders opens from the outside inwardly and its spring must be strong enough to resist the ordinary suction of the intake stroke, for which purpose a four pound spring pressure [per square centimeter] is sufficient, even if the carbureter is throttled down.

A compressed-air motor-starter can be arranged so as to require no attention with regard to the filling of the air tanks. To this end, the compressor pump is connected with one of the shafts in the motor by a cone clutch on the plan shown diagrammatically in Fig. 2. A is the compressor cylinder with piston B and valve C connected by a tube with the air tank G. In the adjacent small cylinder D the piston E is pressed toward the bottom by a spring, against the resistance of the air pressure underneath. If sufficient to raise the piston until the port H is uncovered, the air pressure travels through a tube to the small cylinder F and drives the piston in the latter against a lever which disengages clutch L and releases the compressor shaft from the driving shaft. Obversely, if the air pressure under piston E is low, the clutch springs pushes the clutch into engagement and puts the compressor to work. K is a safety port limiting the air pressure to a maximum, being necessary because a relief port in cylinder F, for example, would leave too small a margin of air pressure to work with, so that the clutch would be continually engaging and disengaging.—From *Omnia, March 22.*

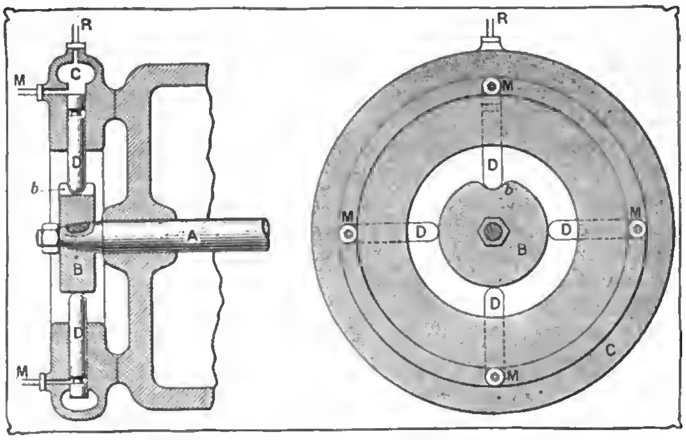


Fig. 4—Distributor for Delahaye starter of fire engine motor

POSSIBLE Causes of Premature Ignition.—While great progress has been made in this respect, no motor builder can yet guaranty absolute immunity against premature ignitions. They may occur as well during the indnction as during the compression stroke in a four-cycle gasoline motor. In two-cycle motors with fresh-air scavenging they can occur only during the compression, but in the two-cycle automobile motors, in which the burnt gases are driven out by the fresh charge under light pressure, ignition may take place also during the charging period preceding the compression.

If in a four-cycle motor the incoming charge takes fire, a loud detonation is heard in the induction tube, but damage is rarely done and the motor usually continues to operate. The usual cause is a mixture [for the preceding explosion] which is too poor, too rich or not homogeneous, so that a part of it burns very slowly and remains aflame after the exhaust is ended. A weak spark which ignites only a very small portion of the charge may cause similar effects. In all these cases the ignition is plainly due to the incoming charge meeting a flame upon entering the cylinder. The same condition, with its slow fires and incomplete combustions, can also cause unburnt gases to become ignited in the muffler. The remedy is suitable carbureter adjustment, a powerful or multiple (dual) spark and the avoidance of dead space in the combustion chamber.

Premature ignition during the compression is, on the other hand, not noisy. It often passes unheard. but its effects make themselves felt very soon. Diagrams taken during such explosions show that the gas pressure begins to rise at the middle of the compression stroke, increasing the torque of the motor shaft at that moment in an abnormal manner, and that it reaches altogether excessive values toward the end of the stroke. Moreover, as the dissipation of heat in the cylinder walls is at the same time interfered with, the sudden absorption of heat in the gas tension creates a negative area (in the diagram) which often annuls completely the positive work. The smallest of the inconveniences which then arise is the stopping of the motor. It is often preceded by heated bearings due to the expulsion of oil from between the friction surfaces under the exaggerated pressures. Obliged to take cognizance of this eventuality, motor builders have strengthened the motor shafts in order to avoid the fractures which previously occurred too often.

This kind of premature ignition may be due to mixtures which are too rich or contain a surplus of hydrogen, but it may also be caused by insufficient cooling of the cylinder, by poor insulation in a high-tension commutator, by an excess of lubricating oil, by the use of an oil which leaves carbon deposits and by the fouling of the cylinder walls due to tar or coal dust contained in the gas charges [the latter item referring apparently to the use of benzol as fuel].

The best means for obviating these damaging pre-ignitions consist, apart from the precautions mentioned before, in working always with very clean gas of small hydrogen-content and constant composition, without excess of lubricating oil and in refraining from pushing the motor to its power limit.

As the effects of pre-ignition is the more serious the higher the compression is, it may be characterized as imprudent to design a motor for average piston pressures as high as 6 or 6.5 kilograms per square centimeter. The exact cause of pre-ignition can in any case be detected without difficulty by a careful examination of the conditions.—From a communication by Prof. L. Letombe to the Society of Civil Engineers of France, February 7, reported in *Technique Moderne*, March 15.

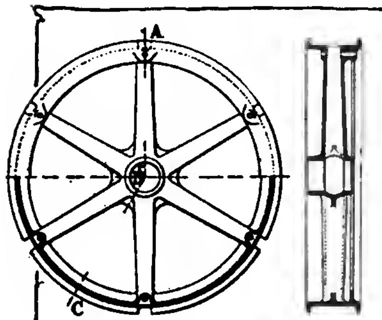
Crisis Expected in Germany—According to an insistent editorial article in *Auto*, the organ of the Society of German Automobile Engineers, the German automobile industry has during the past few weeks experienced serious setbacks in its export business and its representatives in the foreign countries have ascribed the rapid and untoward change to the American competition. An automobile show in Berlin at the earliest possible moment, and preferably during the coming summer, is suggested as a suitable remedy and a means for averting a crisis. What lies at the bottom of the trouble, however, it is admitted, is the hesitating slowness of most German manufacturers in adopting and organizing sound mass-production methods. It is thought an exhibition may furnish a strong object lesson on this point.

CAST-STEEL Wheels for Trucks—The orthodox view to the effect that wood wheels are the only ones which are fit for heavy truck service has been aired industriously in France of late in connection with reviews of the latest military tests, and the one-sided opinions and conclusions which have been expressed have now called out dissenting voices. Commandant Ferrus steps into the breach for cast-steel wheels fitted with rubber tires in an article of which an extract is presented in the following:

The opinion of French constructors continues to be rather unfavorable to the metal wheel, but this opinion seems to rest on a misunderstanding. The theoretical objections to the metal wheel—lack of elasticity, brittleness, sluggish traction vibrations—are in truth well founded and proved, but these reproaches apply only to the metal wheel fitted with iron tires.

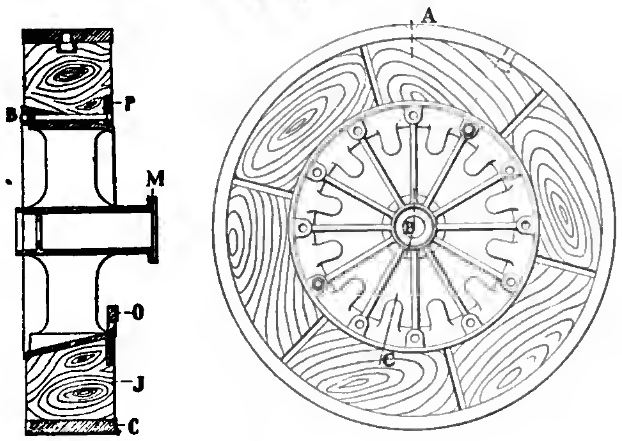
Wire wheels, now coming into fashion again for automobiles, would certainly be detestable if fitted with iron or steel tires; yet they are acknowledged to be excellent when equipped with rubber tires.

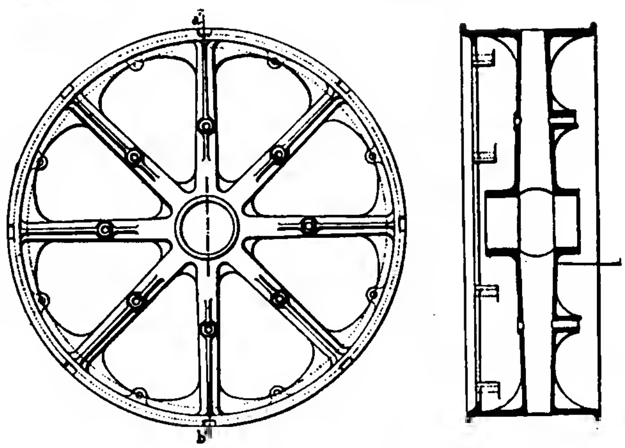
The fact is that in France the metal wheel—with rubber tires—has been condemned without serious trial. On the other hand, a glance at the development in Germany reveals the fact that the German truck builders employ the cast-steel wheel exclusively and that they claim for it the advantages of being cheaper than the wood wheel, notably lighter, unaffected by the weather and never in need of attention, having only the one defect of being practically unrepairable in case of severe accident and breakage. In its new regulations for subsidized motor trucks, which go into effect April 1, 1913, the German government has, moreover, made it obligatory to have these trucks equipped with cast-steel wheels.



Figs. 6 and 8—Front and rear N. A. G. cast-steel truck wheels

Fig. 7—Beausoleil's adjustable mixt wood and cast-steel truck wheel with iron tire.





The very real shortcomings of wood wheels are well known and those of steel wheels are less well known, but the experience gained abroad proves at all events that these possible shortcomings, whatever they are, are not prohibitive. The steel wheel should not be ostracised but tried. But the steel wheel without rubber tires has been tried and has been found wanting, having all the faults charged against it. The types to be examined are those steel wheels which have been used in France or abroad with rubber tires. Among these are the Fischer, the N. A. G., the Hugon and the Beausoleil.

The Fischer wheel is made at the electro-metallurgical works at Schaffhausen, Switzerland, and is poured from electrically made steel (Herault furnace). It is manufactured in two types, one which has hollow spokes and also a hollow rim and which is difficult to cast and correspondingly expensive, and another in which the spokes alone are hollow. Both are cast in one piece. The all-hollow type should be by far the best. It can be greatly deformed without breakage. It is light, a set of four for a five-ton truck weighing, without the tires, 500 to 550 kilograms.

The Neue Automobil Gesellschaft (N. A. G.) of Berlin employs a type the construction of which is shown in Fig. 5 and Fig. 7, representing respectively a front and a rear wheel. The sectional view under Fig. 5 is taken on the broken line ABC of the side view. These wheels are used for six-ton trucks, and the front wheel weighs 50 kilograms, the rear wheel about 135 kilograms. They are assembled in the middle plane by means of bolts, as clearly indicated in the drawings, and the solid rubber tire is mounted directly upon the cast rim.

Some interesting wheels for heavy trucks have been designed by Hugon, an engineer at Calais. The tread is formed of steel blocks, each of which is secured by a socket joint to a steel rod which passes radially through the wheel rim. But on the outside of the rim each steel block rests on a block of soft rubber, and the inside of the rim is lined with a thick band of the same material against which there is pressed a steel plate by passing the securing-rod for each block through all of these parts and threading a nut on its inner end. These wheels are in service on trucks of 2 1-2 and 6 tons used for the transportation of material at the Astricourt mines at Pas-de-Calais.

The Beausoleil wheel is of the mixt type. It comprises, as shown in Fig. 6, a hub of cast steel and an iron tire separated by a wood rim whose function is to deaden vibrations. This expedient of interposing a wooden lining between the metallic parts has been tried repeatedly, especially for vehicles intended for the colonies, and always with the worst possible results. It is in fact easy to understand that the wood will work loose under the influence of alternating drought and humidity and that the wheel will then soon be out of commission. But Beausoleil has had the ingenious idea of giving the cast-steel hub the form of a truncated cone, against which the wooden lining J may be tightened up by means of the bolts B and the plate P, and as the lining is composed of individual wooden blocks this adjustment can be made easily and without taking the wheel apart or dismounting it; in fact as a road repair. As also nothing prevents the use of rubber tires on a wheel of this type, its development may be worth watching.

The experience with sheet-steel wheels riveted together has not so far been commercially favorable, though many wheels of this kind have been turned out. It seems to be feared that the rivets will work loose, but this fear is perhaps not well grounded if suitable rubber tires are used [the fear relates perhaps mostly to that period in the life of a rubber tire when it is worn down and thin.—Ed.]. At all events, however, pressed-steel wheels, in which few rivets need to be used, would seem preferable, and their construction presents at the present time no special technical difficulties—none comparable with those which were encountered at first in the production of cast-steel wheels of small weight and which have been overcome only through the great progress accomplished lately in metallurgical processes and foundry practice.—From *Le Poids Lourd,* March 14.

Engine Testing at the Northway Plant

By J. O. Heinze

¶ Editor's Note.—*This paper is based on a report delivered by John O. Heinze at the January session of the Society of Automobile Engineers from the Motor Testing Committee, of which Mr. Heinze is chairman. The object of this report was to set before the various engineers what the Northway Motor & Mfg. Co. is doing in the way of testing motors, with the object that the various testing methods in use in other factories might be later presented before the society and that eventually the motor testing committee would be able to evolve some standardized form of testing apparatus for the various parts of the motor.*

Justification

Professors in college laboratories have done a great deal of testing, and they have given us certain formulas to work by in our gasoline engine field, but unfortunately a great deal of this mathematical work is rather difficult for the average automobile engineer in the workshop, and we desire something more practical.

Were we to employ mathematics altogether we would a great many times go astray, for the reason that we all have to take into consideration the commercial end of automobile engines, the manufacturing advantages, machining ability and the general behavior of the product in the hands of the customer in general use. We have all been building engines and we have been varying our bore and stroke. We have been varying the individual elements of an engine, and we have been plotting horsepower curves along different lines.

A disadvantage that the automobile engineer has to put up with, differing from that experienced in electrical engineering and other branches of the engineering profession, is that we cannot go on the open market and purchase apparatus in the same way as the electrical engineers, who can go and purchase a voltmeter or ammeter or a Wheatstone bridge. We know no concern to go to and say "I want a complete set of apparatus for testing engines." The automobile engineer must design his own apparatus.

The testing done in colleges is very scientific. A professor can put an engine on the block and leave it there for a month, and in the course of his testing he will take gas analysis; will measure the heat losses with very delicate calorimeters; will measure the explosive temperature with a pyrometer; will measure the cylinder compression very accurately, and will measure the air resistance with venturi tubes, as well as making other scientific measurements. All these tests take a long time to make and are more or less delicate. Consequently, in the average laboratory we wish to resort to testing apparatus which gives us quick and practically accurate results, and I believe that these results will be just as accurate as most of the scientific work done in colleges. A great many pieces of testing apparatus which we would like to use have not been designed, and the apparatus which we have built and designed has been, in a measure, crude. As time goes on, however, more delicate instruments, giving greater accuracy, will be brought into use. It seems to me that we engineers should suggest the kind of apparatus to be used in the engine testing laboratories, so that we may all test our motors along similar lines, and then our results will admit of fair comparison.

As a committee we should suggest a standard curve sheet, a standard data sheet, and also certain essential tests, being careful not to be too scientific.—J. O. Heinze.

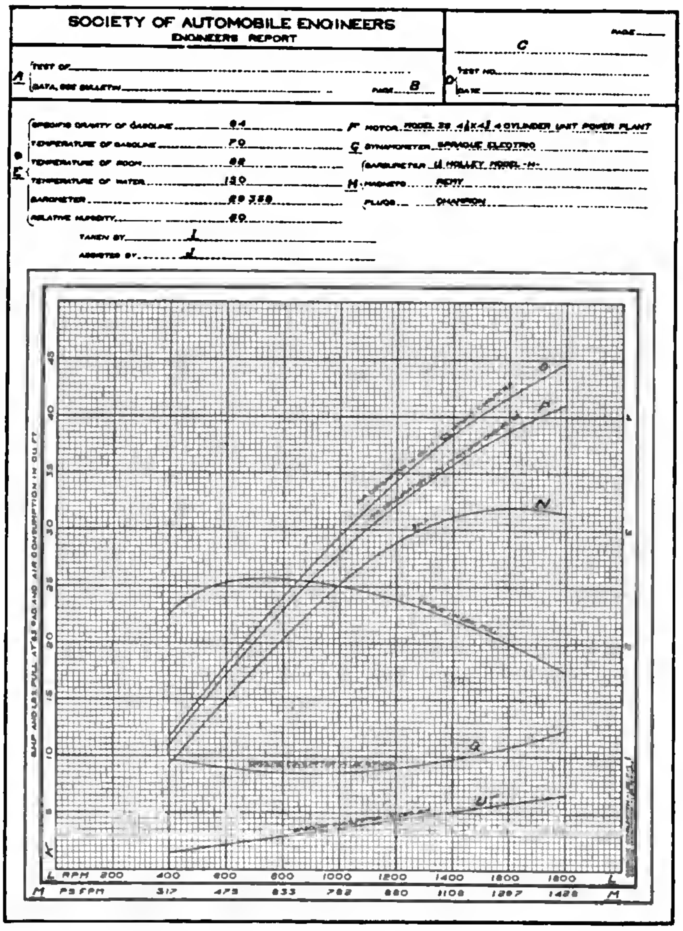


Fig. 1—Proposed standard curve sheet to be used for engine testing

I HAVE here a number of plans, diagrammatic views and apparatus and methods pursued in making tests at the Northway Motor & Mfg. Co. plant. They are not what you might consider the most scientific, but they are of practical accuracy and are such apparatus as give us comparative results from day to day so that we know what we are doing.

Fig. 1 is a sheet which might be adopted as a standard curve sheet to be used by the engineers, and on which I have plotted curves representing different elements in the operation of an engine. On the top of this sheet is the name of our Society, "Engineer's Report," and underneath it the subject of the test. Whatever the test is, whether of a certain make of carbureter, magneto or engine, should be written in here. At A is where we should record that this test is entered in our bulletin of a certain date, and at B the page number of our yearly book or bulletin. At C is the record that the individual engineer can keep in his own files. At D is recorded the test number and the date

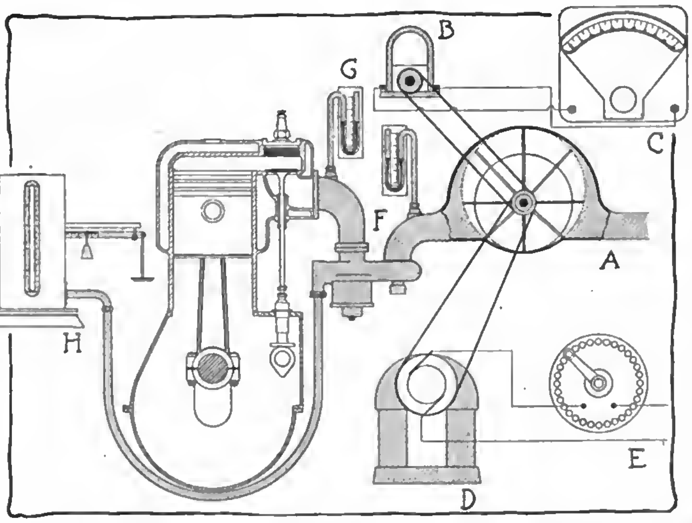


Fig. 2—Method of applying air meter to carbureter for testing purposes

that the test was made. Of course he can put the date of the test for the benefit of the society. At E I have indicated what I believe should be taken into consideration on the day the test is made. It contains the specific gravity of the gasoline, the temperature of the same, the temperature of the room, the temperature of the circulating water, the barometer and the relative humidity. At F is recorded the model, number of the models and the bore and stroke, whether it is four-cylinder or six-cylinder, and whether it is a sliding-valve or poppet-valve motor. At G is recorded the kind of dynamometer, whether it is a water brake or an electric and who is the maker of same. At H is shown the make and type of carbureter used, also the kind of magneto and spark-plugs.

Now it may seem advisable that we also should give the weight of the motor, the weight of the pistons and connecting rods, as well as the amount of offset of the cylinders from the center line of the crankshaft, or, perhaps, give other items which you think are of importance.

At I is given the name of the engineer who made the test. If he has an assistant, the assistant's name should also be given at J.

Calculating Horsepower

Below is the sectional paper. The figures at K give the brake horsepower, also pounds pull on a brake beam of 63 inches radius. It is shown here reading from 1 to 50 horsepower. However, it might be advisable to make this scale show from 1 to 100 horsepower. It is also necessary to give the length of the brake beam in inches from center of shaft. If we use a 63-inch brake beam, which is the size I use, the pounds pull at the same time indicates the horsepower by simply multiplying pounds pull times speed and by placing a decimal after the first three figures, which are fractions of a horsepower.

It might also be advisable to show at K the horsepower output for 1 cubic inch of piston displacement, so that we not only have the total horsepower but the horsepower output per cubic inch of piston displacement.

At L are the revolutions from 200 to 2,000, but it might be advisable to show it read to 3,000 revolutions. On scale M are the piston speeds per minute in feet.

I have plotted six curves of a Northway four-cylinder 4.125 inches bore and 4.75 inches stroke motor. The curve N gives the brake horsepower at different speeds; curve O gives the volumetric air consumption in cubic feet per minute without the carbureter; and curve P the air consumption in cubic feet per minute with the carbureter. Curve Q shows total gasoline consumption in pounds per hour. Curve U gives the gasoline consumption per pound per horsepower-hour and is the gasoline efficiency of the motor.

The object of plotting air curves is to know the volumetric efficiency of an engine in order to give the engineer an opportunity to determine from this curve whether his valve timing, size and lift are correct for the highest efficiency, and measuring the air consumption without the carbureter and with the carbureter, the difference gives the air losses due to the carbureter.

The volumetric efficiency of the engine charted here has depreciated very nearly 10 per cent., due to the use of the carbureter. You might say that is of no importance, but it is if you are measuring different carbureters. If you can get a carbureter that does not depreciate the volumetric efficiency of the engine it naturally produces a greater horsepower output. On the other hand, the gasoline consumption test is for the purpose of determining the carbureter efficiencies, and by comparing the cubic feet of air consumption in relation to the quantity of gasoline consumed in a given time tells us the relation of gasoline to air at different speeds and torques. If I adjust the carbureter

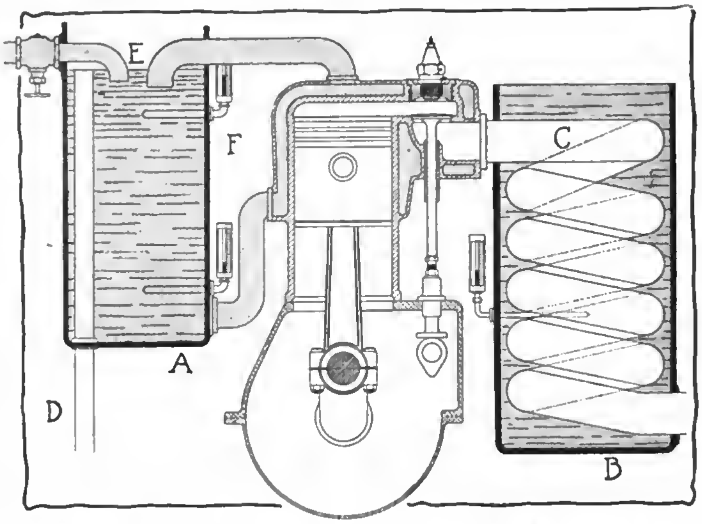


Fig. 3—Apparatus for determining heat losses in water circulation system

to maximum efficiency at 400 revolutions and now speed up the engine to 2,000, and if the relative rate of mixture has varied so that there is a greater percentage of air to gas as compared to the lower speed, this then will tell us that this carbureter is not accurately mixing the gas and air for the different speeds in the proper proportions. What we are trying to do is to select a carbureter which gives that same relative rate of mixture at low and high speeds. Unless we plot air and gasoline curves we cannot very well determine the relation accurately. It therefore seems that it is essential to know what our air efficiency is in comparison to our gasoline efficiency. It is also advisable to show the mechanical losses in the engine; this will tell us whether our connecting-rods and pistons are too heavy or if there is an excessive piston or bearing pressure, and show also in which direction we should proceed along the line of experimentation to make improvements.

Most Efficient Cam Design

By plotting air curves and changing the shape of cams and varying the valve lift, the cam which makes possible the greatest air consumption will produce the greatest horsepower output in the motor.

At the Northway plant we have an experimental engine in which there is a sliding camshaft having a cam on same which is pointed on one end and very broad on the other end. If now by the air meter we measure the cubic feet of air consumed per minute, and move the cam to and fro, and note the indicator of the air meter rise and fall, whatever position of the cam the engine consumes the greatest amount of air determines the proper shape of the cam for maximum power at the particular speed of motor desired. Therefore, you see, to measure the air is one of the processes which it is necessary to consider to get the maximum horsepower output in our motor. We must, however, take into consideration what that engine is supposed to do. Is it for racing purposes and we want to get the greatest possible power out of the engine regardless of speed, or do we desire to build a motor producing the greatest power at 1,000 feet piston speed? What we are striving to do is to determine the proper shape of cam for different revolutions to produce maximum power, so you see volumetric efficiency must be taken into consideration when making engine tests.

Air Meter on Carbureter

At the Northway plant I constructed an air meter, Fig. 2 A, which was calibrated so that every revolution represented a certain volume of air. It consists simply of a drum 10 inches in diameter and 10 inches long with vanes that move in and out. The drum rotates on ball bearings; the air passes through this air meter and on through the carbureter. The revolutions of the drum are recorded by a Weston magneto tachometer, B. The scale C of the Weston instrument, which ordinarily reads revolutions, is graduated to read cubic feet of air. The engine is driven by the electric dynamometer when using the air meter. It is necessary to drive the air meter by a small electric motor D, the speed of which is regulated by a rheostat E. If a motor was not used, naturally there would be some lag in the speed of the drum of the air meter due to suction which would introduce an error. I have inserted in the air pipe between air meter and carbureter a small U-shaped liquid pressure gauge F; if there is any variation of pressure one column of the liquid will be higher than the other. The speed of the air meter should be so regulated that both columns are of the same height. I also use a similar U-shaped pressure indicator G inserted in the intake pipe between the carbureter and the cylinders.

H is a copper tank containing 10 gallons of gasoline, provided with a gauge glass graduated in pints. This tank rests on platform scales so that the gasoline can be weighed. If I run the engine 300 or 400 revolutions for 5 minutes, measure the air in cubic feet, weigh the gasoline in pounds, then run the engine at 1,000 revolutions the difference in the quantity between air and gas at different revolutions determines the carbureter efficiency. It is advisable to always resort to the same instruments to get accurate comparisons. By these measurements I can quickly determine which is the best carbureter.

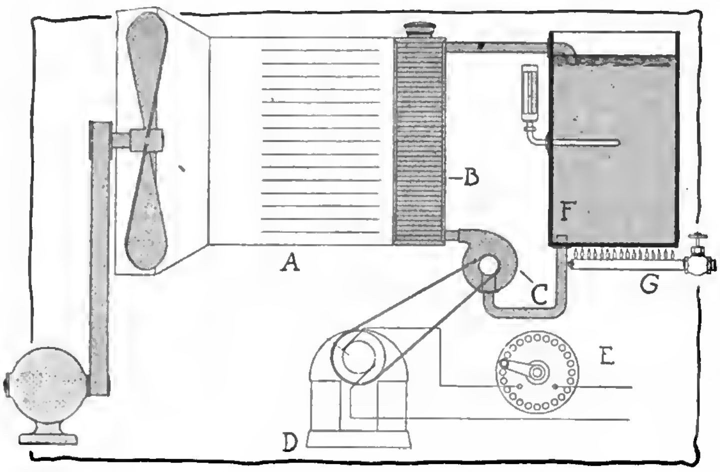


Fig. 4—Method of determining correct size of radiator for given engine

Other engineers may resort to different methods to get the same results. Some use a venturi tube to measure air consumption and by calculus determine the quantity, whereas by this air meter you get direct readings and eliminate figuring. This is a very simple method of getting air and gasoline readings in order to determine carbureter efficiency.

When I run the engine under power and plot air curves the air efficiency due to running the engine under power, and then afterwards run it by the dynamometer, the difference between the air consumption when the motor is running under power and getting the action of the back-pressure as compared with the same engine running without the firing conditions gives the losses that are produced by the back pressure in the cylinder. I can check up readings in that way and know whether the back-pressure due to the muffler produced undue volumetric losses and consequent loss of power.

In connection with engine tests we naturally also want to know what our heat losses are, due to loss of water circulation and exhaust gases. Fig. 3 shows the arrangement of apparatus, which consists of a tank A, which is of a certain size and contains 500 pounds of water. The water from the engine circulates through this tank. On the exhaust side is another tank, B, which also contains 500 pounds of water, and through which circulates a coil of copper tubing C of such length and size that when the exhaust gases finally pass out through the end of the coil the gas is at atmospheric temperature, or nearly so.

Radiator Size Determined

If the motor is run under power at 40 horsepower and has 500 pounds of water in the cooling system at atmospheric temperature, then by recording the degrees rise in temperature of the water, and also the time in minutes, I can quickly tell the heat losses due to the water circulation. The exhaust gas heat losses are similarly measured by water absorbing the heat. In order to maintain a constant temperature there is an overflow pipe E and cold water inlet, and thermometers F indicate the temperature of the water at the inlet as well as the outlet from the motor. By this method I can determine accurately that a motor running at 1,000 revolutions per minute and developing 30 or 40 horsepower produces so many heat units in the water circulation and exhaust.

If we consult a radiator maker using the above method of test he would proceed as follows: He would first connect the 500-pound tank of water to the pump which the automobile manufacturer will send him, and which is for use on that particular motor, and rotate the pump at a certain speed. Then after heating the water up to a certain temperature he would put the radiator inside of a box in which air could be forced through the radiator at a known number of feet per minute, constituting an artificial air draft the same as the car meets on the road. By measuring the velocity of the air by an anemometer at a certain number of inches per hour, it follows if we draw the heat out of the 500 pounds of water in the tank in the same time that it took the engine to produce it, that this would determine the proper size radiator to use in connection with an engine of a particular size.

At the present time what do we do? We go to the radiator manufacturer and say: "I have a 40-horsepower engine. I

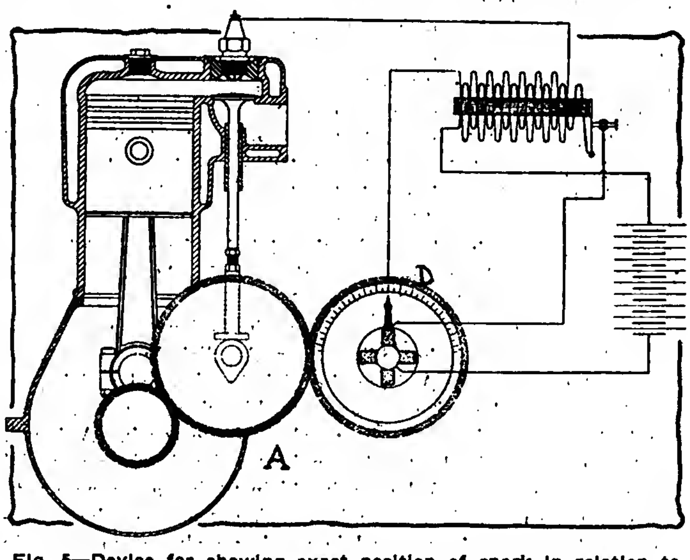


Fig. 5—Device for showing exact position of spark in relation to piston

want you to give me a radiator." From some experience he has had in the past the maker will say, "I think this radiator will be satisfactory." You put it on the car and later find out it is too small because the water gets excessively hot. If you select the radiator in the winter and it gives the best results it then is too small for the summer. If it is correct for the hottest days in the summer then it is altogether too large for the winter. Because of this, we should make our radiator determination by some similar empirical method and adopt some standard volume of water for comparison; it may be 500 pounds or 1,000. I have adopted 500 pounds because I find in the practical testing of engines of different sizes this figure was entirely satisfactory and gave accurate results.

Fig. 4 shows the radiator test apparatus, in which A is a box with a fan at one end of it. The radiator B is placed at the other end of the box inclosing it. C is the water pump. The water pump is driven at engine speed by a small motor D controlled by a rheostat E. F is a tank which contains 500 pounds of water. This water is heated by a gas burner G to a certain degree. *Then air is forced through the radiator at a known velocity and note made of the time that it takes the radiator to pull the heat out of the water. If the water cools off at the same rate that the engine heated it up, the radiator is correct in size. This, then, is a method of determining the proper size of radiator for a given size engine.*

Fig. 5 A shows an instrument of importance in testing, in order to eliminate all possibility of errors being introduced by variations of ignition. It consists of a graduated metal dial D in the center of which a pointer is rotated by the camshaft at camshaft speed. The secondary spark jumps from the end of the pointer to the dial. The pointer is set in relation to position of piston so that when it stands at zero the piston is on upper dead center, or maximum point of compression. The high-tension current passing through spark-plug also passes from the pointer to the dial simultaneously so that one can determine accurately when the secondary spark takes place in relation to the piston. It seems advisable that we should eliminate the breaker box timing and go by the secondary spark entirely. If the breaker box on the magneto is now advanced or retarded the secondary spark will indicate on the dial the amount of advance or retard of the firing point of the ignition. If we make carbureter tests from day to day we want to know definitely the position of the spark in relation to the piston.

Heat of Spark To Be Constant

The other element which enters into consideration is the heat of the spark. It is not absolutely necessary to know accurately what the real heat value of the spark is in heat units, but the spark which we get from day to day should be of the same heat value and should be measured and standardized. I designed an instrument, shown at the left, Fig. 6, for measuring the heat of the spark. A is a very fine wire supported on two posts, B and C. In the center of this wire is soldered a small globule of metal, 1-8 inch in diameter. Fastened to this metal globule is a little hook to which is attached a silk thread which is wound around a pivot and the end fastened to a small spiral spring to keep the thread in tension and also the wire A. Mounted on the pivot is an indicator which moves over a graduated dial. D is a small terminal placed opposite the globule of metal. The secondary jump-spark current crosses the gap E. At the same time this current passes through the spark-plug. If I run the engine and magneto at 1,000 revolutions per minute for 10 minutes and note the readings of the indicator on the dial due to the heat imparted to this wire A from the globule of metal and by the spark, causing the wire to expand, this, then, gives a quick method of determining the heat value of the spark. Although it does not give the heat value in heat units, it gives a useful comparative reading of the spark. If in testing a magneto running at 1,000 revolutions per minute, after 5 minutes the instrument indicates 40 degrees, while another make of magneto in 5 minutes produces only a 20-degree deflection, then the heat

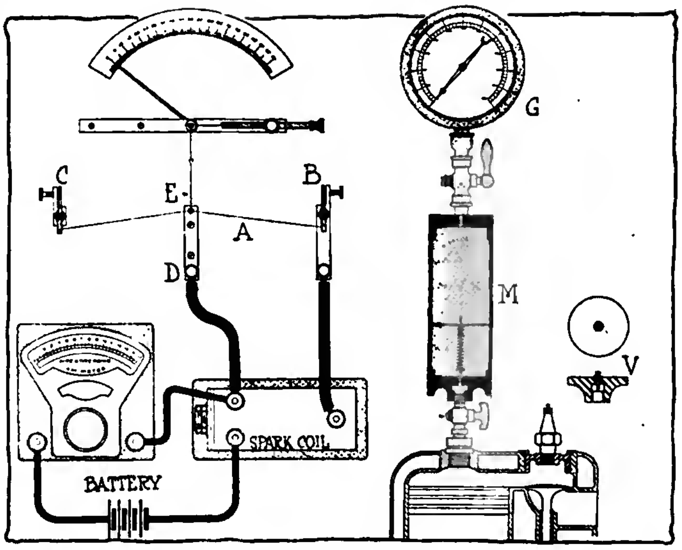


Fig. 6—Instruments for measuring heat of spark and cylinder compression

value of the spark of the magneto which produces only 20 degrees is only one-half as much as the one which produced 40 degrees.

If I am testing an engine today on 20 degrees ignition value and tomorrow on 40 and do not know it and get different results I am then liable to credit the results to conditions which do not exist and thereby introduce errors which should be eliminated. We must standardize the heat of our spark as well as spark setting.

Fig. 7 shows a device for measuring carbureter acceleration and is a means of determining rate of throttle opening. A drum A drives a fan B in which the fan blades are adjustable. Around the drum is wound a cord supporting a weight D. Connection between the throttle lever and the drum is made as shown in the diagram. The weight opens the throttle by the cord, drum and fan at a certain rate. By determining the rate of throttle opening and the increase of speed of the engine at different loads from a certain speed to a higher speed, carbureter acceleration can be accurately determined. Naturally the carbureter which accelerates the engine to the greatest number of revolutions in the quickest time determines the acceleration qualities of that particular carburter, and therefore is the one that we should use.

Fig. 8 shows apparatus and means for measuring engine vibrations. As is well known, that is a very serious matter with many engine builders. We endeavor to reduce engine vibration by reducing the weight of the reciprocating parts, such as pis-

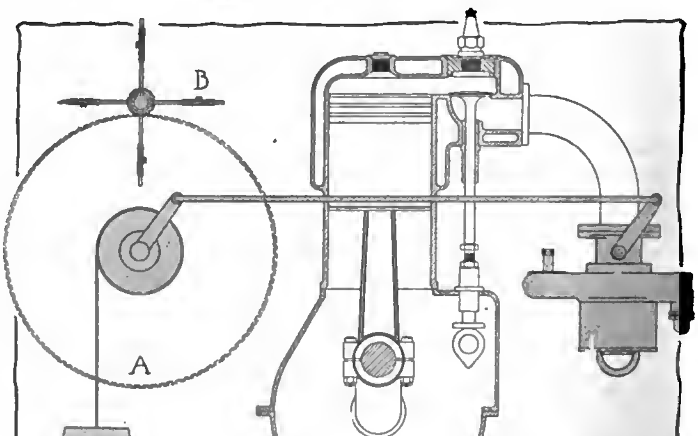


Fig. 7—Fan governor applied to throttle lever for determining acceleration properties of carbureter

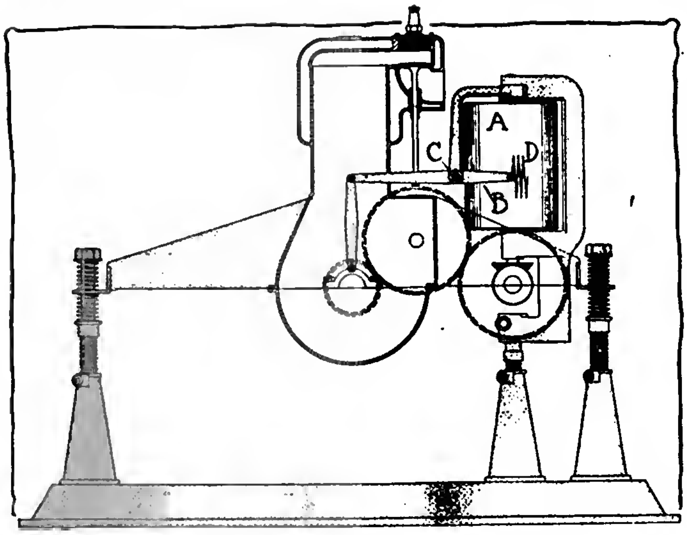


Fig. 8—Apparatus for measuring engine vibration and determining range of synchronous speeds

tons and connecting-rods, and also by balancing the crankshaft and flywheel. I found in practice that the maximum vibration is not altogether due to the weight and movement of the reciprocating parts, as will be shown later on after having described the apparatus used.

The drum A, Fig. 8, is rotatively mounted on a column rigidly held to a base plate. Secured to the engine cylinder is the indicating arm B which is pivoted at C. The end of this arm carries a pencil which marks on the paper at D on drum. If we run the engine by a separate source of power at different speeds we get a certain amplitude of vibration, and when we operate the engine under its own power we get an entirely different vibration having certain peculiar characteristics showing excessive vibration between 1,000 and 1,400 revolutions and minimum vibration below 1,000 and above 1,400, indicating that a sort of synchronism takes place at a certain speed, where power developed and weight of engine are such as to produce harmonious oscillations of great amplitude.

Naturally the automobile manufacturer who designs the car and the engine does not want this excessive vibration to take place at the normal running speed of the engine, say, 20 to 30 miles an hour. He would like to have this excessive vibration take place at a speed at which the car does not ordinarily run, say, at 40 or 50 miles an hour.

Fig. 9 shows apparatus designed along the lines of the Hospitalier Carpentier manograph excepting that I resort to a rotating drum D making one revolution for two revolutions

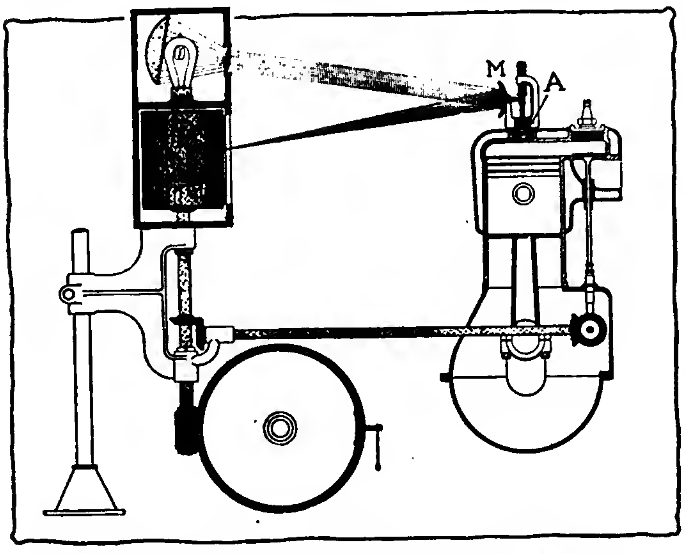


Fig. 9—Manograph for obtaining cylinder pressure diagrams

of the crankshaft. Around the drum is wound a sensitized film. Upon this film is photographed by a beam of light from the mirror M operated by a small piston in cylinder A a line, which line indicates the pressure variation in the combustion chamber of the gas engine cylinder during its four cycles and at various speeds.

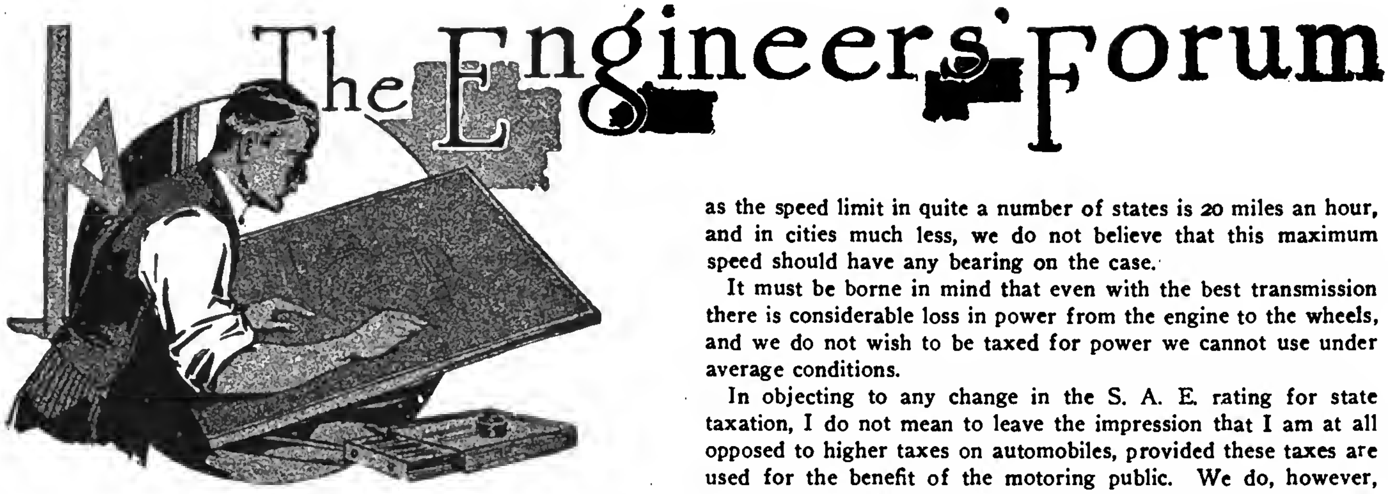
A device which I use for measuring cylinder compression is shown at the right, Fig. 6. M is a chamber of fairly good size, having a valve V, so that as the engine runs the indicator on the pressure gauge G does not bob up and down, but goes up gradually. Now we can get the compression, hot or cold, of the different cylinders by this instrument. There are, no doubt, many other ways to measure cylinder compression; this is simply one way to do it.

Requirements in Leaf Spring Design

¶ *From a paper read before the Society of Automobile Engineers by Leavitt J. Lane.*

In the design of spring leaves there are several important factors to be considered. Each leaf should be so tapered from the center outward that strains set up when the springs are in action may be distributed gradually. In the same manner the leaves taken collectively should have the same resulting taper, that is, the bottom or top leaf, as the case may be, should be the longer, each succeeding leaf being shorter in length so that under load the whole spring will approximate a true arc. In goving over a rough road, springs are subjected to considerable side-sway. To take care of this it is advisable to have some means of preserving alignment. Various methods are available. Near the end of each leaf there may be cut a slot into which projects a bead from the leaf underneath; or at the same point there may be formed a rib having a longitudinal movement in the indentation formed by the making of a rib in the leaf above. These ribs and slots should be so placed that each is covered by the next leaf above, resulting in their being out of sight and free from dirt. There is a little difference in the comparative value of the shape of the leaf points. The round bevel end is in most common use. Springs more than 2 inches wide should not have French or diamond points, as they entail unnecessary waste. In most cases the long leaf supporting the master leaf should have square points, especially with a high cambered spring, in the case of which the torsional strain on the master leaf is considerable. As a means of holding graphite or other spring leaf lubricant the leaves may be slightly concaved on both the top and bottom, and the space between filled with the lubricant to prevent rusting of the parts and to add to the wearing quality of the spring by decreasing friction.

The best results of spring suspension can be determined by experimentation only. The front end of the front spring must be anchored securely to the frame, as it takes the forward thrust load. The rear end may be allowed more or less play by means of a suitably designed shackle. The spring may lie in a horizontal plane or be somewhat inclined. In some cases raising the spring slightly at the forward end adds considerably to the riding qualities. The front end eye-bolt must be of such strength as to take care of the bearing load as well as the forward thrust load. It is imperative that this bolt be made of a steel of good anti-fatigue qualities. The front left-hand spring should be so designed in respect to strength that it will properly take care of the downward thrust induced by the torque developed in the motor, which revolves in a clockwise direction according to the general practice. This torque rarely exceeds 150 pounds, but it is necessary to make a trial for accuracy. The suspension of the rear spring depends to a great extent on the design of the chassis distribution of load, etc. If the spring takes the driving effort, the front eye-bolt must be designed to this end. At the present time about 50 per cent. of the American cars are driven in this manner.



Horsepower As Basis For Tax Discussed

Part II.

Prominent Automobile Engineers Vary in Their Opinions as to the Relative Value of Formulae

Farr Opposed to Changing S. A. E. Rating
Planche Thinks A. L. A. M. Formula Inadequate
Should Rate the Average Motor, Says Holmes
Brake Test Unfair, Says Granquist
Should Be Taxed for Capacity, Says Heising
S. A. E. Rating Should Be Retained, Claims Mixer

THAT the article entitled "Cars Taxed on Unused Horsepower, which appeared in The Automobile for March 27, was timely is borne out by the widely divergent opinions expressed by the leading automobile engineers of the country. Some of these views on the subject are given herewith:

Indianapolis, Ind.—Editor The Automobile:—I am very much opposed to any change in the present S. A. E. rating, as I believe that this is about as good as any other simple formula which could be devised, and also we think it would be rather confusing to adopt any other at present. Also the fact remains that if this should be changed, it should be to reduce the resulting horsepower instead of increasing it, as very few engines come up to the S. A. E. rated horsepower from the formula $\frac{D^2 \times N}{2.5}$ at the average speed at which cars are run. We do not believe that this average speed exceeds 20 miles an hour.

As an illustration of this point, the National company has spent considerable time in developing the maximum horsepower of its engines, and at the rate of 20 miles an hour (cars geared on an average of 3 to 1, which would be turning the engine over at about 560 revolutions per minute) our engines develop about 32 horsepower under steady pull.

According to the S. A. E. formula, this engine, which is four-cylinder 4⅞ by 6, is rated at 38 horsepower, so you see that at 20 miles an hour on the road there is quite a wide margin between the actual horsepower and the S. A. E. rating. Of course we realize that at much higher speeds on the road the horsepower does come up very materially. For instance, at 90 miles an hour, at which our cars have been known to run, this engine develops about 110 horsepower. As there is no possibility of a car running anything like this fact on an ordinary highway, and as the speed limit in quite a number of states is 20 miles an hour, and in cities much less, we do not believe that this maximum speed should have any bearing on the case.

It must be borne in mind that even with the best transmission there is considerable loss in power from the engine to the wheels, and we do not wish to be taxed for power we cannot use under average conditions.

In objecting to any change in the S. A. E. rating for state taxation, I do not mean to leave the impression that I am at all opposed to higher taxes on automobiles, provided these taxes are used for the benefit of the motoring public. We do, however, object to any discrimination against the motor car and the use of these funds for other purposes than good roads and in other ways which are of service to the motorist.—William G. Wall, National Motor Vehicle Co.

Springfield, Mass.—Editor The Automobile:—It is my remembrance that at the discussion on the question of adoption of the Royal Automobile Club's formula by the Mechanical Branch of the Associated Automobile Manufacturers, while nearly all tests of American-made motors at that time showed to more or less degree a considerable increase over the ratings given by this formula that it was the consensus of opinion of engineers present at those meetings that motors in general after being run a year by the average customer would not show on a test bench in excess of this formula, and it is the writer's opinion that the average car will not at this day.

I have made several tests of our motors which were the general run of our output and have found that they run considerably over this, in fact, checked up approximately with the formula that the writer has used for a number of years. This formula is the total cubic displacement of the motor divided by 8. We have made several tests of motors here which have checked with this almost exactly and also have had one test made by the Massachusetts Institute of Technology which showed the same results. We believe that if another formula is to be adopted, it should not give a rating higher than that mentioned above.

Our model S is a 6-cylinder motor, 5-inch bore by a 5.5-inch stroke rates by S. A. E. rating, 60 horsepower, by the writer's formula, 80.99 and the Incorporated Institution of Automobile Engineers, 108.88 horsepower.—H. G. Farr, M.E.—Knox Automobile Co.

Detroit, Mich.—Editor The Automobile:—A great deal has been said, a great deal has been written on the question of a formula for horsepower rating of gas engines, and it seems that no one can agree on that question. However, the question is, and has always been a very simple one.

The formulas given by the Royal Automobile Club of England and the A. L. A. M. were never anything but incorrect formulas. No engineer would try to figure out the power of a steam engine in figuring only on the bore of the cylinders without taking the stroke into consideration. Yet, for several years the public has been deceived with so-called formulas taking in account the bore only, not even mentioning the speed of the motor; and really long before the A. L. A. M. formula or the R. A. C. formula had been created, there existed a correct and accurate formula giving the exact power to be obtained from a gas engine of a given bore and stroke at variable speeds.

We have reference to the Hospitalier Ringelmann and Witze formula, which is as follows:

$$P = \text{Horsepower} = K \times d^2 \times l \times N \times n$$

in which P is the horsepower, d the bore of the cylinders, l the stroke, N number of revolutions per minute, n the number of cylinders of the motor, K a variable co-efficient, which we might call the efficiency co-efficient, varying with the design of the motor, the number of cylinders, the quality of the workmanship, the degree of perfection of the balance of the motor, in short, a co-efficient which can express the exact relation between the efficiency of different types of motors.

This co-efficient has a value well-defined for the maximum power of a given motor of one, two, three, four, six or eight cylinders, and it will be found as the number of cylinders increases in the motor, K decreases steadily for the same power on account of increased frictions and losses of calories.

It is well to state too, that, as the bore of a motor increases, for the same number of cylinders, K increases too, for if the power increases proportionately with the square of the diameter, the losses through friction and dissipation of heat units increase only proportionately to the diameter up to a certain limit.

This may seem a little complicated to the layman, but in the end a pretty fair idea of the power expected may be figured for the average size motor used in automobile construction. The bore and stroke are given in meters. We shall give the following values to K:

One cylinder	K—5.25	Four cylinder	K—4.58
Two "	K—4.90	Six "	K—4.13

To give an example let us take the Chevrolet six motor which has a bore of 3 9-16 inches and a stroke of 5 inches, or in meters 0.0905 bore, and 0.127 stroke. The formula will give us at 1,950 revolutions per minute:

$$P = 4.13 \times \frac{2}{0.0905} \times 0.127 \times 1950 \times 6 = 50.25$$

which is the power maximum shown by inspecting the curve of the Chevrolet motor. A value of K can be obtained easily to apply on bore and stroke given in inches it has only a great many decimals, being of a very low value.

The average owner of a car uses only the maximum power of his motor on exceedingly infrequent occasions, he generally drives his car on high gear at a speed in the neighborhood of 20 to 25 miles an hour, which corresponds to a speed of 750 to 1,000 revolutions of his motor. This is mostly what he uses every day to drive his car. If we apply our formula to the Chevrolet motor, we find that the power at 1,000 revolutions is

$$P = 4.13 \times \frac{2}{0.0905} \times 0.127 \times 1000 \times 6 = \text{about } 26 \text{ horsepower.}$$

If we compare with the A. L. A. M. formula we find that it gives a power of 30.6 horsepower for our motor, therefore our average owner is not even using all the power allotted to him by this dear A. L. A. M. formula and should not be taxed any higher, for it certainly would be an abuse of power (both ways).—E. Planche, Chevrolet Motor Co.

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Syracuse, N. Y.—Editor The Automobile:—I believe the present rating should be corrected to take into account the different strokes of the different motors now being made. The rating which should be adopted should be a conservative one, one that the average motor will meet, and not a rating that represents the best motor, keyed up to the very highest condition. This would really be the rating that the average motor would come up to that is in the service of the owner.—A. Holmes, H. H. Franklin Mfg. Co.

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New Brunswick, N. J.—Editor The Automobile:—Regarding the growing sentiment among our secretaries of state toward adopting new methods of taxation of automobiles according to horsepower and abolishing the present S. A. E. or A. L. A. M. ratings, it seems to us that this tendency is not in the right direction, for the following reasons:

In the first place, the speed at which an automobile may be driven over the highways is fixed by law. Secondly, the power necessary to drive any machine at this speed depends upon the weight and consequent resistance of that machine.

This power may be the full capacity of a small motor or a small portion of that of a large motor. In other words, it requires a certain power to do a given work, regardless absolutely of the size or nature of the power plant. Incidentally it seems to us that any taxation according to horsepower alone is fallacious.

Horsepower taxation according to the S. A. E. or A. L. A. M. formula is fair to all makers alike, while systems based on brake tests or cylinder capacity would be distinctly unfair, as they would put the burden of heavier taxes on makers of more efficient motors in the first case, and on makers of larger ones in the second. Since it is a fact that the large motor is more durable than the small, due to its operating at a lower average speed and frequency, these other systems of taxation would militate against motors superior either in efficiency alone, or in long life also, and would place a premium upon inefficient and undesirable motors, thus working out as highly unsatisfactory to the progress of the art, the owner, and the trade in general.—G. E. Granquist, Simplex Automobile Co.

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St. Louis, Mo.—Editor The Automobile:—Very few of the average car owners and chauffeurs are able to keep their motors in such shape as to develop the full horsepower, according to the factory rating, and which was no doubt obtained at the factory under the very best conditions. This is easily proven when a car is brought up to the factory to be tuned up and a noticeable difference in power occurs after one of the factory experts has worked on it a short time. I believe that the A. L. A. M. rating is entirely adequate for the power obtained in general use.

It occurred to me that it might be more fair to the automobile owner to tax their cars according to their capacity, instead of the actual horsepower or a combination of the two. For instance, a man using a 40-horsepower, two-passenger car should not pay as much as a man using a 40-horsepower, seven-passenger car, any more than the man with a 5-ton truck with a 30-horsepower motor in it should pay less than a man with a 3-ton truck with a 40-horsepower motor.

The subject, we believe, is one of great interest, and there are numerous little points upon which sound arguments could be based. The writer is of the opinion that the article you have in mind will be one of great interest throughout the country, both to manufacturers and car owners.—George F. Heising, Moon Motor Car Co.

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Racine, Wis.—Editor The Automobile:—I wish to express the following views in regard to S. A. E. formula for horsepower rating:

I realize that from a selling standpoint S. A. E. rating is not all that it should be, being based on bore alone it does not give the sales agent the necessary leeway to specify the horsepower, taking into account the different strokes which might be used with this same bore. However, from the manufacturer's standpoint and from the consumer's standpoint I feel that the S. A. E. horsepower rating is a fair rating for operation of the car on the road. I do not figure that we get much more out of our motors with the average driver using them on the road than S. A. E. formula allows them. On block test, however, this runs up from 50 to 60 per cent. more at times. I would therefore suggest that the S. A. E. rating be retained as it is practically the only fair rating which has been suggested up to the present time.—W. G. Mixer, J. I. Case Threshing Machine Co.

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Wilkes-Barre, Pa.—Editor The Automobile:—I believe that a more equitable method of taxation would be one based upon the piston displacement of the motor rather than upon the A. L. A. M., or S. A. E., formula. It is well known that neither of these formulas take account of the high piston speed and consequent increased horsepower developed by the latest type of motors.—A. M. Dean, Matheson Automobile Co.

Light Delivery Cost

Record System and Cost Figures Obtained by Its Use by South Bend Owners

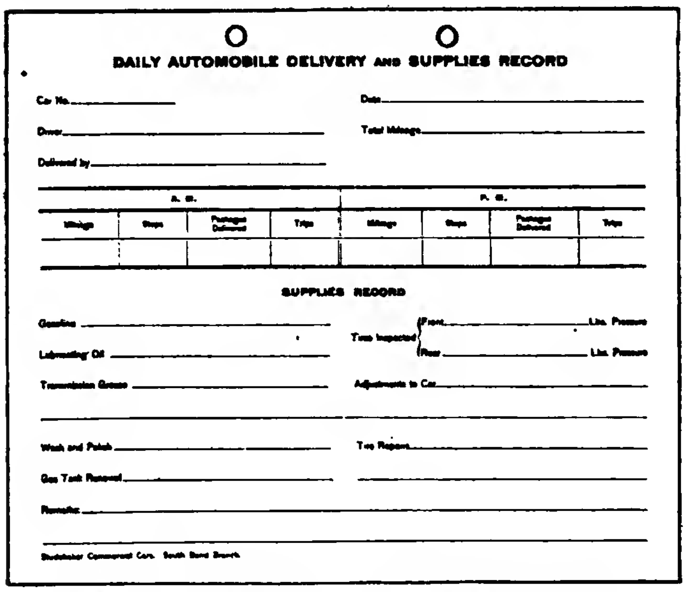
By Proper Economy, Packages May Be Delivered at Average Cost of 1.63 Cents

ONE of the fields in which the exception ought to be the rule is in the application of system to small truck fleets. In other words, among the thousands of companies and individual owners employing one or a few small commercial vehicles there is only an exceedingly small percentage which keeps operating records in scch a manner that actual benefits may be derived therefrom. To produce such records which may serve as a basis for operating cost reduction, it is necessary that the forms used for recording the data are so designed as to permit the entries of all facts bearing any relation to operating cost.

Below are described and illustrated three forms designed by the Studebaker Corp., South Bend, Ind., for the benefit of users of Studebaker 20 delivery cars. A few instances of the results obtained by records kept on these forms are also given.

The basis of the entire record system is a daily delivery and supply record, Fig. 1. This form is 8.5 by 7.25 inches, printed on thin tan cardboard and affording space for recording the mileage traveled by the car, the number of stops made, the number of packages delivered and the number of trips for both morning and afternoon of a day. The total mileage made during the day is recorded at the top of the blank, as are the company's number of the car, the name of the driver and that of the helper delivering the goods to the customers. Below the work record, the supplies used during the day are noted. These records include the quantities of gasoline, lubricating oil, transmission grease and what material is used for washing and polishing the car or any parts thereof. A record is made of the pressure maintained in the tires during the day, of adjustments made on the car and of tire repairs. When the statement has been filled out, it is signed with the driver's and his helper's initials and is turned over to the delivery superintendent.

At the end of the month the information recorded on all the daily cards pertaining to one car is summed up on a monthly operating expense record, Figs. 2 and 3. This form is 8.5 by 13


DAILY AUTOMOBILE DELIVERY AND SUPPLIES RECORD

Car No. Date

Driver Total Mileage

Delivered by

A. M. | P. M.

SUPPLIES RECORD

Gasoline

Lubricating Oil

Transmission Grease

Adjustments to Car

Wash and Polish

Tire Repairs

Remarks

Fig. 1—Daily record blanks for Studebaker wagons

OPERATING EXPENSE RECORD
of
STUDEBAKER 20 PANEL DELIVERY CAR

For Month of August — Date Report Received, Sept. 14, 1912
Owner, Jos. Grueger & Son — Business, Grocer
Address, No. 704 E. Sample St., South Bend, Ind.

Number		Price		Total
42	gallons gasoline at	$.14½	per gallon	$6.09
2	gallons lub. oil at	.40	per gallon	.80
2	pounds trans. grease at	.33	per pound	.66
	Tire repair			None
	Repairs to car			None
	Incidentals for car			None
				$7.55

Total mileage, 480. Average miles per gallon, 11½. Cost per mile. .01 1-2
Total days' service, 30. Average miles per day, 16. Cost per day.. .25 5-6
Approximate deliveries per day, 70. Cost each. .00 1-3

FIXED EXPENSE

Interest on $800 at 6% per year, $48. Per month	$4.00
Depreciation on $800 at 20% per year, $160. Per month	13.33
One new set tires (cases and tubes), year, $90. Per month	7.50
Insurance (value $600), per year, $16.50. Per month	1.37
License and tax per year, $6. Per month	.50
Driver's salary. Per month	60.00
Garaging of car. Per month	....
	$86.70
Grand total expense for one month's operation, including supplies and fixed expense	$94.25

RECORD OF DEMONSTRATION OF

To a South Bend Grocer — Saturday, Oct. 5, 1912

SUMMARY OF TRIP TOTALS

Trip A.M.	Stops	Mileage	Packages Delivered	Time Running	Time Stopped While Delivering	Time Consumed in Loading
1	3	1.09	3	23 M.	12 M.	
2	9	1.05	10	21 M.	11 M.	5 M.
3	14	3.01	15	37 M.	20 ½M.	28 M.
4	17	5.01	17	40 M.	14½ M.	20 M.
5	1	1.00	1	4 M.	1 M.	3½M.
6	2	1.03	2	8 M.	2 M.	1½M.
7	1	3.02		10 M.		Driver to lunch
Total	47	17.00	46	2 H. 23 M.	61 M.	57 M.
P.M.						
1	15	4.07	15	53 M.	16½ M.	
2	14	4.00	15	43 M.	17 M.	13 M.
3	16	5.04	16	55 M.	15 M.	7 M.
4	6	5.00	7	34 M.	7½ M.	8 M.
5	5	5.03	5	35 M.	6 M.	3 M.
	47	24.04	58	3 H. 40 M.	62 M.	31½M.

GRAND TOTAL A.M. AND P.M. DELIVERIES

12 trips.
33.04 miles covered.
103 stops.
107 packages delivered.
6 hours 3 minutes actual running time (motor running continually from time of start till return to store).
2 hours 3 minutes time stopped (motor running while making deliveries).
1 hour 28 minutes time loading and waiting for orders to be put up.

inches and printed with black ink on fairly heavy white paper. Fig. 2 shows the front of the blank, on which the type capacity and model of the car and the date on which the monthly record is filled out are entered; the same applies to the name of the owner and his address as well as the car number used by the company and the name of the driver. The rest of the front page is filled out by the spaces for copying the daily records of mileage, number of stops, packages delivered, fuel, oil and transmission grease used, as well as incidental expenses and remarks. One line is provided for each of the 31 days of the month and the last line serves for footing the totals.

Fig. 3 shows the reverse side of the blank giving the monthly totals of the various items appearing on Fig. 1. It also affords space for recording the average number of deliveries per day, miles per day, miles per gallon and gallons per day.

With reference to these three blanks, the following should be noted. The daily record card blank is not always filled out completely, but in many cases only the mileage, the gasoline and the oil consumption are given. Of course, it is better to also make out complete delivery records as they will help the owner to decide what the truck is worth to him. Anyway, the Studebaker Corp. supplies these blanks principally to companies who have

OPERATING EXPENSE RECORD
of
STUDEBAKER 20 PANEL DELIVERY CAR

For Month of August — Date Report Received Sept. 5, 1912
Owner, J. Bergsted. — Business, Grocer
Address, 1402 Kemble Avenue, South Bend, Ind.

Number	Price		Total
34 gallons gasoline at	$.14½	per gallon	$4.93
3 gallons lub. oil at	.36	per gallon	1.08
1 pound trans. grease at	.33	per pound	.33
Tire repair			None
Repairs to car			None
Incidentals for car			None

Total supplies expense	$6.34
Total mileage, 800. Average miles per gallon, 23½. Cost per mile	.00 2-3
Total days' service, 21. Average miles per day, 38. Cost per day.	.30 1-10
Approximate deliveries per day, 50. Cost each	.00 3-5

FIXED EXPENSE

Interest on $800 at 6% per year, $48. Per month	$4.00
Depreciation on $800 at 20% per year, $160. Per month	13.33
One new set tires (cases and tubes), year $90. Per month	7.50
Insurance (value $600), per year $16.50. Per month	1.37
License and tax per year, $6. Per month	.50
Driver's salary. Per month	....
Garaging of car. Per month	....
Total	$26.70
Grand total expense for 1 month's operation, including supplies and fixed expense	$33.04

STUDEBAKER 20 DELIVERY CAR

To a South Bend Grocer — Saturday, Oct. 15, 1912

SUPPLIES EXPENSE

Total gasoline consumed. 3¼ gallons, at 15 cents per gallon	$.49
Total oil consumed, 1 pint, at 34 cents per gallon	.05
Total cost for day	$.54
Average cost of operating car per mile	$.012
Average cost of delivering each package	.005
Approximate cost of operating car 6 days a week at say 60 cents a day	$3.60
Cost of supplies for running car by the month should not exceed	$15.00

FIXED EXPENSE

Interest on $825 at 6% per year, $49.50. Per month		$4.125
Depreciation on $825 at 20% per year, $165. Per month		13.75
One new set tires (cases and tubes), year, $90. Per month		7.50
Insurance (value $600), per year, $16.50. Per month		1.37
License and tax per year, $6. Per month		.50
Driver's salary (approximate), Per month		60.00
Driver's delivery boy (approximate)		20.00
Garaging of car		....
		$107.245
Fixed expense operating car per month	$107.245	
Supplies expense operating car per month	15.00	
Total	$122.245	
Fixed expense operating car for 12 months or one year, including supplies expense ($122.245)		$1,466.94
Annual overhauling of machinery, and incidental repairs to car due to wear and tear and service of car. (Estimated)		50.00
		$1,516.94
Average cost operating car per day, 300 days in year		$5.00

(In figuring the cost of horse-drawn vehicles, your total year's cost should be figured with the regular 365 days that makes up a full year.)

not used automobile delivery before; after a certain time, progressive companies supplant this stock form by specially designed blanks better adapted to the specific requirements of the company's operating conditions. The Studebaker Corp. also supplies the double form shown in Figs. 2 and 3. This form enables a user to figure totals and averages and the corporation assists him in calculating his fixed expense and depreciation, so that every month he may charge off a certain amount in addition to the running expenses and know to the dollar how much it costs him to operate a car per month, per day, per mile and per package.

Now to the practical record examples. The operating record for the month of August of Joseph Grueger & Son, South Bend, Ind., on page 815, shows a total expense for the month of $94.25, which includes a supply cost of $7.55, figuring gasoline at 14.5 cents per gallon, which, of course, would be too low for any locality farther away from the sources of the national gasoline supply. The amount, $7.55, may seem low, but is explained by the entire absence of repair and incidental expenses. On the working days during August, 1912, the Studebaker 20, to which the record refers, covered a total of 480 miles, making the supply cost per mile 1.5 cents. Figuring an average of seventy de-

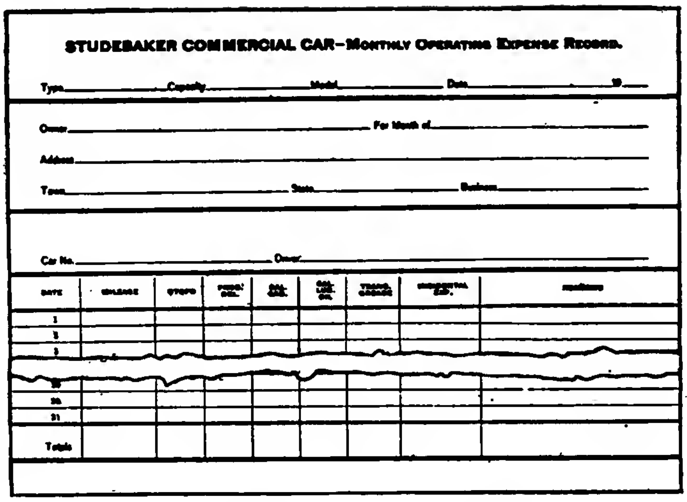


Fig. 2—Monthly record blanks for digesting data

liveries per day, the supply cost per delivery is one-third of a cent. The fixed expense is $86.70, which includes a monthly driver's salary of $60, without which the expense would only be $26.70. Assuming that the owner could run the car himself he could save $60 a month, bringing the total expense of operation down to $34.25, or the total cost per package delivered to 1.63 cents.

Another instance which, while higher in certain items results in a lower total, is that of J. Bergsted's Studebaker 20, the operating record for August, 1912, appears herewith. Like the previous instance, the car referred to in this case is used in grocery deliveries and makes about fifty deliveries a day which, however, are distributed over a wider area than in the case of the other car. Consequently, the supply cost per delivery is .6 cent as compared with .33 in the case of the first-mentioned car. The fuel cost per mile, however, is only .66 cent, against 1.5 cents in the case of Grueger's car. The car operates only 5 days during the week; the owner starts out at 6 a. m. and calls on his customers to take their orders. At 8 he returns to his store and then sets out to deliver the goods as well as those ordered over the telephone. By driving the car himself, he saves the salary of a driver, while the clerk who attends to the store during his absence is required there anyway and his pay is considerably less than that of a driver. Due to this economy the total operating cost of $33.04 per month is realized, which, distributed over 1,050 packages, makes the total delivery cost per package 3.2 cents, or practically twice the cost of the first example. However, the automobile delivery enables the owner to

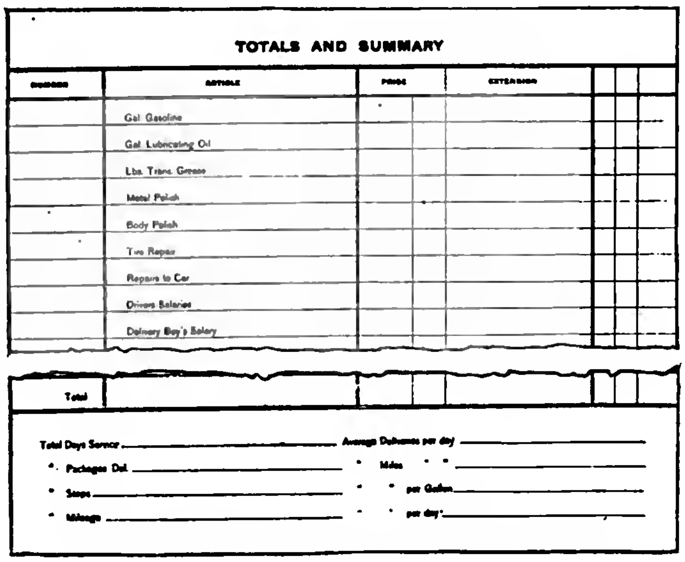


Fig. 3—Reverse of monthly blank for truck records

ACTUAL OPERATING EXPENSE RECORD OF TWO STUDEBAKER 20 PANEL DELIVERY CARS

Owned by
Geo. Wyman & Company,
South Bend, Indiana

For Month October, 1912
Department Store

CAR NUMBER, 2. DRIVER, EMERY COVERDALE

Date	Mileage	Stops	Pkgs. Del.	Gals. Gas.	Gals. Lub. Oil	Wash and Polish	Tire Repair—Remarks
1	38	38	50	4	1 qt.		
2	35	39	64	5	1 pt.	Yes	
3	49	33	52	5	1 pt.		
4	43	48	52	3	1 qt.		
5	42	40	48	5	1 pt.	Yes	
7	44	58	62	2	1 pt.		
8	38	29	68	5	1 pt.		
9	31	32	34	5	1 pt.	Wash	
10	37	44	53	4½	1 pt.	Wash	
11	35	51	79	1	1 pt.		Exchange carburetor
12	52	44	56	4	1 pt.	Yes	
14	34	35	37	4	1 pt.		Cleaned engine
15	40	43	45	1	1 pt.		
16	37	46	55	5	1 pt.	Yes	
17	43	50	59	4	1 pt		
18	44	55	71	4	1 pt.		½ lb. Trans. Grease
19	47	49	68	1½	1 pt.		
21	45	44	55	4	1 pt.	Yes	
22	47	44	58	5	1 pt.		
23	41½	44	61	3	1 pt	Wash	
24	44	39	44	3	1 pt.	Wash	
25	49	61	69	2	1 pt.	Polish	
26	51	59	69	5	1 pt.		
28	43¼	41	43	2	1 qt.		
29	43¾	34	52	5	1 pt.		
30	18	8	14	5	1 pt.	Yes	
31	19½	23	24			Wash	One puncture

CAR NUMBER, 3. DRIVER, R. MILLER

Date	Mileage	Stops	Pkgs. Del.	Gals. Gas.	Gals. Lub. Oil	Wash and Polish	Tire Repair—Remarks
8	23	49	51	5	2 qt.		Speedometer not working. Replaced gratis
9	36	45	49	4		Wash	1 puncture. Ran over dog on E. Sample St.
10	43	65	73	4	1 qt.	Wash	2 lb. Trans. Grease 1 puncture
11	50	88	103		5 pt.		
12	42	55	59	5	1 qt.	Wash	
14	51	78	79	5	1 qt.		
15	43	68	70	4	1 qt.		
16	39	68	74	3	1 qt.	Yes	
17	38	46	57	5	1 qt.		
18	47	84	93		1 qt.		
19	47	61	65	5	1 pt.		
21	43	60	64	5	1 qt.		
22	44	55	69	5	1 pt.		
23	43	56	68		1 pt.		
24	34	56	62	5	1 pt.		
25	43	72	76	5	1 qt.		
26	54	72	74		1 qt.	Polish	
28	31	52	48	5	1 pt.		
29	48	63	66	5	1 qt.		
30	50	65	73	5	1 qt.	Yes	
31	38	53	54	5	1 qt.		Coverdale used No. 3 until noon

FIXED EXPENSE

Interest on two cars at $825 each—$1,650 at 6% per year	$ 99.00
Depreciation on two cars—$1,650 at 20% per year	230.00
Two new sets tires (cases and tubes) $90 a set per year	180.00
Insurance (value $600 each) per year	33.00
License and tax per year, two cars	12.00
Garaging or car-rent (dead storage), $60 per car	120.00
	$674.00
Fixed expense per month	$ 56.16
Total supplies expense per month	134.77
	$190.93
Annual operating expense (12 months), supplies and fixed expense	$1,391.24

SUMMARY AND TOTALS

Number		Price		Total
177	gallons gasoline at	$.15	per gallon	$ 26.55
7	gallons 3 qt. oil at	.34	per gallon	2.64
2½	pounds trans. grease at	.33	per pound	.83
3	punctures (inner tubes) at	.25	each	.75
	Salary two drivers			104.00
				$134.77

Days' service (2 cars), 48. Total miles run, 1,994. Total stops, 2,444. Total packages delivered, 3,095. Average deliveries per day, 64. Average miles per day, 41½. Average miles per gallon, 8¾. Average cost per day each car, $2.81.

HORSE TRANSPORTATION ANALYSIS

INVESTMENT

Stable equipment	$1,000.00	
5 horses at $225	1,125.00	
5 one-horse panel wagons at $200	1,000.00	
5 sets single harness at $35	175.00	$3,300.00

ANNUAL OPERATING EXPENSE OF HORSE SERVICE.

Interest $3,300, 6%	$ 198.00	
Depreciation and repair:		
Horses, $1,125, at 15%	168.75	
Wagons and harness, $1,175, 20%	225.00	
Maintenance and labor:		
Feed—5 horses at 50 cents x 365 days	912.50	
Rent—shoeing, medicine, insurance—5 horses at 30 cents day x 365 days	547.50	
Drivers (average):		
1 man at $2.50 x 365 days	912.50	
4 men at $2.00 x 300 days	600.00	3,564.25

	Horses	Motor	Saved
Total expense per month	$ 297.02	$ 190.73	$ 106.29
Total expense per year	3,564.25	1,391.24	2,173.01

greatly increase his business radius and there the profit comes in.

On this page full calculations of cost referring to two Studebaker delivery wagons used by a South Bend department store are given. The figures are arranged in a form digesting the schemes of both Figs. 2 and 3. An exact survey of the figures will undoubtedly prove of interest to truck users. The calculation of fixed and total expense result in a total cost, for the two trucks, of $1,391.24 per year, as compared with $3,564.25, the cost of horse delivery of the same amount of goods. Companies having experience with horse delivery will be in a position to check the horse figures which are not out of the ordinary, but rather normal; while the automobile fixed expense are taken relatively high, as is seen by the interest charged at 6 per cent., the depreciation at 20 per cent. and the provision of two full sets of tires for 1 year's service.

An interesting record which is well suited to be included with the description of the cost-keeping systems above described is that of a demonstration made by the Studebaker Corp. to a South Bend grocer on October 5, 1912. On pages 814 and 815 the results of this demonstration appear tabulated, much in the same manner as the daily record, Fig. 1, except for greater detail. In making a delivery car demonstration, the corporation, of course, attempted to determine exactly the work done during all the time spent by the truck in demonstration work, and for this purpose not only the number of miles covered and packages delivered, as well as fuel and lubricants consumption, are given, but also the time during which the car was running on each trip, the time spent standing while delivering parcels and the time spent in loading the car again. In this manner a most exact record is obtained, which is best fitted to convince a prospective buyer of the advantages of a truck. The average operating cost per mile was, in the case of the demonstration here recorded, 1.2 cents and that of delivering each package .5 cent. In addition to giving the report of the demonstration made, the corporation supplies the prospective customer with an estimate of truck operating cost based on this experience, so that the whole situation is put clearly before him.

By instructing its customers how to properly record the cost of operating their trucks, the Studebaker Corp. makes it possible for them to soon arrive at a very economical basis of operation. As a result, there is little difficulty in satisfying the purchasers, and a satisfied buyer is always a promising prospect.

Among the New Books

Works on Machine Practice, Automobile Construction, Scientific Management and Metallurgy Are Offered

Third Annual Appearance of the Automobile Engineers Yearbook for 1913—Book Indicates British Trend

MACHINE DESIGN HOISTS, DERRICKS, CRANES. By H. D. Hess, M. E., Professor of Machine Design, Sibley College, Cornell University. Published by J. B. Lippincott & Co., Philadelphia, Pa. 386 pages, with 318 illustrations and 18 inserts. Cloth, $5.

Either as a book of reference or as a text-book on machine design, applied especially to hoist derricks, cranes and allied subjects, this work will be found most complete. The different principles of mechanics involved in the study of these particular branches of machine design embrace so broad a field that it practically covers a general course in this branch of applied science. As the author states, the book is intended to aid the work of machine design in technical schools and colleges and to serve as a reference work in drafting rooms where a general field of machine design is covered. The author has drawn from prominent engineering sources much of his information and supplies the rest by a queerly expressed compendium of compiled information. The early chapters of the work lead into the more detailed study later by giving the elements of the strength of materials entered into the construction and design of all hoist, derrick and crane parts.

WORM GEARING. By Hugh Kerr Thomas. Published by McGraw-Hill Book Co., New York City. 86 pages, with 33 illustrations and numerous tables. Cloth, $1.50.

In this work the author has probably for the first time devoted a whole work to the branch of applied mechanics known as worm gearing. The growth of the worm gear throughout England for the past few years and its introduction into America renders this book of timely interest to the automobile manufacturer and to those interested in the construction of passenger and commercial cars. In fact, the author, although dealing with the worm gear as a general subject, especially considers its application of the rear axle of the automobile and has illustrated this phase of worm gear thoroughly. The work on the worm gear and its ramifications is exhaustive from both theoretical and empirical standpoints.

MOTOR CAR PRINCIPLES. By Roger B. Whitman. Published by Appleton & Co., New York. 335 pages, with more than 100 diagrammatic illustrations. Cloth, $1.50.

Designed as a sister work to *Gas Engine Principles* by the same author, this book, as naturally would be expected, deals with the entire chassis. The engine is given particular attention, however, in a clear and explicit manner. It is a book that renders possible the comprehension of the motor car by the owner or driver new to the mysteries of automobile and gas engine construction. Although elementary in character, the work is sufficiently advanced to provide all the knowledge necessary for a thorough understanding of the principal mechanical features of any car. The movements involved are clearly defined and as far as the purposes of a car owner are concerned the book is complete.

SCIENTIFIC SALES MANAGEMENT. By Charles W. Hoyt. Published by George B. Woolson & Co., New Haven, Conn. 204 pages, illustrated by numerous forms and engravings. Cloth, $2.

The principles of scientific management are difficult to apply to such an occupation as that of a salesman. The personal element is so strong in this line of work that it takes the most careful study to be able to make the application. The personal element reason is not the only one to be reckoned with. The difficulty attached to keeping in touch with a man who is many hundred miles away from the central office renders it necessary to apply considerable thought to the control of the salesman. The author points out the methods employed by different large concerns and suggests others which are the fruit of the author's investigations along these lines. The value of conventions, meetings and councils for salesmen is discussed in the work and the bad effects of the so-called "ginger talks" are also brought out. The value of contests, competitions, house organs, percentage distribution and sales promotion by various means are thoroughly considered and discussed. An interesting chapter is that on the standardization of sales arguments in which printed manuals are given, furnishing a list of questions which may be asked by the prospect and the standard answer which has been worked out, in all probability, at one of the salesmen's conventions.

MIXED METALS OR METALLIC ALLOYS. By Arthur H. Hiorns, head of metallurgical department, Birmingham Municipal Technical School, third edition, revised and enlarged, published by Macmillan & Co. New York City. 469 pages, with zinc illustrations. Cloth, $1.50.

The object of the author is to show what the uses of mixed metal are and where each particular alloy would be most suitable. The preparation of alloys is taken up in the early part of the work, along with a discussion of the nature of the different metallic elements and their methods of working. After this discussion the nature of each class of alloys, such as copper, brass, zinc, silver, etc., is discussed separately in separate articles. The book should be valuable as a handbook as it is arranged in a logical order and takes up the story of mixed metals where the volumes on metallurgy generally leave off.

THE AUTOMOBILE ENGINEER YEAR BOOK FOR 1913. Published by the Automobile Engineering Publishing Co., Ltd., 20 Tudor street, London, E. C., Boards, 1 shilling.

This is the third annual automobile year book. It contains tables and data of special application to automobile work. It is a hand-book of the material, design and features of construction entering into all grades of motor cars. Besides this, methods of making the calculations necessary in automobile design are explained and the work is supplemented by tables giving the specifications of the leading English, Continental and American cars, with illustrations of modern design for engines, gearboxes and axles. It is a complete indicator of the trend of motor car design as seen in the British market.

A PRIMER OF THE INTERNAL COMBUSTION ENGINE. By H. E. Wimperis, M. A. (Cantab.) 143 pages, with numerous illustrative half-tones and diagrams. Cloth, $1. Published by D. Van Nostrand Co., New York City.

Primarily intended as a text-book, this work furnishes an excellent review course. The different chapters throughout the book are supplemented by examples to be worked by the student. The answers to these questions and examples are given in the back of the book and afford a check on the work of the student. The eight chapters are devoted to an introduction and past history of gas engines and a chapter on heat thermodynamics, practical engine problems, gas producers, design and testing. The more important engines of the early days, such as those of Otto, Lemoir, etc. are shown in diagram and carefully explained.

GAS ENGINE PRINCIPLES. By Roger B. Whitman, author of Motor Car Principles, published by D. Appleton & Co. New York City. 248 pages, with seventy-four line drawings and diagrams. Cloth, $1.50.

There are fifteen chapters in this book, all devoted to the gas engine. The first chapters take up the early forms of motor and give a short résumé of the thermo-dynamics involved in the gas engine. The remaining chapters are devoted to carburetion, ignition, lubrication, cooling, care and maintenance. The three last chapters in the work are on motor troubles. The first gives the causes, second gives the effects and the third gives the method of locating the trouble. Large type and good paper help to make the subject matter readily comprehendible. As a text book it would give great satisfaction.

Believes in Wire Wheels—Removing Rust from Metal Body—How to Take Out Stubborn Round-Head Bolts—Effect of Sea Air on a Car—What Is the Meaning of the Word Horsepower?—Deduction of the A.L.A.M. Formula

Views on Wire Wheel Situation

EDITOR THE AUTOMOBILE:—The recent adoption of wire wheels as optional equipment by a number of automobile manufacturers revives interest in the relative advantages of the two types of wheels.

The most valid objection against the wire wheel is the fact that wire spokes will rust, and because of their great number and the way they are interlaced, wire spokes are very difficult to keep clean.

Some people object to the appearance of wire wheels, as they claim that the massive bodies of our modern road locomotives look better when supported on spokes of adequate size, but this objection will probably disappear as we become accustomed to the wire spokes.

That the wire wheel is stronger, especially against side strains, may be accepted as well established, in view of the fact that the design of a wire wheel permits of the distribution of the material to the best advantage. This ability to withstand wide strains is most important, as it is through side thrusts that wheels most frequently collapse.

The fact that the wire wheel was once in almost universal use, only to be displaced by the artillery type, is not conclusive proof of the inherent defects of the wire wheel as a type; for the recrudescence of old ideas in improved forms has been a frequent occurrence in the automobile industry. The use of improved materials, such as non-rusting alloy steels, Monel metal, or bronze wire having a high tensile strength, would remove all objections as to the rusting of wire wheels and would probably be a strong factor in promoting their universal introduction.

Allegheny, Pa. MURRAY FAHNESTOCK.

Compression Fallen Off

Editor THE AUTOMOBILE:—The compression in my motor was greatly reduced just after I had my valves ground. It is now all right. Why is this?

New York City. READER.

—It is very common that a motor has poor compression immediately after carbon is taken from the cylinder. This is due to small particles which lodge on the valve seating, where the cleaning has not been carefully done. The compression soon returns.

The present practice for compression pressure in the modern touring car averages about 65 pounds to the square inch, cold. There are some cars, however, which run as high as 85 and 90, although it is very undesirable to go quite as high as the latter figure in a small or medium-powered car used for touring purposes. Take your compression, however, by gauge, which could be inserted in the spark-plug aperture, rather than by attempting to determine it by volumetric computation. It is impossible to accurately compute the volume of the combustion chamber by any of the empirical formulæ.

Rust Spots on Car Body

Editor THE AUTOMOBILE:—Is there any remedy or preventative for rust spots on a car body except repainting? My car has two or three small patches of rust on the doors, the finish being in good condition otherwise. This rusting will, of course, spread unless something be done to prevent it. What would you advise?

2—There are certain greases on the market which contain wood fiber for use in gear boxes and differentials. It is claimed the use of this grease prevents noisy gears. Is the use of such grease harmful to the gears?

3—Are not the rather complicated and heavy electrical outfits carried on most modern cars a step in the wrong direction, inasmuch as they add much complication and weight to a machine which already has enough of these attributes? It seems to me that, although these electric starting and lighting systems may be all right in the hands of expert chauffeurs, for the average owner who does his own driving they are too complicated to be a very great help or convenience. For instance, what would a driver, who is not an electrical expert, do if he should find himself some dark night, 20 miles from assistance, with his electric lights out and no way of starting his motor? These electric systems do sometimes balk, statements of their makers to the contrary notwithstanding.

With acetylene lights the cause of their failure to work is always easily located and remedied, which cannot be said of most electrical systems.

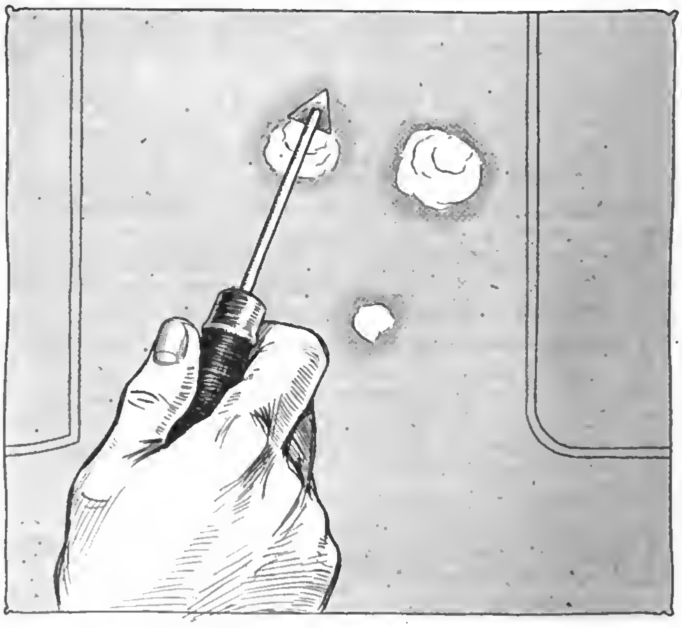


Fig. 1—Use of the scraper comes first in taking off the worst of the rust. The triangular scraper can be used for this work

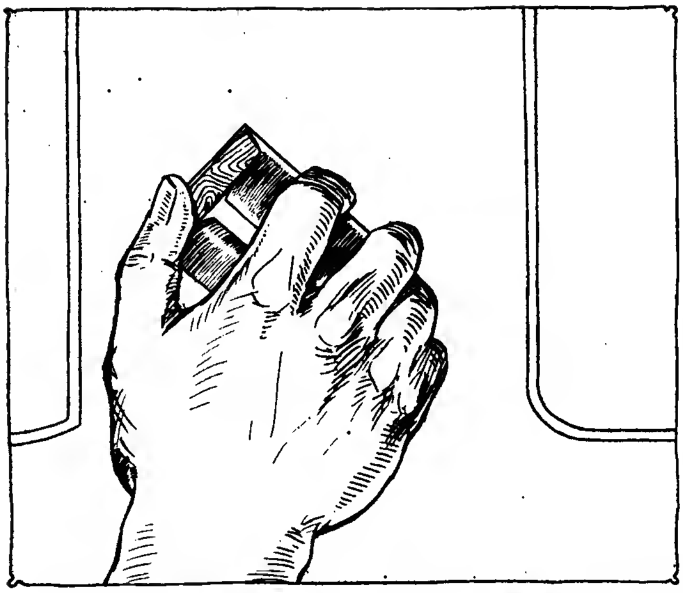


Fig. 2—Using the emery cloth. Put block of wood beneath to secure firm backing

The salesmen and demonstrators are woefully ignorant of the electrical systems on the cars which they are trying to sell. Last winter at the shows many salesmen did not know whether their cars were equipped with 6-volt or 60-volt systems. They did not know how much the system added to the car's weight, how much power they used up, some did not even know where the different units were located. If men who sell cars for their business cannot answer these vital questions, how can the non-technical owner be expected to maintain and operate these electrical puzzles?

East Canaan, Conn. D. C.

—1—The only remedy is to remove the rust spots and touch up with a little paint. This will, of course, leave these spots of paint standing out from the other paint on the surface of the car, but the appearance will not be so bad as it would be were the rust left on the body. If your car has not a polished finish, it would be possible to give the entire car a coat of paint or two. This is done frequently with cars finished in a dull battleship grey or similar colors.

Removing the Rust

The method in removing the rust will be to first scrap off the rougher part of the rust and then finish by rubbing with emery and finally with cloth and kerosene. This will give a smooth surface that will hold the paint. The latter should not be applied, however, until the kerosene has entirely vanished from the surface of the metal. A good painter can touch up small spots so they can hardly be noticed after a few days' use of the car. The degree to which the new paint is apparent, however, depends to a large extent on the color of the car.

About the best method of applying paint to spots and fading this paint off into the older painted parts is to employ a paint gun. By this method the paint is sprayed on the surface of the metal and the amount put on in each particular spot can be gauged to a nicety. The progressive steps in the work of removing rust and coating the surface of the metal are shown in Figs. 1, 2 and 3. Fig. 1 illustrates a method of doing the scraping work. The scraper used may be of any type, even an ordinary piece of metal being sufficient for the purpose. It is necessary to use such a device to break the harder accumulations of rust and to get it started. Fig. 2 shows how the body should be rubbed gently with fine emery. A block of wood is used to give a hard surface beneath the emery and to be able to apply the pressure at the necessary points. After the emery has done its work and taken off the last perceptible bit of rust and the metal is bright and clean, the paint is sprayed on with the paint gun, as in Fig. 3, or a brush may be used instead of the gun.

As far as rust preventives are concerned, it may be stated that the only method to pursue is to keep the metal work painted. A combination of moisture and air will always cause rust, and since along the East Coast the air contains more or less saline moisture it is necessary to be particularly careful.

2—Greases such as you mention are merely temporary devices for preventing noise. If a gear is worn badly enough to require some such means of silencing it, it will surely go further in a short time. As far as harming the gears is concerned it is doubtful if actual damage would be done. The only thing to be feared is that the wood fiber of a somewhat stringy nature may get into the bearings and prevent their functioning as freely as they should.

3—It cannot be said that the electric systems which have proven so popular during the past 2 years are a step in the wrong direction. The care of these systems is so simple that it is a fact that the car manufacturers who use this system say the more the driver or owner leaves the system alone the better they are satisfied, with the exception, of course, of adding a little distilled water to the storage battery from time to time.

The supposition you make of a driver finding himself some dark night 20 miles from assistance with his lights out and no way of starting his motor is highly improbable. It would mean that the storage battery was exhausted or that the generator had failed to store it or to operate correctly or that the car was not equipped with an auxiliary ignition system. Where the storage battery is depended upon to furnish ignition as well as lighting and starting current, there is always a set of dry batteries to use in an emergency. Where the magneto is used, the dry cells are, of course, not required.

Convertible Lamps Used

As for the lights, the side lamps generally supplied are of the combination kerosene and electric type so that should anything happen to the electric system the kerosene part of the lamps may be used. This leaves a fairly good emergency equipment in case the complete breakdown you mention should ever occur. It may also be said of the acetylene system that if you were in a bad place and your tank went empty you would have a hard time getting home. You are no doubt right in stating that it would be easy to find out the cause of the trouble, but it would be harder to remedy the trouble on the road. It all comes back to care on the part of the owner. If he lets his acetylene tank run empty or allows the electrolyte in the battery to become bad through his failure to add water he must shoulder the responsibility and not try to put it off on the manufacturer or an alleged complicated system in the usual manner.

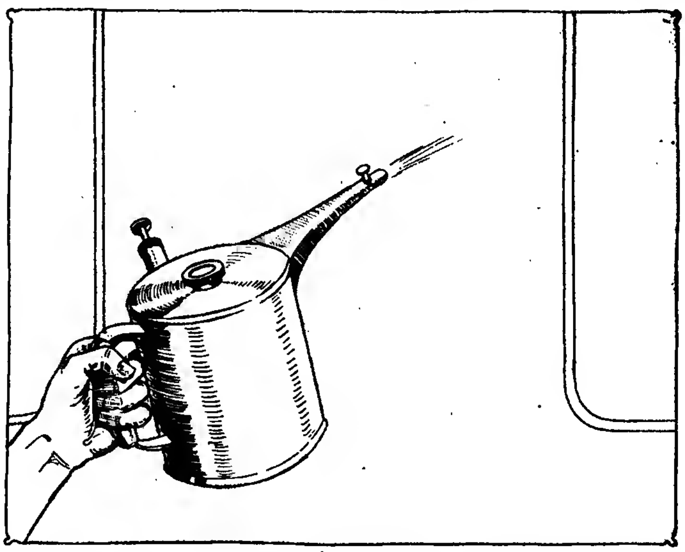


Fig. 3—Spraying paint on spot with paint gun. New color should fade into old

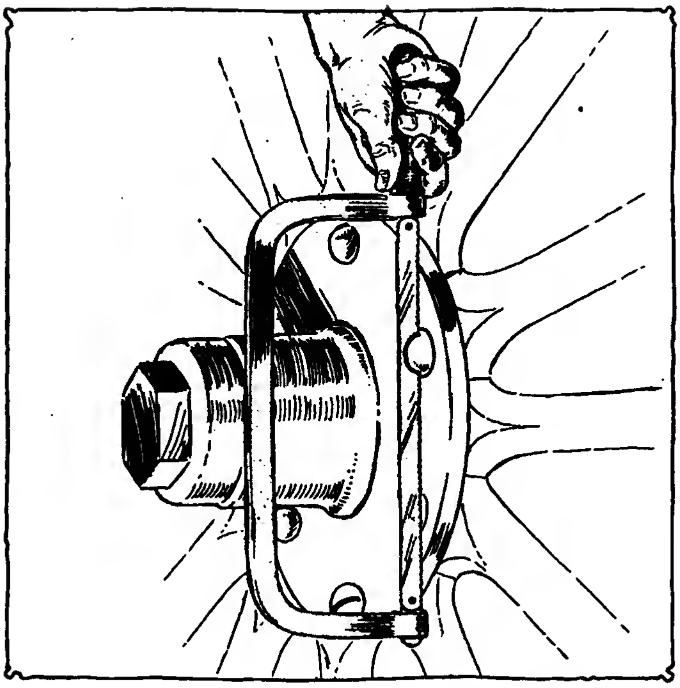


Fig. 4—Slot the heads of the round-headed bolts to make space for screwdriver

Your statement in regard to the ignorance of salesmen on the electric starting and lighting outfit is true in most respects. You must remember, however, that in many instances the cars seen at the New York show with electric starters were merely sample cars and the first to appear with this equipment. In fact, many of the cars which went to the Garden and the Palace have never been inside of the New York showrooms and the salesmen themselves saw these hurriedly assembled products for the first time at the automobile show. Since that time many have become familiar with the details and construction of these starters and have mastered the electric knowledge necessary in explaining them to prospective buyers.

In many instances the cars which were equipped with electric starters at the Garden and Palace shows had the electric equipment fitted on them in such a hurry that it has been decided to change the method of installation. It did not take a keen student or observer to note that the method of drive and mounting employed on some cars were so weak that it could not stand up under the vigorous requirements of electric cranking.

As far as the non-technical owner is concerned, he need only confine himself to adding water to his battery and to operating his starting switch when he wants to start the motor.

Storing a Car in Salt Air

Editor The Automobile:—I am a winter resident here and expect to store my car for the summer. As the salt air is bad for rust I will ask for advice:

1—The best way to leave the radiator. Some recommend filling with rain water and keeping full. Others to fill with water with some oil on top and the drain so the oil will form a coating on the metal as the water lowers. Others say to flush and dry out and nothing else. I have been thinking that after cleaning and drying out it might be a good plan to fill with a light grade of cylinder oil and before using clean with warm water and sal soda to remove what remained after draining. This would clean out the oil.

2—The best way to leave engine. Will it be best to leave everything intact, as used—oil in reservoir, ignition connected, etc., and wrap a blanket around to keep out moisture? How would it be to inject a gun of cylinder oil into each cylinder and then turn the engine over a few times so as to give the walls extra lubrication to prevent rust and insure easy starting? Have heard of cases where the piston rusted fast.

3—Would you advise something for the leather, and have you anything to recommend?

4—Is it good policy to entirely deflate tubes? My experience has been that tubes left partially inflated on wheel were all right when put in use again, while those which were taken out and left flat developed cracks when put under pressure.

Daytona, Fla. J. W. F.

—1—If you are willing to sacrifice the rubber hose connections on your radiator the best way would be to fill the water system with kerosene oil. You can then be absolutely sure that the radiator will remain uncorroded and that the water-jackets will not rust, no matter how long you leave your car exposed to the sea air. Any oil would suffice for this purpose but kerosene is mentioned on account of its cheapness and the fact that it will fill the bill as well as anything else. Another method is to fill the radiator with rain water and then seal it so that it is impossible for any air to enter. Water alone cannot cause rust. It requires the presence of free oxygen and this is only found to any extent in the atmosphere. The free oxygen present in and around sea coast towns owing to the ozone-like atmosphere and the presence of a large amount of water vapor render rusting processes rapid. When the atmosphere is not allowed to come in contact with the metal while it is damp but little rust will form. If this method is to be used the radiator should be filled to its very top, corked and the cap then screwed tightly in place. The radiator overflow pipe should also be corked.

Oil Needed in Cylinder

2—If you will run your motor for a short time with an excess supply of oil getting it up to high speed and then cutting off the ignition so that it will have opportunity to throw itself over several times or be thrown over by the weight of the car in coming down a hill or coasting up to the garage there will be sufficient oil in the cylinder to avoid all chances of rust during the summer. If you were to shoot a gun full of cylinder oil into the cylinders, it would deposit in a thick layer on top of the piston and give you carbon trouble when you again started your motor next fall. The outside of the motor should have every bit of rust scraped off and a coat of black engine paint put over it.

3—You should take a can of neatsfoot oil and go all over the leather work. This will keep it soft and will not permit it to crack or break when again used. If you use a leather cone clutch, this should also be soaked with neatsfoot oil to keep it soft while the car is not in use. In lieu of neatsfoot oil castor oil may be used. The odor of the latter is not so pleasant, however, and the neatsfoot oil is more advisable.

4—You should partially deflate the tire and block the car up to take the weight off its wheels to relieve the strain on them as much as possible. Leave about 30 pounds pressure beneath. Do not store the car in a place where the sunshine can beat in on the tires or on the body. The best place to keep tires is in a cool, dry, dark spot where the temperature does not exceed 70. This may be an impossibility, but you should approach it as nearly as possible. It would be wise to take the tires off and coat the rims with graphite paint in order to prevent any possibility of the tires rusting on the rim. It would be also wise to throw a large cover over the car while it is in storage.

Explanation of Horsepower

Editor The Automobile:—Please let me know what is meant and how is the horsepower of an engine determined and when does this engine develop said horsepower?

Brush, La. M. W. Lenert.

—To understand what horsepower means one must first understand what the meaning of the term foot-pound is. A foot-pound is the amount of energy required to lift the weight of 1 pound 1 foot. Two foot-pounds of energy are required to lift a 1-pound weight through a distance of 2 feet or to lift a weight of 2 pounds through a distance of 1 foot. In other words, foot-pounds are the products of weights multiplied by distances. For

10 pounds to be lifted a distance of 10 feet would require 100 foot-pounds of energy.

Power is energy applied at a given rate. A horsepower is 33,000 foot-pounds applied in 1 minute. That is, if 1 pound was lifted a distance of 33,000 in 1 minute 1 horsepower would have been exerted, or if 66,000 pounds were lifted a distance of 1 foot in 1 minute 2 horsepower would have been exerted.

Power Includes Time

When it is understood that a horsepower is the power required to exert 33,000 foot-pounds of energy in a minute, the horsepower of a motor will be readily understood. Suppose that to move a car of given weight at a speed of 1,000 feet per minute a steady resistance of 330 pounds was offered. In pushing this 330 pounds resistance through a space of 1,000 feet 330,000 foot-pounds of energy would have been exerted in 1 minute. In other words, since 33,000 foot-pounds per minute make a horsepower, 10 horsepower will have been exerted by the motor.

When a motor is tested on the block in the laboratory the throttle is opened wide and the motor is made to work against the greatest resistance it can overcome. Supposing that the motor exerts a given pull during the period of 1 minute and this pull is exerted through a certain leverage. We would have the factors necessary to calculate the horsepower of that motor because we would have the foot-pounds per minute exerted. The resistance against which the motor works is commonly secured by means of a brake, and consequently this horsepower which is calculated from the tests on the laboratory block has been named the brake horsepower. This is the horsepower of the motor which is commonly referred to. The motor develops this horsepower when it exerts the energy in foot-pounds corresponding to the horsepower rating.

There is another kind of horsepower known as the indicated horsepower and the letters i. h. p. are used to designate it, while the brake horsepower is generally expressed by the letters b. h. p. The indicated horsepower is figured in this manner:

The exploding gases exert during the working stroke and average pressure P upon the heads of the pistons. This average pressure is what is known in engineering work as the mean effective pressure, and is often expressed by the initials m. e. p. Since the pressure P is expressed in pounds per square inch the total pressure will be this pressure P times the area of the piston head A. That is, during the working stroke these is a pressure P. A. being exerted on the head of the piston. This working stroke pressure is in pounds. If it is multiplied by the length of the stroke L we will have the foot-pounds exerted by the exploding gases. We have but to bring in the factor of time to get the expression into foot-pounds per minute. If the engine is turning over N revolutions per minute and it is a four-cycle engine there will be $\frac{N}{4}$ working strokes in which the pressure P. A. is being exerted or in which the energy P. A. L. foot-pounds is being exerted. In one minute, therefore the number of foot-pounds will be $\frac{1}{4}(P \times L \times A \times N)$ foot-pounds exerted. Since there are 33,000 foot-pounds per minute to a horsepower, the horsepower of the motor will be $\frac{P \times L \times A \times N}{4 \times 33{,}000}$. This horsepower is known as the indicated horsepower of the motor.

It is evident that the i. h. p. does not take into account the mechanical efficiency of the motor. That is to say the brake horsepower will never equal the indicated horsepower of the motor owing to the fact that there are frictional and heat losses which cannot be prevented. The mechanical efficiency of a motor is the relation of the brake horsepower to the indicated horsepower.

The A. L. A. M., an association of automobile manufacturers which has now passed out of existence, realizing the value of a formula which would give an approximation of the brake horsepower without the time required to make the block tests have deduced a formula from the indicated horsepower expression given above. In deducing this formula they have reasoned as follows:

They have noted that the length of the stroke times the number of revolutions per minute or $L \times N$ in the numerator is equal to the speed of the piston in feet per minute. After making numerous tests, they have decided that a motor generates its maximum power under average conditions at a piston speed of 1,000 feet per minute, has an efficiency of .75. They have therefore equated $L \times N$ to 1,000. This leaves the expression for indicated horsepower $.75\frac{P \times A \times 1{,}000}{4 \times 33{,}000}$ or $.75\frac{P \times A}{132}$

The expression area A is equal to $.7854\,D^2$. Substituting this and also 75 pounds for P, which is assumed to be the average mean effective pressure, we have by solving:

$\frac{D^2}{2.48}$ or, for N cylinders $\frac{D^2N}{2.48}$ approximately $\frac{D^2N}{2.5}$.

This formula is used extensively in horsepower calculations.

Removing Wheel Hub Bolts

Editor THE AUTOMOBILE:—I cannot remove the bolts which hold the hub on my front wheel. Round-headed bolts are used and when I turn the nut, the entire bolt turns. As the bolts are round-headed there is no way of holding them so they will not turn. How can I get them off?

Batavia, N. Y. SUBSCRIBER.

—You can get them off by following the method illustrated in Figs. 4 and 5. That is by slotting the heads of the bolts with a hacksaw and then holding them with a screw driver. This will take but a few minutes and will not mar the appearance.

Please Sign Your Inquiries

[THE EDITOR OF THIS DEPARTMENT is in receipt of several letters signed Reader, Subscriber and by initials. No attention will be paid to anonymous or unsigned letters; readers who wish to make use of these columns must sign their letters as an evidence of good faith. No names will be published if the writer of the inquiry or communication does not wish the name to appear. It is only necessary to state this in your letter. Other letters which have not been deemed of sufficient general interest to publish in these columns have arrived without the sender's address so that it is impossible to answer them by mail. We are delighted to have our subscribers use these columns and most cordially invite correspondence, insisting only on the rules just mentioned.—EDITOR.]

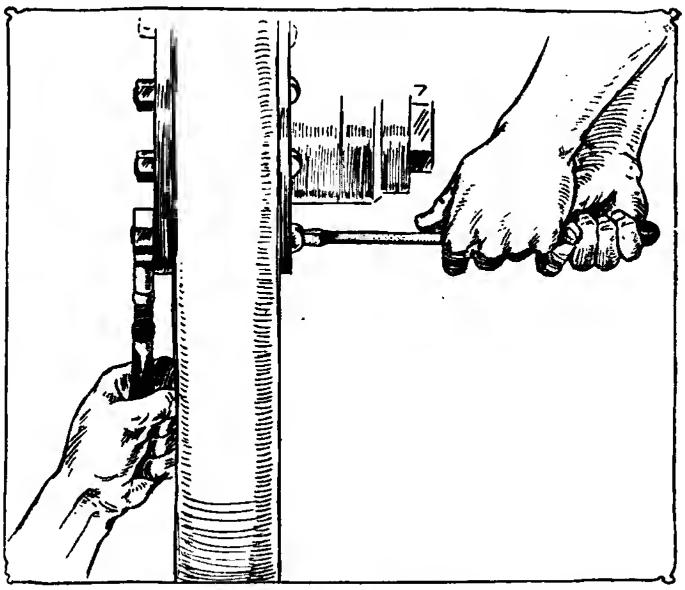


Fig. 5—Bolts can now be readily removed by holding with screw driver and removing nuts

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The Youthful Giant

GROWING at the rate of 200 per cent. per year, the motor truck industry gives promise of soon becoming a dangerous competitor, numerically, of the passenger car industry. The latest statistical figures compiled by the commercial vehicle department of the National Association of Automobile Manufacturers show unmistakably the phenomenal growth of the truck industry since 1910, containing, as they do, the interesting fact that this year the total truck output will exceed 56,000 machines.

¶ *This increase in manufacture has an added interest in that state legislatures are today focusing their major efforts for higher registration fees on trucks.*

¶ *In less than 18 months there will be approximately 100,000 motor trucks in use in this country, and if it were possible for legislators to increase the annual registration on these from an average of $10 per vehicle to $50 it would mean an added annual tax on the industry of $4,000,000, a sum that eventually must come out of the pockets of the makers.*

¶ *This year has witnessed the first concerted action of legislators to impose irrational registration fees annually on motor trucks. Next year will witness a campaign for still higher fees. It is today imperative on all concerned to work against the spirit of compromise, accepting a limited fee this year, only to be pestered next session and all thereafter for higher fees. The motor truck must bear its share of the burden, but all users of streets and public highways must pay their equal share for the use of these public thoroughfares.*

A Competitive Tariff

THE Underwood competitive tariff bill has been introduced, but introduction is a long distance from passing. Introduction in such measures means the signal to begin opposition, and from this date forward opposition will be the word from many interests in the automobile industry.

Reducing the tariff on automobile chassis from 45 to 30 per cent. would mean an approximate saving of one-half this to the ultimate buyer. Reducing the tariff on finished parts of automobiles, not including tires, from 45 per cent. to 20 per cent. would mean a serious invasion in a few accessory lines, but even should such a cut be made, which is highly problematic, the increased facilities for production in the American factory would practically balance the lower wages paid to the European maker.

By a reduction in forging of iron and steel from 30 to 15 per cent. little commotion will be created because the American forging plants are better equipped for economical production than the foreign plants and while it is true that a few years ago the foreigner surpassed us in the production of alloy-steel forging, yet today the majority of these used in our automobiles are largely the products of American plants and American labor.

The most serious aspect of a possible tariff reduction is that of passing the critical point when American methods of multiple-economical production fall below the level of cheap factory labor in Europe. The labor scale in American factories is in some cases two and nearly three times that of the foreign manufacturer, and the framers of the present tariff will be defeating their own aims if by hoping to benefit the working man by reductions in the necessities of life they cut off his available income by placing him on a competitive basis with the worker of Europe, an act which would mean a cut in labor prices among the thousands of workers in the American automobile factories.

While American automobile factories are the most modern so far as equipment of any manufacturing plants in the world there is one respect in which production can be economized upon without sacrificing quality of materials, quality of workmanship or quality of appearance, and that is in the matter of more advanced systems of scientific management so far as production is concerned.

Conditions of this nature have been unearthed in many of the older industries, which had imagined they had reached the zenith of efficiency production. It is certain that in a number of automobile factories similar conditions exist. In fact, this is true in a few of our large plants. To such few makers the words of President Wilson in his message should be heeded. They are:

"We long ago passed beyond the modest notion of protecting the industries of the country and moved forward to the idea that they were entitled to the direct patronage of the government. For a long time—a time so long that the men now active in politics hardly remember the conditions that preceded it—we have sought in our tariff schedules to give each group of manufacturers or producers what they themselves thought that they needed in order to maintain a practical exclusive market as against the rest of the world."

Urges Outdoor Fall Show for Trucks

Should Be Held Between the Truck-Selling Seasons—Believes That Such a Show Will Be Held Within Another Year.

By William E. Metzger

DETROIT, MICH.—April 4—The editorial in THE AUTOMOBILE for March 13, entitled "Silk Stockings on Trucks," meets my ideas precisely.

Naturally, I believe, Detroit would afford as good a location as any for a midsummer truck show. The state fair grounds here offer every necessary accommodation for such a show.

This show ought to be held, in my estimation, between the truck-selling seasons—say the middle of September to the first of October. This date would be best for the reason that most trucks are delivered to consumers just before the hot summer season or just before the cold winter season. By having the show late in September, at which time the business men would have returned from their summer vacations, I am inclined to feel that the truck manufacturer would be able to get a line on the market in time for his fall deliveries.

Nearly 2 years ago I advanced the idea of an early fall show, believing then that what the truck manufacturer needed was an opportunity to show by actual demonstration the superiority of motor trucks and the possible saving to the great and varied lines of industry which are in the market for these commercial vehicles.

This truck display at any central point in the Middle West would, I believe, bring interested people from all over the United States—people who would want to come and investigate the truck as applied to their particular line of business. The educational feature would be much enlarged by the display of the various labor-saving devices that accompany the trucks, many of which are being made by independent concerns, not truck manufacturers. Contests could be had in the loading and unloading and the carrying of various commodities. These tests would forcibly bring before those interested throughout the country the actual loss that they are sustaining daily in their various lines of business by not using up-to-date truck equipment, and this necessarily would be of great benefit to the truck manufacturers. Personally, I cannot see, excepting from a selfish standpoint on the part of some makers who fear competition, any possible reason why one commercial show held in the early fall is not the best solution of the matter of commercial shows. In all of my talks with various truck manufacturers, not one of them has advanced a reason against this show, which to me seems logical. I am inclined to believe that such a show will be held within another year.—WILLIAM E. METZGER.

Why Should Automobilists Pay State Fees?

By Charles E. Duryea

SAGINAW, MICH., April 4—I am much pleased to see your editorial on "Raising Revenue," which appeared in THE AUTOMOBILE for March 20. This is a matter on which automobilists have been asleep all these years. Just why they should pay for as a privilege that which is their constitutional right, namely, the right to use their machines on the highways, as freely as other vehicles use them, is a question I have never been able to understand. The bicycle people fought this matter to a finish, and won, many years ago; and one of the automobile magazines coming directly from the bicycle business has maintained a consistant stand on this ground, but most of the others have paid no attention to this important question.

That it is a matter of revenue only is readily seen by watching the progress of this form of taxation in the various states. New York at first issued a perpetual license, or tag, for identification purposes, but lately seeing an opportunity for revenue has made it an annual one. There is no excuse for such action. One registration during the ownership of the vehicle is just as good as a dozen so far as police protection is concerned. Further, the mere cost of registration at the most is all that should be charged. If the automobile user must pay toll, he is discriminated against, and such legislation is objectionable class legislation. How it works in Pennsylvania may be shown by the following facts:

The commissioner of highways has full power there. My motor buggies were not serially numbered, and my owners could not give manufacturer's number. A statement to this effect brought licenses 1 year, but the next year they were refused, although the law had not been changed. The owners appealed to me, and I took the matter up with the highway commissioner, who insolently replied that it was none of his business. The law required a manufacturer's number to be given, and if there were none, why no license was issued, or words to that effect. If this is not confiscation of property, what is? After considerable delay and inability to use their cars the commissioner relented enough to issue the licenses without a manufacturer's number, as he had previously done. Not only is this an outrage which no American citizen should be compelled to stand for, but it is rank idiocy. I could have conveniently supplied numbers to those particular owners and no one would have known the difference. They would have been my numbers so far as the law was concerned, but of what value would they have been to the state department or anybody else, and how could the commissioner of highways know whether or not those numbers were correct ones? Further, most vehicles are numbered, if numbered at all, on a removable metal plate, so there is nothing to prevent moving the plate if the owner desires to transfer the number to some similar vehicle.—CHARLES E. DURYEA.

Struggle Against Bills

Pennsylvania Automobilists Endeavor To Stop Bad Legislation—Many Measures Against Trucks

HARRISBURG, PA., April 5—Automobilists in this state are rallying around the Pennsylvania Motor Federation and the various dealers' organizations in their effort to stem the flood tide of motor-mad legislation now pending before the legislature here. Senator Buckman's bill is the bone of contention. This bill was originally drafted by the Pennsylvania Motor Federation, but was changed in not a few respects before its introduction so that in its present form it is being opposed not only by the Federation but by all other motoring interests in this state. This bill has a new scale of registration fees for passenger cars and motor trucks. The fees for passenger cars are according to horsepower, and those for motor trucks according to gross weight. Following are the fees:

Passenger cars under 20 horsepower	$5.00
Passenger cars under 20-50 horsepower	10.00
Passenger cars over 50 horsepower	15.00
Motor trucks under 4,000 pounds	10.00
Motor trucks under 4,000-5,000 pounds	15.00
Motor trucks unler 5,000-10,000 pounds	20.00
Motor trucks under 10,000-15,000 pounds	25.00
Motor trucks under 15,000-20,000	30.00

By this schedule the registration fees on motor trucks are more than doubled as compared with the present fees, but other bills have been introduced which make these fees $30, $50 and $100 according to the load capacity of the trucks.

Restrictions on Motor Trucks

This new legislation places further restrictions on motor trucks, in that the maximum weight of a truck with its load is 20,000 pounds, or 10 tons, and that of this total, not more than 15,000 pounds can be carried on one rear axle. This places a restriction on present methods of truck construction in which the total gross weight carried on the rear axle is sometimes 80 and as high as 85 per cent. of the total gross. Naturally trucks of this construction wil be barred from the highways if such legislation were to be enforced. There is at present a movement to get the maximum permissible weight on a truck increased to 25,000 pounds, but it is certain that this is being opposed by certain canal interests throughout the state who have many bridges not capable of withstanding such loads; and it is also being opposed by certain counties in which the old-fashioned type of covered wood bridge as constructed 60 years ago is still in existence. The present legislation goes still further and aims to restrict the overall width of a motor truck to 88 inches. One interesting aspect of the present campaign is the fact that a traction engine company selling many traction engines in this state has circularized every county in the state asking that the voters go against the present $50,000,000 bond issue on the ground that traction engines with cleats on the wheels will not be permitted to use the improved highways. So strong was the influence against the bond issue in several counties because of this circularizing work that the bill was again returned to committee and a public hearing on it will take place this week.

Of the many bills against motorizing interests introduced many will never come out of committee. One or two desirable bills have been introduced. In this category is the Dunn bill providing that "All fees for licenses of motor vehicles collected shall, after deduction of collection expenses, be returned to the respective county where the licensee shall reside to be used in repairing and maintaining the roads of such county." Another bill provides that "All moneys derived from the registration of motor vehicles and the licensing of operators are to be paid into the treasury to be used in the improvement of roads." This bill further goes on to state "that the sum of $1,800,000 now in the treasury derived from the fees of registration be specifically appropriated for highways improvement and maintenance." Up to the present time Pennsylvania has not had a law permitting of the use of registration fees for highway improvement.

NEW YORK CITY, April 7—The automobile authorities of New Jersey are doing their best to inforce the 15-day limit for foreign cars entering the state. Two inspectors are stationed at the ferries which carry cars from Manhattan to New Jersey and other inspectors check incoming and outgoing out-of-state cars in other places. The inspectors meet regularly and by comparing their records determine what automobilists pass the 15-day limit for free travel in Jersey, so that their owners may be requested to take out Jersey licenses.

The state legislature has adjourned without taking any action of the various automobile measures proposed to it.

Motorists Fight Bay State Bills

BOSTON, MASS., April 5—Those who have been following the motor legislation and fighting the battles for automobile owners in the Bay State this year have had plenty work cut out for them, for there was a much larger number of bills presented than in past years.

The two most important matters have not yet been reported, the bill relative to trucks, limiting the weight and increasing the fees on them, and a bill to limit the speed of motor vehicles in the state.

The Highway Commission began the year by making a report to the Governor in which it went into the matter of legislation. This report stated that some some law should be passed for the preservation of the highways by limiting the speed and weight of motor trucks and prohibiting traction trailers that dug holes in the roadways. It also suggested that the same fee be charged for trucks as horse-drawn vehicles. Another suggestion was a law limiting the speed in this state to 25 miles an hour. It also suggested that the law be amended relative to operators from other states; that the law of the road be fixed, and the penalty for reckless driving be changed. Bills covering all these points were drawn by the commission and submitted. The bill relative to reckless driving is now a law, so that any person convicted of operating a car recklessly, without authority, for a wager or under the influence of liquor may be sentenced to jail for from 2 weeks to 2 years, and fined $200 for a first offense and for a second offense of driving while intoxicated the penalty is 1 to 2 years, no fine being allowed.

The bill to change the law of the road so that motor vehicles could pass street cars on the right-hand side—the Supreme Court having ruled it was unlawful to go other than on the left—was passed. Also the Commission's bill placing non-resident operators under the same regulations and laws as Bay State motorists got a favorable report and was passed.

This year there has been no bill to increase the passenger car fees, but there is a bill that would reduce them. It calls for $5 for 25 horsepower or under; $10 for 25 to 50 and $15 for all over 50. No report has been made by the committee on this yet, but it will probably be given leave to withdraw. Other bills on which the committee has not reported is one to strike out the 10-day clause for non-residents; a rebate bill to refund part of the money for registration if a veichle is lost, stolen, burned or sold before August 1, so that an owner loses the use of it; a bill put in by Mayor Fitzgerald to give back to the different counties the money taken in fines and which now goes to the State treasury for good roads, and the truck and speed bills reported above. It is expected that if the committee reports a speed law it will be one of 30 miles an hour, but any change will be fought by the motor interests, who are satisfied with the present law which calls for a reasonable speed.

The bills that have been reported upon make quite a representation when considered. One bill seeks to change the burden of proof from the government to the motorists in case of an accident by having the numbers of a car become prima facie evidence that the owner was responsible for whatever damage it caused. This bill was killed in other years, but this time it got to the Senate up to a third reading when the motorists woke up and sent a flood of letters to the State house that checked it.

A bill put in by the Highway Safety League requiring all motorists who figure in an accident to send a report of it to the Highway Commission was reported favorably, and is now in the lower branch of the legislature. The words "full report" were stricken out so that merely the notice of the accident is to be given. There is some doubt as to its being a constitutional measure. A bill that would require judges to place on file all complaints of motorists arrested for not having their licenses, if they proved in court that they were entitled to drive a car was reported leave to withdraw. The A. L. A. measure seeking permission to erect signs on the State highways met with the same report. So did the bill to increase the penalties to 20 years' imprisonment for anyone causing a death with a motor car. Mayor Fitzgerald's bill seeking to get a portion of the motor fees for the Boston Park System was dropped. A measure to prevent motor cars going within 15 feet of a street car that had stopped to take on or leave off passengers was also dropped. Another bill to compel motorists to stop within a few feet of a moving or standing car was dropped. The measure to change the age for licensing operators from 16 to 18 years of age got an unfavorable report.

From the point of view of many owners and makers the most important measures put in were two bills that would prevent cars being registered if it were possible to turn off the lights from any seat, either in front or in the tonneau, or the body of a limousine. This would mean the rearrangement of all cars electrically equipped. There were two hearings on these bills and the committee reported unfavorably on both. The bill to change the light law so that it would apply to vehicles in cities as well as those on the State highways as the law now reads was not reported favorably. The same fate was given the bill for a force of State Highway inspectors to check speeding. A bill that would prevent a man ever getting a license if he had once been convicted of operating under the influence of liquor was reported leave to withdraw.

S. A. E. on Worm Drive

Larger Bearings and Means of Adjustment Advocated at Detroit—Aluminum Alloys Also Discussed

DETROIT, MICH., April 4—The annual business session of the Detroit section of the Society of Automobile Engineers was held last night in connection with the regular monthly meeting. Officers for the ensuing year were elected as follows: Chairman, E. T. Birdsall; Vice Chairman, G. E. Cox; Secretary and Treasurer, H. A. Connell.

The report of the secretary and treasurer showed that at present the section has 147 members and that cash on hand in the bank totals $515.27, with no outstanding debts.

Following the business session technical matters were taken up. The first talk was given by Mr. R. T. Wingo, of the Superior Machine & Engineering Co., Detroit, Mich., and was a comparison of worm and bevel drive axles, which was characterized as being an exceedingly live subject just now. Mr. Wingo's remarks were confined chiefly to the shop end of the question of final drives. Many worm constructions have failed, due to several adverse conditions, and hence many engineers condemn them all. It is the same with the successful type. When one proves to be efficient many consider them all equally good.

Where Adjustment Is Needed

In the automobile vehicle many conditions govern worm and worm wheel drives, said Mr. Wingo. If the teeth are adjusted so as to be in correct relation to each other, they very often do not stay where they are placed. The fallacy is in making no provision for permanency of adjustment. It was advised that for best results adjustment should be provided for both members and for locking these after once properly set.

In the design of worms and worm wheels we are governed by conditions on either side of the assembly. In ordinary machinery the design is an easier matter, in that the speed can be governed more readily than in the motor vehicle.

Speaking of the mounting of the members on ball or roller bearings, Mr. Wingo advocated the use of larger sizes than those recommended by hiring salesmen. For taking both the radical load and end thrust it will be found that over-sized bearings are most satisfactory. This applies both to level drives and to worm gearing.

Workmanship is responsible for many worm-gearing failures, assuming that the designer has chosen the most efficient angles and ratios. The tooth forms must be smooth, free from scratches and absolutely true to form. If the surfaces are smooth and properly run in oil, the heat loss is reduced on account of less friction; hence, durability is augmented. This also applies to bevel gearing. Scratches and imperfections tend to breakage and noise and no amount of lapping in will cause them to wear smooth enough.

Methods of manufacture of various types of worm gearing were taken up and the best ways of cutting the members were pointed out. The Hindley and the Lanchester types were discussed and a third design also spoken of. This latter resembles the Hindley, but is really very much different in that the worm and worm wheel, as ordinarily considered, are reversed, the wheel in this case being the smaller member. This combination gives an oiling arrangement, which is said to be satisfactory.

Mr. Wingo is in doubt as to the best efficiency of the three types, but on numerous occasions has found it to be about 92 per cent. in the best cases. The rather remarkable figure of 99 per cent. has been reached by Mr. Wingo with specially constructed bevel gearings having ball thrusts. This, he stated, should be ordinarily nearer 97 per cent., while with machinery of the ordinary type it has been estimated at about 75 per cent.

In closing Mr. Wingo made the rather startling statement that the worm gearing must come for trucks, while for passenger cars it is on the decline, due to the greater perfection of bevel gearing and its less cost of manufacture for equal efficiency. The reason that it is essential to trucks is that these have a lower gear ratio and slower speeds, it being easier to properly proportion the parts and provide for lubrication för this slower running. The passenger car offers the disadvantage of too great average speed.

An open discussion on aluminum alloys for motor car construction was next staged, H. Goldberg, of the Aluminum Castings Co., speaking in favor of zinc alloys in preference to the No. 12 S. A. E. specification, which is a copper alloy. He stated that alloys up to 33 per cent. zinc are just as good as copper and they offer the advantage of cheapness and better machining. They have a higher tensile strength also.

Past zinc alloy failures were attributed to improper pouring temperatures, the alloy being more liable to crack when poured hot than when cold. Hot pouring means larger crystals, which are an evidence of weakness. Mr. Goldberg would like to see the automobile engineering fraternity get over its prejudice against this alloy, which unfavorable opinion was gained because it was not properly produced.

It was pointed out by one of the members that zinc has a strong adherence to oxygen and is, therefore, very easily oxydized, while copper is not nearly so prone to do so.

Several alloys which have been more or less successful were discussed and the advantages and disadvantages of each brought out. Mr. Goldberg stated that the best zinc alloy has the following specification: 19 per cent. zinc; 25 per cent. copper; 3.10 specific gravity; 30,000 pounds per square inch tensile strength.

The final discussion of the evening was that by E. J. Stoddard, member of the Nomenclature Division of the Society. He spoke of the very great importance which the skidding factor has on automobile construction. It was the consensus of opinion that skidding is a much bigger consideration than the average engineer believes. Mr. Stoddard's talk was short, and consisted mainly in the presentation of a problem which, he stated, has obsessed him for some time, relative to the apparently different rates of travel of the forward and rear ends of a motor vehicle in skidding around a curve.

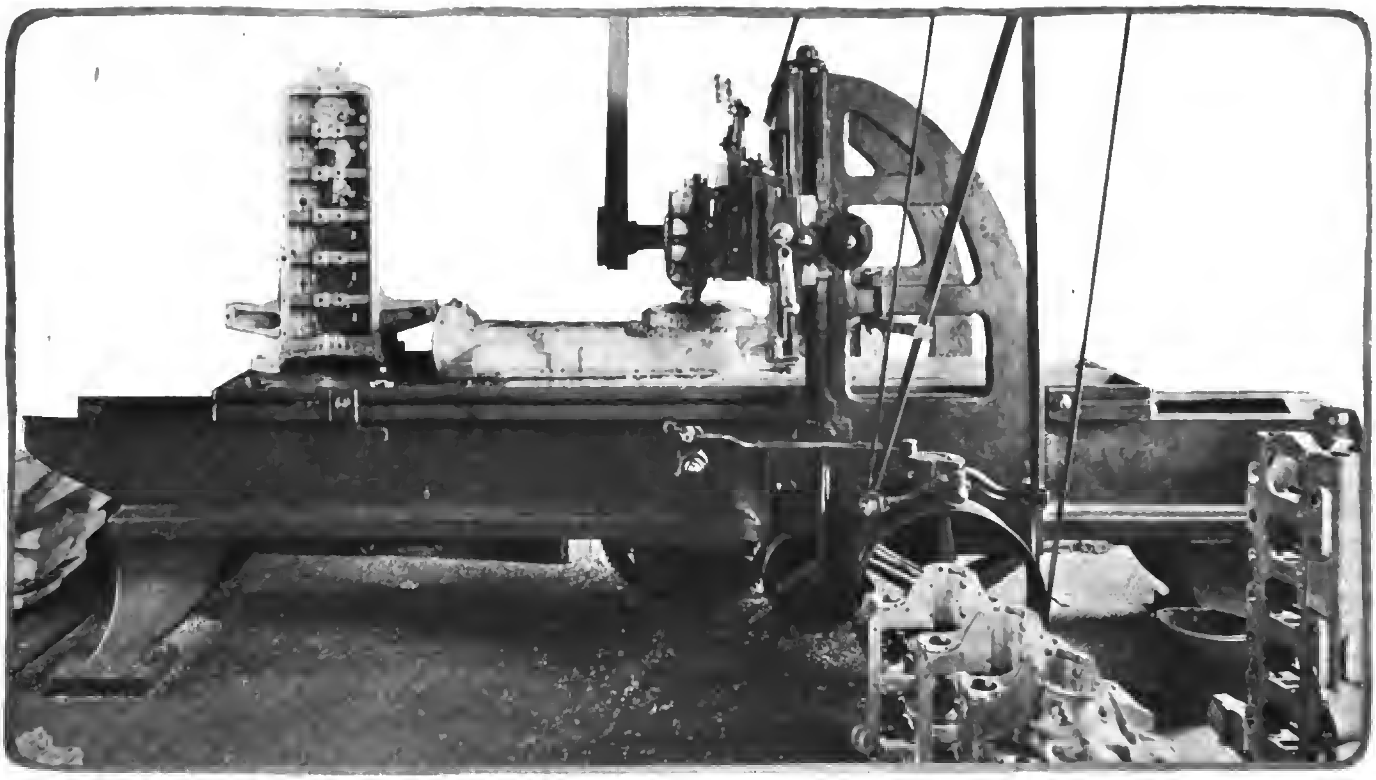
S. A. E. to Standardize Rim Sizes

NEW YORK CITY, April 7—In developing standard dimensions for rims the pleasure car wheel division of the standards committee of the Society of Automobile Engineers has not run against any difficulty which is not surmountable. At the meeting last Wednesday afternoon a report was read which stated that the variations in diameter and felloe width did not exceed .125 inch and .25 inch respectively, and that standard limits of toleration were possible. The work is now in the hands of the sub-committee on the ways and means of carrying on future tests which are necessary before definite action can be taken. This committee is expected to report at an early date.

About seventy-five tests have to be run and a good pressure line needed to make tests on various types of straight side and beaded tires in connection with the different forms of rims. These tests are apt to cost a large amount of time and to be expensive on account of the tubes and casings needed. The specimen rims are now all at the headquarters of the S. A. E. in this city and as soon as the sub-committee has reported the additional work will be taken up.

PHILADELPHIA, PA., April 7—A factory branch of the American Locomotive Co. has been established here, succeeding the Longstreth Motor Car Co., which has heretofore represented the Alco line of pleasure cars and motor trucks for Philadelphia and vicinity.

Factory Miscellany



Special machine used for milling crankcases in the factory of the Kline Motor Car Co., Richmond, Va.

THIS machine can mill twenty-five crankcases in one working day of ten hours. One crankcase is milled at a time and the machine is readily attended to by one man. The gain in factory efficiency so far as this particular branch of the milling work is concerned is 75 per cent over less modern methods of doing the same work. Every piece of work turned out by the machine is uniform and the maximum variation is well within the tolerance limit of .001 inch plus or minus. The accompanying illustration shows the machine at work on a Kline six-cylinder crankcase. This has seven bearings. The four-cylinder crankcases with five bearings are handled in the same manner. The same machine can be used for the five-bearing or the seven-bearing crankcases. The upright crankcase has been placed in this position for the purpose of showing the milling work necessary.

GARFORD Secures American Rights—W. F. Brown recently returned from London, England, bringing with him the American rights for the manufacture and control of some metals of which an alloy of aluminum is the most important. The new metal is called aeromin and is said to have twice the tensile strength of aluminum. The metal has been in use in England for several months and the American rights were secured for the Garford Engineering Co., Elyria, O. In the near future a meeting of the company's directors will be held and a location determined upon for the manufacture of the new product. Mr. Brown is president of the company, which is capitalized at $100,000, and it is believed that the plant will be located in Toledo, O.

Whitehall Wants Apparatus—Whitehall, Pa., is desirous of receiving bids for a motor-driven chemical apparatus.

Butler Tire Company's Salesrooms—The Butler County Tire Co., Hamilton, O., has opened salesrooms and a vulcanizing plant at 105 Main street.

Baker Sales Manager—L. M. Baker has been appointed sales manager for C. N. Peacock & Co., New York City, agent for the Ames shock absorber.

Promoting New Tire Company—W. F. Beasley of Plymouth, N. C., is promoting an organization of a company to manufacture emergency automobile tires, etc.

Bartholomew Sells Out—C. A. Bartholomew, who operated a garage in Peoria, Ill., has sold his business and removed to Knoxville, where he has opened a new garage. His old place in Peoria will be occupied by J. A. Vance & Son.

Cleveland Machine Builds—The Cleveland, O., Automobile Machine Co. will erect a factory addition at its present plant on East Sixty-fifth street. The building will be three stories high, 60 by 200 feet, and will be of the heavy factory type construction.

Trucks for Bell Telephone—Nine commercial cars for the American Bell Telephone Co. have been ordered by the Western Electric Co., from the Stewart Corp., of Buffalo, N. Y. It is probable that another order, for twenty more, will follow.

New Philadelphia Garage—Plans for a four-story-and-basement garage building, 58 by 90 feet and 116 by 90 feet, to be built at 2302 Chestnut street, at a cost of $20,000, were recently filed at that city. Kahn & Greenberg and Murray White are the owners.

Toledo Truck to Move—The Toledo Motor Truck Co., located on Spencer street, Toledo, O., is to be removed to Moose Jaw, Sask., in western Canada, according to the announcement of the owner, Edwin Tait. The machinery is now being packed for removal to the new quarters.

Tire Company Resumes Business—With repairs and enlargements completed, the Iron City & Repair Co., Pittsburgh, Pa., whose building was gutted by the fire started in the storeroom of the Pioneer Automobile Co. last winter, will resume business in the near future.

Automobile Plant to Reopen—More machinery has arrived at the Maxwell plant in Newcastle, Ind., from the Maxwell Motor Co.'s plants at Dayton, O., Tarrytown, N. Y., and Auburn, Ind. The force is being increased every day. A call has been issued for all the former employees of the die-sinking and screw-machine departments to send in applications for positions at once.

Mather Spring Doubles Capacity—The Mather Spring Co., Toledo, O., is planning to double the capacity of its plant.

Vulcan Purchases Plant—The Vulcan Mfg. Co., Painsville, O., has purchased an idle plant and will remodel it. The company will manufacture automobiles.

Secures New Site—The Automobile Mfg. & Engineering Co., Detroit, Mich., has acquired a factory site, comprising 108 acres, in Nashville, Tenn., where it expects actively to commence the production of the Evans truck. The plant will be 60 feet by 200 feet in size.

Another Safe Storm Addition—At the annual meeting of the Safe Storm Shield Co., Fremont, O., plans were adopted for erecting an addition to be 40 by 40 feet, two stories high, to the present plant, the addition being for storeroom purposes and a woodworking department.

Morgan & Marshall Build—With Mayor R. J. Marshall and Dr. Morgan Howell, of East Liverpool, O., as the chief moving spirits, the Morgan & Marshall Co-Operative Tire & Rubber Co., with a capital of $500,000, will soon begin the construction there of a factory for the manufacture of automobiles.

Expansion in Long Island City—Some of the automobile concerns already established in Long Island City, N. Y., are enlarging their plants, while others are building important structures. At the present time the automobile industry is spending more than $1,000,000 in increasing facilities in this section.

May Open Amplex Plant—The Lewis Motor and Engineering Co., Detroit, Mich., is about to take over the Amplex automobile plant in Mishawaka, Ind., and will again open the factory, according to reports. The plant was formerly operated by the Simplex Motor Car Co., composed by Mishawaka men, but has been closed for the last several months.

Rubber Company in Coshocton—The Cuyahoga Falls Rubber Co., of Cuyahoga Falls, O., has submitted a proposition to the Coshocton Board of Trade, Coshocton, O., to locate a plant of the proposed company, to be capitalized at $400,000, if free site were given this company and if the citizens would subscribe to a block of capital stock. The company will manufacture tires.

Pacific Factory Plans Progressing—Plans for the erection of an automobile factory in Seattle, Wash., on the property of the Seattle Car & Foundry Co., are rapidly assuming shape. The buildings necessary to the assembling of the cars are being remodeled and a testing track near the factory is being put in shape for testing the product. The car will be called the Pacific, and will be assembled from standard parts, including Hess axles, Warner gears, Wisconsin motors and Gemmer steering gear. It is to be offered in two models, both sixes.

The Automobile Calendar

Shows, Conventions, Etc.

April 5-19.........Pittsburgh, Pa., Annual Show, East Liberty Market House, Dealers' Association.
April 21-26........San Antonio, Tex., Annual Show, San Antonio Motor Car Show Co.
June 5, 6, 7.......Detroit, Mich., Midsummer Meeting of Society of Automobile Engineers.
October............Paris, France, Automobile Show, Grand Palais; 10 days.
November.........London, Eng., Annual Automobile Exhibition, Olympia.

Race Meets, Runs, Hill Climbs, Etc.

April 27..........San Antonio, Tex., Track Meet, San Antonio Automobile Club.
April 28-30.......Chicago, Ill., Commercial Vehicle Demonstration, Chicago Motor Club.
May 2.............New York City, Secret Time Run to New Rochelle, Motor Dealers' Contest Association.
May 5-8...........Washington, D. C., Motor Truck Reliability, *Washington Post.*
May 14...........New York City, Start of 2-Day Hudson and Catskill Scenic Tour.
May 30...........Indianapolis, Ind., 500-Mile Race, Speedway.
June 7............Philadelphia, Pa., Inter-Club Reliability, Quaker City Motor Club, Automobile Clubs of Delaware County, Philadelphia and Germantown.
June 25-28........Chicago, Ill., Non-Motor-Stop Reliability, Chicago to Boston, Chicago Automobile Club.
July 1............Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Association to the Pacific Coast.
July 1-16.........Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.
July 4-5..........Sioux City, S. Dak., Track Meetings, Sioux City Automobile Club and Speedway Association.
July 5-6..........Tacoma, Wash., Road Race, Montemara Festa Automobile Committee.
July 8-16.........Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager.
July 27-28........Tacoma, Wash., Tacoma Road Races.
Nov. 24..........Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 27..........Savannah, Ga., Grand Prize Race, Automobile Club of America.

Foreign

April.............Barcelona, Spain, International Exhibition.
May..............St. Petersburg, Russia, International Automobile Exposition, Building of Michael Maneze, Imperial Automobile Club of Russia.
July 12..........Amiens, France, Grand Prix Race.
July 18-26........London, Eng., Imperial Motor Transport Conference.
Sept. 25..........Isle of Man, International Stock Car Race.

Battery room in the factory of the Baker Motor Vehicle Co., Cleveland, O.


National test car crossing railroad bridge over the White Water River, South of Connersville, Ind. This car was the first out of Indianapolis into Dayton during the flood.


Two Premier test cars pulling a King road drag over Indiana roads injured by the recent flood

RECORD Contract—What is claimed to be a record contract was closed recently in Boston, Mass., by the R. & L. Co., agent for the Garford, whereby the L. & S. Co. of Providence, R. I., contracted for forty pleasure cars and twenty-two Garford trucks, the total amount represented being $209,850.

Kellam Ohio Electric Manager—J. Kellam has accepted a position as assistant sales manager with the Ohio Electric Car Co., Toledo, O.

Hartford Accessory Store Opened—The Automobile Owners' Supply Co. has opened an accessory store at 284 Trumbull street, Hartford, Conn.

LaFrance Contemplated Building Garage—The LaFrance Motor Car Co., Elmira, N. Y., it is reported, is considering the construction of a large garage near the central part of the city.

Motordrome in Milwaukee—A motordrome with a ¼-mile macadam track will be constructed in Milwaukee, Wis., this year by a company now being organized. The opening is set for July 4.

American Tire Branch Established—The American Tire & Rubber Co. has established a branch office and wholesale stock depot at 252 Fifth street, Milwaukee, Wis., in charge of Albert Weisskopf.

Schweers Purchases Frogner Garage—The Schweers Hardware Co., Shawano, Wis., has purchased the garage and business of the Frogner Auto Co., that city, and will continue it as a division of its business.

American Cars in Majority—Ninety per cent. of the automobiles used in Aguascalientes, Mexico, and in that vicinity are of American makes. Owing to the amount of quartz rock on the roads the life of tires is short.

Edwards with Midland Co.—C. C. Edwards has severed his connections with the Bergdoll Motor Co. branch at Boston, Mass., and will take charge of the Eastern territory for the Midland Motor Co., East Moline, Ill.

New Building for Cadillac—The Cadillac Automobile Co., Providence, R. I., recently signed a lease for 10 years for a new building that is being erected in that city. There will be three floors, all of which will be occupied by the company.

Amphibious Garage Planned—Harry L'Hommedieu, automobile dealer of Buffalo, N. Y., has purchased property in that city for the construction of what he terms an amphibious garage, which is to accommodate motor boats as well as automobiles.

Buys Another Garage—L. A. Vashon, proprietor of the Chestnut Hill garage, Brookline, Mass., recently purchased the Brandon garage in that same town and will conduct the two in future in addition to handling the Ford agency in that territory.

Now in New Building—J. T. Meagher, proprietor of the Mattapan, Mass., Motor Car Co., who has the Chalmers and Ford agencies in that town, has recently moved into a handsome new building 125 feet deep and 55 feet front on the main thoroughfare.

Jefferson Company Builds Garage—The Jefferson Auto Co. of Jefferson, Wis., has started construction work on a new concrete garage building on Main street. The size is 50 by 80 feet, but the building is so arranged that additional space may be taken at any time.

New Location Selected—The United Motors Co., Boston, Mass., the New England branch of the new Maxwell corporation, has moved from Massachusetts avenue and Newbury street to the building first occupied by the Locomobile Co. further along the latter street.

Velie Gets the Contract—The Velie Motor Car Co. of Boston, Mass., was the fortunate one to secure the contract for the runabouts to be used by the district chiefs of the Boston fire department. Seven runabouts will be ordered on the first contract and more may be secured later.

Feps, N. Y., Factory Branch—The Schoen-Jackson Co., manufacturer of the Feps carbureter, has opened a New York City factory branch office in the Thoroughfare Building, at 1777 Broadway. In addition to this the Schoen-Jackson Co., has established installation facilities at 107 West Fifty-first street.

Fenway Garage Opened—The Fenway Garage, the latest addition to Boston, Mass., which is being conducted by the Saunders & Butler Co., that does a taxicab service in that city, was recently opened. It is two stories high, fronting on the park system and adjoining the American League ball grounds. There are 100,000 square feet of space, and instead of elevators specially designed runways are used to move cars in and out of the building.

New Agencies Established During the Week

PLEASURE VEHICLES

Place	Car	Agent
Bar Harbnr, Me.	Cadillac	O. H. & F. Jellerson.
Bar Harbor, Me.	Cartercar	Fred Sawyer.
Bar Harbor, Me.	Metz	Fred Sawyer.
Bar Harbor, Me.	Overland	W. H. Davis.
Bar Harbor, Me.	Studebaker	O. H. & F. Jellerson.
Bar Harbor, Me.	Velie	O. H. & F. Jellerson.
Bath, Me.	Cutting	Bath Garage Co.
Bingbaoiton, N. Y.	Speedwell	W. D. Sweet M. C. Co.
Boston, Mass.	Cartercar	Hollander Motor Car Co.
Boston, Mass.	Maxwell	M-B-M Motor Co.
Boston, Mass.	Mercedes	Alfred Cutler Morse.
Boston, Mass.	Pathfinder	F. K. Patch.
Brookline, Mass.	Ford	L. A. Vashon.
Concord, N. H.	R-C-H	Concord Auto Sales Co.
Edgerton, Wis.	Imperial	F. P. Carrier.
Evansville, Wis.	Studebaker	The Durner Co.
Harrisburg, Pa.	Crawford	Bowman & Co.
Janesville, Wis.	Cartercar	J. H. Burns & Son.
Janesville, Wis.	Cutting	Janesville Motor Co.
Janesville, Wis.	Herreshoff	Janesville Motor Co.
Janesville, Wis.	Marathon	F. B. Burton.
Janesville, Wis.	Michigan	Park Hotel Garage.
Janesville, Wis.	National	Janesville Motor Co.
Janesville, Wis.	Overland	Janesville Motor Co.
Janesville, Wis.	Pathfinder	R. F. Buggs.
Janesville, Wis.	Rambler	Janesville Motor Co.
Janesville, Wis.	R-C-H	Goodman Livery Co.
Janesville, Wis.	Regal	R. F. Buggs.
Janesville, Wis.	Stutz	Janesville Motor Co.
Jefferson, Wis.	Ford	Jefferson Auto Co.
Kewashkum, Wis.	Studebaker	Remmel Mach. & Fdry. Co.
Lebanon, N. H.	Buick	Smith Auto Sales Co.
Lebanon, N. H.	Ford	Smith Auto Sales Co.
Lebanon, N. H.	KisselKar	Smith Auto Sales Co.
Lewiston, Me.	Chalmers	Androscoggin Motor Co.
Lewiston, Me.	Fiat	Androscoggin Motor Co.
Lewiston, Me.	Paige-Detroit	Androscoggin Motor Co.
Lewiston, Me.	Peerless	Androscoggin Motor Co.
Lewiston, Me.	Studebaker	Androscoggin Motor Co.
Manchester, N. H.	Overland	Smith-Ramsey Auto Co.
Plainville, Conn.	Michigan	F. O. Thompson.
Ridgeway, Ont.	Hupmobile	G. Weiss.
Ridgeway, Ont.	Oakland	G. Weiss.
Stevensville, Ont.	Hupmobile	G. Weiss.
Stevensville, Ont.	Oakland	G. Weiss.
Waterbury, Conn.	Ford	Jefferson Garage
Waterbury, Conn.	Overland	Jefferson Garage
West Cornwall, Conn.	Michigan	Edward Cartwright.
Worcester, Mass.	Havers	J. R. Hawks.

COMMERCIAL VEHICLES

Place	Car	Agent
Albany, N. Y.	Lippard-Stewart	W. S. Dodds.
Boston, Mass.	Blair	W. A. Magill.
Boston, Mass.	Jeffery	Thos. B. Jeffery Co.
Boston, Mass.	Lansden	Lansden Motor Co.
Boston, Mass.	Mercury	G. F. Kexhew.
Boston, Mass.	Vulcan	R. G. Howard.
Edgerton, Wis.	Dart	F. P. Carrier.
Hartford, Conn.	Autocar	Miner Garage Co.
Janesville, Wis.	Chase	J. A. Strimple Co.
Janesville, Wis.	Commerce	J. H. Burns & Son.
Janesville, Wis.	Jeffery	Janesville Motor Co.
Janesville, Wis.	Kissel	A. A. Russel & Co.
Janesville, Wis.	Service	Janesville Motor Co.
Minneapolis, Minn.	Dart	H. T. Heberels.

STEAM CARS

Place	Car	Agent
Janesville, Wis.	Stanley	Janesville Motor Co.
Worcester, Mass.	Stanley	Stanley Motor Car Co.

ELECTRIC VEHICLES

Place	Car	Agent
Boston, Mass.	Baker	F. N. Phelps.
Detroit, Mich.	Ohio	E. A. Rumsey.
Janesville, Wis.	Borland	Janesville Motor Co.
Janesville, Wis.	Detroit	Kemerer Garage.
Memphis, Tenn.	Ohio	Wright Motor Car Co.
St. Louis, Mo.	Ohio	Ohio Electric Sales Agency.

Cooley Prest-O-Lite Manager—S. M. Cooley has been appointed general manager of the Prest-O-Lite Co., Indianapolis, Ind.

Tudhope Moves Hamilton Branch—The Tudhope Motor Co. recently moved its Hamilton, Ont., branch from 280 King street East to 148 King street West.

Hamilton Wants Three Trucks—Hamilton, Ont., is in the market for three motor trucks for use in hauling gravel from nearby towns to that city for use in public works.

Lee Joins Motsinger Staff—Claude Lee has joined the Motsinger Devices Mfg. Co., Lafayete, Ind., and is said to be slated for the position of assistant general manager.

Copeland Sells Interests—W. A. Copeland, a Pontiac, Ill., garage owner, has sold his repair and garage business to John Hardie, of Streator, Ill. He will continue to handle the sales of Cadillac cars.

Albion Opens Toronto Station—The Albion Motor Car Co. of Canada recently opened a service station at 112 Richmond street West, Toronto, Ont., the building occupied by the Consolidated Motors, Ltd.

Building Work Planned—A garage will be built by Wendell & Wright, Philadelphia, Pa., on the south side of City avenue west of Lancaster avenue. The size will be 27 by 21 feet, two stories, and will cost $2,000.

DeSchaum Opens Own Office.—W. A. DeSchaum has opened engineering offices at 608 Wayne County Bank Building, Detroit, Mich. He has resigned as general manager and chief engineer of the Suburban Motor Car Co., that city.

North Tonawanda Wants Automobile—Police Chief J. F. Ryan of the North Tonawanda, N. Y., department renewed recently his application for an automobile for his department. The Common Council is considering the application.

Grand Trunk Installing Service—The Grand Trunk Railroad is considering the advisability of installing motor-car service between Buffalo, N. Y., and Bridgeburg, Ont., for Sunday travel. Definite decision will be announced shortly.

Sproul Increases Garage Capacity—Matt Sproul, who has the agency for the Buick and Maxwell cars in Sparta, Ill., has enlarged his garage facilities and installed a rebuilding and repair station for second-hand cars. He announces that he is in the market for equipment.

New Sales Plan—Martindale and Millikan, who are manufacturing the Continental at Franklin, Ind., have inaugurated a plan for selling cars on payments covering a period of one year. This company recently took over the property and business of the Indiana Motor & Mfg. Co.

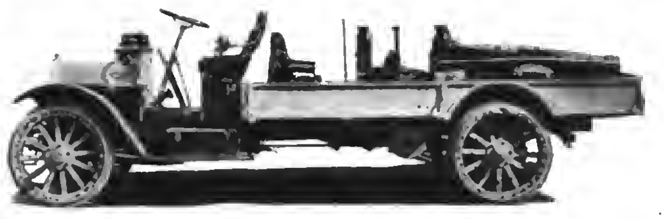
Multibestos Makers to Move—The Standard Woven Fabric Co., maker of Multibestos brake lining, is to move from Worcester to South Framingham, Mass., where larger quarters have been secured, a three-story concrete building having been erected there for the company that will be finished in a couple of months.

Automobile Deal in Newark—A large sale for automobile uses has been made in Newark, N. J. A piece of property on Central avenue near New street having a frontage of 56 feet on Central avenue and a depth of 245 feet with 96 feet in the rear. A four-story automobile building will be erected to cost $80,000. With the land the total cost will be about $125,000.

Bowman Leaves Schacht—F. P. Bowman has severed his connections with the Schacht Motor Car Co., Cincinnati, O. He will be connected with the Norwalk Motor Car Co., Martinsburg, W. Va., in the capacity of assistant sales manager with headquarters at Chicago, Ill. He will take care of the states of Ohio, Indiana, Illinois, Minnesota, Michigan, Iowa, Kentucky and Wisconsin.

Splitdorf Establishes Service Stations—The Splitdorf Electrical Co., Newark, N. J., will establish a European branch and service station at 6 City Road, Finsbury square, London, E. C. The company will also open a similar branch for the Southern territory of this country, with headquarters at Atlanta, Ga., within the next 60 days, and shortly after a branch for the Canadian trade, with headquarters in Toronto, Ont.

Kelly truck used in relief work at Dayton, O. The trucks loaned to the city by the various manufacturers were used in distributing food and in carrying away debris.



Upper—A 1908 Packard 30 equipped with a special squad body in the service of the Brooklyn Union Gas Co., Brooklyn, N. Y. Lower—Truck especially designed and built by the Federal Motor Truck Co. for the Detroit United Railway

Marvel Goes with Fiat—H. E. Marvel, who has been with the J. W. Bowman Co., has gone with the Fiat Sales Co., of Boston, Mass., and will handle that car.

Boston Republic Moves—The Republic Rubber Co., Boston, Mass., has removed to larger quarters at 863 Boylston street, where it has three floors at its disposal.

Fifteen Years Old—Last week brought the fifteenth anniversary of the sale of the first Winton automobile. On March 24, 1898, Alexander Winton closed the sale.

White Appointed Manager—E. W. White has been appointed manager for the sales branch of the Dupont Garage Co., Cleveland, O., agents for the Hudson line.

Manhattan Club Moves—On or about April 25 the Manhattan Automobile Club, Inc., New York City, will be lodged in new quarters in the Gainsborough Studios, 222 West 59th Street.

Rea Opens New Garage—West Philadelphia, Pa., has a new garage and repair shop which is called the Columbia Garage and is located at 421 North Fifty-fourth street. It is the property of A. D. Rea & Co.

Fire Loss at San Antonio—Fire which broke out in the service station of the Staacke Bros. Automobile Co., San Antonio, Tex., destroyed the building and consumed twelve automobiles, causing an estimated loss of $30,000.

Novel Office Organization—More than 100 department heads and employees of the Studebaker Corp.'s automobile division in Detroit, Mich., have banded into a Studebaker club for the purpose of becoming more familiar with each other's work.

Houpt with Elevator Company—H. S. Houpt, who recently resigned as sales manager of the Alco car, was recently elected vice-president of the Gurney Elevator Co. He will have charge of the sales and installations and will have his office in New York City.

New Kissell Service Station—The KisselKar Motor Co.. Chicago, Ill., has opened a new service station in that city at Wabash avenue and Twenty-sixth street. This building contains 70,000 square feet of floor space and is three stories high and occupies a site 120 feet by 192 feet.

Two Cars for St. Louis Line—Official notice of the motor car service between St. Louis, Alton and Chautauqua on the C., P. & St. L. Railroad has been given out to the effect that two cars will be put in service, one between Alton and Chautauqua and the other between St. Louis, Mo., and Springfield, Ill.

Swinehart Opens Buffalo Agency—The Swinehart Tire & Rubber Co., Akron, O., recently opened an agency in Buffalo, N. Y., at 726 Main street. It will be under the management of E. F. Howell and C. A. Couch. This agency will act as a distributor in western New York and northwestern Pennsylvania.

By Way of Correction—In the issue of March 27 of THE AUTOMOBILE, under the heading of Communications from Makers, the letter appearing under P. P. Dean's name formed part of a talk that he presented before an automobile school on engine testing apparatus in general and did not form part of a communication from his company.

Organize New Lamp Concern—H. J. Johnson, W. C. Montie and J. L. Ballash have organized the Cleveland, O., Motor Lamp & Radiator Co., as successors to the repair department of the Guide Motor Lamp Co., which concern is now centering its efforts along manufacturing lines exclusively. The new company has leased the former quarters of the Guide company on the fourth floor of the Graves Building, 2069 East Fourth street,

Bosch Offers Winners $1,000—The Bosch Magneto Co., New York City, will make the following prize distribution to the winners of the 500-mile International sweepstakes to be held at Indianapolis, Ind., on May 30: To the winning driver, $500; second man, $300, and the third man $200. The condition attached to each award is that the driver of the car gaining first, second or third position must employ a Bosch magneto for ignition purposes during the race.

Belgian Bodymaker Visits States—Willy Van den Plas, the Belgian body builder, well known as the creator of the Metalurgique body styles, has arrived in New York City. Mr. Van den Plas contemplates the creation of an American branch which is to supply the makers and owners of automobiles with special body designs. After having spent a few days in New York Mr. Van den Plas will go to the large manufacturing centers of the West in order to feel the pulse of the industry and if possible establish relations with the car makers.

Bosch Appointments—The Bosch Magneto Co., New York City, has appointed the following concerns to act as supply stations and to be of help to the users of its products: The Lemke Electric Co., Milwaukee, Wis.; Miller-Dudley Co., Washington, D. C.; Beverly Garage, Staunton, Va.; Virginia Motor Car Co., Petersburg, Va.; Dan Valley Motor Co., Danville, Va.; Fairchild Auto Co., New Orleans, La.; Ozburn Auto Supply Co., Memphis, Tenn.; Drennan Motor Car Co., Birmingham, Ala.; Chester Motor Car Co., Nashville, Tenn.; Hobbie Motor Car Co., Montgomery, Ala.; Mobile Auto Co., Mobile, Ala.,; Woodside Motor Co., Charlotte, N. C.; American Ball Co., Providence, R. I., and the Bakersfield Garage & Auto Supply Co., Bakersfield, Cal.

Automobile Incorporations

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AUTOMOBILES AND PARTS

BRONX, N. Y.—North End Coach & Auto Co.; capital, $2,000; to deal in automobiles. Incorporators: A. A. Bertini, Seymour Mork.

BROOKSBURG, N. Y.—A. R. Newcombe; capital, $5,000; to deal in automobiles. Incorporators: A. R. Newcombe, Luella P. Newcombe, M. W. Newcombe.

CHATTANOOGA, TENN.—Hirsch Motor Car Co.; capital, $5,000; to deal in automobiles.

DETROIT, MICH.—Gilmore Motor Mfg. Co.; capital, $35,000; to manufacture motors. Incorporators: George Gilmore, M. A. Shaw.

DOVER, DEL.—Motor Car Sales Co.; capital, $25,000; to deal in automobiles. Incorporators: Newton Gies, G. M. Emory, C. C. Frederick.

GRAND RAPIDS, MICH.—Michigan Hearse & Automobile Co.; capital, $600,000; to manufacture automobile hearses.

LYNN, MASS.—Atlantic Auto Co.; capital, $10,000; to deal in automobiles. Incorporators: C. J. Goldman, W .A. Bishop.

MACON, GA.—Macon Auto Co.; capital, $6,000; to deal in automobiles. Incorporators: C. F. Calhoun, J. P. Stubbs, F. T. Abel, W. E. Henry.

NEWARK, N. J.—Smith Motor Car Co.; capital $25,000; to deal in automobiles. Incorporators: J. L. Smith, L. W. Smith, J. W. Mason.

NEW YORK CITY.—Motor Coach Co.; capital, $500,000; to manufacture automobiles and motor car hearses. Incorporators: Sam Richenthal, Elbert R. Benyunes, Herman Miller.

PINEVILLE, KY.—Cumberland Motor Co.; capital, $50,000; to deal in automobiles. Incorporators: N. J. Weller, A. W. Bryant, M. J. Moss, J. A. Pitman.

RALEIGH, N. C.—Citizens' Motor Co.; capital, $25,000; to deal in automobiles. Incorporators: W. D. Adams, G. C. Glenn.

SACRAMENTO, CAL.—Golden West Motors Co.; to manufacture automobile engines. Incorporators: W. H. Williams, I. Williams, K. M. Robinson, H. Breniser, G. Breniser.

SCHENECTADY, N. Y.—Schenectady Autocar Co.,; capital, $10,000; to deal in automobile buses. Incorporators: Emmett Fisher, A. Langeneuer, L. Buonfigils.

GARAGES AND ACCESSORIES

BOLIVAR, N. Y.—Star and Crescent Oil Co.; capital, $18,000; to deal in automobile oils. Incorporators: J. A. Wilber, R. B. Moore, C. M. Van Buren.

CAMDEN, DEL.—Easy Starter & Speeder Co.; capital, $25,000; to manufacture and sell starting devices. Incorporators: F. R. Hansall, G. H. R. Martin, S. C. Seymour.

DETROIT, MICH.—Crescent Co.; capital, $200,000; to manufacture starting devices. Incorporators: H. H. Potter, F. W. Owen.

DETROIT, MICH.—Tire & Auto Service Co.; capital, $10,000; to operate a garage. Incorporators: R. C. Wanto, W. H. Bishop.

GRAND RAPIDS, MICH.—Auto Tire & Vulcanizing Co.; capital, $3,000; to repair tires.

Babcock Firestone Advertising Manager—E. S. Babcock has been appointed advertising manager of the Firestone Tire & Rubber Co., Akron, O.

Seattle Reo Moves—F. A. Mitchell & Co., Seattle, Wash., distributors for Reo cars have recently moved into new and larger quarters at 1010 East Pike street.

Fall Tire Distributors—Naegee & Lamb have been made northwestern distributors for the Fall tire in the Dakotas and Minnesota with offices in Minneapois, Minn.

Tremme Manager—Arthur Tremme, formerly with Chancler & Lyon, Seattle, Wash., has become manager for John Millen & Son at Vancouver and Victoria. B. C.

Moon Agency in New Home—The J. D. Perry Lewis Automobile Co., St. Louis, Mo., agent for the Moon car, is in its new quarters on Walton and Washington avenues.

Entz Opens Office—The T. B. Entz Automobile and Battery Co., St. Louis, Mo., has opened a downtown office in that city, where it will make a specialty of caring for electric cars.

Columbia in New N. Y. Quarters—The United Motor New York Co. is now settled in its new and larger quarters at 1932 Broadway, New York City. R. L. De Lisser is manager of the company.

Metz Opens Factory Branch—The Metz Co., Waltham, Mass., recently opened a factory branch in Los Angeles, Cal., at 1821 San Pedro street. A. C. Lown is in charge of the service station.

Opens Magneto Station—C. L. Dobbs has opened the Twin City Magneto Exchange, Twin Cities, Minn., at 1018 Nicollet avenue and will test, repair and install electric ignition and starting systems.

Automobile Agencies Combine—The Keystone Auto Co. has taken over the interests of the United Motor Pittsburgh Pa., Co., and in the future the firm will be operated as the Keystone Auto Co.

Whitman Changes—D. E. Whitman, for some time past with J. W. Leavitt & Co., in Los Angeles, Cal., has recently been placed in charge of the Apperson department of the Reo-Pacific Co., that city.

Curt Now Sole Owner—Joseph Curt, Jr., is now the sole owner of the Anthracite Motor Car Co., Scranton, Pa., with offices and salesrooms at 625 Lackawanna avenue. This company handles the Overland car.

Upper—Packard 3-ton truck chassis equipped with a tank body, used by the Brooklyn Union Gas Co., Brooklyn, N. Y., to pump water out of gas lines

Lower—A 5-ton Peerless vinegar truck with an ingenious quick-loading device, which is operated by Alarth & McGuire, of New York City

Automobile Incorporations

HUNTINGTON, W. VA.—Fourth Avenue Garage Co.; capital, $10,000; to do a general garage business. Incorporators: C. L. Hamilton, C. I. Leftwich, J. M. Stark.

NEW YORK CITY.—Normal Automobile Station; capital, $10,000; to conduct an automobile garage. Incorporators: J. F. Bokelman, A. Bokelman, Edward Ganter, John Ganter.

NEW YORK CITY.—Henschel Tire and Rubber Co.; capital, $10,000; to deal in automobile tires. Incorporators: R. Henschel, Anna Henschel, W. A. Wollman.

NEW YORK CITY.—Approved Auto Specialties Co.; capital, $10,000; to deal in automobile accessories. Incorporators: J. B. Brandreth, K. D. Brandreth, E. C. Phelps.

NEW YORK CITY.—Mercer Rubber Co.; capital, $10,000; to manufacture and deal in rubber goods. Incorporators: W. A. Dale, J. C. Dale, W. H. Saijer.

NEW YORK CITY.—Peerless Tire Co.; capital, $15,000; to deal in tires. Incorporators: Michael Schiavone, G. P. Calenda, Louis Schiavone.

NEW YORK CITY.—Ireland Rubber Co.; capital, $25,000; to deal in automobile tires. Incorporators: F. W. Humphreys, Charles Summa, Walter Elrich.

NEW YORK CITY.—G. C. Vaporizer Co.: capital, $50,000; to manufacture vaporizers and carburetors. Incorporators: George Richards, D. W. Richards, Frank Sowers.

NEW YORK CITY.—Seeing New York Automobiles; capital, $10,000; to operate sight-seeing automobiles. Incorporators: G. H. Milligan, Thomas Frost, J. V. Fallon.

ROMAY, W. VA.—Hampshire Garage; capital, $5,000; to carry on a general garage business. Incorporators: J. J. Cornwell, E. V. Parker, D. E. Pugh.

SAVANNAH, GA.—Savell Rubber Tire Co.; capital, $25,000; to manufacture automobile tires. Incorporators: W. B. Savell, W. W. Horndell, Charles Savell.

ST. JOHNS, MICH.—T. C. Beach Auto Turntable Co.; capital, $10,000; to manufacture an automobile turntable for use in garages. Incorporators: T. C. Beach, R. S. Clark, W. J. Moss, R. H. Chapin.

ST. LOUIS, MO.—St. Louis Rubber Mfg. Co.; capital, $10,000; to manufacture automobile tires. Incorporators: J. A. Mulherin, G. P. Dougherty, Paul F. Mulherin.

SUFFOLK, VA.—Suffolk Garage and Machine Co.; capital, $15,000; to do a general garage business. Incorporators: C. C. Parker, G. L. Bower.

WASHINGTON, D. C.—Imperial Motor Tire Co.; capital, $100,000; to deal in automobile tires. Incorporators: F. D. Geraghty, E. A. Garlock, M. T. Wiggins.

CHANGES OF NAME AND CAPITAL

DETROIT, MICH.—Motor Foundry Co.; increase of capital from $35,000 to $100,000.

MEMPHIS, TENN.—Blomberg Automobile Co.; increase of capital to $30,000.

WABASH, IND.—Service Motor Car Co.; capital increase to $250,000.

General Motors Builds Garage—The General Motors Truck Co., St. Louis, Mo., the Missouri corporation of the General Motor Co., Detroit, Mich., has taken out permits to build a large garage and repair plant in that city.

Parker Anderson Manager—E. Reese Parker, formerly manager at Philadelphia, Pa., and elsewhere for the Anderson Electric Car Co., Detroit, Mich., has been made manager at Minneapolis, Minn., to succeed W. R. Jenney.

Murray Transferred—E. C. Murray, manager of the Minneapolis, Minn., branch of S. F. Bowser & Co., has been transferred to the combined headquarters at Chicago, Ill., but will continue to supervise the Minneapolis service station.

Another New Garage—Another new garage will be built in Ridgway, Pa., in the near future. The building will be 50 by 160 feet, of brick construction and probably two stories high. Mr. Curry will lease the building for a period of 10 years. He will repair automobiles.

Plans Thirteen-Story Garage—Plans have been filed with the city building department, New York City, for an eleven-story garage building 100 by 118 feet on Sixty-first street near Columbus avenue. A. Penchot, 60 Broadway, is owner. The building will cost $325,000.

Bennett with Standard Roller Bearing—R. M. Bennett, who until recently has been in charge of the automobile department of the Jones Speedometer Co., New Rochelle, N. Y., has accepted a similar position with the Standard Roller Bearing Co., Philadelphia, Pa.

New Truck Company Formed—A new company, called the Henry Tobin Co., Inc., has been formed to market motor trucks of all kinds. A. H. Chadbourne has been appointed sales manager. The company has leased the building located at 50 West Fifty-ninth street, New York City.

Hupmobile's Hamburg Parts Depot—The Hupp Motor Car Co., Detroit, Mich., has established a parts depot at Hamburg. Germany. Mr. George Chailley will manage the plant. The depot will carry a complete stock of parts of every Hupmobile ever built and will supply stock on a moment's notice.

Edison's Electric Car Garage—Following an address by Mr. W. C. Anderson, president of the Anderson Electric Car Co., Detroit, Mich., to a meeting of the New York Edison Co.'s managers, a special appropriation of $30,000 was voted for the purpose of establishing an exclusive electric car garage in New York City.

AUTOMOBILE CARBURETER—In which throttle needle valve and auxiliary air valve are operated by connections so linked as to be simultaneous in their action on the parts mentioned.

Fig. 1 illustrates the carbureter described in this patent, which includes a vertical tubular mixing chamber M, a float feed F, a throttle valve T between M and the outlet connected to the cylinder and a rotary auxiliary air valve A which is arranged below the mixing chamber M on an axis longitudinally to and within M. A needle valve N for regulating the flow of fuel from the float chamber to the mixing chamber is arranged between A and T at an acute angle to the axes of these valves. Connections Ct, Ca and Cn—corresponding to the three valves—operate the latter simultaneously and conjointly, being provided with means for varying the relative throw of each valve. The connections consist of cranks on the valve stems having a number of holes and two connecting rods with ends adjustable in these holes to or from the centers of the cranks.

No. 1,0578,506—to Elbridge W. Stevens, Baltimore, Md. Granted April 1, 1913; filed June 2, 1910.

Automobile Wheel—Including dash pot spokes.

The wheel Fig. 5 includes a hub H, spoke cylinders S connected with it and containing a fluid rim, a rim R and pistons P connected with it and reciprocating in the cylinders. Each piston includes a head J for dividing the cylinder S into separate chambers and is provided with a valve controlled passage Q connecting the chambers formed in S. The piston is formed with a constantly open passage O of restricted cross area which connects the chambers formed in S.

No. 1,057,907—to Levi B. Wilson, Philadelphia, Pa. Granted April 1, 1913; filed August 5, 1911.

Internal Combustion Motor Valve—Including a piston valve driven by a half-time shaft geared to the crankshaft of the motor.

The subject matter of this patent is an internal combustion motor, Fig. 2 operating on the four-stroke cycle. The design described in this patent includes, in combination with a crankshaft S and a cylinder C, a piston valve V which is adapted to be reciprocated inside of a cylinder communicating with C, for the purpose of regulating the admission and exhaust of gas to and from the cylinder C. A valve rod R is connected to the valve while its other end is connected to a member M so mounted and driven by gearing from the crankshaft of the engine, that the axis of the member connected to the bottom of the valve rod describes, during one complete cycle of the engine a three-lobe hypocycloidal path of movement.

No. 1,057,399—to Daniel Appel, East Cleveland, O. Granted April 1, 1913; filed March 31, 1912.

Automobile Tire—Consisting of elastic cushions secured in place on a rim by flanges fastened to it by means of keys fitting transverse rims.

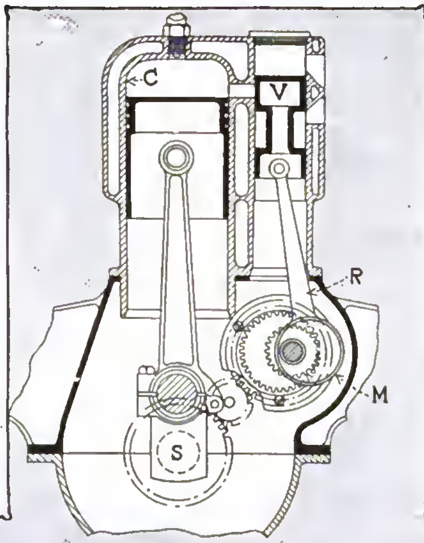
This patent refers to an automobile tire design as that shown in Fig. 3. In this tire the rim R is formed with transverse ribs Q each of which is provided with a keyway K on each side. Elastic cushions C formed with lateral flanges are in position between the ribs. Treads T formed with similar flanges fit over into individual cushions and are formed with keys adapted to engage the transverse ribs on both sides. Means M for preventing the accidental displacement of the key are provided, consisting of teeth and engaging notches on the sides of the key and the adjacent tread flanges.

No. 1,057,672—to Jacob Ruppert, Jr., and Ernest Siegel, New York City. Granted April 1, 1913; filed March 5, 1912.

Pneumatic Tire Design—Including separate inflatable compartments.

The tire described in this patent is illustrated in Fig. 4. and consists principally of a number of inflatable compartments made of rubber or a similarly elastic material, and being permanently connected at their ends and arranged in a sheath S. An air tube communicates with all the individual compartments C and the air for inflating the latter is supplied to the tube through an inflating valve V carried by it. Means are provided for cutting off communication between the tube and compartments C.

No. 1,057,580—to Elbert Charles Rhodes, Chicago, Ill. Granted April 1, 1913; filed February 16, 1911.



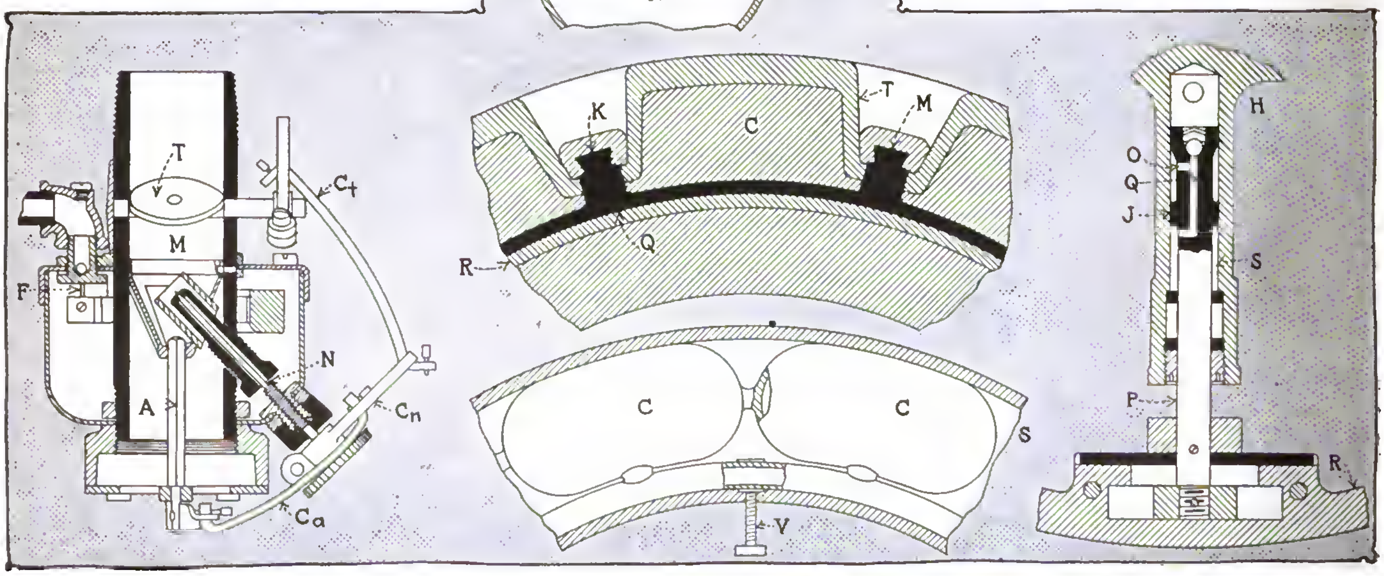


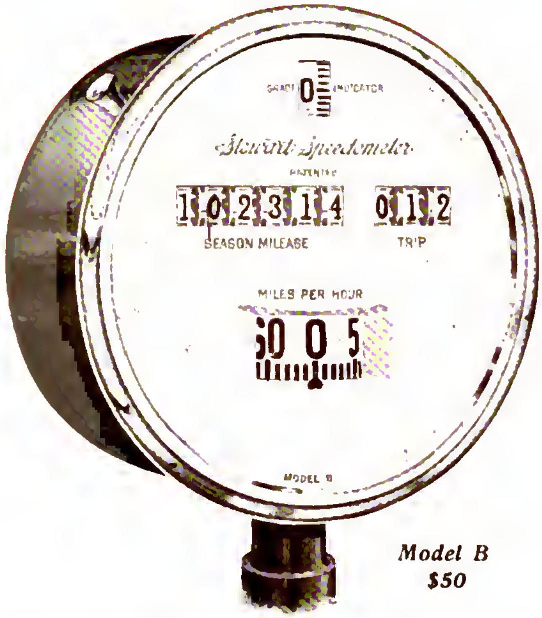
Fig. 1—Stevens carbureter. Fig. 2—Appel valve. Fig. 3—Ruppert-and-Siegel tire. Fig. 4—Rhodes tire. Fig. 5—Wilson wheel

The AUTOMOBILE

NEW YORK, APRIL 17, 1913

Stewart Speedometer

MAGNETIC PRINCIPLE



Model B
$50

More Practical—More Popular—
More Prestige

It is estimated that about 450,000 cars will be built during 1913. Of this amount 400,000 will be equipped with a magnetic speedometer—like the Stewart.

The point is, that it is much better to have your car equipped with that which is acknowledged to be the most practical and scientific, rather than to have on it something that was considered the best before the magnetic speedometer was invented.

The magnetic speedometer means entire satisfaction and world wide service for all time.

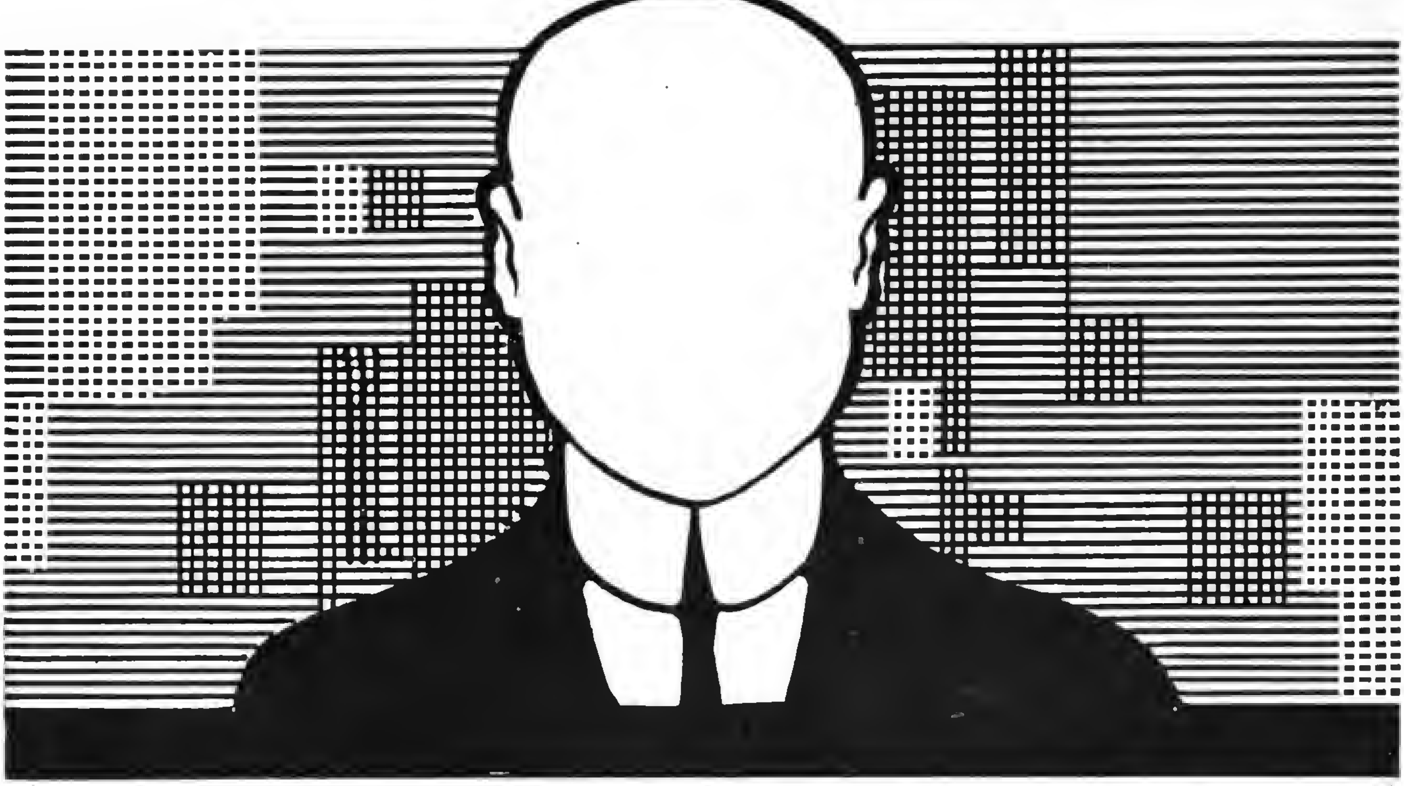
The centrifugal speedometer means all the old inaccuracies such as shaft troubles, etc., and no service.

And the gyroscopic speedometer is, of course, exactly the same as the old familiar and inaccurate centrifugal speedometer in a new dress and design.

Insist on a Stewart—it is built on the magnetic principle.

The Stewart Speedometer Factory,
1930 Diversey Blvd.
Chicago, U. S. A.

Service Stations in every important city in the world



Some big manufacturer needs me

My name or picture would be recognized not only by every car and parts manufacturer, but also by the leading dealers of this country.

So for the purpose of this announcement I wish to be known as X Y Z.

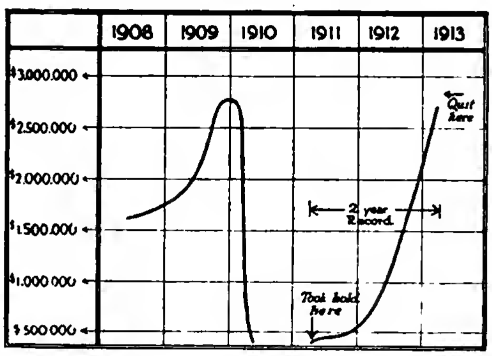
My connection with the industry dates back 15 years. I have a record of achievement that ranks me with the five most successful sales managers in the motoring world.

This record began by importing on a large scale European automobile parts and selling them to America's leading car makers.

I introduced to the American market what was probably the most successful accessory manufactured abroad.

In 1908 I designed and built the most successful vehicle of a certain type, and sold $1,250,000 worth of them from blue prints. This vehicle is still the standard in its field.

My last record as an organizer of sales is best indicated by this chart:



I am a *sales specialist*, and have used my thorough technical training as a basis for my sales work.

I believe I know how to judge the demand of the public and how best to take advantage of it.

There are perhaps a half dozen big unfinished jobs in the motor industry which my long experience and ability equip me to handle.

Is there one in your organization?

If you think it is large enough for a man who can do big things, it will pay you to write to me. I have well-defined views on the art of marketing products in the automobile industry. Perhaps my selling ideas are just what your business needs.

The *right* connection concerns me more than the question of salary. I will stand or fall on the results of my work. All correspondence will be treated with the utmost confidence.

I have adopted this means of announcing myself so that private interviews may be arranged between interested parties and myself without embarrassment to either side.

X Y Z Care of The Class Journal Co., 239 West 39th St., N. Y.

Most Electric Starters Increase Tonnage of Cars

Motor cars are increasing in tonnage at a disturbing rate. Only one or two makers, apparently, are directing their efforts toward lighter weight cars.

Addition after addition has been made until now many cars are under-tired and the additional weight is threatening the safety of the car's design.

Of all equipment to become standard for automobiles the Electric Lighting and Starting System weighs the most. It is natural then, that manufacturers and engineers should turn their attention to the lightest and most powerful electric starter ever offered.

The Hartford Electric Lighting and Starting System *complete* weighs no more than the starting motor *alone* on many other systems.

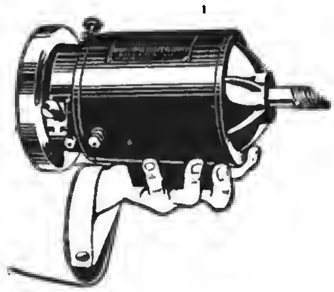
Completely installed, its weight is not enough to seriously affect either the tires, the chassis or any part of the car.

Combined with its wonderful lightness is its unequalled power and noiseless operation, secured by the use of a reduction gear and worm drive.

In view of these facts, is it not to your interest as well as ours to test the Hartford Electric Starter?

Our corps of expert engineers will attach the Hartford System to any car you may have available without a single structural change. Catalog on request.

Hartford Electric Starter



Every Buyer Should Specify the Hartford Starter for His New Car

HARTFORD SUSPENSION CO.

EDWARD V. HARTFORD, Pres.

Office and Works: Jersey City, N. J. Dealers Everywhere. Offices in all Principal Cities

Makers of the Truffault-Hartford Shock Absorbers

The AUTOMOBILE
THE CLASS JOURNAL COMPANY
231—241 W. 39th STREET NEW YORK CITY

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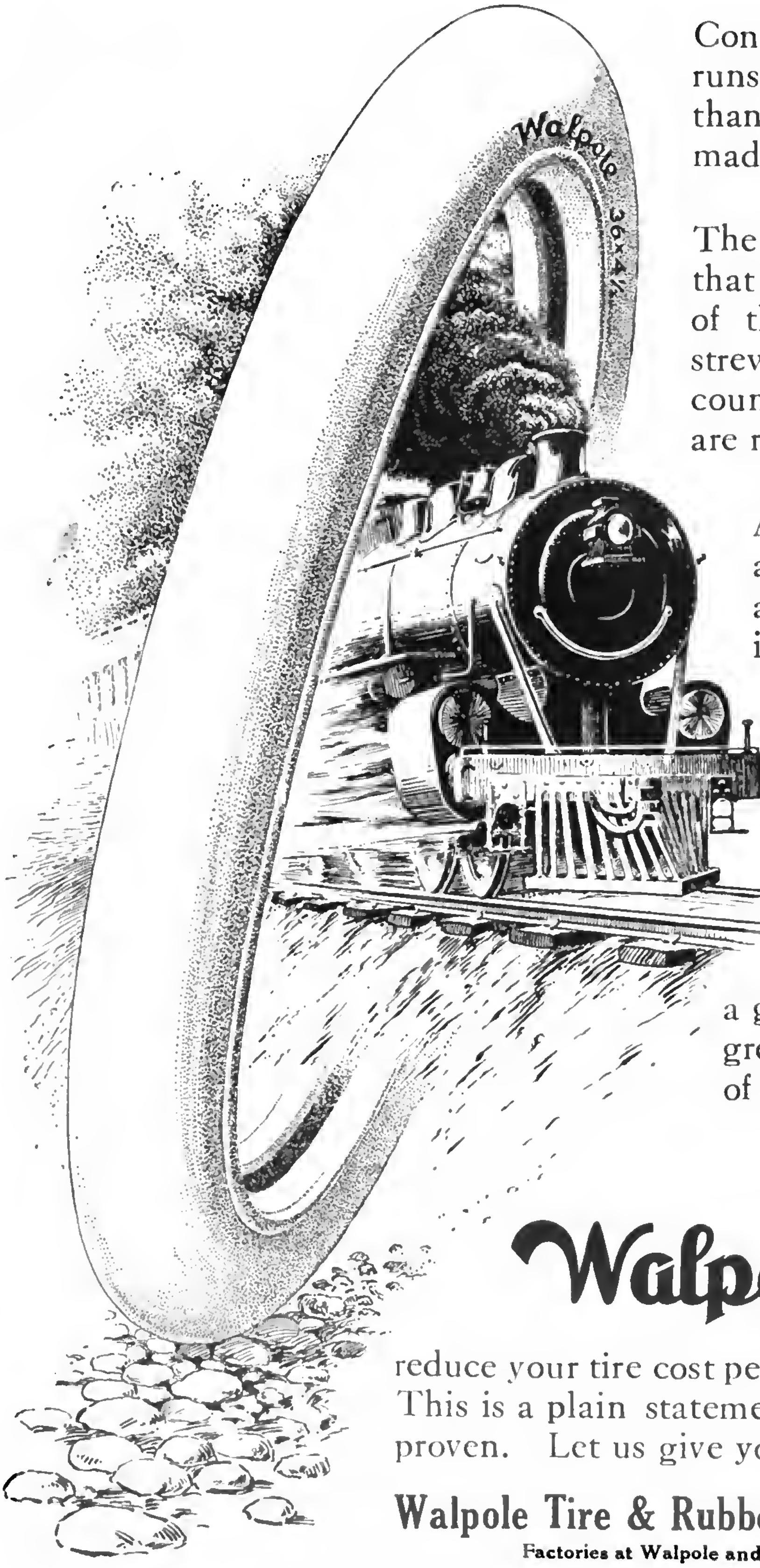
VOL. XXVIII NEW YORK, APRIL 17, 1913. No. 16

THE PATH OF THE LOCOMOTIVE AND THE PATH OF THE TIRE



Consider this:—The locomotive runs on a path that is smoother than a billiard table. Its tires are made of steel.

The automobile runs on a path that varies from the smoothness of the boulevard to the stone-strewn roughness of the back-country road in the hills. Its tires are resilient rubber.

As a matter of fact, the modern automobile tire is a marvel and its efficiency and economy in the face of the task it has are remarkable.

With the improvements found in WALPOLE TIRES — the extra-tough tread and extra-heavy side-walls scientifically designed to protect against stone-bruise—still greater efficiency and reduction of tire cost are attained.

Walpole "NO STONE BRUISE" Tires

reduce your tire cost per mile through longer service. This is a plain statement of fact that can be easily proven. Let us give you the proof.

Walpole Tire & Rubber Co., General Offices 757 Boylston Street, Boston, Mass.

Factories at Walpole and Foxboro, Mass., and Granby, Can.

The Automobile

Detecting Resistance—Saving Fuel

Accelerometer, a New Instrument, Tells What the Motor Is Doing, Indicates Effort Required to Propel Car at Any Speed and Shows the Exact Condition of the Car's Running Gear

By W. C. Marshall

¶ Hundreds of dollars in tires, gasoline and repairs can be literally thrown away by asking the car to overcome unnecessary resistance. It is impossible for the automobile owner to have his motor taken down and tested on the block every little while to see if he is maintaining it at the efficiency it should be. With the accelerometer he is able to get a complete check on the motor and running gear of the car. No flexible shafting or other connection is required. It is merely clamped to a flat surface on the car. The floor will do well enough or a little shelf may be placed on the dash to support the instrument. A small bracket will readily suffice.

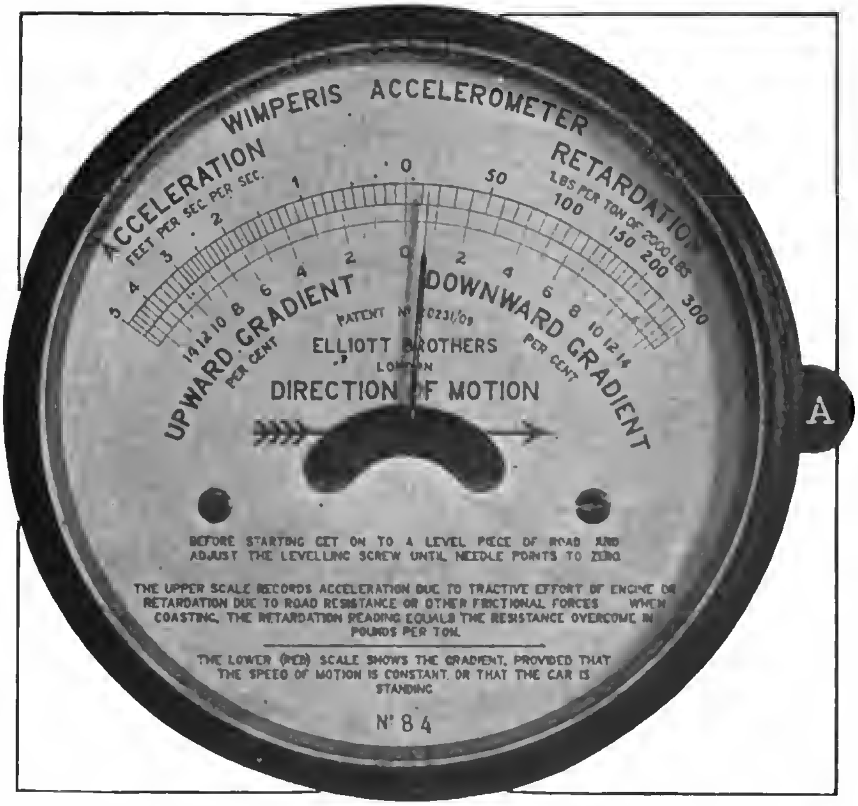
A STEADY effort of 119 pounds is required to drive an average 2-ton automobile along a dry level macadam road at 30 miles an hour. The average touring car weighs very close to 2 tons, therefore if you have a car of this class and it is necessary for your motor to exert a greater effort than this, there is something wrong with your running gear.

A natural question is, "How am I going to know that my car requires too great an effort to propel it?" The answer to this is a mere glance at the dial of the accelerometer, an instrument to be described in this article.

The first idea which would naturally occur to a person would be that an instrument of this kind must be something in the nature of a speedometer, but it is not. It has absolutely no connection to the car in any way except that it is within it or on it. It is just as free of flexible shafting of electric wires as the watch which you have in your pocket. Yet it tells the story of the condition of your car much more completely than the speedometer on the dash or the report of the manufacturer, because the first tells nothing of the effort required to drive the car at any speed and the second offers no proof as to the condition of the chassis after it has been in your hands 10 minutes.

The accelerometer as it appears mounted on a small built-up platform support. The readings can be readily taken as the dial is near the eyes of the operator and can be seen clearly. Note that the instrument is free from any connection to the car other than being carried in a flat place. It is held to the platform in this installation by means of straps. The accelerometer enables the driver to know how many horsepower are needed to drive his car over any road surface at any time. Cars differ amazingly in the amount of power needed for propelling them, and tests have shown that with two cars of approximately the same weight, 20 horsepower more is needed to propel one than the other at 40 m. p. h.

In appearance and in size the accelerometer is very similar to the average alarm clock. The dial is shown on page 834. When carried on the car it can be very conveniently arranged on a Z-shaped support; the bottom arm of which rests on the seat of the car and the



The dial of the accelerometer and directions for its use and adjustment as printed thereon

upper arm of which carries the instrument. This means of carrying the device is illustrated on page 833.

The accelerometer tells the car owner the total resistance offered to the progress of the car at any time. Once set it is independent of grades, curves or rough roads. Since the resistance offered by the car is at any time equal to the power exerted by the motor when traveling at a uniform rate of speed the accelerometer gives a full statement of the power exerted by the motor. It would, therefore, be possible to plot a full set of brake-horsepower curves by utilizing the readings on the accelerometer at different motor speeds. All that would be necessary would be to have a table showing how fast the motor was revolving at any car speed. The combined readings of the speedometer and the accelerometer would furnish sufficient data for a complete set of curves.

The total resistance interposed to the progress of a motor-driven vehicle consists mainly of two factors: A fixed quantity due to the rolling resistance and a variable quantity due to air resistance.

The fixed quantity alone gives the resistance to traction and on the average amounts to about 31 pounds per ton for pneumatic tires. For solid tires the resistance amounts to about 26.4 pounds per ton and for non-skid tires about 40 pounds per ton.

Besides the rolling resistance and the wind resistance there are three other factors which enter into the total resistance. These are, the friction in the vehicle itself, grades and curves. If we propel a vehicle at a certain speed over a level road and suddenly stop the propelling force the speed will decrease with a retardation proportional to the total resistance. If the latter is small the retardation will be small and the time required to change the speed will be longer than if the resistances were large as they would be, for example, if the brakes were applied or a strong head wind were blowing.

Again considering the car weighing 2 tons traveling at the rate of 30 miles an hour against a steady resistance of 119 pounds we find this resistance on analysis to be composed of $47 \times 2 + 25 = 119$ pounds. The rolling resistance is 47 pounds to the ton. For 2 tons it will be 47×2 and the wind resistance against the exposed surface of the car at 30 miles an hour, considering 12 square feet exposed, is 25 pounds.

With the accelerometer even this small calculation which is based on empirical formulae, would not have to be made. The indicator on the dial immediately shows the total resistance per ton of the car. It is only necessary to multiply the weight of the car by the reading on the dial to secure the total retarding force. In this way an accurate check may be made at any time on the condition of the brakes or of the motor.

A study of the dial of the instrument will show that it reads in two directions from the zero mark. On one side of 0 is acceleration and on the other side retardation. When measuring the pick-up of the motor, the needle is first set to zero with the leveling screws A when the car is on a level piece of road. The motor is started and the readings taken directly from the dial when speeding up. It will be noted that acceleration is read in feet per second per second. After any required speed has been attained and it is desired to determine the resistance to progress, the clutch is thrown out and the car allowed to coast. The retarding force will then be read on the retardation side of the dial directly in pounds per ton. The weight of the car in tons and fraction of a ton multiplied by the reading on the retardation scale will give the total resistance to progress. It must be noted that the ton is considered as 2,000 pounds in all of these calculations.

The practical value of the instrument is readily explained. Suppose in the car of 2 tons which we have considered, the resistance instead of being 119 pounds, the normal amount should suddenly show to be 200 pounds. The owner of the car would immediately realize that something was wrong. He would be using 60 per cent. more power than he required before. In other words, for every dollar's worth of gasoline he purchased he would be throwing about 40 cents away in overcoming useless resistance.

Dragging brakes, bearings which are too tight, badly aligned wheels and other faults which go to increase the power necessary to pull the car over the road can increase the cost of automobiling enormously. A light-running car is an economy.

When the operator sees by the accelerometer that the resistance has increased to a noticeable extent he goes over his car and perhaps checks a large amount of damage before it occurs. The instance of badly aligned front wheels may be taken to illustrate. The wear on the tires of the front wheels when they are out of alignment is so great that a new pair of shoes may be worn through in about 500 miles of travel. If this misalignment occurred on a car equipped with an accelerometer it would be detected immediately.

Formerly the measurement of road resistance has been determined by observing the pull on a tow line while the experimental vehicle was being pulled by another car along the road. Another method has been by reading the amount of current used in the motors of an electric vehicle at different speeds on roads of varying surfaces.

The accelerometer, as designed by H. E. Wimperis, an Englishman, measures the road resistance when merely attached to the floor, seat or dash of the car.

The instrument is small, being 4 inches in diameter, 2.25 inches high and of cylindrical form. The general appearance of the accelerometer is shown on page 835. There are three legs to support it on a flat surface, one of them which is shown at A being a leveling screw to level the instrument when the vehicle to be tested stands on a level surface. B is a milled screw used to lock the needle when the instrument is not being used for readings.

The needle is made to stand at 0, when the car is level, by turning the milled-head screw A. The needle swings in a horizontal plane and is not affected by other forces than those acting in the direction of the arrow. When the car is standing on a level, or moving at constant speed on a level, the needle remains at 0. If there is a change in speed, either increasing or decreasing, the needle swings respectively backwards or forwards and this enables the acceleration or retardation to be read on the scale under the needle.

The retardation is read directly in pounds per ton of 2,000 pounds. This is read when the car is coasting, and makes it possible to calculate the resistance of the car by the simple multiplication of the reading by the weight of the car and passengers taken in tons.

This resistance includes road resistances, air resistance and the resistance of the internal mechanism of the car.

If the speed of the car is known in miles per hour the product of speed multiplied by weight in tons multiplied by retardation in pounds divided by the constant 375 will give the horsepower to drive the car at that speed, neglecting tire losses.

This is obvious from the fact that the power lost is equal to the power furnished to drive the car.

As a car will decrease in speed more slowly on a slight down grade, or on a level, than on a rising slope, it will be found preferable to take readings on the former in order to give greater accuracy.

If the instrument is tilted in the direction of motion the needle will move through an angle corresponding to the angle of tilt, and this angle can be read from the graduations at the bottom of the scale. The instrument thus becomes a gradometer and has the power of enabling a slope to be determined while the car is in motion just as well as when standing, provided the speed of the car is uniform.

Although the instrument is sensitive to slopes, it is a fact that the coasting resistance readings do not need correction on account of being made when the car is running either up or down hill. The explanation is, moreover, quite simple. When a car is coasting down hill the slope tends to throw the needle forward while the acceleration, due to the slope throws it in the opposite direction, by just an equivalent amount, so that these two effects neutralize each other. If there were no road resistances the needle would stand at 0. The frictional resistances, due to the motion is practically causing the needle to move away from 0. The needle therefore shows the amount of this resistance, no matter whether the car is on a sloping road or not.

As mentioned, it is better to take readings on a slight downward slope of from 1 in 60 to 1 in 30.

In addition to the longer time thus given for taking the readings, the complicating effect of the change in the momentum, stored in the rotating parts, becomes insignificantly small.

If the rotational momentum is X per cent. of the translational momentum the true road resistance is X per cent. higher than that deduced from the retardation induced by that resistance. This is shown on the dial of the accelerometer when running on a level road.

When the road is not level the instrument reading shows the acceleration or the retardation due directly to the engine, the brakes, the road resistance or to a combination of them, and a knowledge of the slope is unnecessary.

The acceleration scale is useful in measuring the power exerted in accelerating the motor, either from rest or from one speed to another.

The retarding or coasting resistance of the car is first measured at any particular speed. This road resistance in pounds per ton is then added to the acceleration reading at that speed and multiplied by 62.5.

In cases where rubber tires are used the coasting resistance must be increased to find the actual power exerted by the motor at the rim of the driving wheels, on account of the loss in power in the tires.

This amounts to from 20 per cent. to 25 per cent. of the power at the rims. If the front wheels are also included the total tire loss will be approximately 27 per cent. with pneumatic tires, according to Dr. A. Reidler's recent experiments.

Suppose, for example, the coasting resistance of an automobile fitted with pneumatic tires showed 50 pounds per ton reading on the accelerometer. The weight of the car was 2 tons and the speed was 20 miles per hour. If the tire loss were 27 per cent. of the real resistance then the corrected reading would be

$\frac{50}{.73} = 68.5$ pounds per ton.

If this car were running at 20 miles per hour and the acceleration produced by opening the throttle wide was 1.75 feet per second per second then the tractive effort produced would be $1.75 \times 62.5 + 68.5 = 177$ pounds per ton.

(The constant 62.5 is obtained by dividing the number of pounds in a ton by the gravitational constant in feet per second per second.)

This also gives a means for comparing the power of different car engines, or comparing the effect on accelerating power by change of carbureter nozzle diameters, or change of air-inlet opening in the carbureter.

Successive trials of various nozzles with varying air inlets for each nozzle eventually determine which combination is most effective in producing the greatest acceleration from 20 miles per hour or from any other assumed speed.

In the example above the power necessary to accelerate the car 1.75 feet per second per second from 20 miles per hour would increase the speed to 28 miles per hour 10 seconds.

At this rate the horsepower at the rear-wheel rim would be about 21, which indicates a motor power of approximately 28.

It might be that a car was ascending a gradient during the test but, as explained above, this in no way affects the calculation.

This power of acceleration would be equivalent to the power necessary to drive the car at 20 miles per hour up a hill the gradient of which was 1 to 18.4 or a 5.4 per cent. grade.

In making tests on the road the influence of the various internal mechanisms of the car on its speed may be studied by running at different speeds with the various gears in mesh.

The engine friction can be approximately determined by running at a certain speed, then cutting off ignition and coasting.

(To be continued.)

Partial side view of instrument, showing needle lock B and leveling screw A

Goux Makes 106.2 Miles in 60 Minutes

Breaks 50 and 100-Mile Records and Establishes New 1-Hour Figure in 30-Horsepower Peugeot

¶ LONDON, ENG., *April 12.—Special Cable.—At Brooklands today Jules Goux on a 30-horsepower Peugeot shattered Lambert's existing 1-hour record of Feb. 15 on the same track by covering 106.2 miles within the 60 minutes. The world's records made by this latest speed performance are 50 miles in 28 minutes 18.65 seconds at a speed of 105.97 miles per hour; 100 miles in 56 minutes 29.93 seconds at a speed of 106.2; and 150 miles in 1 hour 28 minutes 35.67 seconds at an average speed of 105.9 miles per hour. The motor dimensions are 110 millimeters bore by 200 millimeters stroke, cubic capacity, 7,603 cubic centimeters. The weight of the machine is 3,220 pounds.*

THE terrific average speed of 106.2 miles an hour maintained for the entire period of an hour is scarcely believable in so small a vehicle as the automobile. The finest trains of America maintain a much lower average than this when traveling over their specially constructed highway of steel. The Twentieth Century Limited, making the trip between New York and Chicago in 20 hours, averages only 45.6 miles an hour. It would be interesting to note where this train would be as compared to the racing car driven by Goux, could they travel over parallel routes between New York and Chicago at the respective relative speeds of 106.2 and 45.6 miles an hour. A table showing this comparison follows:

City	Elapsed Hours	Distance in Miles from New York	Miles, Covered by Train	Miles, Covered by Racing Car
New York	0	0	0	0
Albany	3	142	142	319
Buffalo	8.9	411	411	947
Cleveland	12.6	575	575	1340
Toledo	15.1	688	688	1608
Chicago	20	912	912	2123

By the time the train reaches Buffalo the racing car will have been in Chicago for several minutes. When the Twentieth Century had reached Chicago the racing car would have been two-thirds the way across the continent of America.

The idea of speed is relative. We compare the speed of a certain vehicle with that to which we are accustomed in our daily travel and which is compatible with safety according to modern methods of construction. On the ocean, we say a vessel is fast that can make the transatlantic trip under 5 days. Let us consider the record of the Mauretania, made in 1910. This vessel made the trip from Queenstown to New York in 4 days 10 hours and 41 minutes. The distance between these two ports is 2,820 nautical miles. Reducing the average speed of the vessel to land miles for the sake of comparison we find that the Mauretania averaged 29.7 miles an hour on her record-breaking trip across the ocean. If Goux had a good track to travel across the ocean and made the same average speed that he made in his record-breaking race against time, it would take him 30 hours to make the trip. Just 6 hours over a day!

The automobile is the fastest vehicle which man has yet found to satisfy his craving for speed. The flights of fancy of a Jules Verne or Baron Munchausen are surpassed daily, even on the streets of the larger cities. Ultimate speed has always been of intense interest to the human mind. The runners at the Olympic games always provoked the greatest interest. The chariot races, horse races, aeroplanes and automobile races have been and are the means of drawing a thrill-loving audience. The history of speed has interwoven itself so closely with the history of nations that it almost may be said to measure civilization.

The accompanying chart gives the records made with some of the fastest methods of transportation in the hands of man.

Goux, in establishing his record for the distance covered in an hour also established new 50-mile and 100-mile records. It is interesting to note that his speed was greater during the second 50 miles than during the first 50 miles. At the end of the first 50 miles he had averaged 105.97 miles an hour. The second 50 miles was made at a sufficient rate of speed to bring his average up to 106.2 miles an hour. In other words, for the second 50 miles the average was 106.43 miles an hour.

LONDON, ENG., April 1.—Following up his successful driving, which appealed so strongly to those who attended the Easter motor-car racing meeting at Brooklands, Jules Goux has been busy attempting records on his 30-horsepower Peugeot in which he won the French Grand Prix on the Sarthe circuit last year. He succeeded in bettering on all the figures in the 40-horsepower class from the flying .5-mile to the ten laps of the track, which is equal to about 27.5 miles. For the flying .5 mile he occupied 16.38 seconds, which is equal to a speed of approximately 110 miles an hour. The flying kilometer was covered in 20.79 seconds, which is equal to 107.5 miles an hour and the flying mile was returned at 33.87 seconds, which is equal to 106.5 miles per hour. The car was then brought to a halt and from the standing start the car covered ten laps of the track, which is equal to 27.5 miles, in 16 min. 4.9 secs., which is equivalent to 102.5 miles per hour.

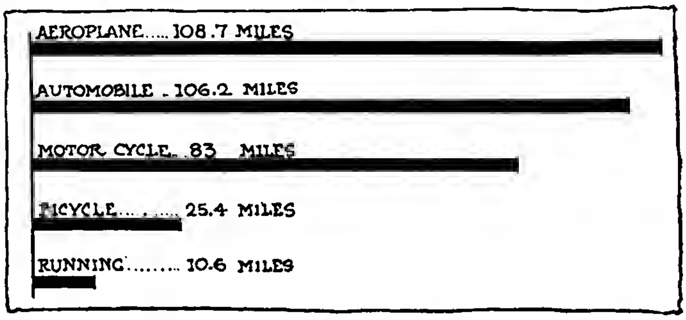
A day later Goux was again in action with the 30-horsepower Peugeot and it was decided that the 6 hours' record should be attempted and a start was to have been made at 9 a. m., but, owing to rain, it was delayed. It is interesting to note that in this attempt, despite the stoppages for tire trouble, for the second time in the history of racing, 100 miles was covered within the hour. He covered that distance in 59 minutes 49.78 seconds.

This 30-horsepower Peugeot is not one of the cars that will compete in the 500-mile race at Indianapolis on May 30, but those that will compete are now undergoing alterations at the French factory and will not be on the roads for 1 week or 2 yet. They are identical to the Peugeot that has been running in England at Brooklands in every respect with the single exception of cylinder capacity. The 30-horsepower Peugeot at Brooklands at the time of writing, has a bore of 110 millimeters and a stroke of 200 millimeters, whereas the racers for the Indianapolis Speedway will have new cylinders cast, measuring a bore of 108 millimeters in order to comply with the regulations laid down for all entrants for this great event.

Sixteen Entered for Decoration Day

INDIANAPOLIS, IND., April 14—Among the sixteen cars entered so far for the Memorial Day race are the following makes: Stutz, Nyberg, Keeton, Mason, Henderson, Smada, Peugeot, Sunbeam.

NEW YORK CITY, April 15—The N. A. A. M. has published a statement explaining that at present there are no plans on hand for the use of a special automobile exhibition building in the 1915 show at San Francisco. The N. A. A. M. some time ago started an inquiry among the automobile makers whether they were sufficiently interested in the Panama show, with negative result, whereupon plans for a special building were dropped.



Comparison of the record distances covered in 1 hour by various means of locomotion

Bill To Tax Trucks $5 a Ton in Bay State

Automobile Interests are Preparing to Fight—Are Now Resolved To Kill All Legislation on Trucks

BOSTON, MASS., April 12—The Committee on Roads and Bridges of the Legislature reported today a motor truck bill calling for a tax of $5 per ton for each ton capacity of commercial vehicles. The motor interests were very much surprised at this for, by agreement in conference between the representatives of the motorists and the Highway Commission, a bill was drawn calling for $5 for the first ton and $2.50 for each additional ton. A meeting has been called by the motor interests for Monday morning to take action on the matter, and the plans of the motorists are now to try to defeat all motor bills on trucks before the Legislature, leaving the law as it is. Interesting developments are looked for as the result of this seemingly uncalled for report after the conferences and compromises that had apparently straightened out things. It will be the best thing all around, however, if all the proposed legislation is defeated.

Lien Law Passed in Indiana

INDIANAPOLIS, IND., April 14—The Indiana Legislature, which recently concluded its biennial session, passed a lien law for motor car interests. This was not generally known, as it passed through both houses without debate.

Within 1 year from the refusal or failure of the owner of any motor car, including trucks, to pay any storage, repair or supply bill, a complaint may be filed to foreclose a lien in the Circuit Court where the car or truck is located. The law allows a lien for storage charges, supplies furnished or repairs done in favor of every person, firm or corporation or others maintaining automobile garages or engaged in storing or furnishing supplies or repairing.

Another important law passed is that aimed at joy-riders. It makes it unlawful "for any person to take possession or to assume control of any vehicles of any character whatsoever, which vehicle is the property of another, and to use, drive, run or operate such vehicle without first procuring the consent of the owner, or to ride with or accompany a person who is so doing, knowing that it is being done without the knowledge and consent of the owner."

For violations the penalty is a fine of from $25 to $500 to which the court, at its discretion, may add imprisonment or from 10 days to 6 months.

Hartford Sues Concrete Bumper

NEW YORK CITY, April 15—Rollie B. Fageol, the inventor of the concrete steel bumper, and the Hartford Suspension Co., Jersey City, N. J., have sued the Concrete Bumper Co. (Ed. R. C. Struthers), New York City, charging infringement of the Fageol patents. The complaint has been filed this week and will come up in the United States District Court, Southern District of New York, on April 18. The complainants are praying for a preliminary injunction to prevent the defendant from manufacturing and selling concrete-filled bumpers or to have him file a bond with the court.

Cut Boston Owners' Insurance Rates

BOSTON, MASS., April 10—Insurance companies in Boston and vicinity that handle automobile insurance announced today that a reduction had been made both on pleasure cars and motor trucks. On the cars used for pleasure a reduction of $2.50 for each automobile will be made, regardless of its horsepower, provided the employers' liability hazard is eliminated. In other words, the reduction affects principally the man who operates his own car. To secure this reduction the following indorsement must be attached to policies: "It is understood and agreed that the policy to which this indorsement is attached does not cover accidents occurring to employes of the assured while engaged in operating or caring for automobiles covered hereby."

Special attention is called to the fact that this reduction applies only to the rate for liability insurance for private pleasure automobiles. No change is authorized for property damage or collision insurance. The reduction in the premiums on commercial cars is more sweeping. Such cars are rated in classes according to the nature of the business their owners are engaged in, and shows the trend of recognizing the growing importance of the truck business. On class 4 the premium rate for liability insurance is reduced from $60 to $45, and for property damage from $24 to $18; on class 5 the liability rate is reduced from $45 to $35, and for property damage from $18 to $14. Class 4 includes all machines used by barrel and box makers, contractors and manufacturers of building materials, carpenters, cleaners and dyers, coal merchants, hay, grain and feed dealers, furniture dealers, gas and water concerns, ice dealers, laundry men, lumber dealers and piano manufacturers. Class 5 comprises all makes of commercial vehicles not otherwise classified.

Batavia Campaign Looks Hopeful

NEW YORK CITY, April 15—According to Holmes, Rogers & Carpenter, attorneys for the Batavia Rubber Co., Batavia, N. Y., the matter of this company's campaign against alleged imitators of its non-skid tread is progressing well. The United & Globe Mfg. Co., Trenton, N. J., has decided to change the design of its tread so as to prevent a possible confusion on part of buyers with Batavia tread. The same holds good of the Stoddard Rubber Tire Works, Worcester, Mass. Several other important companies also in negotiation with the Batavia concern are almost ready to make a similar agreement.

The attorneys of the Batavia company have succeeded in convincing the court that the motion of the Seamless Rubber Co., New Haven, Conn., in the suit of the Batavia Rubber Co. against it, to dismiss the suit was not justified, and Judge Noyes of the United States District Court, Southern District of New York, decided against the Seamless company. The attorneys of the complainant showed to the satisfaction of the court that while Seamless tires were sold in New York under another company's name, payments were made to the New Haven concern.

NEW YORK CITY, April 14—Justice Henry G. Ward, of the United States District Court, Southern District of New York, last week ruled that the Automobile Tire Co., of this city, file a bill of information in the suit pending against it on complaint of the Fisk Rubber Co., Chicopee Falls, Mass. The suit, which is for payment of three notes, amounting respectively to $3,000, $3,000, $3,272.95, or a total amount claimed of $9,305.45 and interest since July 3, 1911, has been brought by the Fisk company through its attorney, Sydney S. Meyers.

Sparton Users Reply to Klaxon

NEW YORK CITY, April 15—The Jackson Eastern Distributors, the Haynes Automobile Co. and the Garland Automobile Co., New York City representatives of Jackson, Haynes and Velie manufacturers, respectively, have filed their answers to the complaints of the Lovell-McConnell Mfg. Co. in the United States District Court, Southern District of New York. In their reply they claim that the Klaxon patents Nos. 923,048, 923,049 and 923,122 were anticipated by earlier patents granted to Woolstock & Ostrander, Edison, Stromberg, Gray and others. The defendants ask the court to dismiss the complaint on the grounds that even if the Klaxon patents are, as is claimed by the Lovell-McConnell company, capable of conjunctive use, the plaintiffs have not stated in their complaint that conjunctive application of the patents has been made in the case of the Klaxon horn.

Gotham Speed Limit Is 25 Miles

NEW YORK CITY, April 16.—The Board of Aldermen of the City of New York yesterday passed an ordinance regulating the operating speed of automobiles. Speed limits of 15, 20 and 25 miles an hour were established for sections of varied density of population. The ordinance also provides for slowing down to 4 miles when turning a corner or crossing a street or highway and prohibits passing a street car within less than 8 feet while the car is standing for the purpose of taking on or letting off passengers. In passing a public school on a school day or a bridge, 10 miles an hour is the limit. Federal and municipal vehicles are exempt from all the foregoing regulations when on duty.

The penalty for a first offense is from $25 to $100 fine, 15 days in jail or both; for second offense committed within 1 year after the first, from $50 to $100, imprisonment up to 30 days or both; for a third or subsequent offense, within 1 year from the first, $100 fine, 60 days in prison or both.

The ordinance which repeals all city ordinances contrary to it, will go into effect on June 1, 1913. It is practically an amendment to the Callan law which is very vague in the points covered by the ordinance and leaves many of them to the discretion of the judge.

Big February Exports

Canada Bought Cars for $1,086,560—International Motors' New Officers

WASHINGTON, D. C., April 15—*Special Telegram*—Canada leads in the importation of American automobiles for February among foreign countries, with 916 machines, representing $1,086,560. The United Kingdom is second with 431 machines, representing $359,779. South America is third with 283 machines, representing $304,630. By comparison with February, 1912, big increases are shown in exports to different countries in each instance.

The monthly summary of commerce issued by the National Bureau of Statistics continues to show a falling off in the value of imports and an increase in the value of exports for the automobile and allied industries. The report herewith on automobile parts, rubber and gasoline shows the figures as compiled for the month of February, 1912, and February, 1913:

Imports	Feb., 1912	Feb., 1913.
Automobile parts (not tires)	$29,241	$17,483
Unmanufactured rubber	10,726,975	9,026,124
Exports		
Automobile parts (not tires)	345,965	444,728
Rubber tires	267,036	276,253
Total rubber, all kinds	1,042,630	1,103,742
Gasoline	560,684	636,578

WASHINGTON, D. C., April 14—The Department of Commerce at Washington has compiled a report showing the comparative value of automobiles exported from the United States, England and France during the past few years. It will be noticed that the export business of the United States has jumped more than $10,000,000 during the past year. The figures from England and France are not as yet available for the past year, but no startling change will be seen when they are published. The comparative table follows:

	—Year Ended Dec. 31—		
Year	United Kingdom	France	*U. S.
1897	....	$121,000	....
1898	....	340,000	....
1899	....	832,000	....
1900	....	1,834,000	....
1901	....	3,070,000	....
1902	$837,000	5,883,000	$950,000
1903	1,674,000	9,898,000	1,207,000
1904	1,747,000	13,825,000	1,895,000
1905	2,637,000	19,568,000	2,481,000
1906	4,228,000	26,833,000	3,497,000
1907	6,725,000	28,098,000	5,501,000
1908	6,423,000	24,779,000	5,278,000
1909	8,141,000	28,541,000	5,992,000
1910	13,460,000	31,510,000	11,190,000
1911	17,246,000	30,795,000	15,509,000
1912	....	....	25,657,000

*Year ended June 30.

Consolidated Lubricants Now Wagner

NEW YORK CITY, April 14—The Consolidated Lubricants Co., maker of Wagner lubricants for automobiles, has changed its name to the Wagner Oil Co. The officers and capitalization of the company remain the same. Fred J. Wagner is president, I. M. Uppercu vice-president and J. C. Nichols treasurer, the capital remaining at $25,000.

A. A. A. Negotiates with W. A. A.

NEW YORK CITY, April 16—Matters are not entirely settled between the American Automobile Association and the Western Automobile Association, the new California body organized to control motor contests in the West. Chairman Schimpf of the Contest Board went West some weeks ago to settle the situation and agreed with the Automobile Club of southern California, through a committee of seven, to administer contest affairs in that territory under the jurisdiction of a contest board. Edward G. Kuster, of the club, was appointed member of the contest board to work with a committee of seven to be selected by the California club. At this point in the proceedings the Western association demanded that the club allow them to name the seven members of the committee, which was refused. Further, the club of southern California has refused to recognize the Western association and continues its membership in the A. A. A. It would appear that what the Western association originally asked for has been granted, but no sooner was such given than a new issue has been taken up by them. The committee of seven is to be made up of four from Los Angeles, one from San Diego, and two from other sections of the territory. It would appear now that if the Western organization does not agree, that its action is simply taken to delay settlement.

S. A. E. to Study Steel's Properties

NEW YORK CITY, April 16—At a meeting of the Iron and Steel Division of the Standards Committee of the Society of Automobile Engineers held at the headquarters of the society here it was decided to delve further into the physical properties of the steels. The manufacturer cannot get satisfaction from an entirely chemical specification and requires definite data on the physical properties. At the same time the steel manufacturer can work better from a chemical analysis. It was decided to amplify the results of the committee's investigation as reported at the January meeting of last year with further reports on the elastic limits and other physical properties to be expected of steels of different chemical constituents. The next meeting of the sub-committee of fuels will be held at the headquarters of the society on April 24.

NEW YORK CITY, April 14.—The vice-presidency of the International Motor Co., vacant heretofore, has been filled by John Calder, with L. H. French and E. C. Fink, first, second and third vice-presidents respectively. Mr. Calder was connected as factory manager with the Cadillac Motor Car Co., while the other two officials were members of the International organization before. R. E. Fulton, formerly assistant sales agent, has been made general sales agent, and George H. Hodges, formerly traffic engineer, is now assistant general agent. J. N. Van Harlingen is manager of the company's transportation-cost department.

Automobile Securities Quotations

The general trend in the stock market this week was down, and as a consequence all automobile securities except Pope Mfg. and Maxwell first preferred either dropped or remained unchanged. Renewed weakness in tire securities seemed to indicate chariness of the public toward the assurances that the industry was again in normal condition.

	—1912—		—1912—	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	150	165
Ajax-Grieb Rubber Co., pfd	..	..	93	99
Aluminum Castings, pfd	..	..	98	100
American Locomotive Co., com	42	42½	36	37
American Locomotive Co., pfd	110	110½	103¼	104
Chalmers Motor Company, com	..	..	125	132
Chalmers Motor Company, pfd	..	..	98	102
Consolidated Rubber Tire Co., com	11	20	17	21
Consolidated Rubber Tire Co., pfd	20	40	60	75
Firestone Tire & Rubber Co., com	234	240	265	270
Firestone Tire & Rubber Co., pfd	108	110	104½	106
Fisk Rubber Co., com	..	..	..	..
Fisk Rubber Co., pfd	..	..	..	102
Garford Company, preferred	..	..	99	101
General Motors Company, com	36	37	30½	33
General Motors Company, pfd	80½	81½	75	76
B. F. Goodrich Company, com	..	..	34	35
B. F. Goodrich Company, pfd	..	..	95	96
Goodyear Tire & Rubber Co., com	396	400	300	..
Goodyear Tire & Rubber Co., pfd	108	110	100	102
Hayes Manufacturing Co	..	..	..	90
International Motor Co., com	..	..	5	10
International Motor Co., pfd	..	..	25	40
Lozier Motor Company	..	..	..	20
Maxwell Motor Co., com	..	..	5	10
Maxwell Motor Co., 1st pfd	..	..	55	70
Maxwell Motor Co., 2nd pfd	..	..	20	30
Miller Rubber Company	..	..	160	170
Packard Motor Company	104	107	98	103
Peerless Motor Company, com	..	..	35	45
Peerless Motor Company, pfd	..	..	95	100
Pope Manufacturing Co., com	37	40	19	22
Pope Manufacturing Co., pfd	78	80	60	65
Reo Motor Truck Company	8	10	11½	12½
Reo Motor Car Company	23	25	21	22
Rubber Goods Mfg. Co., pfd	100	105	100	105
Studebaker Company, com	..	..	29½	31
Studebaker Company, pfd	..	..	90	93
Swinehart Tire Company	..	..	87	91
U. S. Rubber Co., com	57	57	66	66½
U. S. Rubber Co., 1st pfd	115	115½	108	108¾
White Company, preferred	..	..	107½	109
Willys-Overland Co., com	..	..	63	68
Willys-Overland Co., pfd	..	..	90	98
Portage Rubber Co., com	..	..	38	42
Portage Rubber Co., pfd	..	..	90	94

Miller To Double Stock

Plan To Increase Capital to $2,000,000 —Maxwell Capital Now $37,000,000

AKRON, O., April 15—*Special Telegram*—The Miller Rubber Co., of this city, at its last directors' meeting decided to submit a plan to the company's stockholders, by which the capital stock of the company be increased from $1,000,000 to $2,000,000. The increase is to be half common and half preferred stock, 5,000 shares of each to be issued at $100 a share. A meeting of the stockholders will be called at an early date to decide on the question of this issue. The company means to offer one-fourth, or $250,000 of the new issue, for sale, the present stockholders to be given an opportunity to buy to the extent of 25 per cent. of their present holdings, while the rest of the $250,000 worth of stock is to be disposed of in the open market.

NEW YORK CITY, April 14—The Willys-Overland Co.'s board of directors on April 11 declared the quarterly dividend of 1 1-2 per cent. on the $20,00,000 of common stock to be paid on May 1. A quarterly dividend of 1 3-4 per cent. was paid on the $5,000,000 preferred stock issued on April 1.

Maxwell Sheet Shows $47,000,000

NEW YORK CITY, April 14—The Maxwell Motor Co., Inc., has published its balance sheet, showing its assets and liabilities on January 31. This account shows assets to the amount of $46,753,668.08, of which more than half, namely, $26,849,880.44, is put down as the aggregate value of the company's good will, models, patents, trade marks and trade names. Operating equipment as well as current and working assets amount to approximately $10,000,000 each. On the liability side of the sheet, the capital liabilities, amounting to $37,000,000, take the first place. The current liabilities total only $1,135,592.64. The detailed report follows:

Assets

Capital assets:	
Real estate, buildings, machinery, equipment	$9,026,330.72
Investments—Briscoe Mfg. Co., etc.	680,056.36
	$9,706,387.08
Goodwill, models, patents, trade marks, trade names	$26,849,880.44
Current and working assets:	
Inventories	$5,415,339.26
Account receivable	1,985,355.57
Note receivable	288,648.08
Prepayment	77,866.55
Cash on hand together with $1,552,022.07 from Reorganization Committee	2,430,191.10
	$10,197,400.56
Total assets	$46,753,668.08

Liabilities

Capital liabilities:	
Common stock	$13,000,000.00
First preferred	13,000,000.00
Second preferred	11,000,000.00
	$37,000,000.00
Deferred liabilities:	
First mortgages and purchase obligations	$156,342.50
Current liabilities:	
Notes and accounts payable	$756,688.22
Customers' deposits	131,834.75
Receivers' certificates (paid March 24, 1913)	150,000.00
Accrued interest, wages and expenses	88,069.67
	$1,135,592.64
Reserve for depreciation of capital assets:	
Buildings, machinery and equipment	$2,598,760.70
Reserve for depreciation of current and working assets:	
Inventories	$3,594,621.21
Accounts and notes receivable	1,103,140.43
	$4,697,761.64
Reserve for establishment of business expenses:	
Applicable to prior period and other items	$1,165,210.60
Total liabilities	$46,753,668.08

The capitalization of the company given in this balance sheet as $37,000,000 includes an increase of $6,000,000 over the original capitalization of the company, which amounted to $31,000,000. The new issue of $6,000,000 has been incurred in order to pay for property acquired by the former Flanders interests after the original reorganization plan which provided for $31,000,000 stock had been put into practice. By issuing additional stock it is possible to carry out the original plans of the company practically without alteration.

MILWAUKEE, WIS., April 12—Intimations have come from many quarters that the Allis-Chalmers Mfg. Co., the reorganization of the defunct Allis-Chalmers Co., of Milwaukee, which will take control of the properties within the next 2 weeks, will devote much of the time of its extensive electrical works to the production of electrical apparatus for motor cars and trucks, notably cranking and self-starting devices. The company's electrical business is almost entirely concentrated, for the purposes of production, in Cincinnati, the seat of the Bullock Electrical Co., one of the Allis-Chalmers group. Here there are being manufactured at the present time a large number of electrical cranking devices for the Mitchell-Lewis Motor Co., of Racine, Wis., in conformity to the specifications of the Mitchell engineers. However, it is intimated that the company will bring out an electrical cranking device of its own design and manufacture, bearing the well-known Allis-Chalmers trade mark and name.

COLUMBUS, O., April 12—The Ohio House of Representatives has concurred in the Senate amendments to the Hudson-Hite good roads bill which definitely fixes the system of market roads and inter-county highways to be constructed under the supervision of the Ohio state highway commission. The system of roads is to be built with proceeds from a special tax levy and will amount to approximately $3,350,000 yearly. One-quarter of the fund will be used by the state to construct market roads and the prisoners of the Ohio state penitentiary will be used in that work.

The remainder of the fund is to be used for road construction under the present law and will be apportioned to the eighty-eight counties of the state. An amendment was also made permitting the work to be started earlier in the spring.

A bill has been introduced in the Ohio Senate providing that the receipts of the state automobile department shall be turned into the state treasury without deducting expenses.

NEW YORK CITY, April 14—W. P. Kennedy, head of the Transportation Cost Bureau of the American Locomotive Co., resigned last week. No successor will be appointed. This department will be handled by a member of the engineering force.

Market Changes of the Week

Tin held full sway in this week's markets, rising $1.00 per hundred pounds. Starting at $48.50 it rose to $50.00, the highest during the week, then dropped and closed at $49.50. The demand for lead is fairly active with prices calling at $4.35 and $4.40. Both coppers experienced a slight gain of $.00 1-8, closing at $.15 1-2 per pound. There was an absence of new developments in the petroleum markets this week, both Pennsylvania and Kansas remaining firm with unchanged prices. The market for automobile scrap retains a firm tone. The market for foreign scrap remains unchanged. According to importers the demand from consumers holds up well, and stocks abroad are in some cases said to be inadequate for the supply.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.	.07⅝	.07⅝	.07⅝	.07⅝	.07⅝	.07⅝	....
Beams & Channels, 100 lbs.	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Copper, Elec., lb.	.15⅜	.15⅜	.15⅜	.15⅜	.15½	.15½	+ .00⅛
Copper, Lake, lb.	.15⅜	.15⅜	.15⅜	.15⅜	.15½	.15½	+ .00⅛
Cottonseed Oil, bbl.	6.80	6.79	6.81	6.83	6.89	6.88	+ .08
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil, Menhaden, Brown	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 gals.	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime	.94	.94	.94	.94	.94	.94	....
Lead, 100 lbs.	4.35	4.35	4.35	4.35	4.35	4.35	....
Linseed Oil	.47	.47	.47	.47	.47	47	....
Open-Hearth Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Petroleum, bbl., Kansas crude	.88	.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa., crude	2.50	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	....
Silk, raw, Italy	....	4.35	....	....	4.35	4.35	....
Silk, raw Japan	....	3.70	....	....	3.70	3.75	+ .05
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb.	48.50	48.60	49.10	49.10	50.00	49.50	+1.00
Tire Scrap	.10	.10	.10	.10	.10	.10	....

Motor Spirit on Test

Stromberg Finishes a Series of Comparisons with Gasoline

CHICAGO, ILL., April 12—The first complete tests of the new fuel Motor Spirit were completed today when the Stromberg Motor Devices Co. finished a series of exhaustive comparisons of the new distillate and gasoline extending over a period of 3 weeks. Both road tests and laboratory tests in the completely equipped Stromberg testing laboratories were made. The same engines and carbureters were employed with both fuels.

Comparisons of power and economy and response to throttle opening were made at all speeds with each fuel. The results of the tests show practically no difference between the two fuels, either in fuel consumption or power. There was very slight difference also in the picking up of the motor with the two fuels, one being slightly less responsive at some speeds and the other less responsive at other speeds.

What is perhaps the most important feature for those who contemplate trying out the new fuel is that with Stromberg carbureters, at least, no change whatever in the adjustment of the carbureter is necessary. The Stromberg test showed that best results were obtained with the same proportion of air on either motor spirit or gasoline.

Interchangeable With Gasoline

This means that when a motorist's supply of Motor Spirit is exhausted, he can simply fill his fuel tank with gasoline and go ahead without even adjusting the carbureter. This is in contradiction to the results obtained by the Standard Oil Co. of Indiana, which developed the new fuel. This company finds that more air should be given with the Motor Spirit than with gasoline.

Road tests at the Stromberg plant were made on a six-cylinder car weighing 3,700 pounds and showed 15 miles per gallon on both Motor Spirit and gasoline. The fuels used were gasoline of 56 degrees Beaumé and motor spirit of 60 degrees Beaumé gravity.

The official report of the tests follows:

The new fuel, Motor Spirit, was tested in direct comparison with gasoline, first in the laboratory and second on the road. Curves are submitted herewith showing the results of the laboratory tests.

As will be seen, there is practically no difference. However, on the exhaust gas analysis at low speed there is a slightly larger quantity of CO present in the exhaust with the Motor Spirit, but at high speeds combustion is the same as with gasoline. Tests were made for acceleration as well and as far as can be determined the Motor Spirit is slightly "logy" at low speeds, but much snappier above 600 revolutions per minute. On the road the results were about the same. Below 10 miles per hour the car with Motor Spirit was slightly "logy," but at medium and high speeds had about the same snap.

On the fuel consumption test, running with 1 gallon of each fuel over the same course and in the same direction, they both checked the same mileage at 15, 20 and 25-mile rates. This was accomplished with no change whatever in the carbureter, and, in fact, when the carbureter was adjusted for gasoline, could not change the adjustment when using Motor Spirit to make it the least degree better. Starting was accomplished as readily with Motor Spirit as with gasoline in the coldest weather.

With the Motor Spirit there is, however, a faint smoke in the exhaust and the odor is slightly noticeable. The peculiar odor of this fuel would be obnoxious for pleasure driving, as if any is spilled on the car filling the tank the odor remains for several days. Cannot see any reason why this fuel cannot interchange in any car without making any difference whatever in the running conditions. Should say it was desirable for truck work on account of its low price.—EARL A. BESSOM, Engineering Dept., Stromberg Motor Devices Co., Chicago, Ill.

The Fuel Situation in England

By J. S. CRITCHLEY.

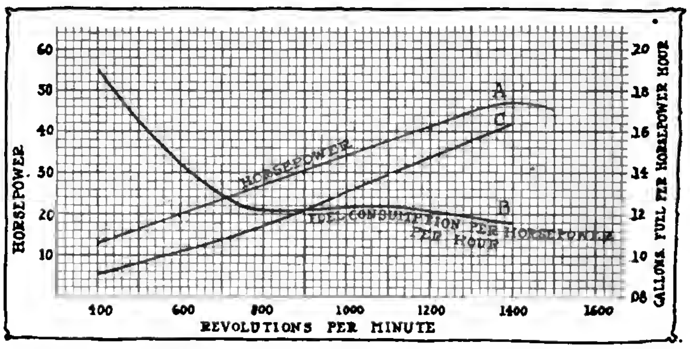
LONDON, ENG., April 1—The fuel question is much more serious in this country than it is in America. The present price of gasoline is 42 cents per gallon and there is every indication that it will go up to 48 cents.

The Society of Motor Manufacturers & Traders, the Royal Automobile Club and the Automobile Assn. have put up together a sum of $5,000 in order to further investigate the question of a gasoline substitute. The three bodies referred to have each appointed three representatives, and it is the intention of this committee to obtain and publish reliable data on the fuel problem.

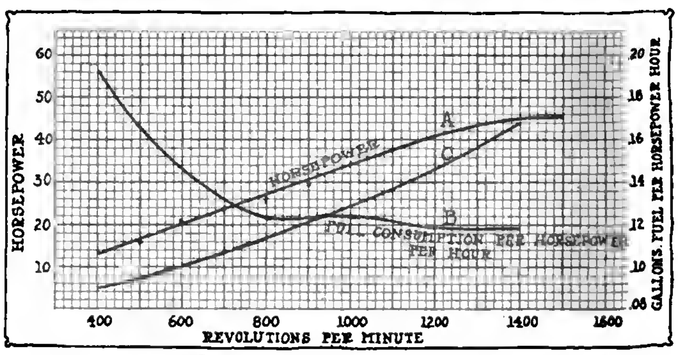
The recent taxicab strike in this city has been entirely due to the increased price of fuel. During the whole of last year the standard price for the gasoline supplied to the cab companies was 15 cents per gallon, which included 3 cents duty. All the contracts ran out on December 31, and the new contracts were fixed by the gasoline distributors at 25 cents per gallon, including the duty. The taxicab drivers were charged by the operating companies cost price, this cost price being agreed to and settled by an award drawn up by an arbitration board appointed by the Board of Trade to settle disputes between the cab owners and the drivers. The award referred to ruled that in the event of any increase in the price of gasoline over 10 per cent. of the then existing price, the increase should be paid by the drivers. In accordance with this award the cab proprietors intimated to the drivers that the future price of gasoline would be raised to the amount of the increased price. The cab drivers then refused to be bound by the award and refused to work the cabs and the whole of the cabs belonging to the Cab Owners Federation were put out of service on January 1 last.

The British Motor Cab Co., which runs about 1,000 cabs and which is composed of members of the Owners Federation, has endeavored to compromise the matter by utilizing a mixture of gasoline and paraffin, the proportion of paraffin being as one to three, and in order to overcome any difficulty in starting, a small gasoline tank was fitted with a direct connection to the induction pipe. This mixture was offered to the drivers at 21 cents per gallon. The drivers refused to accept the fuel at this price whereupon the British Motor Cab Co. offered to supply it at 16 cents per gallon.

This proposition did not meet with the approval of the other members of the federation. Some of them thereupon offered to supply gasoline at the old price of 16 cents per gallon, the result being that the cabs of the federation owners are now again in service and that gasoline is being supplied to drivers at the old price, so that with every gallon of gasoline supplied to the drivers the owners lose 8 cents. As there are some 7,000 cabs



Horsepower and fuel consumption curves on motor spirit



Horsepower and fuel consumption curves on gasoline in London run by companies, and as each cab consumes approximately 3 gallons of gasoline per day, the cost to the cab owners amounts to no less than $1,750 per day, or $525,000 per annum. As the cab companies at the existing rate of fares have only just been able to make ends meet it would appear that with this loss on the sales of gasoline many cabs will have to be put out of service.

With regard to a mixture of paraffin and gasoline, any idea of now running cabs on this mixture is, of course, at an end, as the drivers would resist using this mixture when some of the larger operating companies are supplying gasoline at 16 cents and if one company did attempt to force this mixture on the market the drivers would immediately strike.

There is nothing new in the employment of a mixture of this description, and a large number of commercial vehicles in this country were already running on a fuel of this description.

The most interesting developments in connection with fuel is the treatment of solar and shale oils by the cracking process whereby a light spirit is produced. In order to crack the oil the metal used, namely, iron for heating the oil has been subjected to a very rapid oxidation which has made the process more or less commercially valueless. Recently a new metal has been employed in place of iron which has enabled something like 50 per cent. of light spirit to be obtained from the crude oil. It is calculated that the cost of treating the raw material by this process would be 4 cents per gallon. Bearing in mind the amount of oil-bearing shale in this country it is quite possible that this new process may help to solve the difficulties in connection with the existing supply of gasoline. The only objection to the fuel produced at the present time is its very unpleasant smell.

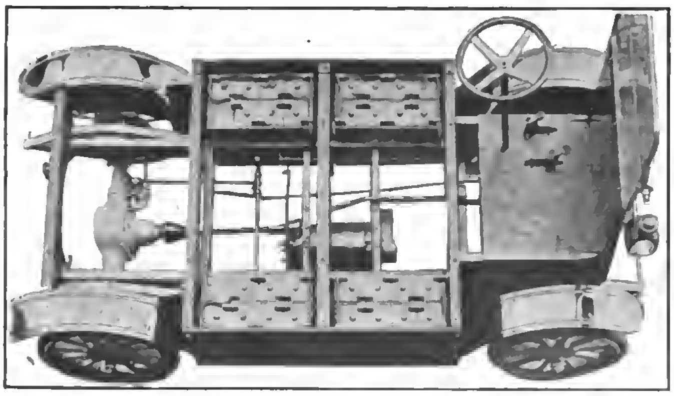
Buick To Produce Six-Cylinder Car

CHICAGO, ILL., April 14—The latest recruit to the ranks of the six-cylinder makers is the Buick Motor Car Co., which is bringing out a six of 60 horsepower, it is stated. The company expects to commence deliveries by the middle of the coming summer. Trial cars are undergoing tests at the factory and complete description of the new product will appear later. The Buick company refuses to give out any details at present.

Motocart Co. To Build Cheap Wagons

NEW YORK CITY, April 15—The formation of the Motocart Co., incorporated at Albany with a capital of $250,000, has been announced today. The officers of this company, which purposes to build a $400 light delivery wagon, constructed on a principle similar to the motorcycle, but with four wheels, are: A. R. Gormully, formerly with the United States Motor Co., president; Wallace Odell, a newcomer in the field, vice-president and treasurer; B. G. Knerr, formerly with the United States Motor Co., secretary.

The company will issue $50,000 of stock as the first move and a factory with over 30,000 square feet of floor space will be opened in Tarrytown, N. Y., in the near future. The offices of the company in this city are located at 1790 Broadway.



Grinnell electric 1,000-pound commercial vehicle chassis

Grinnell Builds Trucks

1,000-Pound Electric Vehicle Has Four Speeds

DETROIT, MICH., April 14—Although not new to the manufacture of electric vehicles, having brought out its first electric passenger car some 7 years ago, the Grinnell Electric Car Co., Detroit, is just entering the business vehicle field, having placed upon the market an electric truck of the light delivery type. Though there is an increasing demand for this class of motor vehicle for all kinds of light delivery service, a brand new field has been opened up with the coming of Uncle Sam's parcel post, and, like a number of other makers, the Grinnell concern has risen to fill the breach, so to speak.

The new Grinnell is styled an "All-Purpose" vehicle and while its rated capacity is 1,000 pounds, it is designed to carry loads 50 per cent. in excess of this amount if desired. Referring to the illustration of the chassis which is shown herewith, it will be noticed that the most distinctive feature is the method of carrying the battery. This is carried in two boxes located amidships and outside of the frame, fifteen cells being placed on a side. This construction makes for even weight distribution and gives plenty of room within the frame for the placing of the motor and drive members.

Motor Hung Under Frame

The motor is made specially for the Grinnell construction and is hung under the upper level of the side frame rails from two cross-members. The motor is not directly connected to the drive shaft, but is mounted to one side of it, connecting through reduction gearing, as shown. In the standard construction a nineteen-plate, thirty-cell W. B. T. battery furnishes the current to the motor. The jars are of the "no wash" type.

The controller is of the drum type, affording five forward speeds and reverse. These speeds are 3, 5, 8, 12 and 16 miles an hour, while the battery mileage ranges from 75 to 95 miles on a charge. Steering is by an irreversihle wheel, it being placed on the left, together with the control pedals.

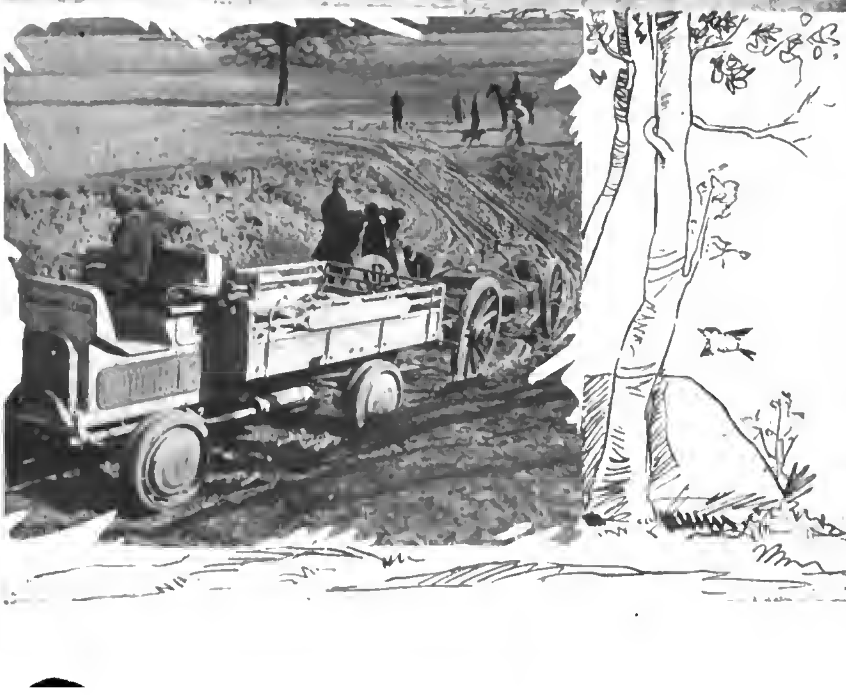
As already noted, the drive is through shaft leading directly back to the rear axle. The shaft is fitted with two universal joints, one just back of the motor and the other at the rear axle connection. Two sets of brakes are supplied, the service pair being operated by pedal, while the emergency brakes, also operated by pedal, are of the regulation internal-expanding type working on the rear hubs. These are 14 inches in diameter and 2 inches in width.

Looking at the more conventional features of the new Grinnell, it is found that the frame is of the pressed steel channel section construction, cross braced with corners reinforced with steel gusset plates. The various parts are carried on annular ball bearings. Springs all around are of the elliptic type, measuring 38 inches in length and having a width of 1 3-4 inches. The fenders are all of the standard metal type.

The wheelbase is 98 inches and the tread standard is 56 inches. As to tires, the option of either the Motz cushion or special electric truck Firestones, 34 by 4 inches, is given.

As to body constructions, the new Grinnell is supplied with either a delivery type or a platform design of any desired dimensions in proportion to the truck size. With the former, the interior dimensions are: Length, 6 feet 6 inches; width, 3 feet 9 inches; height, 4 feet 8 inches. A two-passenger seat is provided which has a comfortable "lazy-back." It is upholstered in machine buffed leather and has a 4-inch hair cushion.

The equipment includes an ampere-hour meter, speedometer, one searchlight placed in the center of the front of the dash, side and tail lights, one interior light, windshield, electric gong and tool kit.



French Army

PARIS, France, March 18.—Horses have been marked down for abolition from the artillery service of the French army. The French, who claim to have the finest artillery in the world, have come to the conclusion that better service can be obtained on the field with motor trucks than with teams of horses.

¶Higher speed and greater mobility is assured with the use of motor vehicles, the degree of reliability is higher, the number of men per gun is less, and all possibility of a battery being rendered useless by a stampede of horses is avoided.

¶Experiments have been carried out for a considerable length of time and such satisfactory results have been obtained that it has been decided to make use of motors in place of horses for all the regiments stationed in Africa. For the time being mechanical traction is being used for the heavy 220 millimeter guns, the lighter arms still being served by horses.

¶Orders have been placed with automobile manufacturers for special types of four-wheel drive tractors and some of these were put through their paces last week on the military grounds at Vincennes, to the east of Paris. The accompanying illustrations show some of the scenes at these demonstrations. The vehicles were supplied by Panhard & Levassor and Messrs. Dalachowsky & Caire.

¶The program called for an ability to haul a load of 12 tons over any kind of ground

Truck Tests

on which horses could operate. The tractors took in tow a line of gun carriages and ammunition wagons, the first carriage bearing the 220 millimeter gun, and was called upon to haul it over every kind of ground on which horses had successfully ventured.

¶The most severe tests consisted in taking the load up very steep banks of soft earth forming the background to the artillery firing ranges. The earth was either so soft or so muddy that there was very little grip for the wheels, yet all these tests were successfully accomplished.

¶In the mud-plugging competition the machines had to go through mud reaching to the hub caps.

¶Another test was the ability to get over the trunk of a big tree which had been laid across the track and pinned in position to prevent it being pushed out of the way by the wheels. This was also done successfully.

¶Finally, there was an immersion test, the Panhard tractor being taken down the muddy river bank under its own power and run into the stream until its wheels were entirely under water, the frame members just being submerged. After remaining in this position for a little while, the machine was brought out under its own power.

¶The Panhard & Levassor tractor is a six-cylinder machine with its motor under a bonnet and a platform body carried behind the driver's seat.

Non-Poppet Motors Influence Poppet Types

Easier valve stem operation secured by use of rockers and lubrication

Part III

By E. P. Batzell

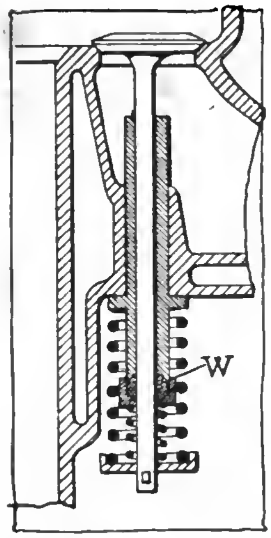


Fig. 5—Method of lubricating valve stem

IT has been mentioned that valve-lifting rockers are used partly with the idea of reducing wear in the tappet bushing by relieving it from the side thrust of the cam action. A very clever arrangement for the same purpose has been brought out recently by Panhard-Levassor, which are the only poppet-valve motors up to the present possessing a special and original construction made solely with the object of avoiding the consequences of worn tappet guides. The method is illustrated in Fig. 6. The tappet bushings have been entirely discarded, and instead, the tappets are guided at their lower ends in specially formed lifting rockers R, and at the upper ones around the ends of the valve stems. The side thrust arising from the cam action is wholly taken up by these rockers through their pivots. These pivots are formed in small circular doors D, which are fitted in pairs to the crankcase by bridge clamps. The tappets proper are quite long, which reduces their possible angularity with the straight vertical direction due to not absolutely perfect alignment and also to the swinging of their lower ends around the rocker pivots. A great angularity in this place, constantly changing with the motion of the valve could have harmful effects upon the valve stems and their guides by working them loose. There is no provision for adjustment of the clearance between the valves and the tappets, except by shimming the bottom of the upper tappet socket into which the valve stem enters. This shimming is easily done here, because by lifting the valve out of the tappet the latter can be directly picked out of the mechanism. Moreover, the method of tappet adjustment by shimming when once properly done generally retains its permanency longer than the common adjustment by screws.

The tappets and valve stems of the Panhard-Levassor motor are inclosed from outside influence, but their compartment is connected with the interior of the crankcase, whereby an adequate supply of lubrication should be assured. This is of particular value to the valve stems.

Valve stem lubrication is just as important as that of any other moving motor part. Thus far it has been grossly neglected, notwithstanding the trouble universally experienced with worn valve guides and sticky valves, both largely due to absence of lubrication. Various means of individually supplying lubricant to the valve stems, as, for instance, by greased washers under spring tension, as seen at W, Fig. 5, have been tried, but these arrangements have not proven to be satisfactory. The mentioned features of the Panhard-Levassor in having the interior of the crankcase open into the tappet and valve space offers a far better and at the same time a very simple solution of this problem, and one which promises to be a big success. Some other motors use the same idea of connected valve tappet chamber and crankcase, and it is difficult to say whether the credit for this arrangement belongs to the Panhard-Levassor or to someone else. In this country the new Garford six has a construction which, although entirely different from the Panhard-Levassor, nevertheless follows the same principle.

In the foregoing are practically covered those means which have been devised and actually employed to silence poppet valve action. They all involve increased cost and complication of the motors, in their construction as well as manufacture, a fact which thus tends to bring nearer in this respect the two motor types, giving the advantage to the non-poppet engine.

This competition between the motors extends over other lines besides that of silent valve action. The constant positive character of valve opening in almost all non-poppet valve motors is a feature that has stimulated improvement in this direction of the poppet valves. A great deal of noise is generated when the positive operation of poppet valves is interrupted, for instance, at high speed when the valve parts cease to follow each other in their motion. This occurrence bears on the strength of the valve spring and the lightness of reciprocating valve parts. Of late considerable improvement can be noticed in the introduction of lighter parts and in cam action giving the least possible change in their inertia motion. The springs are made somewhat heavier benefiting the silent motor range. The camshaft, tappets and valves are more carefully made to withstand the greater amount of work imposed upon them by the heavier lifting to be done without bad effects upon the parts.

Large Valves Affect Operation

This problem of positive valve operation, however, has been hampered somewhat by the present tendency towards larger valve lifts for the sake of gaining a larger valve opening, thereby giving more power and efficiency at high speed. There does not exist a poppet-valve motor which could rightfully claim uninterrupted positive valve operation at its highest speed. Some remarkably good high speed performances with poppet-valve motors have taken place in special instances, but failed to be repeated by the average product. Moreover, the valve gear noise of such motors in action indicates that its motion was far from positive. This field still belongs to the non-poppet valve motor practically undisputed, though it is probable that the poppet valve motion has not yet attained the limit of perfection.

Another feature in which the non-poppet valve motors remain more advanced is their ability to preserve a permanent gas-tight sealing of the valve ports when closed. On the other hand, the poppet valves need more or less frequent grinding-in to keep them tight. Of course, there are also non-poppet valve systems which leave much to be desired in the matter of valve leakage, but generally the rate of their tightness is very little influenced by the amount of service rendered by the motor.

Hardly anything has been done to improve the poppet-valve motor so as to render its valves tight for a long time. Better selection of material for the valve heads has been made, the size of the valves has been decreased to prevent their warping, double inlet and exhaust valves have been used, special self-seating valve heads have been tried, but the results have not encouraged a widespread use of these improvements.

A marked change in the improved exterior appearance of poppet-valve motors is noticeable of late, which purely and simply has been made under the influence of the non-poppet type. In the non-poppet valve motors the cleanliness and simplicity of the exterior is due to the generally complete absence of exposed valve mechanism parts, to the simplicity of the valve drive construction, the absence of caps and other small paraphernalia attached to the poppet-valve motor.

External Appearance Simplified

An important improvement brought about by the introduction of the non-poppet valve is a desirable simplification of the motor exterior. This is due in a large measure to the extensive use of valve covers for the purpose of protecting the mechanism from dust, etc., and the outsider from the noise of operation.

More motors are built now with separate cylinder heads from the main cylinder casting, which also helps materially towards a simple, clean upper structure, when the design is properly worked out. Their upper structure closely resembles that of the non-poppet valve motors, being free from valve caps and small details. The casting integrally of the main cylinder block with the upper half of the crankcase goes parallel with the separation of the cylinder heads from this block. This eliminates the unsightly flange fastening of the cylinders to the crankcase, still so common in the majority of motors. Although this last trend cannot be attributed solely to the influence of the non-poppet valve motors, nevertheless it can be traced back to that source.

In the matter of power development, endurance and efficiency the poppet-valve motors have advanced a marked extent. The details of construction affecting these items all underwent a number of improvements, so as to bring the motors close to the results obtained with the non-poppet valve type. It is difficult to distinguish present superiority of either of the motor types over the other, except in the matter of endurance, where the non-poppet valve motor succeeded to pass through more severe tests than the poppet-valve. Nevertheless it should be mentioned that in single instances with particular care the poppet-valve motor has been able to demonstrate equal ability with its competitor. The poppet-valve motor lacks in minor details of the valve mechanism, like valve springs, sticking or leaking of the valves, etc. Its power output and efficiency have been increased even in the average product by the extensively used large valves and valve lifts, the value of which has been disclosed to

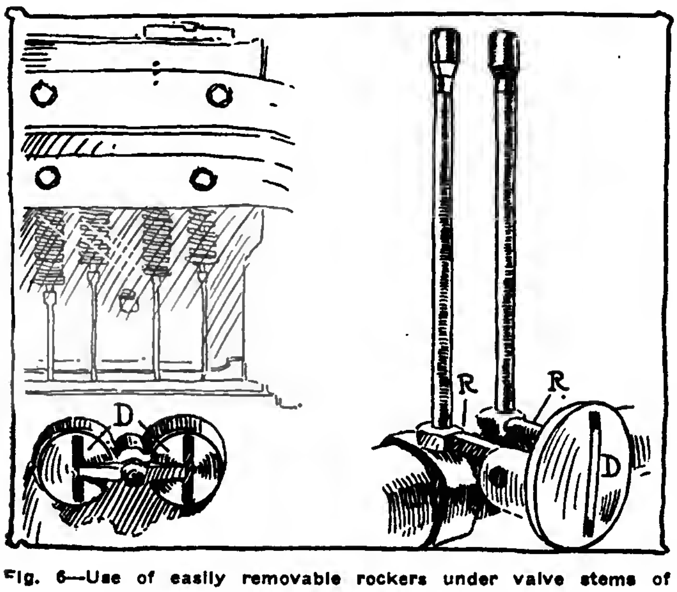


Fig. 6—Use of easily removable rockers under valve stems of Panhard-Levassor motor

the public practically simultaneously with the publication and general discussion of the early performances of the Knight motor in 1908-1909.

Concerning compression pressure the poppet-valve motor undergoes a turn at the present time, namely, towards somewhat higher pressures than that of a few years ago when the tendency was to lower it. The higher compression is essential for competition with the non-poppet valve motors, which generally are of such a construction that high pressures are permissible without causing harm to their action.

Referring to constructive simplicity, this point has not presented itself as an immediate requirement for an advantageous comparison between the two motor types. The fact that the really successful non-poppet valve motor, like the Knight, cannot boast simplicity has given encouragement to the appearance of the poppet-valve lifting mechanisms of increased complication over the common arrangement and, although the greater complication of some poppet-valve systems may be serving some good purpose in the perfection of their action, it remains undesirable, particularly in view of the continued development and improvement in the simple type of non-poppet valve motors.

This could serve as an explanation why only few motor makers have followed the tendency to obtain a somewhat better valve performance at the cost of simplicity. The majority of motor makers are trying to improve their products while retaining its simplicity. Should they fail by those means to approach the existing advantages of non-poppet valve motors, the appearance of practically successful and at the same time simple types of the latter should become the moment of a general turn in the industry and in the public towards adopting and using them.

Transverse Vibrations in Stationary Shafts

¶ From a paper read before the Society of Automobile Engineers by J. M. Thomas.

Consider the case of a long, slender stationary shaft supported at the ends by bearings which exercise no restriction on bending. Let the shaft be loaded in the center. Let the load be suddenly removed. The elastic forces are now unbalanced and transverse vibrations are set up; the frequency, or number of vibrations per second, being termed the "natural frequency" of the shaft.

If left alone, all the energy in the shaft will ultimately be dissipated in internal friction and in friction between the shaft and the air; but considering one complete vibration we may say that the total energy in the system is constant. In the mean position the energy is wholly kinetic. At the ends of the path of vibration the direction of motion is changed, the shaft is for an instant stationary and the energy is wholly potential, or strain energy. The stress in the shaft has now its greatest value, and the greater the amplitude of vibration the greater will be the stress.

Moreover, the stresses are of an alternating character and we know from the researches of Wohler and others that the stress intensity, when of the alternating kind which will produce permanent distortion, is less than under static conditions. When a periodic force acts upon the shaft forced vibrations of the same frequency as that of the force are set up, the amplitude of the vibration depending upon the relation between the frequency of the force and the natural frequency of the shaft.

As an illustration: The vibration of a headlight, or mud guard, which may frequently be observed on cars standing with the engine running at a slow speed, are forced vibrations of this type. If the frequency of the force is the same as the natural frequency, it then at each application acts in the direction of motion and increases the amplitude of vibration, or greatest deflection; the kinetic energy of the system, and what is more important the stress at the extreme points of the path of vibration. The continued action of the force under these conditions will evidently result in stresses beyond the elastic limit and the shaft will either fracture or become permanently bent.

The Engineering Digest

A Digest of Technical Information from the Engineering Journals

Some Principles in the Action of Tires and Vehicle Springs Succinctly Expressed and Limned by Celebrated German Authority—Short-Circuiting Magneto Current Against Car Thieves—Two Motor-Starting Devices, One by Maybach

RIEDLER on the Action of Springs.—Among writers on technical automobile subjects *Geheimer Regierungs Rat* Professor Dr. Riedler of the Technical Highschool at Charlottenburg, Berlin, has attracted universal attention by his books on Scientific Automobile Valuation, in one of which he published very elaborate test data relating to different modern motors and presented the conclusion that the double-sleeve valveless motor was intrinsically unfit for further development because it could not be cooled easily enough for a continued maximum development of its power without an uneconomical excess of lubrication and other heroic means. His unreserved expressions gave rise to heated polemics between him and the producers of Knight motors in all European countries and these have continued until now since last summer and have contributed to a close examination of all the intricate questions involved in the subject. Meanwhile Dr. Riedler has taken pains to show his versatility by sending interesting descriptions of an automobile trip in the Balkans and recently by writing a relatively popular treatise on automobiles for the encyclopedic work *Die Technik im Zwanzigsten Jahrhundert.* Some of the terse technical ginger which abounds in his more strictly scientific publications crops out also in this work. He does not take the motor as the factor which must first of all be understood by one who desires to study automobile requirements, but the relations between a wheeled vehicle and the actual roads. Some extracts from his presentation are given in the following.

The traction resistance of a vehicle on a good level road amounts to about 20 kilograms for each 1000 kilograms of load and on rails only to about 4 kilograms. On account of this single advantage, the entire transportation traffic, including goods and passengers, has been condensed in an unnatural manner upon a few already greatly overloaded steel rails. [Riedler underrates perhaps the importance in this respect of automatic steering, by rail, and of the relative independence of weather and seasons.]

Knowledge of automobiles can be gained only by studying the fundamental conditions for their work and not from a hodgepodge of machine-technical details which moreover, to be understood, call for specialized knowledge, while the foundations are intelligible to every person with a general scientific education.

In contrast with the railway, the automobile may be characterized as a power vehicle for the common road, but this a road which is not built for it and therefore poorly adapted for speed. Nevertheless the motor vehicle must be driven over it three times as fast as a horse-vehicle of the same class. And in all cases the load is greater in the motor vehicle, and the time for its operation is not limited by fatigue. The tripling of the speed is therefore an enormous demand to make and can be realized only by a highly developed specialization of the means.

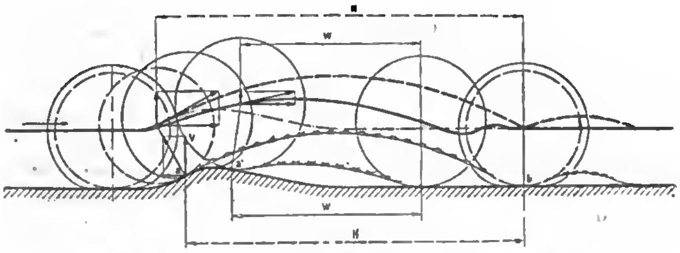


Fig. 1—Movements of running-gear with hard tires and with soft tires occurring when vehicle strikes road obstacle

[Dr. Riedler here goes on to show that the great differences in the construction of automobiles of the different classes are necessary and natural, all being due to the need of compromising with the very severe requirements; a compromise which of course must vary in its nature according to what is most important in each type of vehicle, considering its purpose in each case.]

The running, the steering and the driving are the most fundamental functions of an automobile to be looked into, and, with regard to the running, the actual condition of roads makes it a first consideration how a vehicle may be driven as fast as required over numerous obstacles without injury to it and its occupants. The object must be to reduce the force of impacts to a minimum and to control them by a successively acting spring resistance. For this purpose it is indispensable to subdivide the acting masses by means of the springs and to reduce the mass which is not spring-suspended through the use of very high-class materials. Wheels and axles, which constitute the unsuspended weight, must be made as light as possible. While the careful driver who avoids shocks and circumvents obstacles is the principal factor in lengthening the life of a car, the use of high-class materials to reduce weights and masses stands as the most important factor of progress so far accomplished in automobile construction. These materials—the alloy steels in forgings and castings—have fitted the automobile to survive normal wear and tear at the required speeds.

The springs between axle and body divide the entire vehicle bulk into an unsuspended running-gear and the larger spring-suspended mass of the body and load. The springs must take care of the equalization of impacts between these two masses. Springs cannot absorb or anul impacts but can only transform them and at once transmit them or return them in subdivided form. The impact places the spring under tension, but it cannot remain in this condition. It must give up the energy stored in it by a rapid spring-extension, and the object is to have it return this energy to the running-gear and not to the vehicle body. In a correct spring suspension the force of impacts travels therefore to and fro, from the road to the wheels and the springs and back again to the road, the wheels and axles swinging rapidly, while the wagon body remains at an almost undisturbed level. Only when the spring is prevented from at once reacting upon the axle, the spring rebound must take effect upon the wagon body, which is never desirable.

For fast driving the force of an impact must be reduced at once at the spot where it is received; that is, by a spring action at the circumference of the wheel. The time between impacts is too short to admit of any other method. Springy tires are therefore an indispensable requirement for speedy driving.

When a hard tire (see Fig. 1) is driven against an obstacle and the vertical component of the impact is greater than the axle load, the wheels and axle are thrown upward from the road. The actuated mass follows the parabolic curve H and the wheels reach the road again at *b*, whereafter there follows a series of diminishing reflex bounds, unless a fresh impact intervenes. But if an elastic tire is driven against the same obstacle it is locally compressed and operates as a first element in the cushioning of the shock. Consequently the curve W of the bound becomes shorter and the wheel returns quicker to contact with the road. Only that portion of the impact which has not been transformed in the tire reaches the vehicle springs, which return it to the running-gear.

The spring is before the beginning of the impact under its normal load, as represented under I in Fig. 2. By the impact it is compressed (II) and immediately rebounds. When the wheel again hits the road, the spring is again extended. The larger mass of the vehicle body participates only very little in this movement, because the short time of the spring action suffices only for accelerating the small mass of the running-gear but not the larger one of the body and load.

From these few kinetic principles it is possible to assign rational causes for many important experiences in driving, and by reasoning from them many arrangements of springs and tires may be recognized as correct or faulty.

For example, vehicles not provided with cushioning devices must necessarily either rise above every road obstacle or smash it; a large amount of lost work, resulting in the destruction of both the road and the vehicle. Motor vehicles without a spring suspension of some kind are therefore impossible. Hard tires on otherwise correctly spring-suspended vehicles answer only for speeds up to about 12 kilometers per hour. At highest speeds the impacts of the unsuspended running-gear become too severe, and likewise the destructive effect upon the road surface, because the cushioning at the locus of the impact is missing. [Here follows an exposition of the great and indispensable advantages of air tires for all fast driving and also of the unavoidable economical drawbacks, power losses and inconveniences in their use.]

The second element in the spring suspension is the real vehicle springs. These can operate correctly only for one given load and speed. By reason of the transformation of energy in the springs vehicles run more quietly fully loaded than partly loaded, if the springs are designed for the full load. On good roads fast driving is steadier than slow driving and heavy vehicles steadier than light ones, but on a poor and rough road this is reversed. Heavy vehicles run smoothly over cobble stones and similar surfaces when driven fast, but not otherwise, while light vehicles never run steadily over such a surface. All of this may be inferred from the time required for accelerating the large mass of the vehicle body and load. In running over a ridge or a furrow the wheels no longer hit the road level but the higher or lower surface of the obstacle, and the vehicle

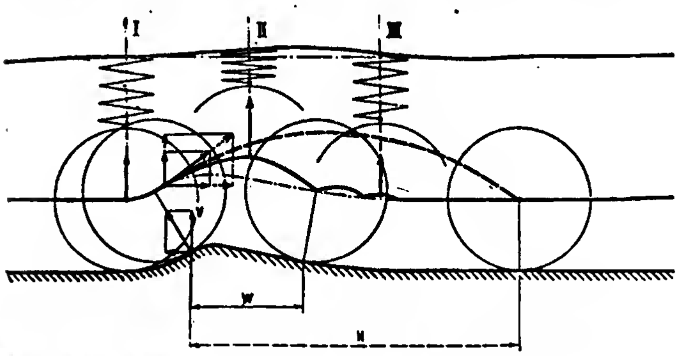


Fig. 2—Successive positions of running-gear and of vehicle springs when fast-driven vehicle strikes ridge in the road

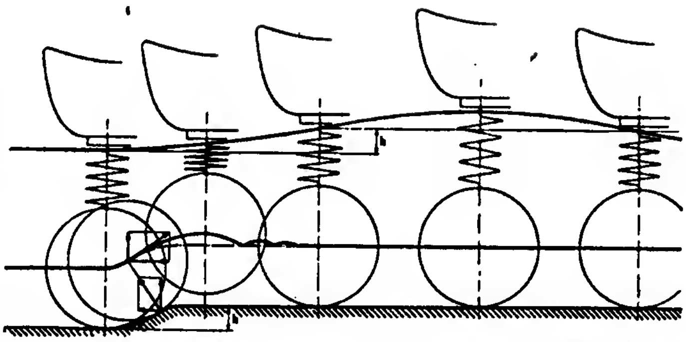


Fig. 3—Effect on vehicle springs and body when the springs are prevented from extending downwardly after a jolt

spring, after being compressed by the first impact, has no chance to rebound toward the ground but must spend its stored energy upward against the heavy vehicle body, which is thrown upward until the springs are entirely extended, as shown in Fig. 3. By this action the vehicle body is unavoidably thrown up so high that, when it comes down again by gravitation, it compresses the springs till the frame comes down hard against the axle. Such excessive oscillations of springs can only be avoided by cautious driving. Something similar occurs on undulating roads. Here, too, the springs get time to accelerate the vehicle body upwardly, and intolerable swinging movements are set up, sometimes.

A stepwise distribution of the spring action is recommendable also in the case of the vehicle springs. For this reason auxiliary springs are secured at the ends of the leaf springs. These enlarge, when properly designed, the range of the spring movement and take effect first, in advance of the slower-acting leaf springs. By this means it is possible to make a closer compromise in suiting the suspension to different loads, speeds and road conditions. Dampers on the spring action can be justified only when they guard against excessive upward movements of the vehicle body. They should therefore take effect only at the moment when such movements begin but not before. Most dampers, and particularly all the elbow-joint dampers work on just the opposite principle and are therefore valueless. Hydraulic dampers can be made to operate correctly but are too complicated [*umständlich*]. Elastic wheels with interior springs can work only like vehicle springs but can never supplant elastic tires, being unfit for absorbing an impact locally. Moreover, such springs work only in the wheel plane, while the shocks come from all sides.—From *Automobil-Rundschau*, March 15.

STARTING on the Spark.—In order to be able to start a motor on the spark, the mixture contained in the combustion chamber must be ignitable in the immediate vicinity of the spark plug terminals. Owing to the higher specific gravity of gasoline vapor as compared with air, a mixture left standing in a cylinder will stratify, the air going to the top, and only the middle strata will be in a proportion that makes it inflammable. The first condition for being able to start easily on the spark after the motor has been at rest for some time is therefore that the spark plug extends well down into the mixture. When the gases are churned by cranking, this favorable location of the plug is less urgently required. As the relative amount of vapor to air is small, as rich a mixture as possible should be left in the cylinder when the motor is stopped, so as to raise the inflammable portion to the highest possible level. The longer it is intended to stop, the richer the mixture should be, as every minute of delay makes the vapor sink to a lower level. It is the wrong method to open the gas wide when stopping the motor, as a wide-open carbureter does not give the richest mixture. Assuming that the plug is well located and that the carbureter is normal, the procedure can be varied according to the length of the intended stop. For one of five minutes it is enough to throttle down somewhat and effecting the stop by cutting off the ignition. For a stop of fifteen minutes, close the air-shutter after cutting out the ignition and open it again before the motor is stopped, but don't race the motor. If the stop is to be for two-three hours, speed the motor to about 800 revolutions and close the air-shutter. For a still longer wait, as for over night, race the motor and block the air. These rules are of course subject to variation according to the type of motor and the weather. The mixture left in the cylinders should be richer for cold than for warm weather. At zero temperature it may be impossible to start without cranking first, but one turn will generally churn up a well-prepared mixture sufficiently.

With carbureters which have no additional air inlet to be operated, the mixture can be enriched, even to excess, by speeding the motor up and then throttling down tightly and suddenly. —Henri Petit in *La Vie Automobile*, March 22 and April 5.

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MECHANICAL Motor Starter.—While the mechanical type of motor starter may be destined to give way in course of time to one which is more intimately built into the motor system, rather than constituting an accessory mechanism, it still has advantages in the way of low cost and reliability—though only the same limited kind of reliability which the old starting-crank offers—and these appeal to a portion of the public. One such device, known as the Rofill, is now being pushed in the Belgian market and is illustrated in Fig. 5, in which the portion to the left represents the parts close to the driver and that to the right the parts located in front of the motor. The operating

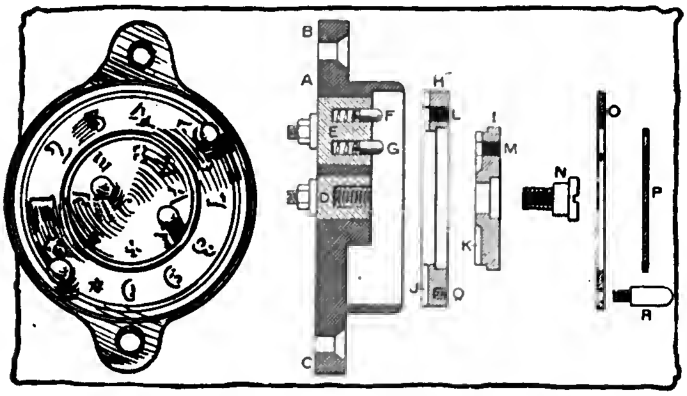

Fig. 4—Combination lock on the ignition current

lever 24, when pushed forward, actuates another lever 18 by the mesh of gear sectors 22 and 20, the motion being resisted by the spring-rod 21, which is attached to lever 18, and the cable 14 extends through or under the motor hood to the pulley 17 and, around it, to the end of arm 12 of the free-wheel device 9, being always kept taut by the tension of springs 21 and 13. The starter-shaft 2 has a bearing in front in the piece 1 usually supporting a starting-crank [the whole device being intended for application to old as well as to new vehicles] and is connected to the motor shaft 4 by a ball clutch inside of sleeve 6 which is pinned to the motorshaft. But this clutch ceases to operate when the motorshaft is turned fast, as the balls are then, by the centrifugal action, thrown into recesses formed in sleeve 6. The operation now consists in pushing the lever 24 forward, thereby extending spring 21 and detending spring 13, the latter taking the free-wheel into the position, with the arm 12 downward, in which the cable acts most favorably, and thereafter pulling sharply back upon lever 24 with the assistance of spring 21. If the motor should backfire, the shock will be absorbed for the greatest part in spring 21, the strength of which is calculated for this eventuality. A side view of the interior of the free-wheel, in which 10 is the ratchet and 11 the pawls, is given in one corner of the illustration.—From *Automobile-Aviation*, March 20.

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COMBINATION Lock on the Ignition.—The device shown in Fig. 4 serves to short-circuit the magneto, as a protection against automobile thieves when the owner has left his vehicle at the curb, and it also affords some protection against other unauthorized use of a car. The dial is composed of two concentric disks O and P, the outer one bearing 12 numerals and the inner one 8 letters. Both can be turned by means of small knobs, like R, which also secure them to the corresponding interior disks H and I which are mounted together on the shoulder of the assembling-screw N. The body A is made of ivorine, an insulating hard-rubber substance, and the metallic plug D is wired into the primary magneto current, a terminal post being provided for the wire attachment, while the other metallic plug, E, is grounded. Unless the spring-knobs F and G are opposite to and in contact with the fiber plugs L and M rather than with the bodies of the disks H and I, the magneto is thus short-circuited. To change the combination the dial-disks O and P are brought in different relations to disks H and I—a new numeral opposite to plug L and a new letter opposite to plug M. This, it is said, may be done by loosening the knobs R and re-securing them in new positions. [There must therefore be a series of threaded holes, similar to the one marked Q in the drawing, in both the interior rings.]—From *Omnia*, March 8.

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STARTER for Airship Motor.—In connection with a six-cylinder motor designed by Karl Maybach for a new German air-cruiser, a patented starting device has been installed, and it is reported to have worked perfectly at trials of the airship. By means of a single lever all the valves of the motor are raised at the same time, and by the same lever action, a rotary valve is operated which closes the exhaust exit from the muffler and opens instead a conduit leading to a vacuum pump. A few pumping strokes send rich explosive mixture from the two carbureters to the cylinders, whereafter the motor valves are closed again and the exhaust is opened. The motor is then started by actuating a Bosch magneto-booster.—From *Allgemeine Automobil-Zeitung*, No. 12.

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Properties of Benzol.—Gasoline contains 85 per cent. carbon, 15 per cent. hydrogen and boils at 70 deg. centigrade, while benzol contains 92 per cent. carbon, 8 per cent. hydrogen and boils at 80 degrees. As the hydrogen content makes for rapid flame propagation and increased power but also for easy ignition, the compression used with gasoline cannot be as great as that which is practicable and desirable with benzol, and as in turn the higher compression makes easier ignition and increased power, the question of the relative efficiency of the two fuels depends largely upon the construction details of the motor—the shape of the combustion chamber, the nature of the ignition and the design or adjustment of the carbureter. As, however, the larger carbon and smaller hydrogen content of the benzol militates against much variation of the proportions of the explosive mixture, while practically all modern carbureters do change these proportions with the speed, the flexibility of the motor cannot be so great with benzol, if by flexibility is understood, as usual, that increase of torque at lowered motor speed which renders it possible to avoid gear-changing to a considerable extent.—From *Allgemeine Automobil-Zeitung*, March 21.

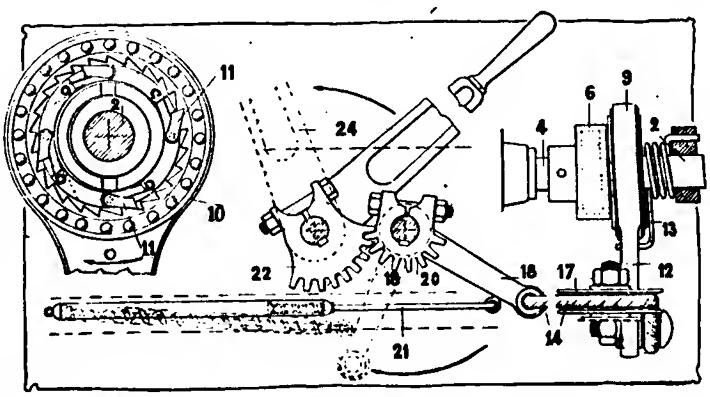


Fig. 5—Elements of the Rofill mechanical motor starter—Drawing in left corner represents interior of the free-wheel 9

The Engineers' Forum

Horsepower as Basis For Tax Discussed

Part III

Automobile Engineers Express Dissatisfaction with the Principle of Levying Fees According to Horsepower of Car

Cunningham Satisfied with S. A. E. Power Rating
Apperson Says Rating Should Be Lowered, if Anything
R. P. Henderson Is Satisfied with S. A. E. Rating
Creighton Considers S. A. E. Formula Accurate

SO many letters have been received by THE AUTOMOBILE from prominent automobile engineers, expressing their opinions as to the ideas embodied in the article entitled "Cars Taxed on Unused Horsepower," which appeared in THE AUTOMOBILE for March 27, that the Engineers' Forum for next week, and perhaps for the week following, will be devoted to the discussion of this timely subject. Some of these letters are given herewith:

Base Tax on Cylinder Development—Cunningham

ROCHESTER, N. Y.—Editor THE AUTOMOBILE:—The tendency on the part of state legislatures to provide new horsepower ratings seems to me to be entirely called for. The present S. A. E. rating certainly is fair enough. It represents, as a matter of fact, a great deal higher horsepower than the average developed by automobiles on the road. A car whose motor rates 30 S. A. E. does not develop more than 15, as an average, in ordinary touring, and considerably less than this for ordinary city driving. If automobile taxation is to be based upon a horsepower rating, the S. A. E. formula should be in every way adequate. If any change is made it should be to base taxation on actual cylinder development.—JAMES CUNNINGHAM, James Cunningham, Son & Co.

Rating Should Not Be Increased—Apperson

KOKOMO, IND.—Editor THE AUTOMOBILE:—I am glad to have an opportunity to express myself on the movement which seems to be on foot among many of the secretaries of the different states to force a change in the horsepower rating of automobile motors. I have been watching with interest the reports that have come through the press of the agitation on this subject which is being stirred up in different localities as a result, undoubtedly, of the publicity which is being given just now by many manufacturers to long-stroke motors.

Realizing that such action would be in direct opposition to the service which the majority of public officials seek to give the people—that is, it would be inimical to the interests of the motoring public at large—we are anxious to set forth what our experience in getting the horsepower out of gasoline motors has been.

At the start, when the A. L. A. M. horsepower rating was first promulgated, I was of the opinion that it was too high. But as we continued to apply it to engines as we built them and tested them out here we found it was a very accurate formula for the determination of the horsepower of a motor on the block. It does not give the maximum horsepower our engine will develop under the block test but as an indicator of the power which will be obtained by the driver on the road it is in our estimation, far too high. In making a statement of this kind I mean that the average user of a car is not sufficiently educated mechanically to keep the mechanism of the motor in such condition as to enable it to develop 100 per cent. efficiency at all times. In my opinion, the majority of cars in the hands of users, owing to changes in adjustments which are made by them, do not develop anywhere near the horsepower shown by the block test when they are tested before shipment. This loss, therefore, would bring the horsepower down below that given the engine by the standard A. L. A. M. formula. So by increasing the rating and thus boosting the license tax to the user, you would be asking automobilists to pay for something which they do not get.

It is my opinion that the formula should either be left as it is or revised downward if it is to be changed at all.—EDGAR APPERSON, Apperson Bros. Automobile Co.

Change Would Bring Confusion—R. P. Henderson

INDIANAPOLIS, IND.—Editor THE AUTOMOBILE:—I am inclined to believe that in designing laws to provide a graduated tax or license for all automobiles, basing on horsepower, influence should be brought upon the law-making bodies to adhere to either the A. L. A. M. or the S. A. E. formula.

It would lead to confusion of the worst kind should the states attempt to work out a new horsepower rating other than the above, which are recognized as standard throughout the country.

I recently met with a committee representing the Hoosier Motor Club at our state legislature at which time the above views were expressed and seemed to represent the general feeling of all present.—R. P. HENDERSON, Henderson Motor Car Co.

Makers Should Not Over-rate Cars—Creighton

PERU, IND.—Editor THE AUTOMOBILE:—My opinion is that while the block test of a motor generally shows higher horsepower than the S. A. E. rating, if the loss in power from motor to rear wheels is taken into consideration the actual horsepower of the car will about correspond to the S. A. E. rating. Some motor builders claim an excess rating which may be obtained by a few seconds' pull on a dynamometer and is not to be compared to a constant pull of several hours' duration, such as a car would be subjected to in long trips under unfavorable road conditions.

In regard to the length of stroke altering horsepower rating, as it is being discussed so much at the present time, I would not care to enter into discussion regarding it. If automobile manufacturers in general will not over-rate their cars to more than the actual block test of the motor, I think there would be no criticism to the S. A. E. rating of the different secretaries of the states.—P. L. CREIGHTON, Great Western Automobile Co.

(*To be continued.*)

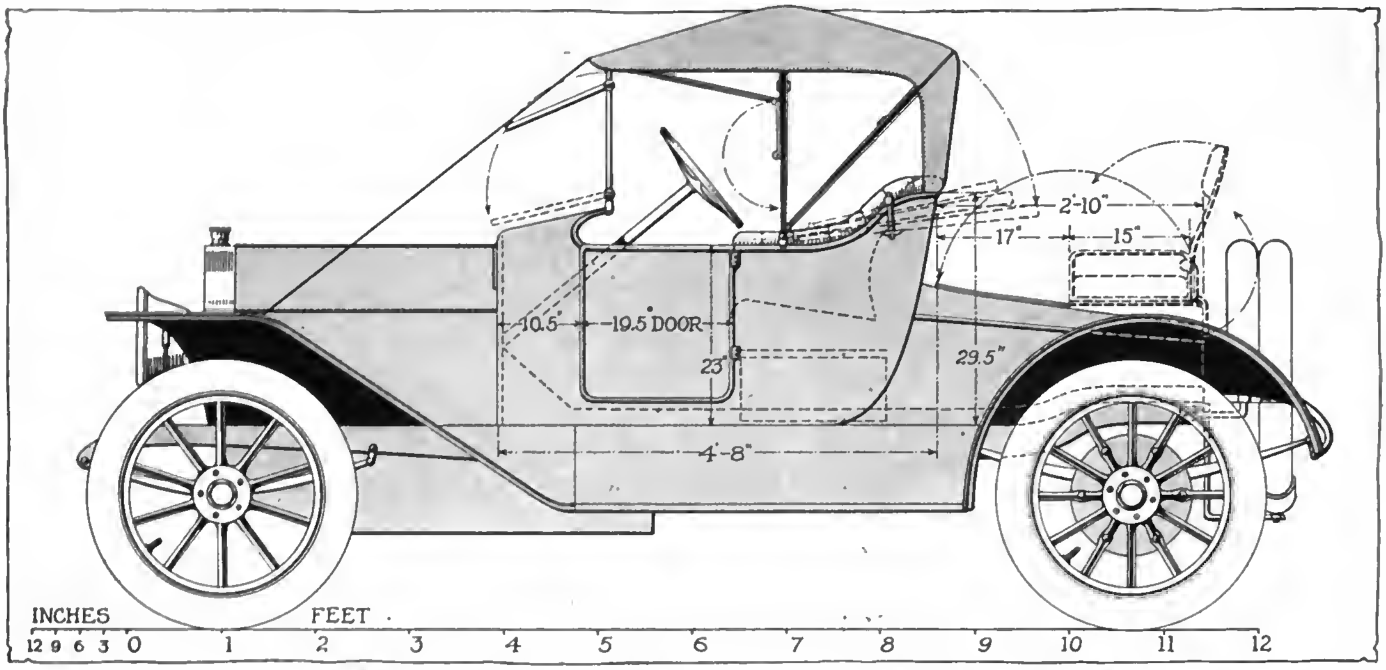


Fig. 1—Elevation to scale of suggested body adapted to chassis of Moon model 39

Design for Runabout Body with Doors

Ventilation of Interior Secured by Oppositely Hinged Doors—Rear Emergency Seat and Luggage Compartment Incorporated

A VERY seasonable type of body design for consideration at this time of the year is the runabout. With the beginning of warm weather comes the call for outdoor exercises and the open air and for purposes of business or pleasure there is no handier type of vehicle for the owner who drives his own car.

The runabout has the advantage over other body types, in being very light, and therefore can be adapted to any chassis. In common with other body types it has adopted the foredoor and it is a body with this door included in the design that is illustrated in the accompanying scale drawings. The particular chassis shown, on which the body is mounted, is the Moon, model 39, having 116-inch wheelbase, 34 by 4-inch tires, left drive and center control and four cylinders, 4 by 5.75 inches.

Fig. 1 shows the side elevation completely worked out in detail. The primary idea of the design is to give comfort and therefore no attempt is made to include features of the racy type. The steering wheel retains the standard angle of the stock chassis, and as it is well back, plenty of leg room can be allowed between the front of the seat and the dash. The left hand drive also adds to the ease of entrance from the right side.

As shown, the body is roomy and comfortable and affords protection in any kind of weather. It has been developed in a thoroughly practical manner to suit the chassis on which it is mounted, and the lines of the design are harmonious and in conformity with general standard practice.

Taking up the design in detail, the accommodation is for two but there is an addition or folding seat at the rear which can be used for a mechanician when touring or as an emergency seat for a third passenger.

The body is made with rounded corners at the rear, and the sides and back are high enough to afford protection and comfortable rest support. The windshield is capable of being turned to any angle desired and in addition to having the storm visor, the shield in its entirety can be folded down over the cowl and be out of the way, in which latter position it also offers the minimum wind resistance.

The body at the dash is made rounded, both from the sides as shown in Fig. 3 and from the top, Fig. 1. The cowl is carried well back and is elevated slightly. A straight line effect is preserved as much as possible, curves only being used where absolutely necessary. The distance from the dash to the door is 10.5 inches and the doors are 19.5 inches wide.

These doors are hinged at opposite sides, that is, the left door is hinged at the rear and the right door is hinged at the front. In warm weather they are held partly open, and the theory is that the pressure of air entering through the door that opens toward the front, will expel the air through the opening on the opposite side and in the opposite direction. This current will assist in cooling the compartment.

Folding Seat Fitted at Rear

The emergency seat is shown by dotted lines in Figs. 1 and 4, the dimensions being included. It is supported at the back by a folding leg that engages in a socket at the rear of the luggage compartment. This socket, although a permanent fixture, is not unsightly on account of its inconspicuous position at the back of the tires. When this folding leg is engaged in the socket, the top ends press firmly against the side supports of the folding lazyback and prevent this latter from swinging with the motion of the car, a condition of things which would not add to the comfort of the rear passenger. When folded down this seat does not extend very far into the compartment, and if it is desired to carry luggage the space occupied by the seat will hardly be noticed. Luggage space is provided at all times at the rear of the seat even when this latter is in commission. The gasoline tank is located under the driving seat and the space allotted will accommodate a tank of approximately 20-gallon capacity.

The top is made of dark colored mohair supported by three bows which are rounded. The front bow revolves on a center below itself as indicated by the arrow, Fig. 1, when the top is being folded down. The arch of the roof or dip at the front and back from a horizontal is greater than usual. This is done to make the front and rear bows short, so that when the top is folded down it will not interfere with the occupant of the rear seat. This folded down position is indicated by dotted lines on Fig. 1. The top is made very light and the front end is secured by straps that fasten to the front fenders. Side curtains are provided for stormy weather and by referring to the rear view in Fig. 3, it will be noted that the celluloid light in the back curtain is larger than is customary practice and is strengthened by running bars of the top material across both horizontally and vertically. In the plan view the top is removed to better illustrate the interior.

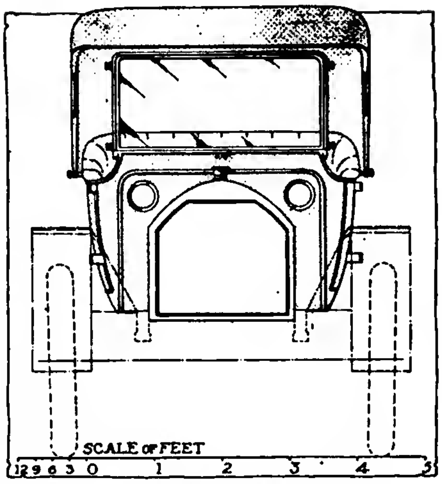


Fig. 2—Front view of runabout with hood in raised position

The construction of this body is aluminum sheet of 16-gauge for the panels throughout, except the perpendicular side and rear panels of the luggage compartment, which are made of steel and joined to the deck sheet under the moulding that runs along the side and back near the top edge. Very few mouldings show on this body, as the main body panels are butted to the panels of the luggage compartment at the rear and on the lower line these panels are turned under and fastened to the body framing. At the front the panels are fastened under a metal moulding that is fastened to the wood dash.

No difficulty is experienced now in shaping up aluminum sheets to the shape required for this design, and a body of this description can be constructed by any bodybuilder having only a simple organization.

Parts To Be Specially Made

Most of the parts of this design will have to be specially made, as for instance the ironing of the emergency seat and the ironing of the front windshield. The fixtures for the hinges for this latter can be purchased, also the curved pattern hinges and the locks for the doors. These latter should have inside or concealed handles. The tubular bow sockets for the top can also be purchased.

The cover of the luggage compartment is hinged with a strong piano hinge at the rear and at the front, each corner is locked and the keyhole covered with a flap. This cover is made watertight by being provided with a flanged edge which fits over a raised coping on the deck.

The standard equipment is used throughout except the rear fenders, which are made to suit the lines of the design. The front fenders are standard as well as the front and dash lamps. Both of these are electric and the dash lamps are set in flush. The tail lamp and tire carriers are standard equipment and remain in their regulation place.

A suitable color combination for this design would be to retain the Bavarian blue used on the stock touring car, for the chassis throughout, with white striping and black fenders. For the body a rich, very dark blue with white striping and white mouldings. All metal parts including lamps either black or nickel and all exposed wood finish to be mahogany.

The trimming material to be black, soft luster, hand buffed leather and the trimming to be luxuriously thick. The pleats to be held in place by small straps in place of buttons, in the same manner as adopted on the standard Moon cars. The seat cushion can be 7 inches deep and still leave 9 inches under the steering wheel rim to the top of the cushion, and the width and length of the body are sufficient to permit of plenty of thickness to the side and back trimming. The covering of the floor boards and the runboard to be cork linoleum trimmed with aluminum.

Quick Painting of Metal Bodies

For cars that are required to be painted and finished in the shortest possible time the following system of applying the coats is recommended: First see that the metal is perfectly clean and free from foreign substances. Then apply an approved make of metal primer, which bake for 3 hours at 200 degrees. In the afternoon of the same day apply a coat of knifing surfacer, thinning the material with turpentine to a brushing consistency, and apply with a brush, working the material out very thin and fine. Oven bake for 3 hours at 225 degrees.

The next morning sandpaper thoroughly and apply second coat surfacer and bake the same as first coat. Follow same day with third coat surfacer baking as before. Sandpaper each coat of surfacer. The third day apply sealer coat, a thin material which seals the surface against subsequent sinking in. Bake 3 hours at 190 degrees, then apply coat of japan color.

The following morning apply coat of color varnish which bake for 6 hours at 170 degrees. Next morning rub lightly with water and pulverized pumice stone. Clean up, stripe, and later in the day flow on a quick finishing varnish, which bake for 6 hours at 140 degrees. Next morning the car is ready for service having taken 6 days to paint. The above method produces a satisfactory though not strictly high-grade finish.—From *The Carriage Monthly* for April.

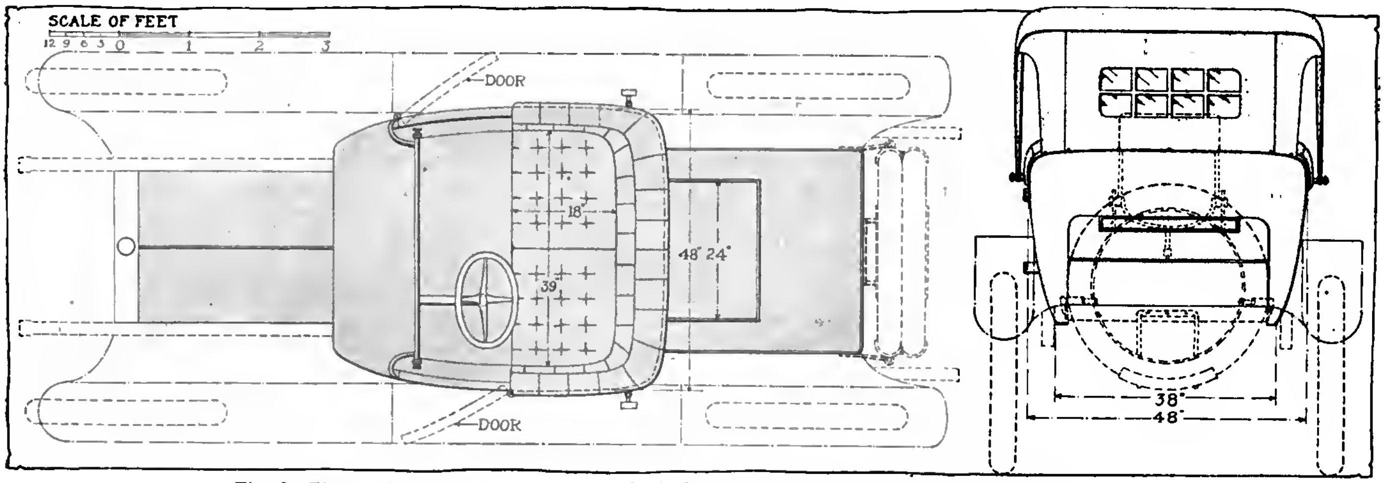


Fig. 3—Plan and rear view, showing method of ventilating interior by arrangement of doors

Stearns Model Service and Inspection

Inspectors Look Over 400 Cars in New York Territory Once in 3 Weeks—Service Plant System

SERVICE, comprising prompt repair of automobiles requiring it, has become an almost general feature with most automobile companies of any standing, especially in the large cities. New York City, for instance, contains fully two dozen service stations where cars are adjusted and repaired in the shortest possible time and at the least possible cost to their owners. This service, which signifies the gradual extinction of the old-fashioned city repair man, has in the case of many commercial automobiles been supplemented by an inspection service. Various schemes of periodical truck inspection and making what immediate repairs and adjustments are necessary, together with a letter to the truck owner, have been described repeatedly in THE AUTOMOBILE. Now, inspection service is being introduced in the passenger-car field as well. The F. B. Stearns Co.'s New York branch is the first to install such system in New York.

The scheme of the Stearns company, which has about 400 cars operating in New York City, is as follows. Three inspectors attempt to see every car once in a fortnight, although often 3 weeks pass between two inspections. It is thought best not to molest the car owners with the inspection service, even though the latter is in force to benefit them; but the inspectors try to get into and to remain in communication with the chauffeurs driving the cars. From them they get information as to how the cars are used ordinarily. For instance, a car may take the children to school in the morning, the master of the house to his place of business, miladi on her shopping trip, etc. On the basis of this information the inspectors can form their ideas of what the cars require, in what respects they must be looked over, what instruction should advantageously be given to the chauffeurs, etc. When an inspector finds that it is time to look over a certain car, he runs up to the garage where the car is stationed at the time of day he knows it is there. He looks over the mechanism, sees whether all parts are properly lubricated and adjusted, then asks the chauffeur to drive him for a few blocks so as to develop what trouble escaped the garage inspection. He makes notes as to the status and requirements of the car and for the purpose of a report fills out the form, Fig. 3, which is typewritten in blank on a white sheet of office paper, 8.5 by 11 inches. He also has the chauffeur sign the form, to witness that the inspection has been made. Then the inspector repairs to the service department and dictates a letter to the owner, calling his attention to the state of his car, etc.

It stands to reason that an inspection conscientiously carried out every 3 weeks must nip in the bud every growing misadjustment and other trouble, and consequently reduce repair and maintenance cost to a minimum.

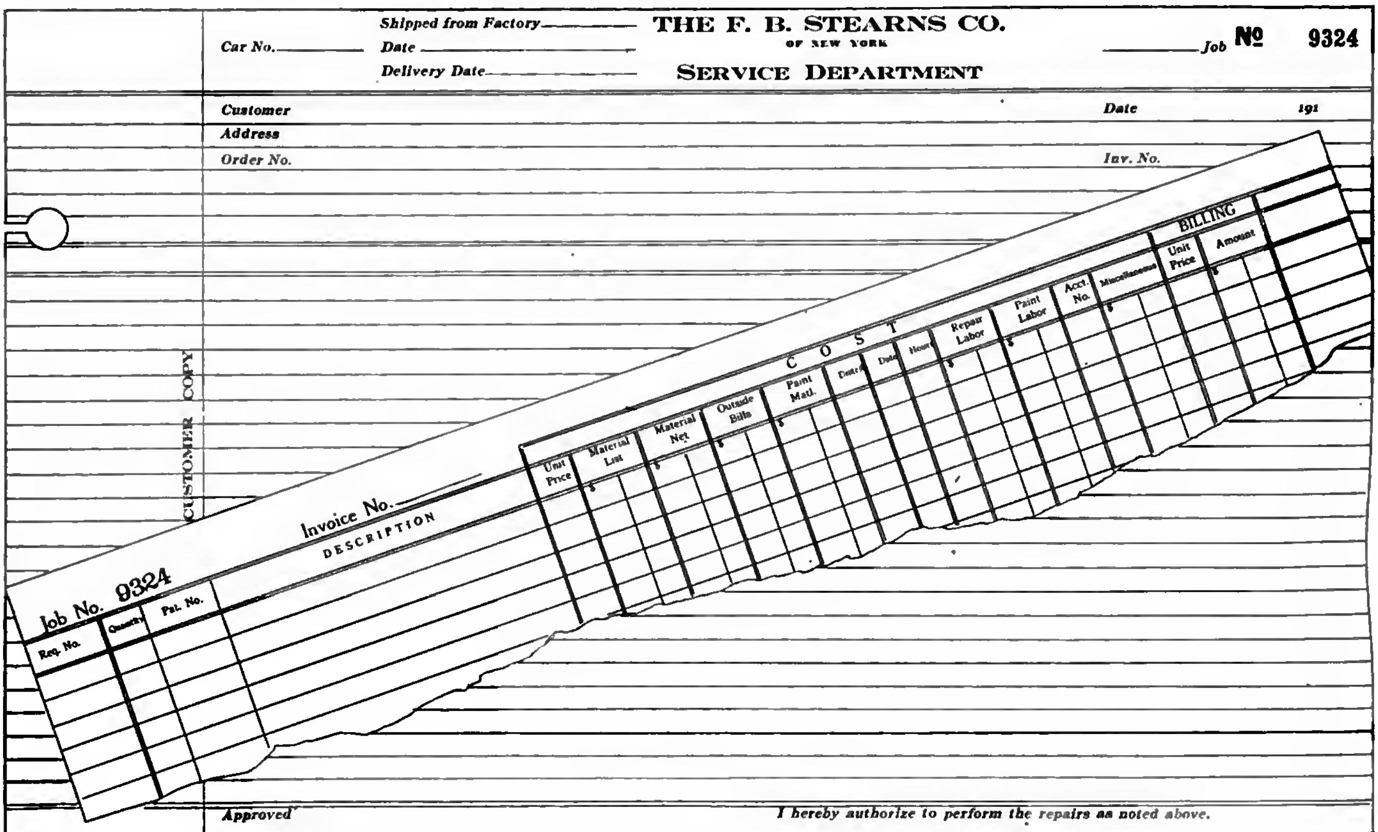
The repair service of the Stearns company is likewise of interest, as it utilizes a record system which practically excludes every oversight and mistake, as long as its conditions are closely followed. This system comprises eight blanks, several of which are filled out in more than one copy.

The following forms are used by the Stearns company:

1. Job order.*
2. Job-supplement order.*
3. Working tag.
4. Operation time card.
5. Material requisition.*
6. Purchasing order.*
7. Return-goods order.*
8. Daily time report.
9. Job cost record.

The forms marked with the asterisk (*) are made out in more than one copy.

1. Job Order.—This form, Fig. 1, is made out when a car is brought into the service department to be adjusted, looked over or repaired—in short, whenever it enters the department. The form is 14.25 by 9 inches and all blanks are kept in the main office of the superintendent. In making out the order, all spaces on the blank are filled out, and, by means of carbon


Shipped from Factory
Car No.
Date
Delivery Date
THE F. B. STEARNS CO.
OF NEW YORK
SERVICE DEPARTMENT
Job № 9324
Customer
Address
Order No.
Date 191
Inv. No.
CUSTOMER COPY
Approved
Supt.
I hereby authorize to perform the repairs as noted above.
Owner. Agent.

Job No. 9324
Invoice No.
Req. No.
Quantity
Pat. No.
DESCRIPTION
Unit Price
Material List
Material Net
Outside Bills
C O S T
Paint Matl.
Date
Date
Hours
Repair Labor
Paint Labor
Acct. No.
Miscellaneous
BILLING
Unit Price
Amount

Fig. 1—Job order used in Stearns service department. Fig. 2—Accountant's cost record form

paper, four copies in all are made out, all of which bear the same serial number printed on the form. The jobs are numbered consecutively, but independently. Of course, every number of the blanks must be accounted for. As to the duplicates, one copy goes to the shop, the second to the stockroom, the third remains in the office and the fourth goes to the accountant. The last copy is 14.25 by 18 inches deep, for reasons explained below. All the work to be done having been entered on the order signed by the owner authorizing the repair operations, the order copies are distributed and the work is started, the various departments receiving the car in turn.

2. **Job Supplement Order.**—This form, Fig. 9, which is 5 by 9 inches, is used when an owner orders repair work after his car has already been delivered to the shop. As its name implies, this order supplements the job order, Fig. 1, and it, too, is made out with an original and three duplicates, going to office, shop, stockroom and accountant respectively. All these forms are of different colors—white, heliotrope, pink and yellow. In making out this order the number of the original job to which this form is supplementary and the owner's name and the number of his car are entered on the form. The owner or his agent signs the order (all four copies) and action is then taken as quickly as possible to carry out the supplementary order.

3. **Working Tag.**—When the car is sent into the shop a tag is attached to it. Fig. 5 shows this form in blank. It is printed black on white, thin cardboard of 4 by 7 inches, and on it the owner's name, the car and job number, as well as the date, are entered. On the reverse side there are spaces for enumerating the repair items to be carried out and spaces for checking the items when the work has been done. This tag is attached by means of thin wire to the steering wheel of the car and is not taken off until the repair job is finished and the car is ready to be re-delivered to its owner. As Fig. 5 shows, the tag is numbered; all tags form a series and each of them must be accounted for.

4. **Operation Time Card.**—In the shop it is of course necessary to keep track of the time spent by the various men on the various jobs in order to make correct charging possible. For this purpose the operation time card, Fig. 4 is used. This is a form 3.375 by 7 inches, printed black on red cardboard. The front side is seen in Fig. 4; it affords space for entering the name and number of the workman, the job number and the number of the account, as well as the car number and the name of the car owner. The rest of the card is designed much in the same fashion as the card for time clocks, so that the form, Fig. 4, may be used for recording time by means of such a clock. If a man spends a whole day and overtime on a job, he must stamp in and out, three times each, during 1 day. The first line is used on the first or sixteenth of the month, the second line on the second or seventeenth, and so on. There is a last column for totaling the time spent working every day, and the total time spent on one repair operation is noted at the foot of the blank, together with the wage rate of the man and the total wages earned by doing the job, or rather, the working operation. For, as indicated by the reverse side of the blank—not shown here—the card is used for only one operation or item of a repair job. On the reverse side the number and name of the employee are entered and the specific operation on which he is busy is named. Also, if the man requires material from the stockroom for doing his work, the number of the requisition used for this purpose is written on the card. Of course, this card is not the only means for checking the time of a man in the shop, but it merely serves as a time-distribution record and the total of a man's weekly operation card must check against his ordinary weekly clock card.

INSPECTION REPORT

CHASSIS NO. Inspector Date
Owner
Address
Distributor, Speedometer Reading
General Condition of motor mechanically
Brand of oil used
Condition of chassis mechanically
Condition of body & Equipment Type Make
Care taken of car
Chauffeur W or P
Ability Attitude toward car
Has Instruction Book?
Owner's opinion of car
Owner's attitude toward distributer
Owner's attitude toward the Company
Remarks:

Mr.________ ________has inspected the above car

Owner Chauffeur

Fig. 3—Inspection report used by the three Stearns inspectors, who regularly, about once in from 2 to 3 weeks, look over each of the 400 Stearns cars operating in New York. All inspection reports are filed under the names of the owners, to whose automobiles they refer. In this manner it is easily possible to trace, at any time, the development of trouble in a car, and to show to the owner, if necessary, that a possibility to overcome growing misadjustment, etc., could have been overcome in the past if prompt action had been taken

FORM 78 J. T. No. 1263

WORKMAN'S NO. ....

JOB NO. ....ACCT. NO. ....

WORKMAN'S NAME ....

CAR OWNER ....

CAR NO. ....

DATE	MORNING		AFTERNOON		OVERTIME		TOTAL
	IN	OUT	IN	OUT	IN	OUT	
1-16							
2-17							
3-18							
4-19							
5-20							
6-21							
7-22							
8-23							
9-24							
10-25							
11-26							
12-27							
13-28							
14-29							
15-30							
31							

TOTAL TIME ....HRS.

RATE ....

TOTAL WAGES $ ....

Fig. 4—Working operation card filled out by each workman when carrying out a repair operation on a car. The time spent on only a single operation is accounted for on this card

5. **Material Requisition.**—When a man working on a car requires a part for the repair work he goes to his foreman with his operation time card, and the foreman on the reverse side puts down the name and quantity of the part required. The man then goes to the stockroom clerk or foreman, and the latter makes out the requisition, Fig. 7, which is 7.25 by 4.25 inches. The original of this form remains in the stockroom, a copy is forwarded to the superintendent's office and a triplicate to the accountant. The requisition gives the quantity and nature of the material drawn from stock and details about the job for which it is required. The accountant later on enters the list and net price on the requisition and this information is transferred to the superintendent's copy of the requisition for future reference.

6. **Purchasing Order.**—When materials are required to replenish the stock of the service department or to supply parts, etc., not on hand in the stockroom but needed to carry out a repair, the purchasing department is notified by the stockroom foreman and thereupon a purchasing order, Fig. 6, is filled out. This order is a blank, 10.5 by 7.25 inches, made out with two duplicates in different colors. The purchasing order, when being filled out, is addressed to the dealer who is to furnish the material, and a note is made of the stockroom requisition number, to which the purchasing order has reference. The white original of the order is sent to the dealer, the blue duplicate to the accounting department and the yellow triplicate remains in the purchasing department for reference. Space is provided for exactly stating the nature and quantity of the material required, and the terms of delivery and payment are printed on the form. When the material is received the shipping department—which also acts as receiving department—checks the goods against the invoice accompanying them, and then forwards the latter to the purchasing department for checking against the purchasing order. This being done, and everything being straight, the invoice is forwarded to the accounting department for repeated checking and settlement.

7. **Return-Goods Order.**—It may hap- that specific repair jobs are sent out of the service departments into special shops. This applies to windshields and other parts, in the cases of which the repairing facilities of the service department shops are inadequate to make a good or economical job. If, say, one pane of a windshield is to be replaced and the shield is sent out, a purchase order is made out for a pane and a return-goods order, which is attached to the shield, is sent with it. The job having been completed, the goods are sent back to the Stearns place, and the instructions given on the form, Fig. 8, are checked against the invoice to see whether they have been properly carried out. After this has been done, purchase, return-goods order and invoice are turned over to the accounting department like the data referring to an ordinary purchase.

8. **Daily Time Report.**—The Stearns company uses a specially-designed blank,

Date______________19

Job No.

Owner

Car No.

Do Not

DETACH

THE F B. STEARNS CO. of New York

SERVICE DEPARTMENT

Tag No 1 997

Fig. 5—Working tag used in the Stearns service department for outlining the work to be done on a car which is sent into the shop. This tag is securely attached to the automobile as soon as it is received by the superintendent of the department. The tag is fixed to the steering wheel and must not be removed therefrom before all repairs have been finished and the car has left the shop ready to be turned over to its owner, whose name appears on the tag. The reverse side of the tag enumerates the various items of repair work to be carried out and there are spaces for checking these items, so as to prevent the shop men from overlooking necessary work which was ordered by the owner when bringing the car into the service department. This record tag positively prevents errors on the part of the shop workers and also loss of time which would arise if the men would have to go to the foreman or his assistant for instruction as work is progressing on a job

STORES REQUISITION. No. 1290 DATE

Issued by Car No. Acct. No. Job No.

CK.	Quantity	Pat. or Item No.	DESCRIPTION	Unit Price	LIST	NET

Received by______________ Total Cost______________

Fig. 7—Stockroom requisition used at the service department

Fig. 10, to check its total labor expense against the distribution among the employees. This form is 4 by 13 inches, printed black on white paper and is filled out on a typewriter. On the first line the date of the day is entered and the remainder of the page is divided into two sections, the first having five columns and the second two. The first section is used for recording the time spent by the various shop workers on the various jobs, and the second for giving the total time each man worked on that day. In the first section each job which is worked upon in the shop is taken up. The job number, the car owner's name, number of the employees who worked on the job during the day and the time spent on the job by each of them are given, as is the total number of hours spent in the shop on that particular job until the evening of the day for which the report is made out. In the same way, paint labor, general work around the building (non-productive, so called) and what small productive work is occasionally done, are recorded. The total time spent by workers on that day is thus found—being compiled from the operation cards. In the second section of the report the total hours spent in the department by every man are copied from the weekly time-clock cards and the total must be equal to that of the time-disribution column. It is stated that as a rule, the total time given by the clock cards and that accounted for by operation cards coincide within a margin of 2 per cent.

9. **Job-Cost Record.**—This form, Fig. 2, is printed on the reverse side of the accountant's copy of Fig. 1, on a sheet 18 inches deep, to afford plenty of space for all labor and material expense items on a job. As Fig. 2 indicates, the cost-record side of the accountant's job order copy is so ruled as to permit of entering the following points of information: Requisition number, number of parts or quantity of material required and the pattern number; then follows the name of the part and the unit list price, the total list and net prices, charges for outside work and the price of materials used in the paint shop. Under distribution the accountant makes a note of whether the paint job—if such has been done—is to be charged at a flat rate arranged for when the car is taken to the service department, or whether the various materials are itemized on the bill. The date on which the parts have been replaced or the repair made, together with the time spent on the job; the total cost of repair and paint labor to the company and the special accounts—if charges are made to such—are also noted. There are some cases, when work is done without charge to the customer, and the work must then be charged to one of the many accounts provided for such purpose: guarantee, repair, etc. Miscellaneous is a column that is hardly ever used, as the others cover almost all possibilities of charges. The amounts billed are also given.

S O NUMBER

REQ. NUMBER

PURCHASING DEPARTMENT

THE F. B. STEARNS COMPANY, OF N. Y.

BROADWAY AT 57TH ST.

NEW YORK CITY

ORDER NUMBER 1281

THIS ORDER NUMBER MUST APPEAR ON YOUR INVOICE

To

SHIP VIA WHEN

SEND ALL GOODS TO 415-417 WEST 55TH ST.

KINDLY ENTER OUR ORDER AS FOLLOWS:

ITEM	QUANTITY	DESCRIPTION	PRICE

DELIVERY F. O. B.

TERMS: 2% 10th Proximo.—60 days net.

No charges allowed for Boxing, Crating or Cartage.

The filling of any part of this order is acceptance of all terms and conditions.

THE F. B. STEARNS COMPANY OF N. Y.

PURCHASING AGENT.

Fig. 6—Purchasing order used by the Stearns service department for ordering stock supplies

The F. B. Stearns Co. of New York **No. 1147**

RETURNED MATERIAL Invoice No.

TO BE PACKED WITH GOODS

Shipped to			Date
Address			Repair Order No.
Via			Purchase Order No.

QUANTITY	YEAR	DESCRIPTION
Claims for errors will not be entertained unless made within ten days from receipt of goods.		

Fig. 8—Return-goods order used when outside repairs are made

As mentioned before, the weekly clock card must very closely coincide with the daily time reports, and the workmen, knowing this, make very exact records in ringing their working times on the operation cards. Of course, the various men are paid at different rates and on different bases, but the time spent on service jobs is charged to customers at a fixed rate.

Practically the only man specially required by this system is the time-keeper who compares weekly and operation time records and makes out the daily reports. The men of course know that exact records work out to mutual advantage and that they are getting a square deal when they exactly account for their time spent in the department.

It stands to reason that the use of such a blank as the daily time report greatly facilitates the economical conduction of the service department. The reason is that while parts and materials are bought at a certain price and sold at a certain price—so that there is almost no chance for loss here and a possibility of a small gain which may serve to pay part of the service expense—it is only by full utilization of the time of all the laborers employed that it is possible to conduct a service department without loss or even with a small profit. It is by this economy that a company is enabled to give its customers the best possible service for a minimum of expense to them. It is due to this consideration that service systems are becoming more and more common with the branches of most large automobile manufacturers.

Coming back to the original subject of passenger car inspection and the single example here quoted, it is important to recognize than an inspection scheme of this nature benefits the car maker fully as much as the user. The principal advantage, of course, goes to the latter, inasmuch as the careful inspections, combined with report letters to the owner, help the latter in reducing the repair expense of his car. Incidentally, such work as carbureter adjustments made by the inspectors go to minimize the fuel bill, so that an all-around profit arises to the owner. But here the maker's advantage comes in. The owner who perhaps had one or two cars before that, the makers of which give inspection service, sees that this institution makes for cheaper car maintenance and consequently is most apt to buy his next car from the same company; and what is more, when advising friends and other prospective purchasers, will influence them, and in many cases finally, to buy the car with which the best service goes. As a matter of fact, passenger-car inspection at this state of the game has distinct advertising value to the maker introducing it. Its cost is comparatively negligible and the advantage immense. This is one of the principal arguments in favor of passenger-car inspection, if not the very largest, and on its strength it is safe to predict that 2 years hence the car inspection will be as common as the service building itself.

JOB SUPPLEMENT

No. 1027

Date

Customer

Job No. Car No.

COST COPY

Please add instructions as follows:-

I hereby authorize to perform the repairs as noted above

Owner
Agent

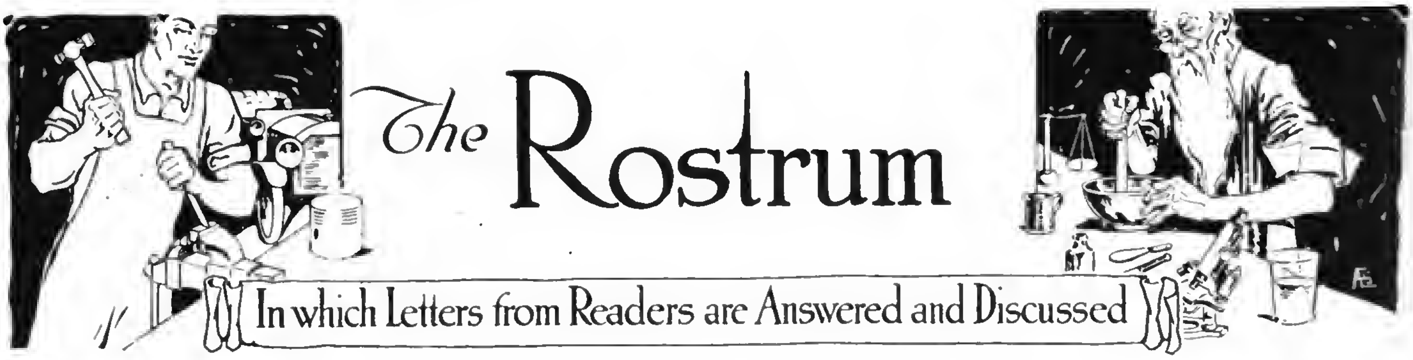
Fig. 9—Job-supplement order for additional instructions

THE F. B. STEARNS CO. OF NEW YORK
SERVICE DEPARTMENT
DAILY REPORT

Date 4/3/13

Job No.	Owner	Roll No.	Hrs.	Total	Roll No.	Daily Hours
4263	Jones	201	3		201	9
		205	4¼		203	9
		210	2	9½	204	9
2133	Smith	214	7		205	10½
		210	2		206	9
		206	3½	12½	207	9
					208	9
4432	Thompson	211	2½		210	8½
		207	6	8½	211	9
3382	Camp	201	6	6	212	9
4111	Williams	203	9		213	9
		204	9		214	9
		205	4½			109
		206	5½			
		207	3	31		
			71½			
Paint Labor						
5666	Wharton	208	9			
		212	9			
		213	9	27		
			27			
Non Productive Labor						
Shop Exps			6			
Janitor			4½			
			10½			
Summary						
Productive Repair Jobs			71½			
Paint "			27			
Non Productive			10½			
			109			109
No. men Employed						12
" Jobs in operation						6

Fig. 10—Daily time report



How To Adjust the Winton-Stromberg Carbureter—Correct Steering —Explanation of the Pressure System of Fuel Feed—Schebler Curves— The Way to Quebec—Adjustment of the Overland Planetary Gear

Maximum Weight Carried by Car

EDITOR THE AUTOMOBILE:—Will you kindly let me know the maximum weight that can safely be carried in a model T Ford car?

Easton, Pa. WILLIAM S.

—In designing this car. the Ford company allowed for a weight of 750 pounds. The car could probably carry double this weight if the owner wanted to take risks of wearing out the tires and drive parts at an exceedingly rapid rate. For ordinary running about the weight of 750 pounds should not be exceeded. The average weight of a person is generally taken in engineering practice to be 150 pounds. Thus in the five-passenger car, five passengers would give a weight of 750 pounds. As 150 pounds is above the average weight of a human being, and since the car is often run with from one to four passengers, the excess allowance readily takes in the baggage that may be carried. Should five heavy men get into the car, however, the total weight would not impose any noticeable strain because the car is designed with sufficient margin of safety to take care of any loads of this nature which may occur from time to time. The maximum weight that could be carried before the frames or any other members of the car suffered permanent distortion is impossible to state and doubtless would even vary with different Ford T cars, since the elastic limits of two pieces of metal are never the same.

Theory of Correct Steering

Editor THE AUTOMOBILE:—What is the correct method of designing a steering gear? Do the front wheels swing about in concentric circles or not? What is the relation of the movement of the rear wheels in relation to the front wheels in turning a curve?

Detroit, Mich. DRAFTSMAN.

—This is well explained in an English book *"Petrol Motors and Motor Cars,"* by T. H. White, which states that the steering gear of the present-day automobile is identical with that patented by Ackerman in the eighteenth century for use on horse-drawn vehicles. Unfortunately, the original intentions of the inventor are too often overlooked by motor car designers, with the result that undue wear is imposed on the steering wheel tires as well as strain to the wheels themselves. When correctly designed and constructed, the Ackerman gear allows all four wheels of the car to move with a purely rolling motion without any tendency to a lateral, or scraping movement. With incorrectly-designed gear, the relative angles of the steering-wheels will not correspond to the direction in which the car is traveling (unless this be in a straight line), consequently, one, or perhaps both, steering-wheels will scrape the road more or less to the detriment of the tires. A further evil is that the sensitiveness of the steering is impaired and side-slip encouraged or even initiated.

To illustrate the difference between correctly and incorrectly designed gear, the diagrams, Figs. 1 and 2, are presented These are purposely exaggerated to make the principle more clear. In Fig. 1 we have the steering arms, A and B, at right angles to the axles upon which the wheels revolve. So long as the car is traveling in a straight line, the front and back wheels will be parallel, and all four will have a rolling motion only. Let us see what happens when it is required to turn a corner. The dotted lines in Fig. 1 show the new positions of the steering-wheels and gear. The arms, A and B, will remain parallel, being coupled together by a rigid connecting link, hence each of the steering wheels is deflected through the same number of degrees. We will assume the vehicle to be traveling along a curved path struck from the center O. If the axes of the steering wheels are produced to intersect the axis of the driving wheels (also produced), as in Fig. 2, we shall obtain the points O and X. To have a purely rolling motion the steering wheels should run along curves struck from O and X as centers. It is obvious that this is not possible, and probably the outer wheel will follow the arc RR struck from center O, whereas its natural path would be along SS, struck from X. The difference between these two paths will be made up by the type sliding laterally on the road.

From this it will be seen that the outer wheel should be deflected through a smaller angle than the inner one, and this is accomplished by setting the steering arms inwards, as A and B, Fig. 1. We now find that the produced axes of the steering

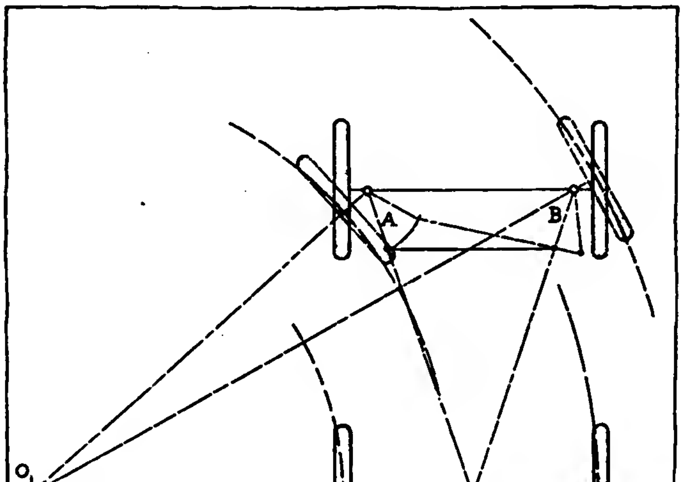


Fig. 1—Showing the concentric circles about which the four wheels of a car swing with a correctly-designed steering gear

wheels both intersect the produced axis of the back axle at the same point O, hence the wheels of the car will have a purely rolling motion.

It is to be regretted that there is no formula for obtaining the correct angle for the steering-arms; a process of trial and error is the only solution. The angle will vary with the distance between the front and back axles, and with the distance from center to center of the steering pivots. It is also slightly affected by the distance from centers of steering wheels to the centers of their respective pivots. The gear cannot be made correct for all inclinations of the steering wheels, but if made right for the extreme inclination it will be sufficiently correct for all practical purposes at all angles. This extreme position will be determined by the radius of the smallest circle the car has to travel around, or by the limitations imposed by the design of the frame of the vehicle. The present practice of giving a long wheelbase to a car tends to reduce the angle of lock of the steering wheels even when the frame of the vehicle is made narrow to give clearance for the wheels.

The method of designing the steering gear is as follows: The center lines of the two axles are first drawn in their correct relative positions, and to as large a scale as convenient; generally quarter size. The centers of the steering pivots are then marked, and the bare outline of the two steering wheels drawn in. The frame of the car, so far as it is likely to interfere with the wheels, is also indicated. The centers of the steering pivots should be as close to the wheels as possible, as this tends to reduce the strains on the steering gear. Strike an arc from each steering pivot center with a radius equal to the effective length of the steering arm. Draw the wheel on the inner side of the curve in the position of extreme lock, and produce the center line of its spindle to intersect the produced center line of the back axle. From this point draw a line through the steering pivot center of the other wheel. This will give an angle through which the outer wheel must be deflected. The two wheels are now traced on small pieces of tracing paper, which are pinned to the drawing board in such a maner as to allow them to be turned about the steering pivots in the same way as the wheels would be in actual practice. Assume a position for the extremities of the steering arms, and with the dividers see if the distance from arm to arm is the same with the wheels parallel, and when they are inclined to their extreme positions as obtained above. If not, the steering arm angles must be modified until this condition is fulfilled. It need hardly be mentioned that each steering arm should be inclined at the same angle. The gear need only be made correct for one direction of inclination; it will then be right for both.

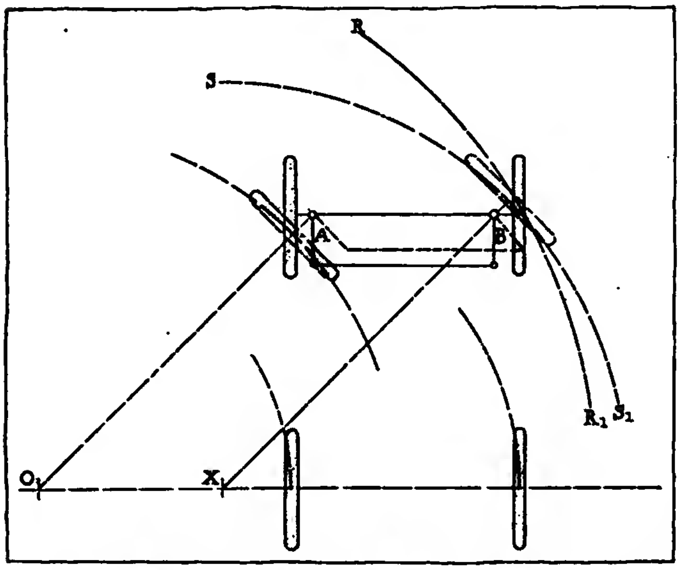


Fig. 2—With an incorrectly-designed gear, the circles through which the wheels swing when turning are not concentric

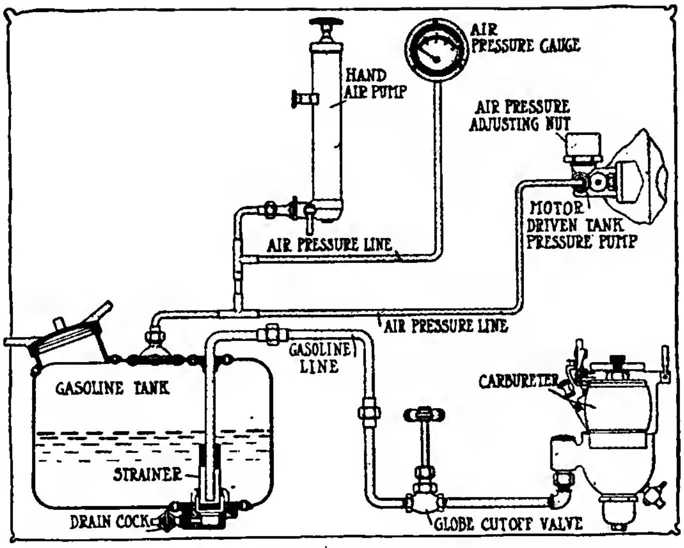


Fig. 3—Diagram of the pressure gasoline feed system used on the National 40, which is typical of practice in this direction

The practice of many designers is to so incline the steering arms that their center lines, if produced, would meet at a point at the center of the back axle. This will only give a correct steering gear when all the conditions of wheelbase, gauge, or track of wheels, centers of pivots, etc., are suitable. It is recommended that the gear be set out for each different size and type of car. Whether the steering arms project in front of or behind the axle depends on the fancy of the designer for the most part; the principles remain the same. If they project forwardly, they will diverge to the same angle as rear arms would converge.

Many designers hold the opinion that forwardly projecting steering arms are preferable, in that the connecting link is then subjected mostly to tensile stress. Rearwardly-projecting arms are held to cause the stress on the link to be mainly compression. In point of fact, the stresses caused in the link are both tensile and compressive, whether they project in a forward or backward direction. The forward arms have the disadvantage that they cannot always be made to diverge far enough to obtain the correct angle, without coming in contact with the spokes of the wheels. With the arms arranged behind the axle there are no such restrictions. In designing the gear, it is well to remember that long steering arms tend to reduce the stresses on the connecting link and its joints. The practice of curving the link connecting the steering arms cannot be too strongly condemned; it should always be straight.

Adjusting Carbureter on Winton

Editor The Automobile:—I have a six-cylinder Winton car, Model 16C. The carbureter on this car is a specially made Stromberg, known as the Winton-Stromberg. I understand. This has not been functioning as it should of late. Please tell me how to adjust it.

Buffalo, N. Y. READER.

—1—The Winton-Stromberg carbureter is illustrated in Fig. 6. As may be noted there are two gasoline jets. The main jet H, is located in the main venturi passage and forms the ordinary method of spraying the fuel at low speeds. At higher speed an auxiliary jet Z comes into play. As will be seen, this second jet is located close to the auxiliary air valve passage. To adjust the carbureter, turn the lock nut N till the auxiliary air valve seats lightly. This may be determined by pressing the finger down upon the valve through the opening above it. When the valve just seats, turn the nut from two to five notches further up for additional tension. See that the nut M, at the top of the auxiliary clears the secondary nozzle lever P. There must be more than 1-64 inch of a space between the two and it will usually be found that between this figure and 1-32 inch clearance will exist when the auxiliary valve is correctly ad-

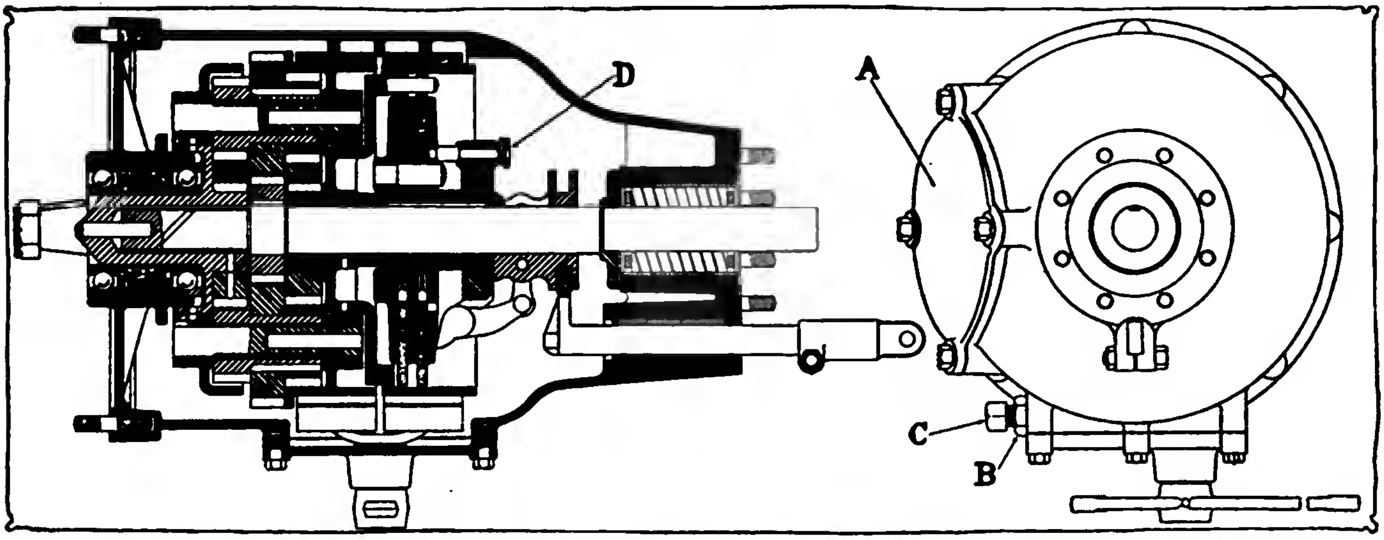


Fig 4—Planetary gear used on the Overland, showing the points which are essential to the making of an adjustment

justed. Turn the adjustable nozzle stem G, to the right as far as it will go without trying to force it when resistance is felt. This will seek the adjustable needle valve H. The stem G, is then turned back from one-quarter to three-eighths of a turn. Now start the motor and turn G, to the left or right until the motor idles properly. Advance the spark and open the throttle wide and if the motor backfires, move down the adjustable nut M, on top of the auxiliary air valve stem. This makes the mixture richer at high speeds. If the motor smokes and the mixture is too rich, move the adjustable nut M up. It would be a good plan to move this nut M up until the motor backfires and then move the nut down until the motor runs smoothly without backfiring.

The gasoline lever in this carbureter is adjusted by the lock nut L on the top of the float chamber. Turning the nut down lowers the level and turning it up raises it. This nut rarely if ever requires attention as the gasoline level is correctly set at the factory. An easy starting device is placed on this carbureter. The valve A shuts off the air supply and allows all the suction to fall on the jet H. In very cold weather the priming attachment on the top of the float chamber may be used. When the motor starts the starting valve A is immediately opened, allowing a free air passage.

Pressure Gasoline System Explained

Editor THE AUTOMOBILE:—Please give me some idea as to the proper layout of a pressure gasoline system, showing proper piping and relationship of gauges, valves, etc.

New York City. SUBSCRIBER.

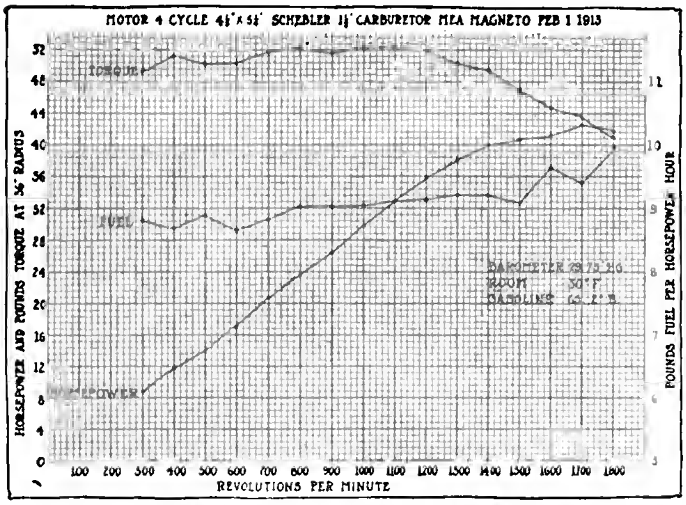


Fig. 5—Curve of Schebler carbureter adjusted for maximum power delivery

—The pressure gasoline is best explained by taking a concrete example. Fig. 3 shows that employed on the model 40 National cars. This is a very complete layout and is typical of practice in this direction. Directly driven from the camshaft or any other moving part of the motor there is a small pressure pump which is so regulated as to produce under moderate speeds a pressure of about 2 pounds in the air line. The air pressure line pipe indicated in the illustration is led directly to the tank. From the air pressure line a pipe leads to the air pressure gauge which shows the pressure in the line of which the gasoline pressure tank is a part, and pounds above atmospheric. It is a law of nature that the pressure at any point in a receiver holding a gas is the same. Therefore the pressure in the tank and piping is the same and the reading on the gauge will be correct and express the pressure in the gasoline tank. It is evident that if the car has been standing some time the pressure will have leaked from the tank in various ways and it is necessary, in order to get the gasoline to flow if the car is standing uphill, to force pressure into the tank by some outside means. The outside means provided on the National car is a hand air pump which is indicated in the illustrations. A few strokes on this pump puts sufficient pressure into the tank to secure a flow of gasoline to the carbureter and start the motor. After this of course the pressure is maintained automatically by the motor-driven tank pressure pumps. The pipe to the carbureter issues from the strainer at the bottom of the tank and carries the gasoline to the flow chamber. Between the tank and the carbureter a cut-off valve is inserted for shutting off the gasoline when removing the carbureter or draining it.

Interested in Trip to Quebec

Editor THE AUTOMOBILE:—1—If I desire to go to Quebec, Canada, say from Bilton Woods, is it possible to go to Newport, Vt., and start from there?

2—If so, can I reach Quebec in 1 day from Newport in comfort?

3—If not, can good accommodation be secured?

4—How are the roads?

5—Is there a better starting point than Newport, Vt.?

Boston, Mass. THOMAS PERKINS.

—1—It is entirely practical to start this trip from Newport, Vt., and, in fact, this is the best way of doing it. The distance from Newport, Vt., to Quebec is 178 miles. Leaving Main street, Newport, and traveling east you pass through West Derby and then at 5 miles on the odometer reach Derby. Turning left into this village and following the main road north you pass across the international boundary into Stanstead, Can. It is at this point that the customs bond must be secured. This is based on the value of the car, as appraised by the customs officials. A fee of $5 is required for the machine and $5 for the chauffeur. The customs bond is returned upon leaving the country.

Passing straight through Stanstead on the main road, you come to Caseville at 17 miles out from Newport. The road becomes hilly at this point with some beautiful views of lakes and mountains. At 32.3 miles there is a fork in the road at which you should keep to the right passing right through a covered bridge and into Lennoxville. Beyond Lennoxville there is another covered bridge and at 40.8 miles there is a fork at which you will have to keep to the left. At 41.6 take the left hand road and keep to the left for the next three forks. At 48.1 you cross a bridge keeping to the right of a saw-mill. Another bridge is located at 51.6 and a fork at 52.8 at which it is necessary to keep to the left. You now pick up a line of telegraph poles which carries you through Ascot village, South Dudswell, Marbleton, Weedon, and taking the branch road to the right at 85.0, into Garthby and 5 miles beyond at a reading of 91.6 on the odometer into D'Israeli. At this point your gasoline tank may be refilled.

Again taking up the journey, leaving D'Israeli by taking Main street along the railroad track and passing out through Colraine Station along the shore of Lac Noir over a stony winding road and then at 103 miles, taking right hand road up hill turning square left at 103.2 and bearing to the left at the fork just beyond. Gasoline may be secured at the offices of the Beaver Asbestos Co. Thetford Mines is then entered at 108.1 and following railroad tracks you come to Robertson Station, turning left to Reedham and keeping left to Kinear's Mills, Leeds village, St. Sylvester and Parkhurst. Keep straight ahead on good gravel road through St. Giles, following poles along Beaurivage river through Chaudiere, turning right at end of road at 166.7 and then left on good dirt road. Turn right on the river road, passing under the railroad at 170 miles and across the iron bridge beyond. Follow tracks to Levis-Quebec Ferry and after crossing ferry turn right and then left of steep hill direct into Quebec.

2—This largely depends on your car. If you have a high-powered car with comfortable suspension you may make a 1-day trip of this, but it would be far more comfortable to break it into two trips, stopping for the night at Thetford Mines.

3—Accommodations are largely a matter of taking the best thing available, but you can probably secure good accommodations at the place mentioned.

4—The roads are of dirt and on the whole not so bad if the weather has been good. There are no heavy grades.

5—Newport, Vt., is the best starting point. A full description of this route is given in Volume II of *The Automobile Blue Book.*

Adjusting Overland Planetary Gear

Editor THE AUTOMOBILE:—I have an Overland car using a planetary transmission. It does not seem to work right and needs adjusting. Will you please tell me how to go about it.

White Plains, N. Y. SUBURBANITE.

—Remove the cover A, Fig. 4. This will expose the clamping bolt on the spider and you may see if it is loose. By pulling out the pin D it is possible to turn the spider and this may be turned to the right until it is tight. It is not desired that the adjustment here be too tight and experience alone will enable you to tell the correct tightness. A moderate degree of tightness will give you an approximate idea as to about what is required. After you have made this adjustment the clamping screw should be tightened. This is visible through the opening and cannot be mistaken. If it is not possible to reach the clamping screw with the cover A off, open the compression box on the cylinders and have someone turn the motor over slowly while you watch the spider until the screw comes where you want it. To adjust the reverse loosen the lock nut B and turn the set screw C to the right till the desired adjustment is attained; then tighten up the lock nut again. The low speed is adjusted in the same manner as the reverse except that the rear set screw is used. Be sure to tighten the locknuts sufficiently in order that the adjustment will be permanent.

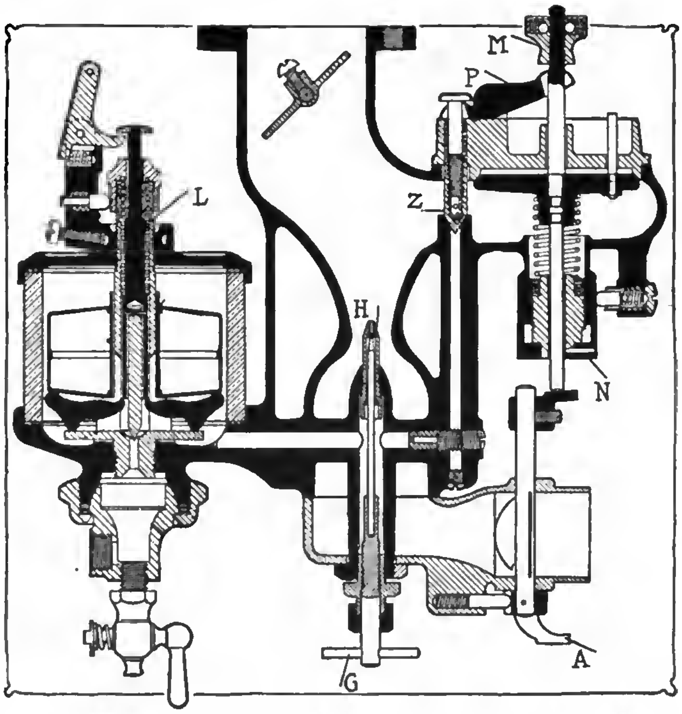


Fig. 6—Section through the Winton-Stromberg carbureter

Schebler Carbureter Curves

Editor THE AUTOMOBILE:—Would you kindly explain the difference between a carbureter adjusted for maximum power or maximum economy?

Kindly show this on a Schebler carbureter if possible.

Newark, N. J. CARBURETER.

—The difference between the two adjustments is better shown by curves than by a descriptive explanation. Figs. 5 and 7 give the results obtained with the same carbureter, one adjusted for maximum power and the other for maximum economy. The one adjusted for maximum economy as will be seen from the curve uses for instance .6 pound fuel per hour at 1,400 revolutions per minute, while that adjusted for maximum power uses .9 pound of fuel per hour. The maximum horsepower attained with the fuel adjusted for economy, 1,600 revolutions per minute, is 34.5. With the carbureter adjusted for maximum power about 41 horsepower is attained at this speed.

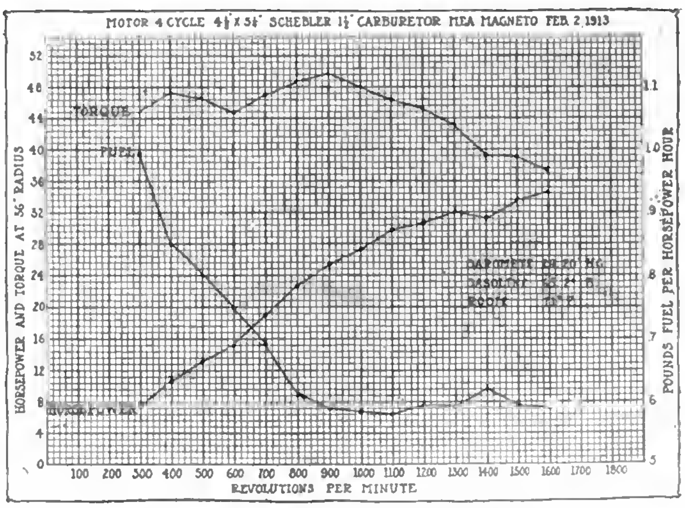


Fig. 7—Curve of Schebler carbureter adjusted for maximum economy

The Rear Axle Gearbox

Light Weight and Efficiency Two Reasons In Its Favor

By S. E. Aulton, Vice-President
Packard Motor Car Company

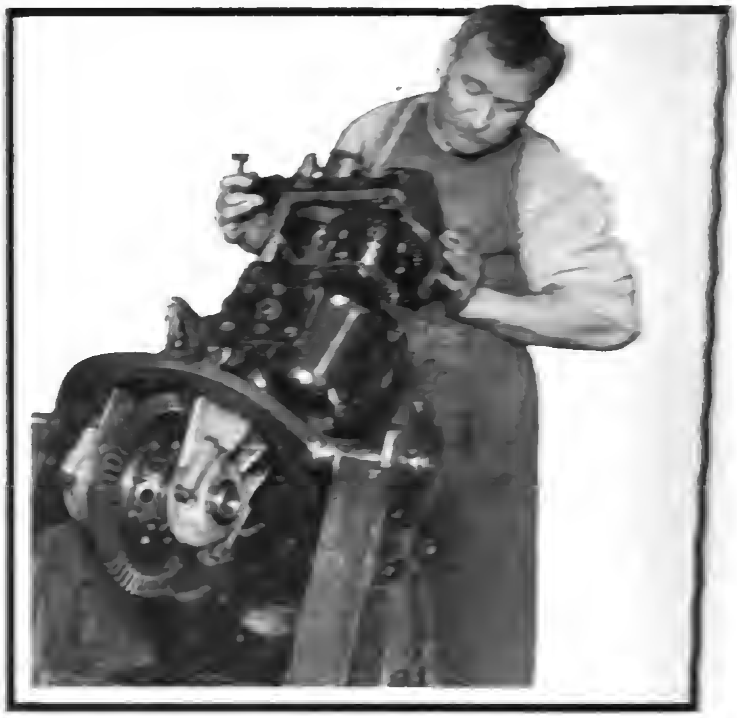
THE present Packard rear axle gearbox was conceived and first built to be a part of the Gray Wolf racer in 1902 at a time when we desired to—and finally did—equal the world's mile-record of 46 2-5 seconds, with an engine having a bore and stroke of 4 and 5 inches, respectively.

We wanted the lightest, simplest, most efficient and most dependable method of delivering every ounce of power developed by the engine to the rear wheels. The combination of the gearset with the bevel gearset in the rear axle accomplished all this.

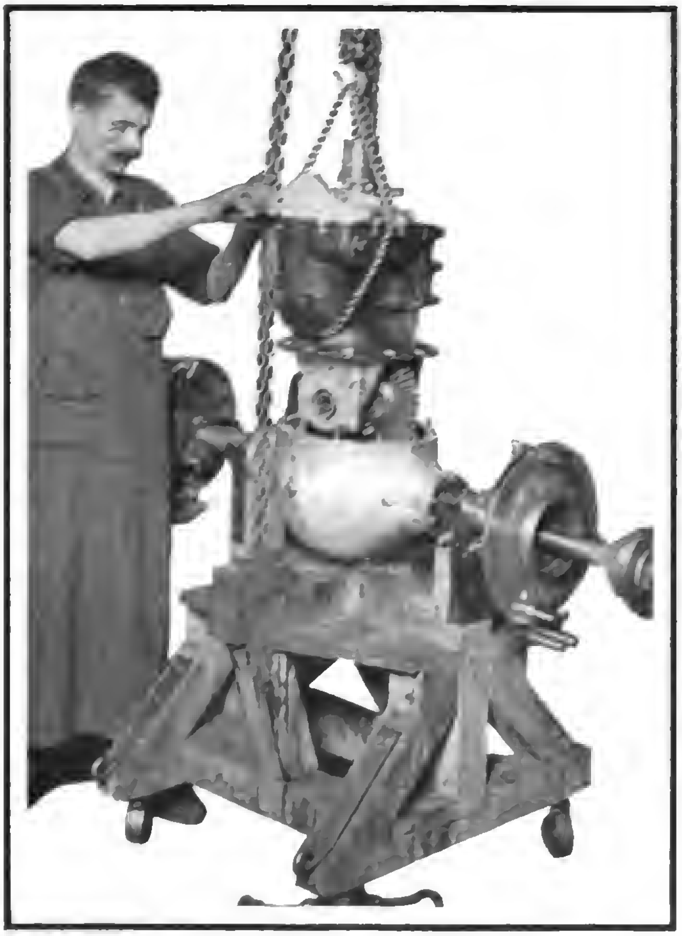
When, in 1904, we departed from the up-to-that-time American practice of a single-cylinder engine under the body and adopted the so-called French practice of a four-cylinder engine under the hood, we unhesitatingly included the Gray Wolf gearset as being the most desirable for American conditions. We had previously built four-cylinder cars with sub-frame and four-speed gearset under the body, and consequently knew both sides of the question when our decision was reached.

The logic of carrying the gearset on the rear axle applies with equal force to cars with six-cylinder motors.

The use of specially-designed machines and appliances enables us to manufacture the housing containing the differential and gearset with great accuracy. The alignment remains absolutely unchanged, and from actual figures obtained from the best cars of this country and Europe, our rear axle with its gearset combined weighs no more—and in many cases weighs less—than the rear axles in cars of similar power and capacity, which contain the differential and bevel gears only, and in which the gearbox is supported on the frame.



The front end assembly is assembled on the bench and then fitted to the gearcase, as shown in the illustration



The axles are placed in the rear axle housing, and when the front end assembly has been fitted to the gearbox the workman assembles the gearbox and rear axle units

Part of this saving in weight is in combining the two assemblies into a single compact unit and part is in the use of materials and design giving great strength with minimum weight. The design of our combination rear axle and gearset has, by reason of its lightness and strength, acquired for itself the characterization of bridge.

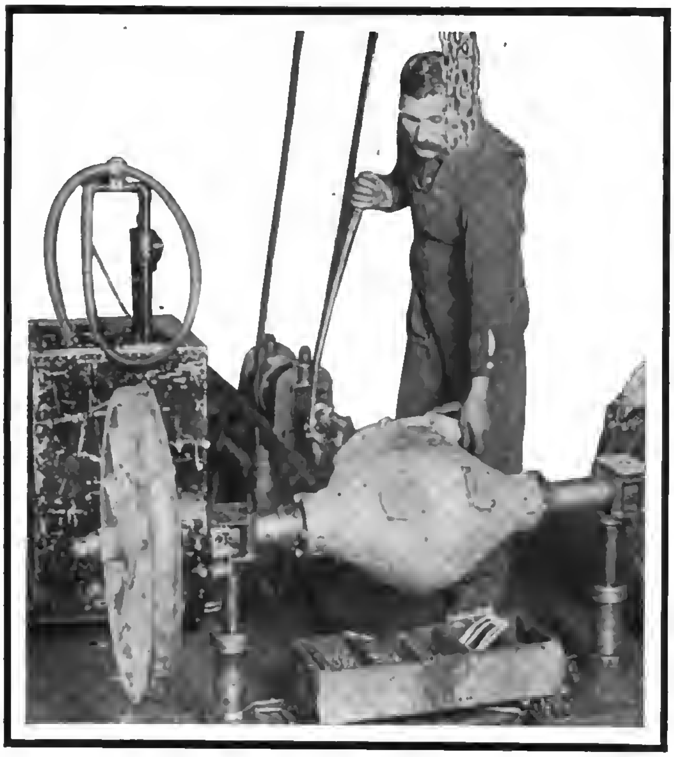
Single Universal on Shaft

Our chassis consists of two major units: One is the power plant forward and the other the transmission unit aft; both connected by a single universal joint shaft. The chassis may be warped and twisted over the most severe inequalities found in any kind of travel, with all the flexibility necessary contained in the one universal joint shaft. This shaft, on account of the fact that it has only to transmit the power of the motor, and not that power geared down for hill-climbing by a gearbox in the frame, can be made lighter and with ample bearing will last longer than if made the other way. Our construction necessitates only two universal joints, whereas the other requires four; that is, two in front of the gearbox and two between the gearbox and the rear axle.

The combination of the gearset with the rear axle leaves more room forward of it for a universal joint shaft. The longer this shaft, the less will be its angle of inclination and the less will be the wear on the joints.

The absence of a gearset from behind the motor makes the clutch more readily accessible and a front cover on the forward end of our gearbox makes all the gears readily removable through it in 20 minutes' time, and without disturbing the body or any other part of the car.

Six-cylinder construction increases the weight on the front axle, which not only brings greater stress on the axle and steering parts, but interferes to some extent with making turns at high speeds. Taking the weight of the gearset away from the front axle produces a better-balanced car.



After brakes and wheels have been attached, the completed bridge assembly is filled with oil and tested under belt

The combination of the gearbox with the rear axle in the Packard produces in the body practically one-third of the reaction from torque, on the low and intermediate speeds, that would be exerted with the gearbox forward. The total of power going into our rear axle unit is only the amount that the motor can develop. The reaction, therefore, from the propeller shaft trying to turn the driving pinion tending to rock the body over to the right, is only equal to the power of the motor.

In the case of a gearbox attached to the chassis instead of to the rear axle, the power of the motor is geared down on lower speeds, and the universal joint shaft back to the rear axle has a tendency approximately three times greater to rock the body to the right with consequent discomfort to the passengers whenever the clutch is jerkily used on these speeds.

No Heat Is Near To Thin the Oil

Gear noise can be reduced to some extent by proper consistency of the lubricating oil, but all lubricating oils get very much thinner with an increase in temperature and this tends to increase the gear noises. With the gearbox on the rear axle, there is no hot exhaust pipe, muffler or motor near it to thin down the lubricating oil. Therefore, if the proper oil is supplied in the first place it retains its consistency and insures uniformly quiet running of gears.

The gearbox being combined with the rear axle permits an insulating current of air to pass between it and the body of the car. The same gears and the same gear sound are about four times more noticeable and objectionable when up in the chassis, as compared with being on the rear axle. This explains to a large extent the greater absence of noise and the increased comfort to the person riding in an inclosed car of our construction.

Considering all the important features of simplicity dependability, lightness of construction, permanence of alignment, facility of manufacture and repair, greater accessibility of all working parts, lessened strain on the universal joint and lighter and longer universal joint shaft, freedom from torque reaction on low speeds, flexibility of the whole car, and the greater satisfaction when used in connection with inclosed bodies, has caused us to retain and perpetuate this construction because it was best and not simply because it was traditional.

Bennett Rear Gearbox

Gearing Situated Between Pinion and Differential

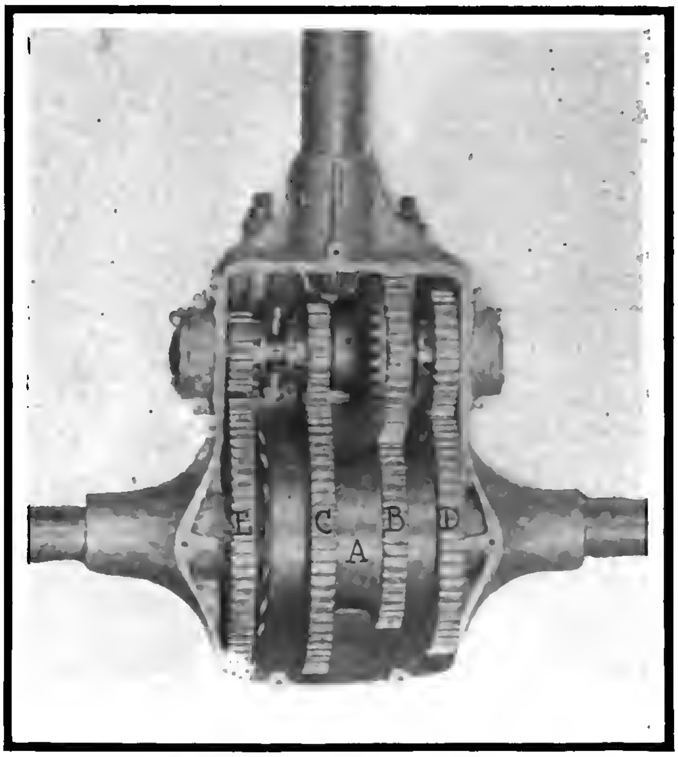
IN the ordinary type of change gearset. the various speed change gears are located forward of the driving pinion and its bevel gear. The latter is usually of the ring type and mounted on the rear axle shaft, carrying within it the differential gears.

S. S. Bennett, Highland Park, Mich., a suburb of Detroit, has invented a rear axle unit, which reverses the position of the pinion and bevel gear and places them forward of the change speed gears, thus causing the driving pinion to be always rotated at the same speed as that of the crankshaft of the motor.

In the illustration herewith a general idea of the Bennett construction is brought out. The change gears are always in mesh, any speed combination being obtained by the use of tooth clutches, the toothed parts of which slide on their shaft, while their mating members are integral with the change gears. To aid in the shifting of these clutches, the jaws are given a worm effect of .125 inch. The gears have six jaws each.

With the Bennett arrangement, the driven gears are all made larger in diameter than the driving gears, with the view of equalizing the strain between the driving pinion and its gear.

The differential gear is carried within the drum, which surrounds the rear axle, its approximate location being indicated by A in the illustration. It is claimed for this arrangement that since the gearset is back of the driving pinion and rotates one-third to one-quarter as fast, there is less shock to the mechanism. This speed difference is also said to render the gearing noiseless while running on the lower gears, as well as when changing speeds. The driven gears are all unhardened, which is a manufacturing consideration. Referring to the illustration, the direct drive gearing is shown at B; combination C gives low speed, while intermediate is obtained by D. Gears at E give the reverse through the use of a small pinion inter-connecting the two main gears and back of them.



Bennett rear axle gearbox, showing drive on differential drum

The Automobile

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Different Tire Prices

THE recent announced cut in tire prices made by one of the largest tire producers in the country, and which was soon followed by similar reductions by several other concerns, naturally suggests the thought, "Is it necessary to sell all tires of approximately the same size at the same price?"

¶ *There are differences of quality in tires, the same as in cars of the same horsepower and passenger capacity. Each rubber company has its own secret processes which are carefully guarded by the respective factories, and on these processes naturally must depend much of the value of the tire.*

¶ *Each factory has its own percentages in the compounding of the rubber which goes into its tire. It is rare that the percentages in this work with one company are the same as those with another.*

¶ *The grade of fabric used in different tires of the same make varies. One concern uses a genuine Sea Island cotton which costs 62 cents per pound or thereabouts, and another concern uses an Egyptian fabric which may be purchased at 42 cents per pound, and in view of the fact that there are about 10 pounds of fabric in a tire there should be here sufficient reason why tires should be of different price.*

¶ *The sooner car owners realize that there are differences in the wearing qualities of tires, the better for the entire industry.*

Welfare in Factories

THE announcement by a leading manufacturer that he is erecting a club house for his workmen in which they can enjoy their luncheons, hold business meetings, have athletic contests, enjoy reading room facilities at a very nominal annual fee, suggests the value in these days of acute labor situations of such measures in which the personal uplift and welfare of the workmen are taken into consideration.

For example: the workman belonging to a factory which has a workingman's club with its reading rooms, gymnasium, spray baths, base ball diamond, etc., generally puts more concentration into this work than the artisan in the factory which is without all of these humanitarian departments.

This workingman's uplift movement is not new, although the erection of workmen's club by a factory is new, and its results will be watched with particular interest. Employers of large numbers of workmen are beginning to realize that frequently there are other things as efficient in production as time. Two workmen paid on the same scale and working the same number of hours per day are of varying value to the employer. In one the activities are solely confined to the few hours of labor, and may be none too intelligently directed; whereas with the other working but the same number of hours a greater intelligence enters into the work from which the employer benefits directly. This suggests the necessity of getting the best effort out of the workman without any thought of introducing longer hours, or other sweatshop practices. It is true that the mind of the workman has a definite effect upon the job; and it is further true that the factory conditions play a big part in determining the mental condition of the workman so far as his relationship towards the work is concerned.

One of the largest German industries, and one which enjoys international repute, is conspicuous by its welfare arrangements, all of which are controlled by the workmen. These organizations have done much to improve the workman's conditions, and also his efficiency to himself and to the factory without expense to either party. Such a German organization, by voting that all workmen drink milk or buttermilk at the midday lunch instead of the native beer, showed the extent to which welfare organizations promoted entirely by the workmen can work towards benefiting his own conditions and also improving factory conditions.

A few of our automobile and accessory factories have done much to develop welfare work by way of organization among the various departments covering sick benefits, accidents, etc. The organization departments of other factories have discovered the value of opening noonday kitchens in the factories where unmarried help can secure at a nominal fee a satisfactory luncheon of wholesome food, and where married men who bring their luncheons can enjoy them in comfort at a table, and for a penny extra secure a cup of hot coffee or a glass of fresh milk.

Much more can be done in this workman's welfare movement, and those factories that are quickest to take it up in its various ramifications will discover in it a good investment.

The House Organ

Its Object—When Published—Made to the Hour

BUILDING up an *esprit de corps* and intensifying sales efforts should be one of the primary objects of the house organ, that local publication which the publishers frankly acknowledge is published "once a month when we can get it out" or "every once in awhile as occasions seem to demand."

While building up an *esprit de corps* among dealers and intensifying sales efforts are supposedly worthy objects of attainment yet it is a difficult task to discover just why certain makers publish these "every-once-in-awhile" organs. Look for a moment at what the makers themselves have to say: One maker says "the house organ we publish every once in awhile is in the interests of ——— owners and for the promotion of ——— motors." Another maker sums it up thus: "We publish a monthly house organ for distribution among our dealers and such of our owners as are interested in factory news." Another maker remarks "The circulation of our house organ is limited entirely to our dealers and in each issue we feature some particular dealer."

Another maker, of a more economic turn of mind and apparently with a desire for intensified effort, publishes two house organs—"one for the salesmen and one for dealers." With a maker who hopes for a general uplift of his owners and dealers we find the house organ "issued monthly and intended for circulation among ——— dealers and owners." And lastly, from a maker with an apparently unsystematic publication center comes the announcement that "This house organ has appeared at very indefinite periods, the last one having been published in July, 1912."

Judging from the policy of makers selling approximately the same commodity, as automobiles constitute the commodity referred to, it is quite impossible to determine just when house organs are published, whether monthly, semi-monthly, weekly or "every-once-in-awhile." Naturally, if house organs are to be of value, in brief, an investment to the company, they should at least have a regular time of issue, once a month, fortnightly or weekly. The intermittent, once-in-awhile type is of little value. It is so spasmodic that it never is taken seriously and it always fails in its purpose.

It is a debatable point whether in the best of regulated families a little once-in-awhile logic cannot be interjected to advantage. In seasons of greatest sales effort the house organ should come out at least once a week, even twice a week would not be an injury if made sufficiently brief and brim full of terse graphic paragraphs to aid in selling cars and meeting the exigencies of the moment. Once a week is not a bit too frequent in the busy season, and the maker who brings his organ out once a month the year round is missing much by his failure of intensifying effort at the busy season.

Sometimes intensified sales effort is carried to the extreme, to a point where sales effort is injured, where the capacity of the workman is injured by overwork. Such is the opposite to the desultory method, both of which are to be avoided.

What should the house organ contain? Not to be dictatorial, it would seem but logical that it should act as an asset to the selling organization, because, if what all of the makers publishing them say is correct, these little publications are to help the dealer, and incidentally go to the owner if he is interested in factory work.

Taking it then for granted that the dealer with his salesmen is the person to be aided then the house organ should be timed to the seasons and not published as a "tale that is told." The publisher then, must breathe the atmosphere of the manufacturer, of the sales organization and should reflect the atmosphere of the dealer. When summer and autumn come round the house organ should feature an analysis of the car—analysis from the salesman's viewpoint rather than from the engineer's. The salesman must see the car as it must eventually be presented for sale; he must see the warp and woof that make the arguments with which he is going to make the sales.

This analysis cannot be accomplished in a single issue; it is a fairly long story, and if there is only one issue a month the salesman will find himself poorly informed on his new car by Christmas. Then, during the period when cars are to be announced, the house organ can be published weekly to the greatest advantage. This period may embrace 2 months.

There are other seasons in the year when weekly issues may be published to advantage, one is that period through which we are passing at present and through which we have been passing for the last month, namely the season of maximum selling effort. The warm spring days are here in many parts of the country; in colder sections they will be on hand soon and the greatest sales efforts of the year must be made.

As a means of stimulating sales too often the house organ is published from inside the factory and only reflects factory conceptions of closing business, whereas the views collected from dealers in representative sections of the country are more up-to-the-minute and are flowing over with practical methods of business that pass the factory conceptions into the background. A much greater interest among dealers can be developed when the "ways and means" of the fellow dealer are analyzed than when everything is a sermon from the general manager of sales or the president. News from the firing line is always welcome; it generally contains the real kernel. But it takes work to get it; good speedy, hustling work, which when done, has proven to be worth while.

Then there are the mid-seasons, between sales and between manufacture, when the house organ is at low tide. Once a month is often enough. It may rarely be read then. But it is needed, the continuity must be kept up, the salesman must not be left to himself, and the interest of the dealer may be kept at the 100 per cent point. At such times it is foolish to talk sales, foolish to talk mechanics. These inter-periods are opportune times for other subjects. At such moments interject a little on scientific management for the coming months. Methods for managing forces of salesmen; methods for managing repair departments; methods for managing the tire repair department; methods for managing the accessory department; and methods for a score of other minor departments. Most valuable work can be done at these between moments, work which will prove a welcome relief from the intensity of sales or the analysis of the car.

Not a few publishers of house organs think that they must bring out special editions for any special event in the motoring world, events, perhaps, in which they are not at all interested, and events which every dealer can become conversant with through his class journal or the daily press. The issuing of such specials rarely accomplishes much value, rather it is apt to take away from the general atmosphere of the publication than add to it. It is poor policy to go out of your legitimate field. Cast the seed on fertile soil rather than wasting it.

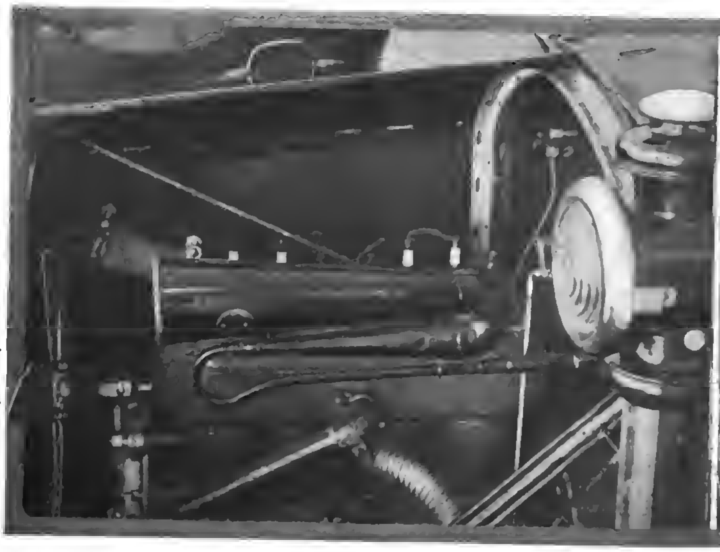


Fig. 1—Left side of Maxwell motor, showing horn mounting

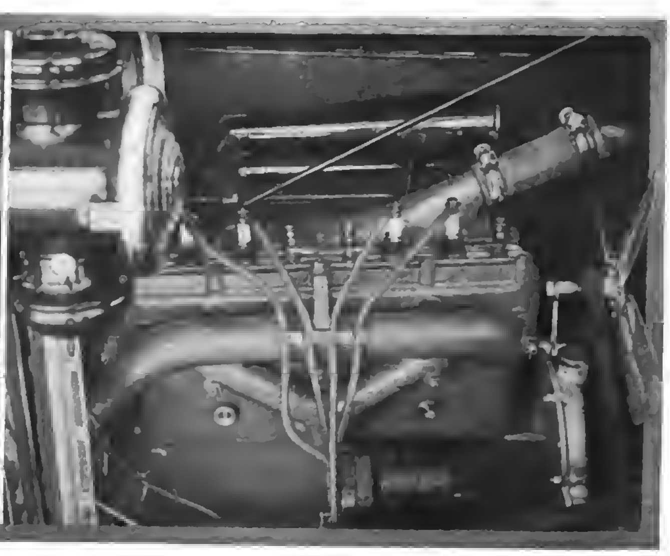


Fig. 2—Right side of motor, with accessories and manifolds

Maxwell 25 Is Out

Latest Five-Passenger Car Has Four-Cylinder Block Motor on Three-Point Suspension — European Body Lines

Left Drive and Center Control Are Features

DETROIT, MICH., April 15—The much-heralded Maxwell small touring car which is to sell at the rather startling figure of $725 has at last appeared. This week it is being exhibited to the dealers of the new Maxwell Motor Co., although deliveries will not commence until May 1.

Generally speaking, the car is up to the 1913 standard in every respect and reveals a slightly foreign look, as far as the hood is concerned at least. This slopes slightly from the dash to the radiator.

The body is of the usual five-passenger type with wide doors and black leather upholstering. Mechanically there is nothing out of the ordinary about the new 25, although it involves a number of features in accordance with the latest engineering dictates.

Fig. 3—Front view of Maxwell 25 touring car

Fig. 4—Rear springs suspension, showing springs shackled to spring horns bolted to frame

Motor Is of L-Head Type

The motor develops 25 horsepower and is of the block-cast type of compact design. It is of the four-cylinder, L-head type with a bore of 3⅝ inches and a stroke of 4.5 inches, giving a stroke bore ratia of 1.24.

The valves are all on the right and are inclosed by easily removed cover plates. They are 1⅞ inches in diameter. A removable plate gives access to the valve heads.

The cooling is by the thermo-syphon system with a large water outlet at the top of the motor integral with the head and extending the entire length of the top.

Both the crankshaft and the camshaft are mounted on two bearings each. The pistons are provided with three eccentric rings each, and are of ample length.

The power plant is carried at three points, two supports connecting directly with the main frame at the rear and a swivel support at the forward end resting on the front cross member just back of the radiator. The various motor bearing dimensions are as follows:

Camshaft bearings: Front, 1 inch diameter by 2 inches length:

rear, 1 inch diameter by 1¾ inch length. Crankshaft bearings: Front, 1⅞ inches diameter by 25 inches length; rear, 1⅞ inches diameter by 3 inches length; connecting-rod, lower bearings, 1⅞ inches diameter by 1.5 inches length; wristpin bearings, ¾ inch diameter by 2¾ inches length.

The lubrication system is of the conventional splash type, employing a plunger pump located at the front in the timing gearcase. This pump is actuated by a small connecting rod which is really an eccentric. The oil is pumped from the lower part of the crankcase up to the individual troughs and after it has been thrown to the various contact surfaces by the travel of the connecting rods it finds its way back to the reservoir where it is strained before being recirculated.

The ignition system is of the single type high-tension employing Simms magneto without the use of batteries. The magneto is placed on the right side of the motor and has regulation spark control. The carbureter is located on the left and is of the Holley make.

The cone clutch is not inclosed but located within the flywheel in the regular way. It is Raybestos-lined and has a diameter of 12.5 inches.

Central Gear Shift Lever

The transmission is placed amidships and has three forward speeds. It is a selective sliding gear type and the gearshaft lever passes directly upward for center control. This shift lever is of the swivel type.

From the gearbox the drive passes to the rear axle through a standard propeller shaft inclosed within a torque tube which is provided with a ball universal joint at the forward end just back of the gearbox. There are no radius rods, the tube taking the entire drive.

The rear axle is a three-quarter-floating design in which no load is carried by the driving shafts which are inclosed within the axle tubes, on which the wheel bearings are located.

The brakes operate on drums on the rear wheels and are of the internal expanding (emergency) and external contracting (service) type. The diameter of these brakes is 10 inches and the width is 1¼ inches.

The frame is of the regular pressed-steel channel section construction, and is provided with three cross-members to brace it. One of these is at the forward end and also forms the front motor support, while the second is in line with the rear spring front hanger, and the third member is at the extreme rear.

Both front and rear springs are half-elliptic, the sizes being: Front, 32 inches length; 1¾ inches width; rear, 40 inches length; 1¾ inches width.

The rear springs shackle at their rear ends to spring horns which in turn bolt to the rear corners of the frame.

The wheels are of the wood artillery type and carry 3 by 3.5-inch clincher tires. The tread is 56 inches for standard roads, although an option of 60 inches is given for Southern driving. Wheelbase is 102 inches and clearance 9 1-2 inches.

The control features are standard, and include pedal for operating the service brakes and for the clutch. The steering wheel is on the left, while the gearshaft lever is in the center together with the emergency brake lever. The ratchet for this brake lever is not placed above the floorboards as usually seen but is mounted underneath, fastening directly to the gearcase. On the dash a small handle is provided for carbureter adjustment.

The body is very roomy and seats five comfortably. A special feature of the model 25 body design is the absence of a door at the left front side. The driver enters from the other side. Standard colors for this car are dark blue with narrow black stripe. The equipment includes top and side curtains with top boot, windshield, gas head lights and gas tank, oil side and rear lamps, horn mounted on the motor and under the hood, Stewart-Warner speedometer.

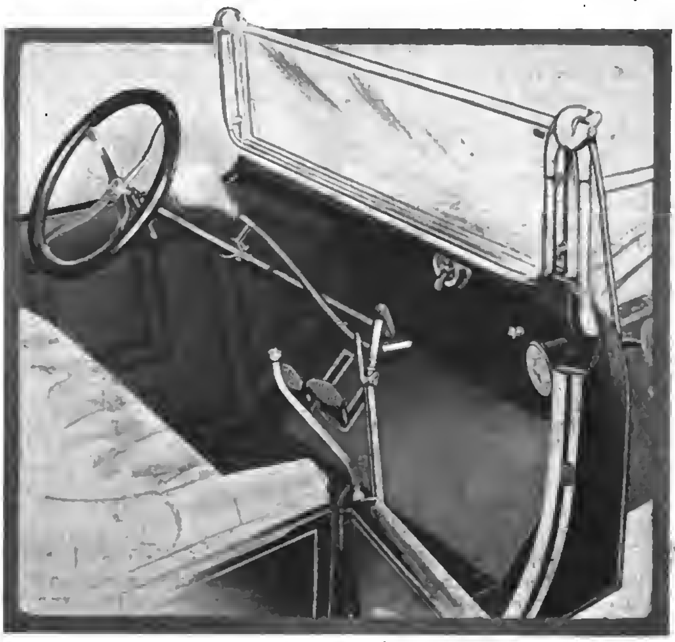


Fig. 6—Driver's seat, showing steer and control

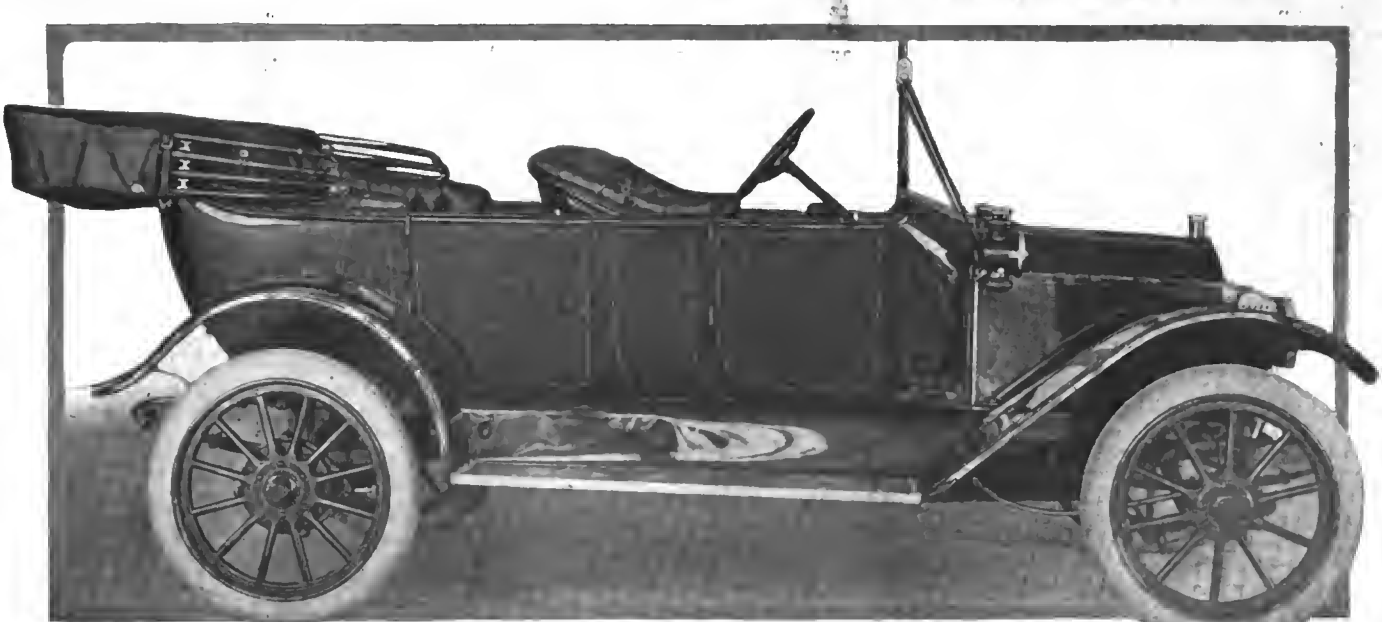


Fig. 5—Side view of new Maxwell touring car, a characteristic 1913 design, with straight, clear lines

Accessories for the Automobilist

THE recent automobile shows at New York, Chicago and Boston included so many exhibits of accessories that it was impossible to describe them in the show issues of THE AUTOMOBILE. Some of these devices for the comfort of the automobilist are mentioned herewith:

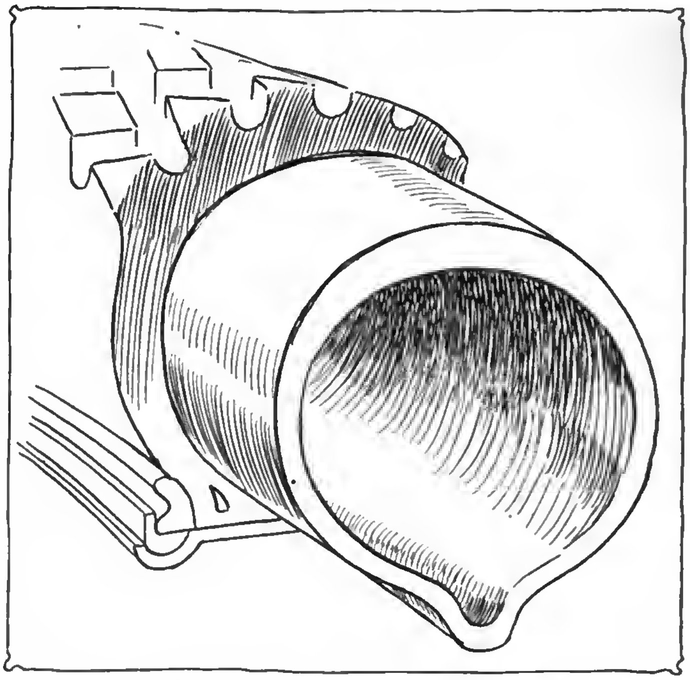
Vail-Osgood Tire Tube—A puncture-closing inner tube is being manufactured by the Vail-Osgood Rubber Products Co., Chicago, Ill. The mechanical principles utilized and applied in the tire are as follows: Pure rubber of sufficient thickness, when confined by side pressure, will hug a nail tightly. If this pressure is increased by the weight of the car and its load, the side pressure mentioned will permit the withdrawal of the nail and will close the cut and hold it closed, maintaining the air pressure. The method of manufacture consists in first laying a strong foundation strip on the form used for making the tinner tube, then building up on the form a layer of pure rubber, .38-inch thick, tapering off at the side or rim edge. After vulvanizing the tube is removed and turned inside out. When placed in the casing aand inflated the thicker portion of the wall of the tube is so confined and under pressure that in the event of a puncture it closes automatically.

Tuthill's Titanic Spring, which has been on the market for some time, has been designed to replace those on standard makes of cars. It is guaranteed against breakage between the clips. According to the makers, the advantages of this spring are that 90 per cent. of the breakages are eliminated and that, owing to the fact that there is no hole through the center of the spring, 25 per cent. is added to the strength. The material of which the spring is composed is a silico-manganese composition of special analysis. It is made by the Tuthill Spring Co., Chicago, Ill.

Detroit Force-Feed Oil—The oiler and tank are combined in a rectangular box. The oil is drawn up from the bottom of the box which forms the oil reservoir by a series of small pumps actuated by a shaft passing through the length of the box. The number of these pumps depends on the number of leads required by the particular motor to which the oiler is fitted. The shaft has a worm upon it for each small pump which gives a reciprocating drive to this part of the mechanism. The oil is taken up through the vertical lead and dropped down to the tubes which carry the oil through the motor. The ends of the lead running up from the bottom of the box project through the top of the box and are curved over to allow the oil to drop down into the heads of the motor leads which are cup shaped. The top of the box is covered with glass to allow the operator to observe the flow of oil. Each pump can have the length of its stroke regulated so that the flow of oil is under control. The action of the lubricator is shown on page 867. The device is made by the Detroit Lubricator Co., Detroit, Mich.

The Campbell All-in-Mesh Gear Transmission is always in mesh. This principle is secured by the use of a tilting or rolling key which forms internal contact with the gears. The transmitting action is obtained by merely sliding the key or keys along the groove in the shaft until they slip under the rings of the desired gear after which the key automatically and with positive action tilts into contact with a series of lugs placed on the inner circumference of the gear. The gear becomes a part of the shaft, turning with it and transmitting the power from the motor to the rear axle. The gear is illustrated in Fig. ??, in which the tilting keys may be observed. This gear was designed by the Economy Equipping Co., Chicago, Ill.

The Boston Starter is a mechanical starter which is operated from the seat. A cable projects through the dash which, when pulled by the operator, turns the wheel in turn connected by chain to the crankshaft. A pull on the cable spins the motor at a sufficient speed for starting. An auto-



Vail-Osgood puncture-closing inner tube

matic release is provided as a protection in case of backfire and as a further precaution the spark is automatically fully retarded before the engine is turned over. The starter can be attached without interfering in any way with the car and does not change the appearance of the latter as the whole device, with the exception of the starting handle, is located beneath the hood. A big advantage of this starter is that it is ready for use whenever the car becomes stalled. It is made by the Auto Appliance Co., Boston, Massachusetts.

Dependo Gasoline Gauge attaches to the dash and indicates at a glance the amount of gasoline in the tank. It operates up-hill or down and is of simple construction. The needle is swung from the top of the dial and the scale, reading in gallons, is at the lower part. At any moment the amount of gasoline in the tank can be determined from the gauge. This gauge can be fitted to any car using a gravity feed tank. It is made by C. F. Roper & Co., Hopedale, Mass.

O-Tak-A Jr. is a special tool for removing punctured tires. As shown in the illustration, page 867, it is similar in form to a pair of pliers, with curved hooks. One end slips beneath the rim and the other pushes up against the tire. When the handle is squeezed the point of the instrument pushes the tire away from the clincher rim. After the tire is loosened the tool can be raised, thus lifting the bead away from the rim, allowing the tire to be easily removed. It is made by O-Tak-A Tire Remover Co., LeRoy, N. Y.

Ko-Nek-To Battery Terminal Blocks—Many wires are broken because the installation chafes across the edge of the battery box. This results in short-circuits and broken leads. The Ko-Nek-To apparatus changes the terminal points to the exterior of the battery box and renders it possible to disconnect wires rapidly and to remake the connections without the necessity of soldering joints. The Ko-Nek-To battery terminal blocks are designed to be used with all electric cranking and lighting systems and since the connections are securely made they greatly assist in maintaining the required efficiency and output. The inside installation is permanent and is vibration proof. The blocks are made by the Detroit Electrical Appliance Co., Detroit, Mich.

Halladay Steel Goods—Automobile specialties manufactured by the L. P. Halladay Co., Streator, Ill., include automobile bumpers, tire holders, baggage carriers, license brackets and gear-shifting sets made to any design. The Halladay Imperial bumper is made of Channel steel. It is entirely self-contained, adjustable to all styles of cars. The tire holders, which are also manufactured by this company, are made of malleable iron, designed to attach to frame and of sufficient size to hold two demountable rims or wheels. The set consists of two frame arms and running-board cup, finished in black japan. The baggage carrier is designed to be attached on the step or running board of the car. It consists of a clamp, attached to the running board, with two upright attachments with eyelets through which there are two straps. The baggage is held to the running board by these straps. The company also manufactures special parts, such as gear-shifting sets, foot pedals, rods and connections, according to any design.

Heco Primer Spark-Plug—The advantage of this priming plug is that the cup is directly over the plug. The priming part can be used for cleaning the plug as well as for priming the motor. When cleaning the plug it is only necessary to open the cup while the engine is running and allow the oil and soot to be blown off the points. When used for priming it is operated in the usual manner by opening the primer with the handle and pouring in a few drops of gasoline. It is made by the Heinze Electric Co., Lowell, Mass.

Vanguard Positive Shields—The Vanguard Manufacturing Co., Detroit, Mich., manufactures four types of windshields, all of which are of the two-pane type, and two of which have double-acting panes. Nos. 74 and 75 are of the latter class. They are actuated by means of a loop attached to a hinge, which is of the ball-bearing type, and each of the shield panes may be placed in any desired position. Nos. 77 and 78 are different from the first two in that only the upper pane is movable. The position of this pane is obtained by the loosening of the loop at one of the hinges, as in the first two types, and the tightening of it to keep the shield rigid.

Illinois Tire Filler—The Illinois Tire Filler Co., Chicago, Ill., makes a filler for tires which is injected into the tube in liquid form by a gun. It is claimed that after the liquid has performed its work inside the tube it is impossible to depress the tire by any pressure. The company claims that the pressure in the tire may be reduced but the tire will not be affected.

Aull-Sides-Klean Polish—The Aull-Sides-Klean Co., Cincinnati, O., is turning out a brass and nickel polish which is waferproof. This product will polish under water. The same company is producing an automobile body and furniture polish, which cleans and polishes at the same time. Both of these products go under the trade name of A-S-K.

Columbus Two-Pane Shields—The Columbus Auto Parts Co., Columbus, O., manufactures five different windshields. They are all of the two-pane type, and are so constructed as to move in an entire circle. The action of both panes of the shield is positive and simultaneous. The frame of the pane is of round section and is held in place by two grip members attached to a double-acting, compensating-gear hinge. The frame and hinges are made of heavy-gauge brass.

Mesinger Rebound Check—This shock absorbing device which is manufactured by the H. and F. Mesinger Manufacturing Company, New York, consists of two coiled springs attached at their upper ends to the car frame through suitable brackets, one a little forward of the axle and the other just to the rear of it. A leather strap passing under the axle connects to each of these springs at their lower ends. Thus the rebound is checked by the action of these two springs working against the upward jerk of the frame after depression through the agency of the connecting strap. The strap is provided with a buckle so that its length may be made to conform with the required spring tension and with the distance between axle and frame.

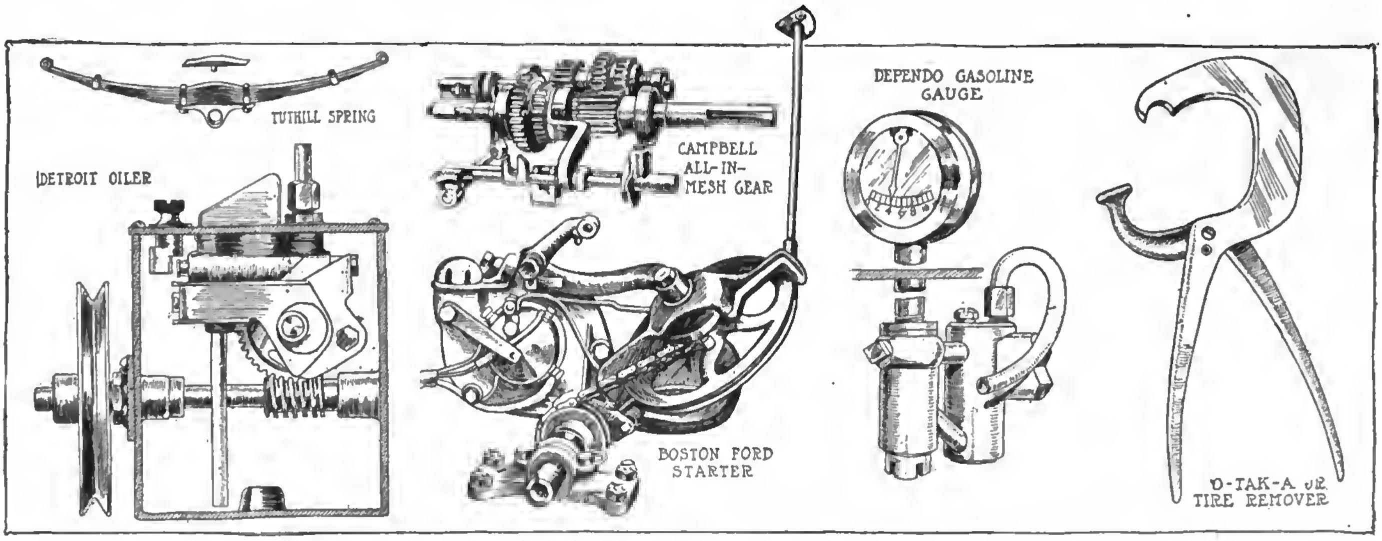
Weaver Garage Jacks—The Weaver automobile twin-jacks are manufactured by the Weaver Manufacturing Company, Springfield, Ill. It consists of a triangular pressed-steel frame the ends of which are mounted on three caster wheels, containing ball-bearings. Two of the side members are connected by a horizontal cross member, at the ends of which two nuts carrying bevel-gear faces are mounted on ball-bearings. The bevel faces are engaged by bevel gears fixed to the above-mentioned cross member, which latter is in turn agitated by a bevel gear mounted on a shaft having a crank at its end. The gear ratio between the crank and the gear carrying the jack is 400 to 1, so that very heavy loads are easily elevated. The combined use of two outfits may take the place of a turntable. It has a double-reinforced steel tube with a brass tube drawn over. It is clamped to the frame of the car and connected thereto by a .75-inch cold-rolled steel rod, which has an oil-tempered spiral spring around the same. The latter is connected to the clamps by four bolts. The clamps are of solid brass.

Grinnell Automobile Glove—The Morrison-Ricker Manufacturing Co., Grinnell, Ia., manufactures an assortment of gloves for the automobilist and cyclist. A ventilated or unventilated glove called the Grinnell is one of the types designed for the automobilist. It is made of colt-skin and is washable in soap and water or gasoline. It fits the wrist tightly and has a quick-adjusting slide fastener and a stiff leather-lined cuff. A short-wrist glove made of colt-skin hide and one specially made for the cyclist, with a new double palm, also of colt-skin, are manufactured. A glove called the Grip-Tite has just been manufactured. The Grip-Tite has an extra palm, sewed so that the leather puckers between the stitches to form corrugations which permit a firm grasp on the handle bars or steering wheel.

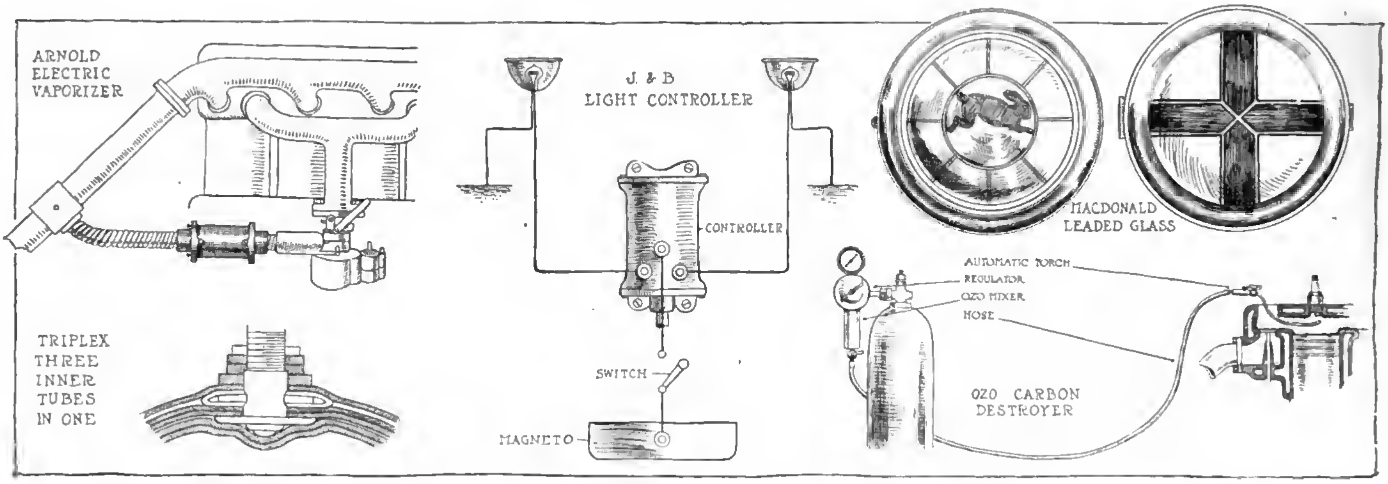
Pratt Automobile Jack—The W. E. Pratt Manufacturing Co., Chicago, Ill., manufactures malleable-iron castings, automobile jacks and accessories. The Pratt jack is made of malleable iron, finished in aluminum bronze. There are only six parts, held together by two bolts in a one-piece frame. The standard is so made that it cannot leave the upright support; it raises the load one notch at a time on every downward stroke. A small trigger, at the base of the frame, determines whether the jack is being raised or lowered. The company also manufactures a spring bumper.

J. H. Tonneau Shield—The J. H. Tonneau Shield Co., New York City, manufactures a windshield designed to protect the occupants of the rear seats of an open car. This shield is collapsible and consists of three sections hinged together at the vertical members of the frames which hold the edges of the transparent panes. To the two hinges connecting the three sections, two horizontal arms are secured the other ends of which are fastened to the rear of the driver's seat. The two small side sections or either of them may be folded over the large main section, and the whole arrangement may be turned about the axis formed by the two joints, so that the shield may be used as a table. The shield frame is made of brass and oxidized steel, and a waterproof curtain is attached to the lower edges of all sections, so as to protect the legs of the passengers against rain.

Herroline Fuel Enricher—Herroline, a gasoline improver,



Sketches of the Tuthill spring, Detroit oiler, Campbell all-in-mesh gear, Boston starter, Dependo gauge and O-Tak-A Jr. tire tool



Arnold vaporizer, Triplex inner tube, J. & B. light controller, Ozo carbon destroyer and MacDonald leaded glass

is manufactured by the Improved Gasoline & Oil Co., Chicago, Ill. It is the discovery and invention of W. H. Herron. Herroline consists principally of hexane and iso-hexane, with a very small quantity of sulphur. The chemical formula is approximately C_6H_{14}.

Arnold Electric Vaporizer is an electric heating device placed in the air intake of the carbureter in order to secure hot air for starting purposes. The vaporizer consists of an electric resistance coil, battery and switch. When the switch is thrown on the vaporizer becomes hot in 30 seconds. The carbureter is then flooded in the usual manner and the motor started. The switch controlling the vaporizer is not shut off until the motor becomes sufficiently warm to run without the aid of the preheated air. This is made by the Arnold Electric Co., Boston, Mass.

The Triplex inner tube is, as its name suggests, in reality three different tubes, three being used so that in case one is punctured it calls for a second inflation to bring the second tube into use and in case of its puncturing an additional inflation will bring the third tube into service. A three-way valve arrangement is used so that each tube can be inflated separately. When the outer tube is being used the two inner ones fold against the inside half of the outer tube so as to be away from the tread of the tire in case of puncture. Inflating the second tube simply causes it to fill all the space within the first one. Inflating the third tube, which is the innermost of all, acts in a similar manner. The tube is made by the Triplex Tube Company, Boston, Mass.

J. and B. Light Controller—This switch controls the output of the Ford magneto so that when this instrument is used to generate current for the lights the bulbs are held at their full incandescence, regardless of the motor speed. When the motor is running at high speed the bulb goes beyond its full incandescence and the filament is fused out. The controller is installed directly forward of the carbureter. It is operated by the lever which controls the throttle. The use of the device enables the current to be controlled to such an extent that it can never burn out from excess current. The only labor necessary is to drill three 3-16-inch holes between the motor base and frame. The connecting levers are arranged to fit the present carbureter and the wiring is according to the diagram given in the accompanying illustration. This is made by the J. and B. Mfg. Co., Pittsfield, Mass.

MacDonald Leaded Glass is used in leaded glass headlights which, while not appealing to those using the car for country travel, make excellent distinguishing marks for the automobile when used in city work. Town cars are especially adapted for these lights. The side and tail lights are greatly beautified by the use of these distinguishing designs which are made up in the form of monograms, crests, emblems, initials or devices in desired colors and set in the automobile lamp. Red Cross marks for physicians are particularly appropriate in leaded glass. This glass is made by Donald N. MacDonald, Boston, Mass.

Ozo Carbon Remover is a garage outfit consisting of an oxygen tank and burner for burning out carbon from the cylinder by the aid of Ozo. Ozo is a flameless gas which consumes the carbon without the use of fire. The outfit is operated by leading the tube from the gas tank and regulating apparatus through the spark-plug or valve cap of the cylinder. The use of this apparatus does not require the motor to be dismounted further than the removal of the spark-plug. The work can be done on an ordinary four-cylinder motor in 20 minutes. It is operated by one man who merely holds the nozzle of the hose through the opening of the cylinder until the carbon has been completely burned from the cylinder. The temperature of combustion is not high enough to fuse the plugs or to do any other damage. This device is made by the Ozo Co., Boston, Mass.

Cook's Automobile Oils—The Albany Lubricating Co., New York City, manufactures the Cook's lubricant and Albany automobile oils and greases. The company claims that its greases will not gum or clog up or will not run or leak out of the gear case or cannot be thrown off the gears by centrifugal force or affected by changes of temperature.

Head-Light Glare Remover—It is difficult to drive against the glare of approaching headlights. In order to rob these of dazzling power this device has been designed. It consists of an amber-colored glass clipped to the windshield in such a position that the driver can see through it by merely inclining his head. When a car is approaching and the glare becomes too dazzling it is merely necessary to look through the colored glass. It is made by William L. Toby, East Boston, Mass.

The New Era tire casing, a product of the New Era Tire & Rubber Company, Boston, Mass., is made up of five layers of para gum alternating with layers of coarse Egyptian cotton fabric. Outside of these is placed the cushion and breaker strip made of pure gum and of liberal thickness in the tread portion. Outside of this comes the binder formed of compounded rubber, thickened slightly at the tread and extending clear around the fabric and forming the outside lower wall of the tire. Lastly comes the tread of white rubber. These casings are made in standard clincher sizes.

Whitney differential roller bearings are interchangeable with the standard series of ball and roller bearings now on the market.

They are adjustable tapered cup and cone bearings, but without the objectionable feature of tapered rollers having restraining shoulders and guiding members to keep them in position.

All loads, both radial and thrust, resolve themselves into forces delivered at right angles to the axis of the rolls; which consequently transmit their loads normal to the contact surfaces without tendency to creep, either one way or the other.

The containing cage is simply a floating guard member, and is not subjected to any of the load forces carried or transmitted by the bearings or rollers.

Motorol, a lubricant produced by the N. Y. & N. J. Lubricant Co., New York City, is made in six grades. It is claimed to be non-carbonizing, made from the selection of the crude oil to the last process of refining. This company also manufactures a product called Non-Fluid Oil, in two grades. This oil varies in consistency, according to what gravity of mineral oil is used, and it is claimed will not drip or cause a waste.

The A. W. Harris Oil Co., Providence, R. I., is this year producing several grades of oil, also a metal polish called Scouree. The light grade of oil is especially adapted for high-speed motors, having a high fluidity and being practically carbonless. A heavy bodied oil of exceptionally high flash test is also made. Two grades of transmission oil are also produced by this company.

The Albany Lubricating Co., New York City, is manufacturing four grades of lubricants. The extra-light, of golden yellow color, is especially adapted to closely fitted pistons and high compression water-cooled engines; the light, a medium body and high flash point adapted for compression, splash or gravity feed systems in any type of water cooled motors; the medium, heavier than the previous and of best use with loose pistons as an aid for retaining the compression; and the heavy, of use only where the piston is badly worn and where extreme heat is developed. These oils are put up in barrels ranging from 30 to 50 gallons.

The Texas Co., New York City, is producing Texaco, a motor oil, which it claims has a zero cold, remaining fluid in mid-winter.

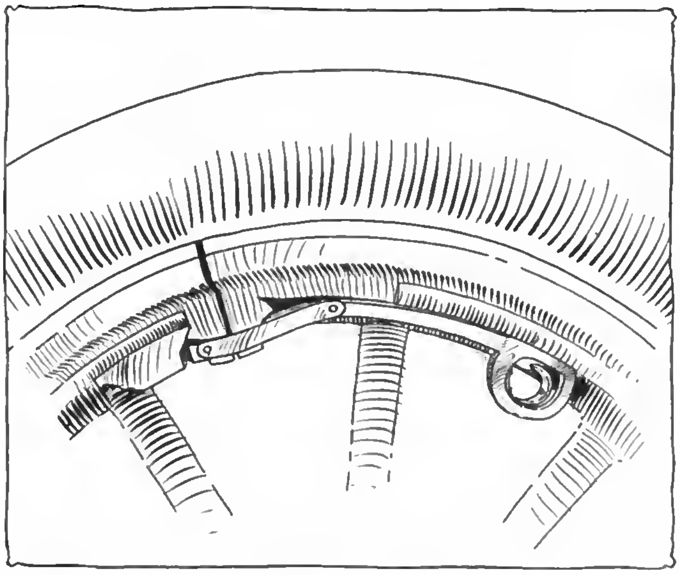
Gargoyle, a product of the Vacuum Oil Co., Rochester, N. Y., is made for the lubrication of all parts of internal combustion engines used for marine purposes. Mobilubricant, another product, is a grease prepared for use in compression cups and gearcases.

Oilzum is a trade-mark of the White & Bagley Co., Worcester, Mass., signifying several grades of oils and greases. These oils, it is claimed, are absolutely carbonless and especially adapted for winter uses. A smooth mineral grease of proper consistency for packing axles, ball and roller bearings, etc., is also produced. Washzum and Cleanzum, the former for cleansing the car and the latter for the hands, are also made.

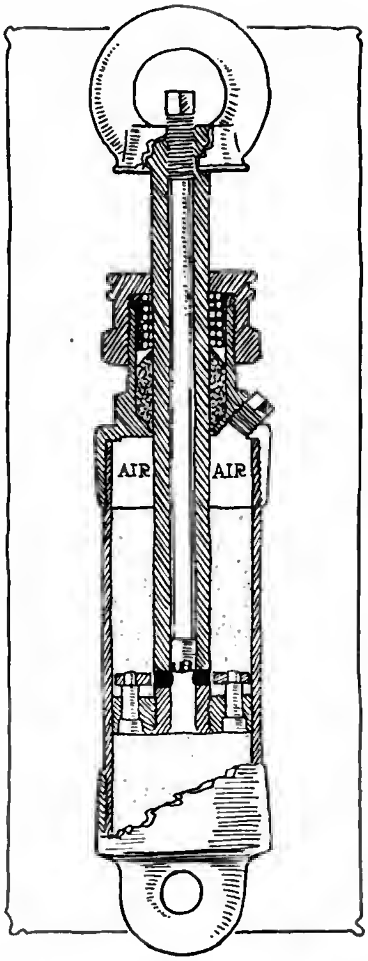
The Turner Brass Works, Sycamore, Ill., is manufacturing motor washers. These are made in three sizes, 1 quart, 2 gallon and 5-gallon tanks. The 1-quart tank is a small hand machine made of drawn brass, with the bottom brazed into place and fitted with a Turner non-leaking filler plug. The handle is an automatic pump, which forces the liquid through an adjustable nozzle. The 2 and 5-gallon tanks are of drawn steel, equipped with a pressure gauge registering up to 100 pounds, having large hand pumps, also connections so they may be attached to a pressure tank or to a power-driven pump in garages where such are used. These washers are fitted with 10 feet of cloth insertion rubber hose and adjustable nozzle. Kerosene may be used and the same results obtained as by using gasoline and is much cheaper. By merely turning the nozzle either a finely-divided spray or an intense needle stream may be obtained.

The Presto demountable rim, the product of the Presto Inter-Rim Co., Boston, Mass., consists of a split side locking ring which rests in a V-shaped groove in the outer edge of the wheel felloe. Each end of this split ring has a hook-shaped piece which is caught between a toggle mounted on the permanent band on the wheel felloe. After positioning the demountable rim and tire on the felloe it is only necessary to position the split locking ring and press the toggle locking device up into position against the wheel felloe. There is not any nut or other locking arrangement used.

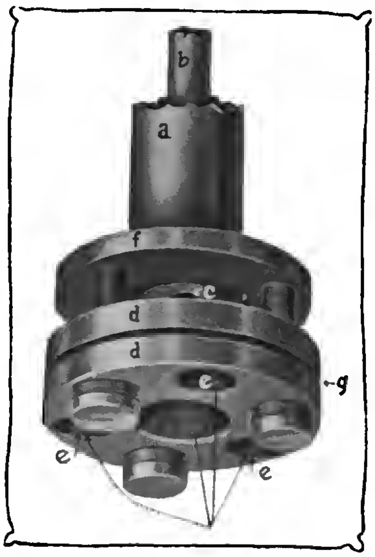
Bair Auto Top Holder, made by the Auto Specialties Mfg. Co., Chicago, Ill., is designed to do away with the unsightly strap device. It is a mechanical device consisting of a rigid separator and a clamp which holds the bows tightly in place and does not permit the weight of the top to be carried entirely by the bottom bow but distributes it equally etween each of the bows. The top holders are sightly and can be manipulated quickly.



Locking device on the Presto demountable rim



General assembly of the Flentje shock absorber, showing how the liquid and air are distributed undes normal conditions, that is to say, when the car on which the device is mounted is traveling over a smooth and level road surface. Under these conditions the action of the spring is not interfered with



Flentje piston. The hollow piston rod a, contains a valve b, for regulating the opening c. There are three bevelled holes, e, through which the liquid passes unless checked by the non-return valve g which covers the holes

The Flentje shock absorber is a hydraulic recoil absorber. The energy of the recoil is absorbed by making it do work in forcing a liquid called oil-o-mica through small openings in a piston rod. A sectional view of the device given in the accompanying illustration shows it to be of plunger formation, a movable piston being carried in a cylinder about 80 per cent. full of liquid. The weight of the car is carried by the car spring, but a movement of the car causes a corresponding movement of the piston through the liquid. At the top of the cylinder is a packing box stuffed with braided expansion packing held in place by a spiral spring. This prevents leakage past the piston rod.

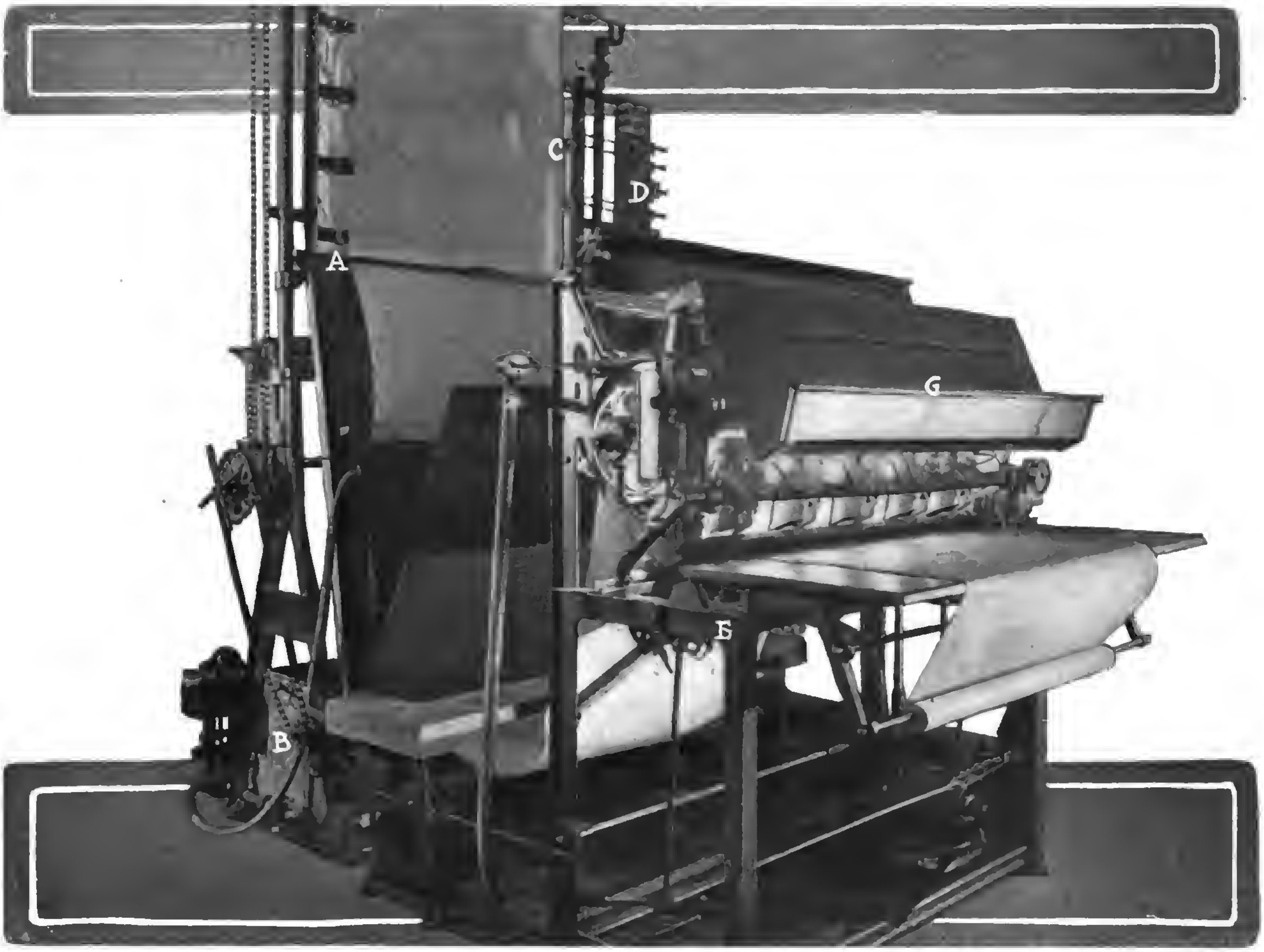
A glance at the piston will show that it is of unique construction. Through it there are three beveled holes which form the relief passages for the fluid on the down stroke. A check valve rests upon the piston which closes the three holes on the recoil stroke. When these coil holes are closed the only passage available for the fluid is through the small hole in the hollow piston rod. The entrance to this opening in the piston rod can be controled by a needle valve regulated from the top of the rod. This forms the only adjustment required to regulate the action of the device.

When passing over smooth roads the action of the spring is not interfered with as the amount of work given up in passing the liquid through the recoil opening is very slight. On a severe jounce, however, the air on top of the liquid mixes with the latter and expands it, checking the violent recoil.

The Edmunds & Jones Mfg. Co., Detroit, Mich., is this year producing several grades of lamps, including gas and electric, and also a generator. This company produces a special lamp with parabolic reflectors, guaranteed to give highest efficiency, having an adjustable device.

The B. & L. Auto Lamp Co., New York City, is manufacturing automobile lamps and generators suitable for large touring cars, runabouts and motorcycles. All the lamps are soldered and riveted, standing the constant vibration of large cars and all sort of hard service.

Factory Miscellany



Special blueprint machine used in the factory of the Willys-Overland Co., Toledo, O.

AT the gateway to the shop stands the hlueprint machine. Before the parts are turned out the tracings must pass through this machine so that reproductions of the drawings showing the details of each part can pass to the workmen. The machine shown herewith is the improved instrument used in the Overland factory. The machine is designed to produce the largest possihle number of prints at the lowest possihle cost. It is in daily operation at the factory in Toledo. The machine is fed from a 42-inch roll of hlueprint paper, and its output of finished prints is about 100 yards an hour. The speed of the machine can he increased up to 200 yards an hour if desired. The tracings are fed past a hank of arc lamps and are returned to the tracing tray marked G, at the operator's hand as he stands at the front of the machine. A canvas helt with tension springs is used to convey the paper and tracings through the machine. From the printing machine the paper passes automatically to the washing and drying machine. These machines can he arranged to work independently or as a unit. In the above illustration A is the spray pipe feeding the water over the paper which runs by gravity to the washing tank B. C is the electric drier composed of a series of resistance coils. D is a set of switches providing eleven gradations of heat, enahling the operator to regulate the temperature according to the speed of output at which the printer E is operating.

GRAY & DAVIS Plan Factory—Gray & Davis, Boston, Mass., manufacturers of automobile accessories, will establish a factory at Cambridge, Mass. The proposed building will be five stories high, 381 1-2 feet long by 81 feet wide on the first floor and 61 feet above that, and is designed to allow for future additions and a power house. It will be absolutely fireproof throughout, being constructed of reinforced concrete. There will be a large showroom on the first floor, while the offices will be on the second floor, occupying the full width of the building for a length of 200 feet. The architects have given the windows 70 per cent. of the wall area. Work is being rushed at present.

Alston Saw Company's Factory—The Alston Saw & File Co. will build a factory, 4 by 103 feet at Folcroft, Pa.

New Automobile Factory—C. H. Lambert, formerly with the W. J. Gillette Mfg. Co., Louisville, Ky., will establish an automobile factory there. Final details have not yet been determined.

Bent Rim Company Builds—The Bent Rim Co., Lowell, Mich., will build a 50-foot square addition to its present plant.

Alliance Mill Factory Planned—The Alliance Rubber Co., Alliance, O., has made plans for the erection of a two-story brick mill factory building, 50 by 150 feet.

High Point Company Adds—The High Point Motor Co., is building an addition to its plant at High Point, Tenn., and contemplates the installation of new equipment.

Fire Damages Oliver Plant—Fire recently burned out the storage room of the Oliver Motor Truck Co., Detroit, Mich., with an estimated damage to the stock of about $15,000.

Gibson Looking for Site—The Gibson Motor Car Co., Pittsburgh, Pa., is looking for a site for an automobile plant. It contemplates manufacturing a commercial truck adapted to Pittsburgh's topographical conditions.

Tire Plant in Jacksonville—Jacksonville, Fla., will have a big industrial plant, employing some 500 hands and turning out 300 tires per day, together with other automobile accessories in which rubber is used, to be known as the Seminole Rubber Co., a concern with a $1,000,000 capital.

Racine Company's Factory—The Chicago Rubber Clothing Co. recently dedicated a large new four-story factory building, forming the largest unit in the factory group at Racine, Wis., where the company has its main works and headquarters. The new building will be devoted exclusively to the manufacture of motorists' apparel of all kinds.

Detroit Steel Products Adds—The Detroit Steel Products Co., Detroit, Mich., has taken steps for the establishment of a branch plant in Windsor, Ont., and has acquired a 5-acre site for its factory. The general plan of the plant will be along the lines of the Detroit factory, and it will be equipped for the manufacture of automobile springs, steel windows, etc.

Falls Machine Starts Building—The Falls Machine Co., Sheboygan Falls, Wis., a large manufacturer of motors for the car-building trade, has commenced work on a large addition which will increase the capacity about 40 per cent. The building will be 140 feet long and two stories high, of brick and steel construction. It will contain a large assembling and testing floor.

Building to Cost $100,000—It is announced that W. J. Hughey, of William J. Hughey & Son, Chicago, Ill., manufacturers of limousine and automobile bodies, who recently purchased the 124 feet by 125 feet plot of ground at Prairie avenue and Thirty-third street for $40,000, plans to improve with a concrete four-story building, to cost about $100,000, to be occupied by the company.

Grant-Lee Enlarges—Ground has been broken for a new addition to the factory of the Grant-Lee Machine Co., of Cleveland, O. The additional space will enable the company to increase its production facilities by 50 per cent. and to still further improve its output of transmission gears, timing and bevel gears, worms and differentials. The new building will be constructed of brick and concrete.

Wants Factory Equipment—The Four Wheel Drive Auto Co., Clintonville, Wis., which recently increased its capital to $250,000 and has broken ground for a large group of motor truck shops, is in the market for a 150-horsepower Corliss steam engine, with direct connections; a 175-horsepower boiler; and a long list of tools, including turret lathes, milling machines, grinders, engine lathes and other equipment.

Motor Foundry Company Extends—The capital stock of the Motor Foundry Co., Detroit, Mich., has been increased from $35,000 to $100,000 to provide funds for extensions of plant, necessitated by greater business activity. Several new buildings are to be erected adjoining the present plant. The company employs 265 men and does a grey iron casting business of from 40 to 50 tons a day. The additions will raise its capacity to 80 tons.

Ohio Electric Expands—The Ohio Electric Car Co., Toledo, O., has prepared plans for the building of two additional buildings, one 60 by 240 feet and the other 60 by 240 feet. The first will be two stories and the second three. Both buildings will be erected on the modern daylight plan and will double the capacity. When the buildings are finished the company will increase its force and manufacture many of the parts now purchased from other concerns.

Plan Large Aluminum Works—The Southern Aluminum Co., Whitney, N. C., has given contracts for the erection of a hydro-electric plant. In the construction of this plant about twelve steam shovels, an electrically driven air compressor developing 5,000 horsepower, a plant with a daily capacity of 1,500 cubic yards of stone and concrete, and twenty steel derricks with masts 115 feet high and booms 110 feet long for a 20-foot lift, etc., will be used. About 600,000 yards of masonry will be required, and the contract calls for excavating the aluminum factory site and the spillway and building a dam and power house at the narrows on the Yadkin River, the dam to be about 200 feet high and develop a 177-foot head, generating 220,000 horsepower. All of this energy will be used by the aluminum factory, lighting the plant, and industrial city to be built, etc. It is understood that about $6,000,000 will be invested for the dam, power house, water power, machinery, electrical equipment, aluminum works, industrial city, etc.

The Automobile Calendar

Shows, Conventions, Etc.

April 5-19.........Pittsburgh, Pa., Annual Show, East Liberty Market House, Dealers' Association.
April 21-26........San Antonio, Tex., Annual Show, San Antonio Motor Car Show Co.
June 5, 6, 7.......Detroit, Mich., Midsummer Meeting of Society of Automobile Engineers.
October ....Paris, France, Automobile Show, Grand Palais; 10 days.
November ....London, Eng., Annual Automobile Exhibition, Olympia.

Race Meets, Runs, Hill Climbs, Etc.

April 23-27.........San Antonio, Tex., Track Meet, San Antonio Automobile Club.
April 28-30.......Chicago, Ill., Commercial Vehicle Demonstration, Chicago Motor Club.
May 2.............New York City, Secret Time Run to New Rochelle, Motor Dealers' Contest Association.
May 5-8..........Washington, D. C., Motor Truck Reliability, *Washington Post.*
May 14...........New York City, Start of 2-Day Hudson and Catskill Scenic Tour.
May 30............Indianapolis, Ind., 500-Mile Race, Speedway.
June 7............Philadelphia, Pa., Inter-Club Reliability, Quaker City Motor Club, Autombile Clubs of Delaware County, Philadelphia and Germantown.
June 25-28.......Chicago, Ill., Non-Motor-Stop Reliability, Chicago to Boston, Chicago Automobile Club.
July 1............Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Association to the Pacific Coast.
July 1-16.........Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.
July 4-5..........Sioux City, S. Dak., Track Meetings, Sioux City Automobile Club and Speedway Association.
July 5-6..........Tacoma, Wash., Road Race, Montemara Festa Automobile Committee.
July 8-16.........Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager.
July 27-28.........Tacoma, Wash., Tacoma Road Races.
Nov. 24...........Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 27...........Savannah, Ga., Grand Prize Race, Automobile Club of America.

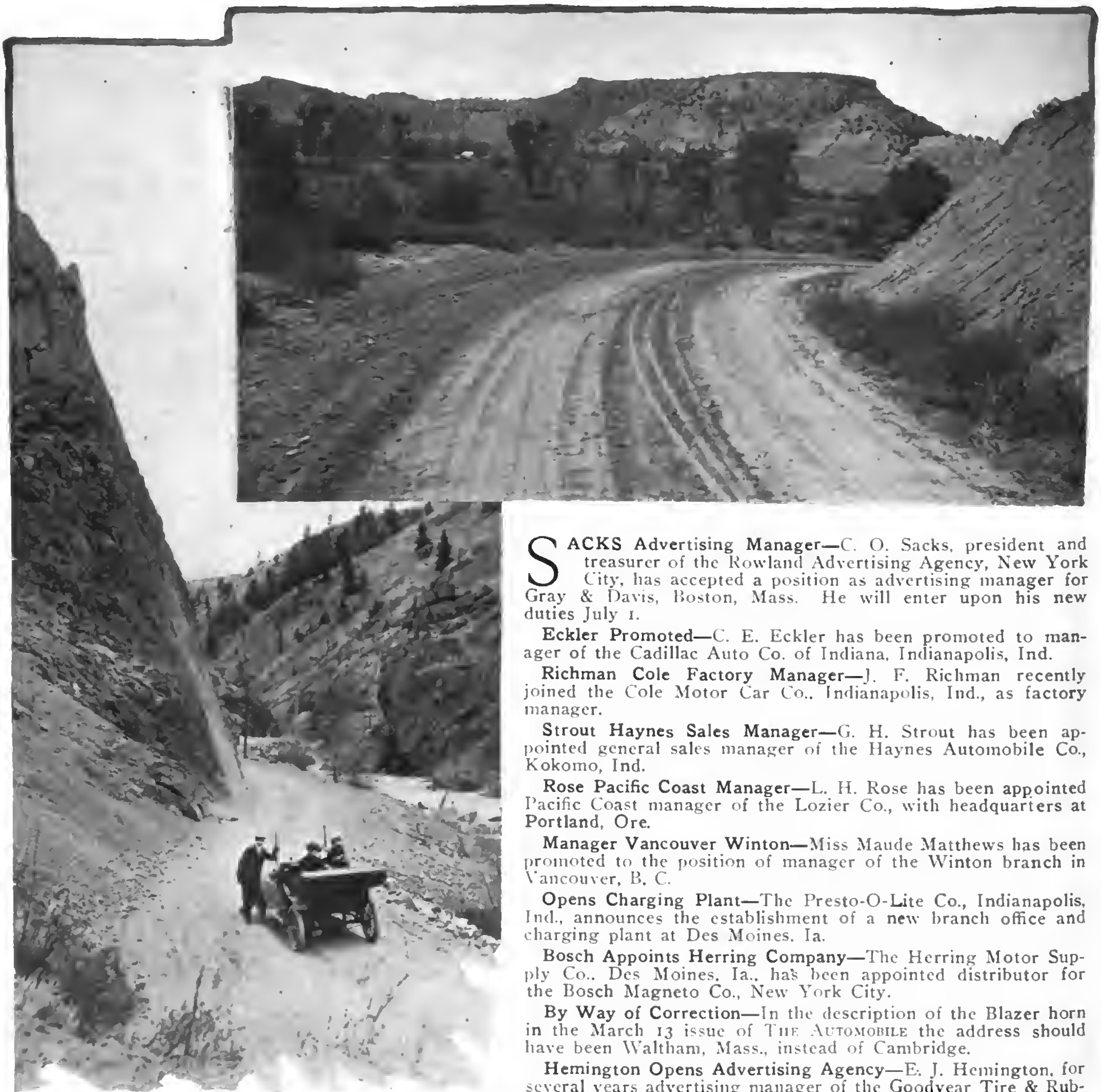
Foreign.

April ....Barcelona, Spain, International Exhibition.
May ....St. Petersburg, Russia, International Automobile Exposition, Building of Michael Maneze, Imperial Automobile Club of Russia.
May 7-10-11.......Paris, France, Sarthe Automobile Meeting and Speed Hill Climbing.
May 11-12.........Palermo, Sicily, Targo-Floria Race.
June 23-28........London, England, International Road Congress.
July 12............Amiens, France, Grand Prix Race.
July 13............Paris, France, French Grand Prix Cyclecar Race.
July 18-26.........London, Eng., Imperial Motor Transport Conference.
Sept. 21...........Boulogne, France, 3-Litre Race.
Sept. 25...........Isle of Man, International Stock-Car Race.
October ....Paris, France, Paris Automobile Show.

The Esterline Co., Lafayette, Ind., has outgrown its present quarters and is now occupying a new three-story factory on South street in Indianapolis, and by May 1 will have increased its working space to over double its present size. The factory in Lafayette is operating to capacity and will be continued until fall, when it will be merged with the Indianapolis factory

The Week in the Industry

Engineer — Dealer — Repairman — Garage



On the Lincoln Highway

Plans for the development of a great transcontinental route through central Colorado to form a link in the national highway are being carried out by the Lincoln Highway Association of Colorado. The upper illustration gives an excellent idea of the good roads in the Pike's Peak region, being a section of the Colorado Springs-Canon City state highway. The lower illustration is from a photograph taken in Ute Pass, just west of Colorado Springs and Manitou

SACKS Advertising Manager—C. O. Sacks, president and treasurer of the Rowland Advertising Agency, New York City, has accepted a position as advertising manager for Gray & Davis, Boston, Mass. He will enter upon his new duties July 1.

Eckler Promoted—C. E. Eckler has been promoted to manager of the Cadillac Auto Co. of Indiana, Indianapolis, Ind.

Richman Cole Factory Manager—J. F. Richman recently joined the Cole Motor Car Co., Indianapolis, Ind., as factory manager.

Strout Haynes Sales Manager—G. H. Strout has been appointed general sales manager of the Haynes Automobile Co., Kokomo, Ind.

Rose Pacific Coast Manager—L. H. Rose has been appointed Pacific Coast manager of the Lozier Co., with headquarters at Portland, Ore.

Manager Vancouver Winton—Miss Maude Matthews has been promoted to the position of manager of the Winton branch in Vancouver, B. C.

Opens Charging Plant—The Presto-O-Lite Co., Indianapolis, Ind., announces the establishment of a new branch office and charging plant at Des Moines, Ia.

Bosch Appoints Herring Company—The Herring Motor Supply Co., Des Moines, Ia., has been appointed distributor for the Bosch Magneto Co., New York City.

By Way of Correction—In the description of the Blazer horn in the March 13 issue of THE AUTOMOBILE the address should have been Waltham, Mass., instead of Cambridge.

Hemington Opens Advertising Agency—E. J. Hemington, for several years advertising manager of the Goodyear Tire & Rubber Co., Akron, O., has opened the Hemington Advertising Agency, Akron.

Borland-Grannis Moves—The executive offices of the Borland-Grannis Co., Chicago, Ill., have been moved from their Chicago retail sales rooms on Michigan avenue to their factory at 310 East Huron street.

Martin Resigns—H. F. Martin, who has been general sales manager of the Pennsylvania Steel Co., has recently resigned and has taken a similar position with the Eveland Engineering & Mfg. Co., Philadelphia, Pa.

New Agencies Established During the Week

PLEASURE VEHICLES

Place	Car	Agent
Aurora, Ill.	Pilot	E. J. Ellis
Bagdad, Fla.	Moon	C. M. Munson
Baltimore, Md.	Regal	Clark Motor Co.
Baltimore, Md.	Jackson	W. J. Meyers & Co.
Birmingham, Ala.	Buick	B. M. Braziel
Binghamton, N. Y.	Pilot	Cossitt & Manning
Bloomfield, Neb.	Apperson	J. Devier
Bradford, Pa.	Pilot	J. Rogerson
Brattleboro, Vt.	Pilot	F. W. Putnam
Canajoharie, N. Y.	Pilot	W. J. Roser
Carmi, Ill.	Moon	T. H. Land
Chelsea, Mass.	Pilot	Capt. J. H. Low
Chicago, Ill.	Haynes	Haynes Motor Car Co.
Clarinda, Ia.	Hupmobile	L. N. Cleveland
Claysville, Pa.	Pilot	E. D. Noble
Columbus, Neb.	Empire	Columbus Auto Co.
Corry, Pa.	Pilot	W. E. Marsh
Cos Cob, Conn.	Moon	J. M. Ulrich
Deadwood, S. D.	Cartercar	L. C. Page
Detroit, Mich.	Keeton	Whiston & Urborne
Easton, Pa.	Pilot	M. H. King
Emerson, Neb.	Moon	Linderink & Kerwin
Erie, Pa.	Keeton	Streuber-Mooney Co.
Fredericton, N. B.	Franklin	Smith Foundry Co., Ltd.
Gering, Neb.	Little	Fred Dooley
Grand Island, Neb.	Hupmobile	C. G. Ruenker
Hamburg, Ia.	Apperson	W. G. Fletcher
Helena, Ark.	Pilot	L. B. Davis
Hemingford, Neb.	Reo	C. B. Wildy
Hemingford, Neb.	Little	C. B. Wildy
Holyoke, Mass.	Pilot	W. D. Ballard
Holyrood, Kans.	Moon	G. G. Baker
Huntington, W. Va.	Moon	F. M. Hawkins
Indiana, Pa.	Pilot	J. L. Culp
Irvington, N. J.	Moon	F. W. Tidy
Joplin, Mo.	Moon	Joplin Supply Co.
Joplin, Mo.	Pilot	E. Barrett
Kansas City, Kans.	R-C-H	A. Garnier
Lincoln, Neb.	Empire	E. W. Fry
Long Pine, Neb.	Hupmobile	Culberson-Engle Co.
Masontown, Pa.	Pilot	Masontown Motor Car Co.
Memphis, Tenn.	Pilot	City Motor Car Co.
Milwaukee, Wis.	Pilot	J. H. Zirgler
Moneta, Ia.	Moon	Louis Ruwe
Murphysboro, Ill.	Pilot	G. E. Craine
Neeley, Neb.	Little	F. H. Bare
Neeley, Neb.	Reo	F. H. Bare
Newark, N. J.	Moon	G. Colyer & Co.
Norfolk, Va.	Pilot	C. B. Cole
Oakdale, Neb.	Little	Charles McKeen
Oakdale, Neb.	Reo	Charles McKeen
Oklahoma City, Okla.	Ohio	Carhart Motor Co.
Oswego, N. Y.	Pilot	E. E. Favreau
Otto, Pa.	Pilot	T. J. Ardinger
Pacific Junction, Ia.	Hupmobile	J. C. Stene
Pomona, Cal.	Moon	H. L. Wood
Pukwana, S. D.	Moon	D. M. Fell
Pender, Neb.	Moon	H. D. Rixen
Petersburg, Va.	Moon	W. P. Atkinson Co.
Philadelphia, Pa.	Pilot	Raymond McCormick
Plainview, Tex.	Pilot	W. C. Wright
Providence, R. I.	Pilot	H. E. Bradford
Rapid City, S. D.	Hupmobile	T. H. Randall
Richmond, Ind.	Pilot	McConaha Co.
Rochester, N. Y.	Pilot	Almy Auto Co.
San Antonio, Tex.	Imperial	Dickinson & Stark
San Francisco, Cal.	McFarlan	Benton Auto Co.
San Francisco, Cal.	Pilot	Henry Hagensen
Shelton, Neb.	Hupmobile	O. R. Winsett
Sheridan, Mo.	Empire	M. Long
South Bend, Ind.	R-C-H	E. H. Rambo
South Boston, Mass.	Pilot	T. H. White
South Manchester, Conn.	Pilot	P. G. Ferris
Springfield, Mass.	Buick	Springfield Buick Co.
St. Louis, Mo.	Davis	Meyers-Busch Motor Car Co.
St. Paul, Minn.	Nyberg	F. J. Beaurline
Toledo, O.	Pilot	G. H. Fisher
Torrington, Conn.	Pilot	J. E. Mallette
Troy, N. Y.	Pilot	J. J. O'Hare
Washington, D. C.	Chandler	Miller Co.
White Plains, N. Y.	Pilot	F. H. Briggs

COMMERCIAL VEHICLES

Place	Car	Agent
Boston, Mass.	Stewart	Harris & Sons
Indianapolis, Ind.	Commerce	Sterling Motor Car Co.
St. Paul, Minn.	Sternberg	E. F. Morgan

Automobile Tire Station Opened—A tire salesroom and repair shop known as the Auto Tire Station has been opened at 9 Park street.

To Build Birmingham Garage—The contract has been let for the erection of a garage for the Birmingham Motor Co., Birmingham, Ala.

Krit Philadelphia Agency Moves—The Philadelphia, Pa., branch of the Krit Motor Car Co. has moved to larger quarters at 256 North Broad street.

Buys Out Business—Arthur H. Chandler has purchased the garage business of David Brown, Jr., at Plymouth, Mass., and will continue it on a larger sacle.

Supply Station Established—An adjustment depot, supply station and office have been opened at 107 Albany avenue by the B. F. Goodrich Co., at Hartford, Conn.

Miller Heads Alco Sales—E. Spencer Miller has been placed in charge of sales of Alco pleasure cars at the Philadelphia, Pa., branch of the American Locomotive Co.

Decker Penn Sales Manager—G. W. Decker, for several years the general manager of the Erie Rubber Co., is now the sales manager of the Penn Auto Co., Erie, Pa.

Russell Establishes Taxicab Line—W. E. Russell has established a taxicab and transportation line at Fond du Lac, Wis., and will soon be in the market for additional cars.

LaCrosse Dealers Association Formed—Fifteen motor-car dealers of LaCrosse, Wis., have banded together for mutual benefit and organized the LaCrosse County Automobile Dealers Assn.

Will Cost $50,000—The Packard Motor Car Co., Detroit, Mich., is erecting salesrooms and a service station in Milwaukee, Wis., which will cost $50,000. H. P. Robinson will be manager.

Back on the Job—C. T. Lawton has resumed the position of sales manager of the Bi-Motor Equipment Co., at Boston, Mass., after an absence of some months spent in developing the business elsewhere.

Has His Own Garage—A. E. Riggs, formerly with the Harvard garage in Cambridge, Mass., has just gone into business for himself and he has opened the Austin garage and repair shop at 139 Austin street.

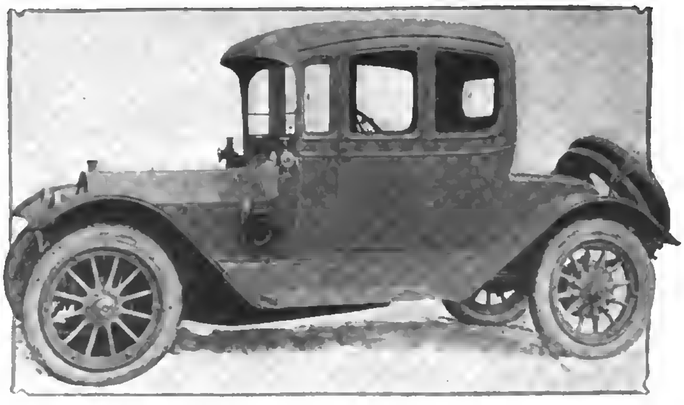
Continental Truck Moves—The Continental Motor Truck Co., Superior, Wis., has been obliged to move into larger quarters to cope with its growing business. The company has leased for a term of years the Carey building at Tower avenue and Nineteenth street.

Baltimore Wants More Automobiles—The purchase of two additional automobiles was authorized by the Baltimore, Md., board recently. One is to be bought by Building Inspector Stubbs and the other by Electrical Engineer Thomas. Each department is to get a Studeaker car at a cost not to exceed $1,290.

Harrisburg Automobile Field Growing—Automobiles have added forty-five buildings, worth about $45,000, to Harrisburgh, Pa., during the past year according to figures secured from the office of the building inspector. From April 1, 1912, until April 1, 1913, permits for the erection of garages valued anywhere from $50 to $20,000 have been issued.

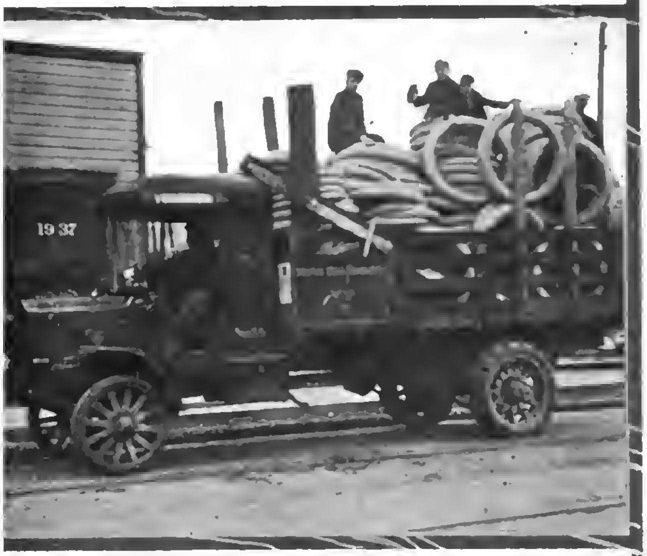
Receives Stewart Patrol Wagon—Delivery has been made in New Orleans, La., of a new motor-driven patrol wagon. The new car will accommodate eleven passengers. The car was furnished by the Stewart factory, Buffalo, N. Y.

Alterations Double Goodyear Space—Alterations now in progress will on completion provide nearly double the present space of the Hartford, Conn., branch of the Goodyear Tire & Rubber Co. An adjoining store formerly used by Kilby & Barrett, the Matheson representatives has been acquired.



Locomobile coupé mounted on little six chassis, adapted from the seven-passenger Berline. Shows close adherence to the current foreign style, which for this year presents all closed car with roof lines unbroken by dormer effects and with no angular breaks at the sides or back. All windows may be readily lowered, giving the advantages of an open car in warm weather

Typical scene in Dayton, O., during the flood, showing house which has been set loose from its foundation



Tires were donated liberally for relief work cars during the flood which recently devastated Dayton, O.

Another use to which the Packard truck was applied during the Dayton flood. Carting away dead animals

Firestone Tire Moves—The Firestone Tire & Rubber Co. has just moved into a new fireproof garage on West Central street, Boston, Mass., 55 by 90 feet.

Hotel Garage Now—F. W. Trowbridge, proprietor of the Knox House at Thomaston, Me., has just bought the Stackpole buildings on Green street which he will convert into a garage to run in connection with his hotel.

With Republic Company—H. E. Parent, formerly in charge of the repair department of the Cadillac agency in Boston, Mass., has resigned to take a similar position with the Republic Motor Co. there, that handles the Chevrolet Six and the Little car.

Harris Goodrich Washington Manager—F. L. Harris has been appointed manager of the Goodrich tire branch in Washington, D. C., succeeding B. A. Thurin, who has been transferred to the Goodrich factory. Mr. Thurin is to be appointed the Goodrich manager in one of the Middle West cities within the next few weeks.

New Salesroom Opened—The Myer Abrams Co., agent for the Lauth Juergens trucks, has turned a portion of its store on Portland street, Boston, Mass., into a salesroom for trucks and it has two machines there now. The reconstruction of its service station in Cambridge, on Vassar street, that was destroyed by fire a few weeks ago, has been finished and the company is now occupying it again.

Bowman Assistant Sales Manager—F. P. Bowman, formerly Eastern sales manager of the Schacht Motor Car Co., Cincinnati, O., has become assistant sales manager for the Norwalk Motor Car Co., Martinsburg, W. Va., with headquarters at Chicago, Ill., and will have charge of the sales in the States of Ohio, Indiana, Illinois, Minnesota, Michigan, Iowa, Kentucky and Wisconsin.

Automobile Incorporations

AUTOMOBILES AND PARTS

Berlin, Conn.—Berlin Auto Co.; capital, $25,000; to deal in automobiles. Incorporators: J. C. Lincoln, R. O. Clark, E. G. Robbins.

Boston, Mass.—M. B. M. Motor Co.; capital, $30,000; to deal in automobiles. Incorporators: G. W. Bollinger, E. H. Marsters, C. A. Malley.

Boston, Mass.—Curtis Motor Repair Co.; capital, $2,000; to deal and repair in automobiles. Incorporators: G. E. Crampton, A. W. Crampton, R. W. Curtis.

Buffalo, N. Y.—Ivey Motor Truck Co.; capital, $10,000; to deal in motor engines, etc. Incorporators: C. A. Ivey, A. L. Rusling, F. S. Heller.

Chicago, Ill.—Haynes Motor Car Co.; to deal in automobiles. Incorporators: A. E. Starbuck, Webb Jay, A. G. Seiberling.

Cleveland, O.—Standard Tire & Repair Co.; capital, $10,000; to deal in and repair self-propelled vebicles, machinery, etc. Incorporators: G. G. Moisey, O. A. Erb, L. T. Fay, R. F. Moisey, F. V. Brady.

Cleveland, O.—Krit Motor Sales Co.; capital, $10,000; to deal in automobiles. Incorporators: R. Scott Smith, C. A. Smith, M. A. Sell, C. B. Tenpler, D. Hakes.

Datroit, Mich.—Gilmore Motor Mfg. Co.; eapital, $35,000; to manufacture motors. Incorporators: George Gilmore, M. A. Sbaw.

Lowall, Mass.—Lowell Buick Co.; capital, $15,000; to deal in automobiles. Incorporators: F. B. Emerson, M. W. Hale, Jr., D. D. O'Dea.

Montraal, Que.—Canadian Drednot Motor Trucks, Ltd.; capital, $250,000; to deal in motor trucks.

Newask, N. J.—Smitb Motor Car Co.; capital, $25,000; general automobile business. Incorporators: J. L. Smith, L. W. Smith, J. W. Mason.

Naw Yoak City—Indiana Motor Truck Sales Co.; capital, $10,000: to manufacture and repair automobiles. Incorporators: W. A. Schwarzkoff, Rosalind Lovy, L. C. Knoegel.

New York City—Still's Automobile & Accessories Co.; eapital, $10,000; to deal in automobiles and accessories. Incorporators: J. H. Still, G. M. Still, G. E. Still.

Poatland, Oar.—Oregon Motor Car Co.; capital, $10,000; to deal in automobiles. Incorporators: E. R. Winchell, Robert Tucker, F. F. Griggsby.

Poatland, Ore.—Ford Taxicab Corp.; capital, $100,000; to manufacture, sell and deal in automobiles. Incorporators: N. R. Dexter, J. B. Reed.

Toledo, O.—Stewart Auto Sales Co.; capital, $10,000; to deal in automobiles. Incorporators: J. A. McMichael, L. E. Flory, E. A. Hudson, J. H. Baumgardner, J. W. Lane.

Yonkers, N. Y.—Yonkers Auto Renting Co.; capital, $3,000; to rent automobiles. Incorporators: William Lowa, Jr., Carl Lowa, Carolyn Lowa.

Naw York City—Normal Automobile Station; capital, $10,000; to carry on a garage business. Incorporators: J. F. Bokelman, A. Bokelman, Edward Gantner.

New Yoak City—Cox's Pneumatic Cushion Co.; capital, $1,000; to manufacture rubber goods and devices used by automobiles. Incorporators: C. H. Cox, Henry Seibel, F. R. Hoopes.

New York City—Allied Motor Accessories Co.; capital, $10,000; to deal in accessories. Incorporators: Annie Minford, G. X. Melbourne, A. K. Harroun.

New York City—Paul's Used & Rebuilt Auto Co.; capital, $5,000; to repair automobiles. Incorporators: G. W. Miller, August Paul, Jr., Albert Sigel.

New York City—National Tissue Advertising and Novelty Co.; capital, $50,000; to deal in automobile tires, axles and other patented articles. Incorporators: Josepb Berkowitz, Eugene N. Sanctuary, C. D. Stillman.

New Yoak City—East Side Auto Co.; capital, $3,000; to earry on a garage business. Incorporators: Morris Eder, Morris Levine, Bertha Levine, Joseph Truck.

Creditors Receive Checks—Creditors of the Flanders Mfg. Co., Pontiac, Mich., received on April 16 checks from the Detroit Trust Co., receiver for the Flanders concern, for 25 per cent of their claims.

Lasher Advertising Manager—H. P. Lasher, formerly with the Beckwith Advertising Agency, Detroit, Mich., has taken the position of automobile advertising manager of the Philadelphia, Pa., Press.

Robartes and King Transferred—F. W. Robartes, manager, and E. W. King, assistant manager, of the Locomobile branch in Washington, D. C., have been transferred to the Locomobile branch in Atlanta, Ga.

Springer President Insurance Company—W. H. Springer is president of the Auto Mutual Insurance Co., Omaha, Neb. This concern is based on the Ohio plan, insuring members against liability from fire or theft.

Blakely with Tribune—H. H. Blakely, former assistant purchasing agent for the Abbott Motor Co., Detroit, Mich., and previous to that holding a similar connection with the R-C-H Corp., Detroit, has been made purchasing agent for the Tribune Motor Co., that city.

Garage Changes Hands—The garage business conducted at Great Barrington, Mass., for the past 2 years has been sold by George M. Bullock, its proprietor, to Elton S. Jones of Riverton, Conn. It is one of the largest garages in the western part of Massachusetts.

Open Repair Shop—Fred Leonhardt and G. A. Woodward have opened a repair shop under the firm name of Leonhardt & Woodward at Toledo, O. The plant has been well equipped with machinery and appliances to handle the repair work and adjustments on all makes of automobiles.

At the Dayton Electric Laboratory Co., Dayton, O., after the flood. Donkey engine and fire engine pumping

Effect on Dayton property of the flood. Steel tank left in the street. Note condition of street

Relief work with a Speedwell. This car was courier for the military authorities between Dayton and Miamisburg

Automobile Incorporations

SCHENECTADY, N. Y.—Tri-City Auto Transit Co.; capital, $5,000; to carry on an automobile bus line. Incorporators: W. L. Coolidge, Bert Carl, J. R. Parker.

WORTHAM, TEX.—Wheatham Auto Supply Co.; capital, $600; to deal in accessories. Incorporators: A. N. Weaver, Roy Simmons, K. W. Sneed.

CHANGES OF NAME AND CAPITAL

LOS ANGELES, CAL.—Brown-Symonds Co.; change of name to the Walter M. Brown Co.

SAN ANTONIO, TEX.—San Antonio Auto Club House Co.; capital increased to $20,000.

TOLEDO, O.—Rapp Mfg. Co.; change of name to the Toledo Spark Plug Mfg. Co.

GARAGE AND ACCESSORIES

BROOKLYN, N. Y.—Haslup Brass Mfg. Co.; capital, $25,000; to deal in hardware, automobile accessories, etc. Incorporators: E. W. Haslup, F. D. Glover, Joseph Scholl.

BROOKLYN, N. Y.—Self-Generating Motor Co.; capital, $250,000; to deal in automobile appliances. Incorporators: O. G. Holzhausen, R. T. Maul, H. B. Wood.

BROOKLYN, N. Y.—Sumner Garage and Sales Co.; capital, $5,000; to repair automobiles. Incorporators: R. W. Katban, C. J. Gillem, E. H. Schmidt.

CHICAGO, ILL.—Specialty Sales & Mfg. Co.; capital, $5,000; to manufacture automobile and motor-cycle accessories. Incorporator: William Klein.

COLUMBIANA, O.—The Columbia Rubber Co.; capital, $100,000; to manufacture and deal in crude rubber and automobile tires and supplies. Incorporators: E. L. Henderson, A. E. Albright, H. J. Richards, J. H. Richards, T. Price.

DETROIT, MICH.—Crescent Co.; capital, $200,000; to manufacture automobile starting devices. Incorporators: H. H. Potter, F. W. Owen.

EAST PALESTINE, O.—McGraw Tire & Rubber Co.; capital, $1,000,000; to manufacture and deal in rubber tires and rubber goods and materials and products of every kind and automobile and motor vehicle accessories. Incorporators: J. C. Chaplin, C. H. Bolton, J. S. Wilson, George Flaccus, E. G. McGraw, L. H. McGraw, John Morgan, R. F. Taggart, R. B. Taggart, J. C. Chamberlin, H. C. Fraser, C. L. Merwin.

KANSAS CITY, MO.—Liquid Tire Co.; capital, $125,000; to manufacture a tire filler. Incorporators: C. S. Wright, G. L. Schofield, C. W. Prewett.

LORAIN, O.—Troike Muffler and Mfg. Co.; capital, $20,000; to manufacture mufflers for gas and gasoline engines. Incorporators: Ernst Troike, Paul Troike, George L. Deeher, G. L. Clitsch, A. H. Babcock.

LOUISVILLE, KY.—Mindease Co.; capital, $100,000; to manufacture and distribute Mindease, a composition of chemicals and ingredients, as a substitute for air in tires. Incorporators: M. J. Hickey, W. C. Broh, T. A. Peake.

MARION, O.—Marion Punctureseal Co.; capital, $5,000; to manufacture and deal in a substance for mending rubber tubing. Incorporators: S. J. Martin, F. P. Beck, I. C. Millison, J. B. Gunder, C. C. Miller.

MOUNT VERNON, N. Y.—Mount Vernon Co-Operative Garage Co.; capital, $3,000; to carry on a general garage business. Incorporators: Martin Lifgren, Robert Jacobsen, Lucy Jacobsen.

MOUNT VERNON, N. Y.—Brennan's Auto Garage; capital, $2,000; to carry on a garage business. Incorporators: A. J. Brennan, C. F. Renning, W. C. Clark.

NEW YORK CITY—Peerless Tire Co.; capital, $15,000; to manufacture automobile tires. Incorporators: Michael Schiavone, Louis Schiavone, Antonio Caropreso.

Automobile  Patents

SHOCK Absorber Construction—In which an air-bag between the axle and the body assists the spring suspension in absorbing the effects of road inequalities.

Fig. 1 shows the subject matter of this patent, a shock absorber, which consists principally of an air-bag A placed on the axle of an automobile. A cross-bar C engages the air-bag and presses it against the axle when it is moved. By means of members M the cross-bar C is connected with the body of the car in such a manner that the bag A must absorb shocks which tend to be transmitted from the axle to the body. A rebound absorber R is in place near each end of the cross-bar C, consisting of a piston connected with C through M and moved by it. A cylinder is provided for each of the pistons to work in, being open to the atmosphere at one end. A valve is arranged at the opposite end of each cylinder, this valve being formed with a vent and adapted to open freely when the piston is moved in one direction and to close in response to opposite movement of the piston, the only possible escapeway for the air being through the vent.

No. 1,058,253—to Thomas J. Mullen and Thomas F. Brennan, New Brighton, N. Y. Granted April 8, 1913; filed July 19, 1911.

Tire Tube and Signal—Consisting of an inflation valve and a sound signal which is operated when the air pressure in the inner tube falls to a certain point.

The device described in this patent is seen in Fig. 2. It consists of a pneumatic tire and a rim for carrying the same. A tube T extends radially through the rim and communicates with the interior of the tire. A plunger P extending through the tube is movable longitudinally through it. Means are provided for rendering the plunger airtight with relation to the tube T. The plunger carries a valve V to prevent the escaping of air when the latter is forced into the tire through the plunger. The plunger also carries a signaling device acting when the tire is deflated to a certain degree.

No. 1,058,571—John Emerson Featherston, Valley City, N. D. Granted April 8, 1913; filed September 27, 1912.

Tire-Deflating Tool—Being in place in the inflation-valve tube and operable from outside by pressure upon an arm.

In Fig. 3 the tire-deflating tool described in this patent is illustrated. This tool consists of a pair of spring-tensioned jaws J which are pivoted together and end in handles so formed as to be able to clamp the threaded extension E of a valve casing of a pneumatic tire. The jaws J have threaded linings of a material softer than the valve substance, insuring the firm gripping action of the jaws on the casing. One of the jaws has an aperture A in which the angular end of a spring arm S is secured, its free portion terminating into an offset extension O formed with threads. A socket member T is threaded to the extension O to receive an extension stem W of a valve in the casing mentioned, thereby holding the valve unseated. An eye-loop L is secured to one of the jaws for guiding the arm S. When the latter's angular end which protrudes through A is depressed, the valve is unseated, permitting the inflating air to escape.

No. 1,058,557—to Michael Lewis Connor, Pony, Mont. Granted April 8, 1913; filed September 12, 1912.

Automobile Shock Absorber—In which the main springs are assisted in their action by a cross spring and a cushion between the latter and the body.

In this shock absorber, Fig. 4, the main springs S are combined with a cross spring T connected to it by universal-joint means which consist of a pair of pivotally connected links at each end of T; the upper links hang from the ends of S and are movable in the planes of these springs, while the lower links are connected to the spring T and are movable in its plane. A cushion element C bearing against the car frame assists the springs and a shock-transmitting element E works between C and T; E consists of a transverse spring bar which is secured at its center to T and is connected at its ends by the car frame by means of links.

No. 1,058,413—to Walter H. Cook, New Orleans, La. Granted April 8, 1913; filed September 10, 1912.

Automobile Muffler—Consisting of a conico-helically formed exhaust pipe.

This muffler, Fig. 5, comprises a cone-shaped discharging chamber open at its base, so as to form an ejecting mouth larger than the area of cross section of the exhaust duct connected to its inlet. A receiving chamber has an ejecting mouth which opens axially into the apex of the discharging chamber mentioned, and an exhaust pipe P which is coiled conico-helically to form the curved inclosing wall of the discharging chamber. The exhaust duct communicates with the receiving chamber so as to discharge the gases tangentially into the same.

No. 1,058,393—to Louis Vaughan, Blair, Neb. Granted April 8, 1913; filed August 14, 1911.

Air-through-Fuel Carbureter—In which the air is forced through the gasoline in a variable number of streams.

This carbureter consists of a carbureting chamber to which liquid fuel may be supplied, in combination with means for driving a number of air streams into the fuel. The chamber has an outlet duct or chamber for receiving the mixture so produced in the carbureting chamber. An obstruction or mixer is interposed between the two chambers and a relief valve in the outlet duct forms also an auxiliary air valve.

No. 1,058,407—to William J. Candlish, Chicago, Ill. Granted April 8, 1913; filed March 6, 1908.

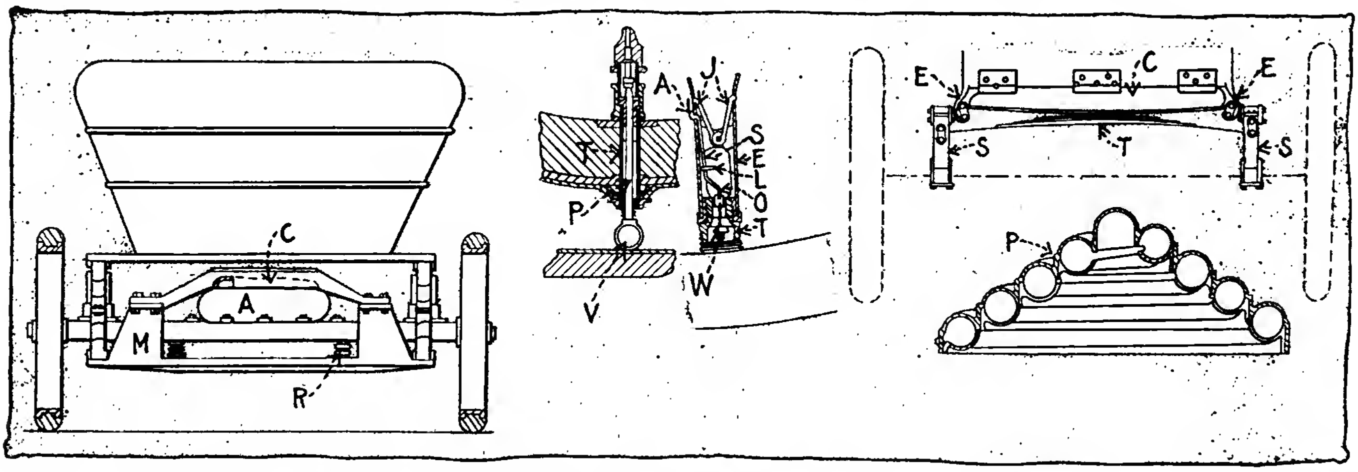


Fig. 1—Mullen-Brennan shock absorber. Fig. 2—Featherston tire-deflation signal. Fig. 3—Connor deflating tool. Fig. 4—Cook shock absorber. Fig. 5—Vaughan muffler

The Automobile

A Transcontinental Hodge-Podge

Part I

By Ernest L. Ferguson

A Photographic Story of Road Conditions from Chicago to California.

Between Windy City and Omaha Are Many Road Activities That Work for Good.

IT is 4,000 miles from New York to 'Frisco. Making this trip by automobile over the transcontinental highway you have six stages of travel. The first is New York to Chicago, 1,100 miles. This is so well known that it may best be described as a tale that is told.

From Chicago to the California line is the section of the transcontinental highway that everyone has more or less concern about. The California line is 300 miles from the Pacific Ocean, and when you once cross it the remaining run to the Pacific is a boulevard.

It is the 2,600 miles between Chicago and the California line that I want to describe with reference to road conditions.

For convenience it logically divides itself into four divisions: One, Chicago to Omaha, 550 miles; two, Omaha to Denver, 650 miles; three, Denver to Salt Lake City, 600 miles; four, Salt Lake City to the California line, 800 miles.

I purpose in this and three succeeding articles giving a close analysis of the various kinds of road building used over this 2,600 miles. This information was obtained during my transcontinental experiences last year on a truck which covered the route familiarly known as the transcontinental one. To be certain to understand this the following is the general itinerary: New York, Albany, Buffalo, Cleveland, Toledo, Chicago, Clinton, Cedar Rapids, Omaha, Kearney, North Platte, Sterling, Ft. Morgan, Denver, Cheyenne, Rawlins, Salt Lake City, Ogden, Wells, Eureka, Austin, Reno, Carson City, Sacramento, Stockton, Oakland and San Francisco.

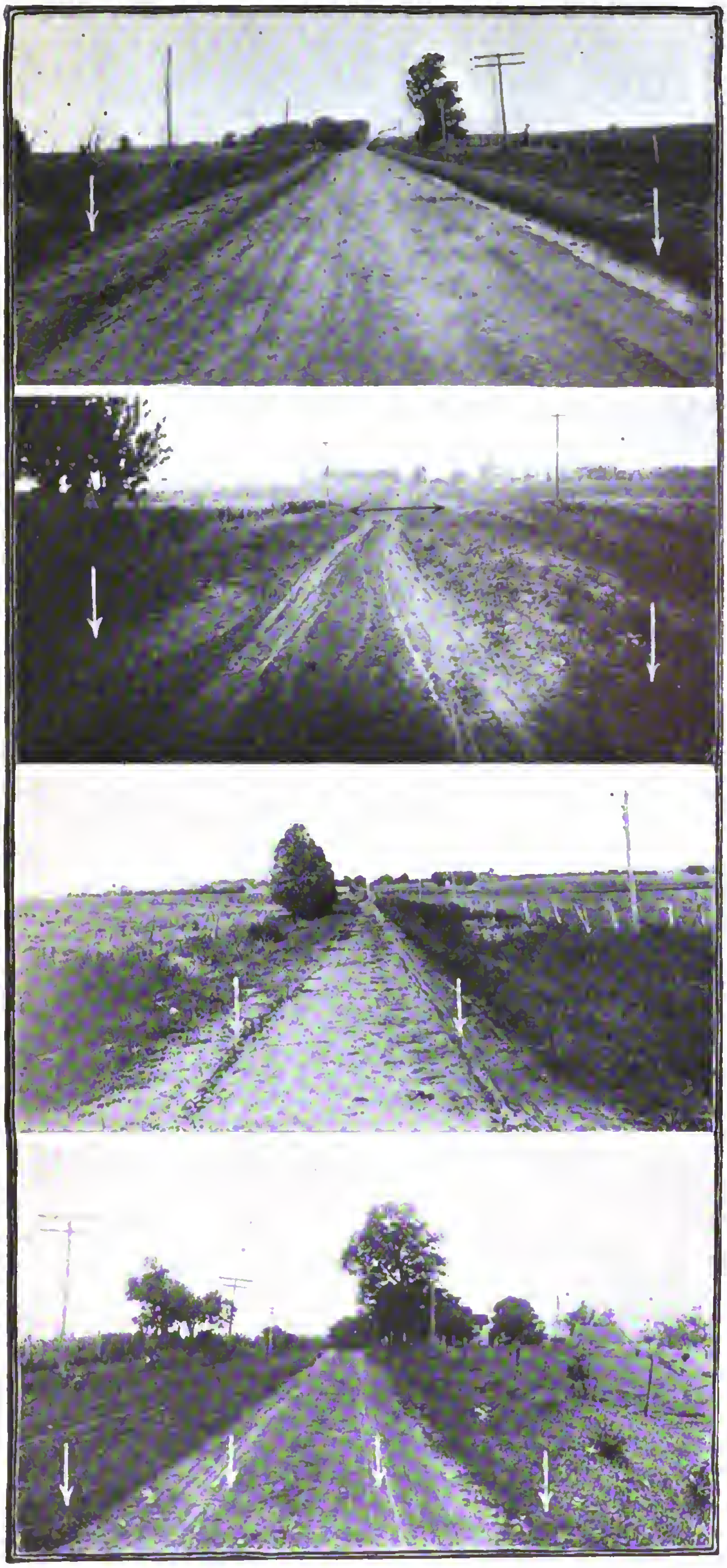
The photographic reproductions herewith are from photographs taken during the route, and which are especially intended to show the variety of roads met with. Those this week are of the roads from Chicago to Omaha, and the captions underneath them tell the variety of roadbuilding carried on in this 550 miles.

That there is necessity for increased transcontinental highway roadbuilding is more apparent to the Westerner than to the Easterner. From direct knowledge more than 300 touring cars made the trip last year over the route outlined. Twenty-five per cent. of this number I met between the Mississippi River and the Sierra Nevada Mountains.

All transcontinentalists do not follow this particular highway. Some prefer the Old Trails highway, some the Southern route, a few the Midland and some the Northern routes. All told, it is conservative to esti-

Upper—A finished macadam highway adjoining a loose stone roadway that has the material merely thrown on with a shovel. The soil underneath has been well crowned and side ditched, but no side retaining earth curb has been cut to hold the stone

Lower—A stone road recently resurfaced. Traffic has done most of the rolling to bind the stone. One rut starting to develop on right side



Top—Stone carelessly placed on top of a soil base. The only ditch is a narrow one on extreme left. All water drainage from the high field and bank on the right has to cross the road to get to ditch, wearing away the road surface.

Upper Middle—Sometime in the past the side banks of this dirt road were cut to fill in a hollow place (middle foreground), but the work was done in an aimless manner. The same effort and time would have given a graded roadway needing only occasional dragging. The general carelessness has forced travel into one line of meandering travel.

Lower Middle—Some years ago this roadbed was raised above the side levels by throwing the ditch excavations into the center. Later crushed stone was put on with a shovel. Traffic eventually depressed the stone, thus forming a ridge at each side of the one line of travel. The result is a trough that holds rain and melting snows.

Bottom—No side drainage. The stone roadway is of the usual spread-with-a-shovel type. Vegetation on each side prevents water from rapidly flowing away from surface.

mate that 500 motorists made the cross-country trip last year. This year the number will nearly double, and next year, with the exhibition at San Francisco, the number will undoubtedly reach well into the thousands.

Crossing the continent in an automobile always brings up two problems in the minds of the novice—one is the hotel facilities en route, and the other is the paraphernalia needed to extricate the car from bad places on the road. After making the trip you invariably find that you overestimated the bad road sections and underestimated the frequency and facilities of the hotels. Such paraphernalia as transcontinentalists have used they have found is sometimes needed in their home sections. The hotel situation en route is illustrated by the experience of a group of tourists which recently started out on the trip with an elaborate camping outfit and high priced chef. In desperation the party finally stopped outside of a town near California and used the combination in order that some returns could be had on the investment.

With malice toward none the criticisms made in this series so far as road and other conditions are from a mileage experience now nearing the 90,000 mark, over an itinerary embracing forty-five states of the Union, together with a considerable section of Canada and a dip into Mexico.

Now comes the Chicago-Omaha section, 550 miles. This is through two states—Illinois and Iowa—with the Mississippi the boundary line between them. The roads in these states make traveling hard.

Bad Roads in Illinois and Iowa

From Chicago to Omaha the route does not present the high quality of roadway conditions that is warranted in the states of Illinois and Iowa when we consider their wealth and their important manufacturing and agricultural communities.

The lack of suitable roadbuilding material is not a claim to be made for Illinois in excuse for its poor roads. In fact the rock removed in constructing the Chicago drainage canal, thousands of cords of which remain as placed at the time of construction, would serve as the foundation of a system of state highways for all northern Illinois.

In crossing the two states every quality of roadway is to be found. Starting at Chicago and its western suburbs, modern construction and upkeep of roads prevail for many miles. Later there are encountered stone roads of more or less quality, but varying in the method of using the crushed stone—lack of method would often be better terminology. The method has a characteristic seemingly peculiar to northern Illinois. This is to haul perfectly good road material onto the prairie roadway and there spread it, a shovel being the only tool used, and then let traffic do the rest.

Effect of Traffic on the Road

Traffic, however, does not let it rest; instead, it is constantly moving the material outwardly at the sides. Where there is side ditching or the stone has been piled as a blanket on the old roadway, or the roadway is higher than the grass sides—such as at fills if an attempt at grading has been made—two deep ruts are soon formed. These become water troughs with every rain and disintegration rapidly takes place.

Then there are long expanses where there is no side ditching, or where the stoneway is level with the grass sides. This latter sometimes comes from previous subgrading and sometimes from the heavier stone blanket, under the weight of traffic, sinking into softer soil. Also there will be found stretches where the stoneway has sunken below the grass sides. Under these circumstances the sides keep the entire surface flooded in rain periods and chuck holes rapidly develop.

Repairing methods, of any of these, generally consist of merely hauling on more crushed stone and usually of the finer sizes. As in the first making the only tool used is a hand shovel. The fresh supply is not only used to fill in the ruts of the first mentioned and the chuck holes of the second, but frequently enough more is added to resurface the entire width.

No attempt is made at binding, under any method, or are there any retaining edge-walls. Neither is there a determined contour, grading or packing, traffic alone being the only rolling-out that the stone receives. These conditions continue as an endless chain, but always with that same weak link and the consequent rapid breaking down of the so-called construction.

During the process of filling and resurfacing traffic is permitted. This at once crowds the new material away at the wheels and ruts are reformed in a few hours. Plus this the stoneway is generally so narrow that only one trackway is possible, thus augmenting the conditions of rut and other destructive penalties. This method, where it is used, is continued year after year and to the writer's knowledge, from direct experiences, has been going on for the past 20 years in some sections of northern Illinois. It can be safely asserted that enough money and crushed stone are and have been used, in the sections where this method prevails, to build a permanent and substantial highway from the lake to the river, together with many laterals.

Earth Roads Show No Care

Some earth road is traveled over and this carries the usual criticism that generally goes with that condition. Even where a measure of care is given, it is generally not of the comprehensive type and is then, at its best, not worthy the title. Even the King drag seems to be an unknown quantity despite its quality for just such sections; turning prairie soil into very good highways.

Through it all there prominently stands out that one big neglect which is constant in most road work not done by highway engineers—drainage, surface and side, and then more drainage. Very little side ditching is to be seen. Crowning on safe and sane lines is equally conspicuous by its absence. When the roadway has not two parallel water troughs, more generally known as wheel ruts, then it has one central water trough the entire width of the traveled portion. The cross-section top line is concave instead of convex.

Now look at Iowa: Crossing the State of Iowa in fair weather is delightful touring where the log-dragged roadway prevails.

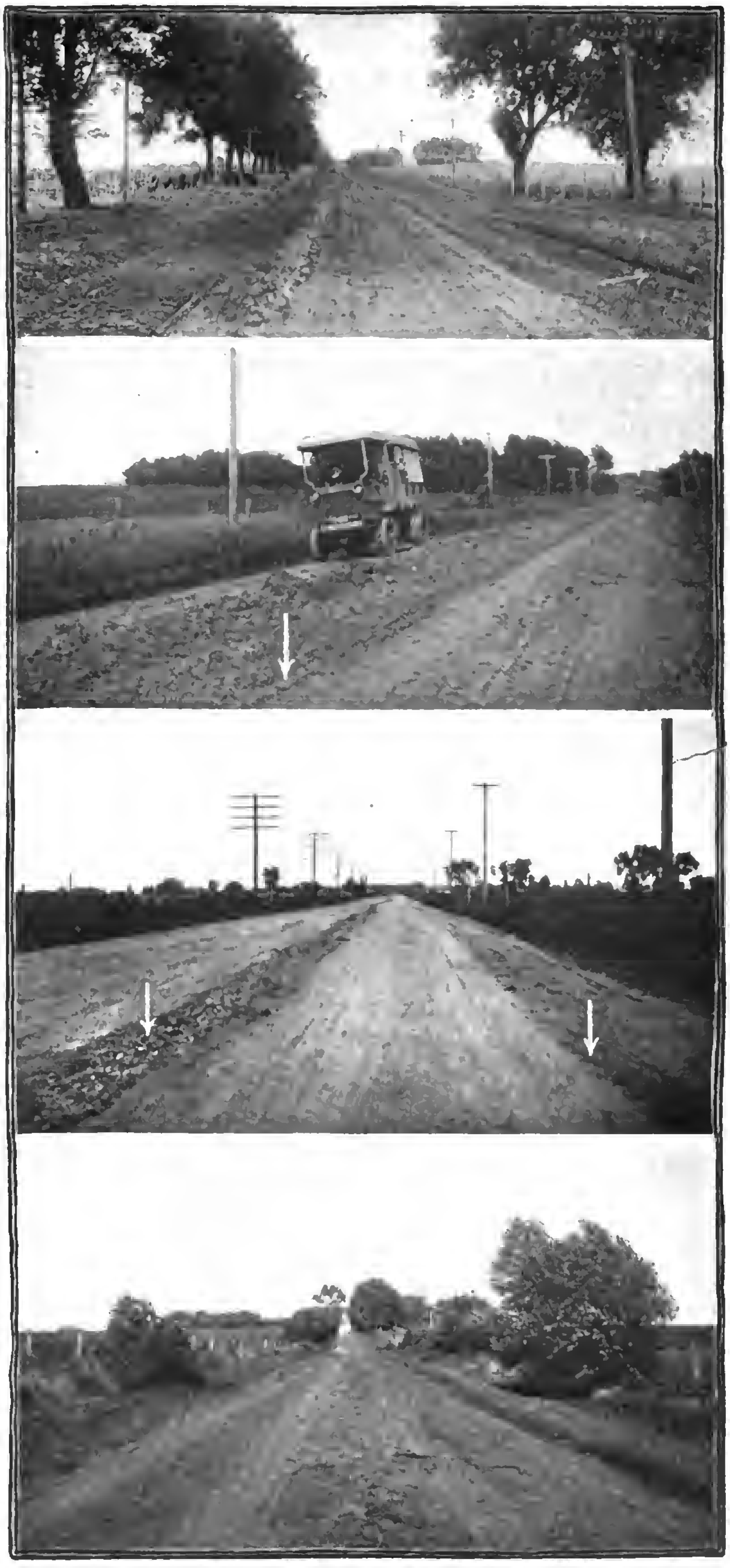
During a rain period it is always safer, when not obligatory, to abandon any attempt at further progress. This applies to nearly all of any route taken, with the obvious exceptions of in or near some of the larger cities.

Mutual road associations in the farming sections, throughout the state, are doing much excellent work to overcome the troubles that are inherent with Iowa's gumbo—clayey—roads. Dragging is the one and chief means used. Where intelligently applied this gives the contour of an engineered stone highway, with its reasonable crown and side drainage, thus taking care of rain precipitation within the limits of the soil.

Soil Limitation Delays Travel

It is this soil limitation that delays and at times suspends travel during and for a time after a heavy rainfall. The length of time varies in different localities. Where there is some grit, such as an admixture of disintegrated lime rock, travel can generally be resumed in from 1 to 3 hours, depending on the amount of precipitation. Where vegetable mold makes up the soil in entirety then the time of hang-up is extended by a large multiple.

However, it is to be understood that proper grading and immediate dragging after each rain does wonders and any analysis of the situation can only be approximate by just so much as either or both of these items of caretaking are applied. **Be it remembered that gumbo has the peculiar quality of quickly drying out from sun and wind. The rapidity with which the surface loses its slippery qualities depends almost entirely on the amount of previous dragging, combined with crowning and side drainage, and the least loss of time in redragging after the rain has ceased.**



Top—A loose stone roadway of many ruts and pockets. On the right there is some side drainage that is intermittent. At some time a crushed stone coating has been so carelessly put on that wheel traffic started zig-zag ruts.

Upper Middle—A wheel scraper has torn the vegetation and roots from each side, piling them into the center. The elements may some day flatten the center but only by washing it back to the sides. In the meantime two rut roads are formed in each side.

Lower Middle—The loose stone center gives a double highway not needed for the amount of traffic along here. The uncertainty of the earlier travel, when the surface material was first put on, as to what part of the extreme width to use, is well portrayed in the tortuous loose center of the background. Enough material has been used to give at least 50 per cent. more mileage at the same cost.

Bottom—Another instance of scraping the sides to the center. In the foreground are two soft earth (gumbo) roadways. In the center of the illustration the two converge and become a single roadway on the left of the scraped surface.

With this hill too much work has been put into widening the cut and not enough into reducing the grade. The grade is so stiff that local traffic cuts back and forth from side to side to relieve the horses, as shown by the various and curving ruts.

This is not a hill but a sharp cross ridge that has all the effect of a two-way grade. It will be noticed in the left foreground that a lot of labor has been expended without definite results. The same amount of work would have cut off the cross ridge, with consequent improved going in both directions.

A plain dirt road good only in dry periods. There are side drains but they are heavily grown with grass and weeds along the edges of the road prevent a quick discharge of surface water. Only little work has been put onto the road, but none of it lost in trying for overwidth. That it is wide enough is shown by the positions of the two vehicles, their separation being more than needed for safe driving.

One of the puzzling factors that forces itself upon the automobile tourist is the opposites encountered in the use and non-use of the King drag in adjoining sections of the state. You travel along on a natural soil road that is kept up to the minute by dragging. It is well crowned and side drained. Driving over it is a joy and a new delight in experiences to those who have only known macadam roads. It is wide enough for three or four teams and by virtue thereof there are no defined ruts of wheel or animal travel.

Old Methods Prevail in Country

Soon there is encountered a roadway that has marginal limits of enough width, but the old-time methods of country road making prevail. All the soil and growth along the sides has been placed in the center of the roadway. Here is always the constant condition of two parallel roads divided by a barrier and each showing all the ill effects of travel in one path.

As likely as not the next experience is with the highway well kept, by dragging, that immediately adjoins one that is the veriest frontier trail. This latter comes down to being just two ruts through the grass and weeds, often with a high bank on one or both sides and never with a side ditch. If the soil is gumbo this condition of roadway might have one advantage. During or after a rain one could travel along the grass sides, provided there were not frequent high banks or low sides.

South Has No Frosts to Fear

Not all natural roads in Iowa are gumbo or gritty clay. There is now and then found stretches of sand. With these, so far as experienced, little has been attempted in the art of bettering. To any who have motored over sand-clay roads of the Atlantic coast states, in the South, the thought comes, cannot a lesson be taken from them? The application of the query has to do with both the sand and the gumbo sections, so treacherously slippery from rain.

The usual answer given is that the South has no frosts of moment to contend with and that Iowa's deep frosts would mean an upheaval and general disturbance each spring. The reply may seem well based and fairly logical, but it can never be a perfect answer until the scheme of construction has been well tried. Even then not a definite answer could be rendered until a number of experiments had been conclusively tested.

Frost can only come from moisture and then in direct proportion to that moisture. Given a sand-clay construction with snow to cause moisture and assume frequent thawings to bring about the cause. First we must so proportion the sand and gumbo that the former will not be in large enough quantity to readily absorb the snow water. Next the roadway must be crowned to properly shed the results of the thawings. A further refinement could be inaugurated by blanketing, or roofing, the highway as is done in Massachusetts, with an oil binder. This would insure a rapid shedding of all moisture, rain or snow water, and prevent surface disintegration.

With either there must be side ditching of correct proportions to carry away the water that it may not, by standing, finally seep through the ditch sides and under the roadway there to freeze and cause an upheaval in the spring break-up. This might particularly occur at the sides of the newly made road section.

Slimy Quality of Gumbo

Whether or no a definite sand-clay construction is entered into it would be well worth the doing that a sandy section and a gumbo section exchange their superfluous quantities. Certainly the gumbo sections would be the gainers in rainy weather by just so much as they reduced the impassable slime surface of their roads by the admixture of grit used in their construction.

With it all there ought to be no let-up in the applied use of the log drag. It will continue to be the best means to keep the roadway in a most excellent condition by maintaining the surface of the mixture of sand and gumbo, whether the mixing is done as an engineering condition or as an impromptu affair.

No attempt of any kind ot road making; travel alone defines the roadway of two ruts divided by o grass center. In wet weather all the water from the high fields on the right crosses the road to the low fields on the left. The rank growth in the left foreground shows how long the water stands. During wet periods the road is more or less flooded and becomes passable only after long dry periods.

Abbott Strengthens Finances

DETROIT, MICH., April 23—*Special Telegram*—Negotiations which have been under way for some time are progressing very satisfactorily for the strengthening of the financial position of the Abbott Motor Co. by the taking in of some of the larger creditors as stockholders. This plan will provide additional working capital for the carrying on of the business. It is substantially a co-operative proposition whereby the assets are placed in a trust, and making the creditors amply secured. According to M. J. Hammers, general manager of the Abbott company, the concern has always been hampered by lack of working capital and the present scheme will remedy this difficulty. The concern is on a paying basis and at the present time marketing about 250 cars a month, orders coming in as they should although no definite statement of the new interests involved in the Abbott company has yet been made. The officers and present management will be left substantially the same under the new plan. The creditors taken in will of course be represented on the Board of Directors. With this trust agreement it is stated that the creditors will take practically no risk since it is a going concern.

A gumbo road just commencing to dry out two doys after a rain. On the extreme right and left are deep side droins, but the lock of crowning prevented the woter from running off as it fell, making heavy going in the meontime. The right hand side is yet miry. Travel on the left has squeezed out most of the moisture, at the same time forming deep ruts to hold the next roin. Travel will then keep to the right which has become sunbaked in the meantime. And so it goes.

This gumbo road hos been scraped and a slight attempt made at crowning, but has no side drains. Rain cannot readily run off and the surfoce becomes treacherous. Too much attention to width has not only cut down the work on the first making, but also presents quick dragging after rain

Receiver for Schacht

Creditors of Company Spring Surprise—Assets Exceed Liabilities by $400,000—Alleged Wrangle of Officers

CINCINNATI, O., April 21—After a wrangle between directors and stockholders, previous to which the participants of a stockholders' meeting had tried to put the business of the Schacht Motor Car Co., of this city, into the hands of a creditors' committee, Wallace M. Gray and Attorney Dwight Marfield filed suit in the Common Pleas Court asking for a receiver and a judgment for $10,000. John H. Miller, holding a note of $8,551.74, payable February 2, 1913, and notes aggregating $11,000 and payable February, 1914. Miller is also the indorser of a note for $20,000, due on April 9, 1913. Creditors demand payments of their claims and Miller alleges that differences which have arisen between the directors of the company indicate a possible squandering of the assets unless a receiver were named. Arthur Stem, secretary of the company, answered the petition. The suit was presented to Insolvency Judge Warner, who appointed John F. Deitz receiver, fixing his bond at $50,000.

While it was known for some time that the Schacht company was in difficulties, the action of the creditors came as a surprise. The recent floods made things worse for the company, tying up material to be received and shipped.

The capital of the company is $500,000, $350,000 preferred and $150,000 common stock. Of the preferred $314,000 has been issued, while $98,100 of common stock are outstanding. The real estate assets are about $136,000, but mortgaged to the extent of $110,000, while machinery and equipment on hand are worth $200,000; accounts amount to about $60,000, and notes to $6,000. Miller states, however, that a fair valuation shows the assets to exceed the liabilities by about $400,000.

Morgan Sued by Bryant Spring Remover

PROVIDENCE, R. I., April 19—Justice Brown, in the U. S. District Court here heard arguments in the case of the Bryant Spring Remover Co., New York City, against Bernard Morgan, of this city, alleging infringement of the complainant's patents and demanding an injunction. The court gave the parties 3 weeks in which to file briefs.

No Oral Hearings on Tariff Bill

WASHINGTON, D. C., April 19—That the Senate finance committee will not hear oral arguments on the Underwood tariff bill when the measure comes to the upper house of Congress is the admission made by Democratic leaders. The matter was debated at length in the Senate this week at which time many Republican senators declared they were in receipt of thousands of requests from manufacturers all over the country asking for permission to be heard on the tariff schedules. It is possible that the finance committee will permit manufacturers to file briefs, but this is doubted by close followers of the tariff measure.

To Sell Columbus Buggy Co. May 14

COLUMBUS, O., April 19—The Federal Court at Columbus has ordered the sale of all of the property of the Columbus Buggy Co., Columbus, O., May 14, excepting bills receivable and consigned goods. The property will be sold at public auction upon that date in four parcels known as A, B, C and D.

Parcel A consists of all real estate and leases both at Columbus and in Minneapolis, where a branch house was operated. The real estate in Columbus is on the tax duplicate at $218,000 and the upset price on this property is $100,000.

Parcel B consists of all machinery and merchandise, including equipment and plans, and the upset price is fixed at $75,000.

Parcel C consists of the Los Angeles branch, which is consigned goods only, and the upset price is fixed at $30,000. Reports show that this parcel has already been sold.

Parcel D consists of the San Francisco branch of consigned goods and the upset price is fixed at $6,000.

It is said the creditors' committee has completed arrangements for bidding in the property at the upset figures in case there are no other bidders. The plant on Dublin avenue is now in shape for operation and most of the damage caused by the recent flood has been repaired.

NEW YORK CITY, April 21—The Appellate Division of the Supreme Court here affirmed the decision of the court, in the case of Thomas Muller against the Pope-Hartford Auto Co., which was the local agent of the Pope Mfg. Co., at that time.

Fedders Incorporated with $400,000

BUFFALO, N. Y., April 23—*Special Telegram*—The Fedders Mfg. Co., Inc., filed papers of incorporation yesterday. It will manufacture automobile radiators and other sheet metal products. The officers of the company are: Theodore C., Christian W., John M. and Louis F. Fedders of this city.

AKRON, O., April 19—Another reduction of truck tire prices took place during this week, when the Goodyear Tire & Rubber Co., announced a 10 per cent. cut on the quotations of its commercial tires. This is the second reduction of this nature during 1913, the first having taken place at the time of the National shows.

Automobile Securities Quotations

The general tone of the market for the past week was steady. Only fifteen quotations showed any difference at the end of the week as compared with last week, while twenty-eight maintained their level. The biggest change for the week is to be found in Goodyear common which jumped 30 points. Next to this is Firestone common which is 10 points higher on the bid price and 15 on the asked. Pope preferred dropped 7 points and the common dropped 3. The rubber stocks continue to be the most variable but are exceedingly steady in these as compared to conditions during the recent strike. Swinehart gained 4 points during the week while Fisk and U. S. Rubber each fell off 2 points.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	150	165
Ajax-Grieb Rubber Co., pfd	..	..	93	99
Aluminum Castings, pfd	..	..	98	100
American Locomotive Co., com	43¼	44	36	37
American Locomotive Co., pfd	108½	108¾	103	104
Chalmers Motor Company, com	..	..	125	132
Chalmers Motor Company, pfd	..	..	98	102
Consolidated Rubber Tire Co., com	11	20	17	19
Consolidated Rubber Tire Co., pfd	20	40	60	75
Firestone Tire & Rubber Co., com	258	262	275	285
Firestone Tire & Rubber Co., pfd	108	110	104	106
Fisk Rubber Co., com	..	..	..	..
Fisk Rubber Co., pfd	..	..	..	100
Garford Company, preferred	..	..	99	100½
General Motors Company, com	35½	36	26	27
General Motors Company, pfd	74	74½	73	74½
B. F. Goodrich Company, com	..	..	34½	35½
B. F. Goodrich Company, pfd	..	..	95	98
Goodyear Tire & Rubber Co., com	238	241	330	340
Goodyear Tire & Rubber Co., pfd	108	110	100	101½
Hayes Manufacturing Co	..	..	..	90
International Motor Co., com	..	..	5	10
International Motor Co., pfd	..	..	25	40
Lozier Motor Company	..	..	..	30
Miller Rubber Company	..	..	160	170
Packard Motor Company	104	107	98	103
Peerless Motor Company, com	..	..	35	45
Peerless Motor Company, pfd	..	..	95	100
Pope Manufacturing Co., com	35	38	16½	18½
Pope Manufacturing Co., pfd	75	78	55	58
Reo Motor Truck Company	8	10	11¾	12¼
Reo Motor Car Company	23	25	21	22
Rubber Goods Mfg. Co., pfd	100	105	100	105
Studebaker Company, com	..	..	28	30
Studebaker Company, pfd	..	..	89	93
Swinehart Tire Company	..	..	92	95
Maxwell Motor Co., com	..	..	5	8
Maxwell Motor Co., 1st pfd	..	..	50	70
Maxwell Motor Co., 2nd pfd	..	..	20	30
U. S. Rubber Co., com	56	56½	64	64½
U. S. Rubber Co., 1st pfd	113	113½	105	106½
White Company, preferred	..	..	107½	109
Willys-Overland Co., com	..	..	62	68
Willys-Overland Co., pfd	..	..	90	96
Portage Rubber Co., com	..	..	38	42
Portage Rubber Co., pfd	..	..	90	94

One Thousand Cars a Day

Detroit Manufacturers Ship Over 250 Freight Carloads of Automobiles Daily —Dealers Plan National Organization

DETROIT, MICH., April 19—Detroit manufacturers are shipping from 250 to 300 freight carloads of automobiles per day at the present time. This is the busiest shipping season of the year and the output shows a material increase over January and February shipments. During January some 20,000 automobiles were sent out, while for February somewhere in the neighborhood of 25,000 were shipped.

It is rather difficult to arrive at an average for the number of automobiles contained in each freight car, but, considering both large and small machines, the average number per freight car is about four. On this basis the probable daily output now runs from 1,000 to 1,200 machines.

If the present rate of shipment were continued throughout the month, April would show a total in the neighborhood of 30,000 machines going out to meet the world's demands from the center of the industry. But greater daily shipments are expected, and doubtless the figure will run close to 40,000.

So far, railroads and the Detroit office of the National Association of Automobile Manufacturers' Traffic Bureau have been able to supply the freight cars necessary for the automobile shipments, and while a few weeks ago it was thought that a freight car famine was imminent, the present rolling stock supply appears to be able to take care of the situation.

It seems to be the general sentiment of the manufacturers and also of the railroads that there will be no shortage this year after all. The Detroit Traffic Office is receiving the hearty co-operation of the car makers and its records show that through its efforts the freight cars are being returned to this territory after taking the automobiles to their destinations.

Plan National Dealers' Organization

NEW YORK CITY, April 20—An informal meeting of motor car and accessories dealers was held in this city today for the purpose of discussing the advisability of a national dealers' association to look after the best interests of motor car and supply dealers throughout the country. It was a general consensus of opinion that such an organization would be of inestimable value and it was definitely decided to take up the matter of such an organization with dealers in all sections of the country. Providing there is a satisfactory response it is purposed to call a meeting in Indianapolis, on Thursday, May 29, the day previous to the 500-mile race at which dealers from all parts of the country would attend and discuss ways and means of perfecting such an organization. Frederick H. Elliott, who has been connected with organization work with the American Automobile Association and the Touring Club of America, is working up the plans for the May meeting. He has already taken it up with many dealers' organizations and has met with favorable reports from practically every section of the country.

Such an organization would have a wide field of activity which would include a system of credits, the regulations of local shows and scores of other problems which the dealer is confronted with.

McCue Co. Adds $300,000 in Reorganization

BUFFALO, N. Y., April 21—The McCue Co., Buffalo, N. Y., completed a reorganization and a refinancing last week, adding $300,000 in cash for working capital.

The following prominent business men of Buffalo have been added to the directorate: Ralph Plumb, vice-president and general manager of the Buffalo Bolt & Nut Co.; R. G. Wright, president of the Reed Mfg. Co., Erie, Pa.; Samuel Ellis, of the Manufacturers' & Traders' Bank, Buffalo, and Edward McM. Mills, of the law firm of Rogers, Locke & Babcock.

These four gentlemen, together with C. T. McCue, form the directorate. The officers elected are: C. T. McCue, president: Ralph Plumb, vice-president; Samuel Ellis, treasurer; Edward McM. Mills, secretary. C. H. McCullough, Jr., vice-president and general manager of the Lackawanna Steel Co., becomes one of the heaviest stockholders in the reorganization.

W. T. Evans was secured as production and general manager of the new company. Mr. Evans was formerly with the Metal Products Co., of Detroit., which concern he has managed since its inception.

Orders have gone forth for machinery and equipment sufficient to place the plant on a 1,000 wheels per day production capacity by the first day of August. Arrangements have been made at this writing to practically double the August capacity of 1,000 wheels within 3 or 4 months from that time.

CHICAGO, ILL., April 21—The Standard Oil Co. of Indiana announces that the trademark name for its new fuel will be Stanolind Motor Spirit, although it will be familiarly known as Motor Spirit. It was found that in England "motor spirits" is used to designate fuel, which prevents the use of the name here as a trademark.

RACINE, WIS., April 19—At the annual meeting of the board of directors of the J. I. Case T. M. Co., of Racine, Wis., the following officers were elected: President, Frank K. Bull; vice-president, Frederick Robinson; secretary, Richard T. Robinson; treasurer, F. Lee Norton.

NEW YORK CITY, April 22—Three companies have declared stock dividends during the past week. The Chicago Pneumatic Tool Co. will pay 1 per cent. on its common stock on April 25, the Russell Motor Car Co. will pay 1 3-4 per cent., the regular quarterly dividend, on May 1 and the Vacuum Oil Co., 3 per cent. payable on May 15; the last dividend declared by the Vacuum company was 3 per cent. paid on October 31, 1912.

Market Changes of the Week

MORE active trading pervaded the markets this week. Tin experienced a decline of $.18 per hundred pounds. The demand has decreased, speculative interest and dealers alike complaining of the extreme dullness. In the London market trading was of very fair volume, with closing cables reporting a net decline of $.30 on spot, and an advance of $.10 on futures. The copper markets are dull, and the demand of very small proportions. The great display of strength and predictions of further advances in copper appears to have been dissipated. Even the statement of a leading authority that consumption is surpassing production, and which is scouted in well informed circles, appears to be of non-effect. The lead market is firm and increasingly active for some days. Lead is calling at $4.35 per hundred pounds. Both the Pennsylvania and Kansas petroleum prices remained constant this week and firm. Pennsylvania calling at $2.50 per barrel and Kansas at $.88. Cottonseed oil rose $.12 per barrel. The consuming demand is very good. Lard oil rose $.01.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb....	.07⅝	.07⅝	.07⅝	.07⅝	.07⅝	.07⅝	....
Beams & Channels, per 100 lbs...	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Copper, Elec., lb..	.15½	.15½	.15⅝	.15⅝	.15⅝	.15⅝	+.00 1/10
Copper, Lake, lb.	.15⅝	.15⅝	.15¾	.15¾	.15¾	.15¾	+.00 1/40
Cottonseed Oil bbl........	6.95	7.00	7.08	7.09	7.07	7.07	+.12
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil, Menhaden, Brown.	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 gals......	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime.	.94	.94	.94	.94	.95	.95	+.01
Lead, 100 lbs...	4.35	4.35	4.35	4.35	4.35	4.35	....
Linseed Oil.....	.47	.47	.47	.47	.47	.47	....
Open-Hearth Steel, ton.....	29.00	29.00	29.00	29.00	29.00	29.00	....
Petroleum, bbl., Kansas, crude.	.88	.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa., crude.....	2.50	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	....
Silk, raw, Italy..	....	4.35	....	....	4.35	4.35	....
Silk, raw Japan..	....	3.75	....	....	3.75	3.80	+.05
Sulphuric Acid, 60 Baumé.....	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb......	49.63	50.00	50.05	50.05	49.50	49.45	—.18
Tire Scrap......	.10	.10	.10	.10	.10	.10	....

Massachusetts Motorists Score First Point

Prevent Senator Johnson from Recommitting Truck Bill

BOSTON, MASS., April 21—The committee representing the motor truck users and dealers, which has been working on the proposed legislation to increase the fees on commercial vehicles to $5 per ton, was successful yesterday in its first move in opposition to the measure when Senator Johnson, chairman of the committee on roads and bridges, moved in the Senate today to have the bill recommitted to his committee.

During the past few days the truck representatives have been very busy working up opposition since they learned that instead of the bill calling for $5 for 1 ton and $2.50 for each additional ton, that was agreed upon in conference with the highway commission, and later agreed upon before the legislative committee, had come out of that body to the Senate calling for $5 for every ton.

With practically but 1 day in which to secure signatures against the measure, the committee got more than 1,000 names from all classes of people from all over the state, and these petitions were brought to the state house today to be put in if the bill came up for consideration as it was scheduled. Meanwhile letters were sent to some of the members of the Senate calling their attention to the matter.

A committee, comprising President Day Baker, of the Electric Vehicle Club, and John B. Sullivan, Jr., counsel for the Boston Commercial Vehicle Dealers' Association, met the officers of the Central Labor Union Sunday and had a conference on the matter. The labor officials took the matter up and agreed to lend their opposition to the measure.

Today Mr. Baker, Mr. Sullivan, James B. Fortesque, of the Massachusetts State A. A., James T. Sullivan and G. S. Draper visited the state house and talked with some of the members of the Senate. Chairman Johnson then agreed to have the bill recommitted to the committee for a further hearing. He said that the hearing would be held either May 6 or 8, as the committee is going to make a tour of the western part of the state next week.

That was satisfactory to the truck representatives. It was then decided to call a meeting next Thursday of all those interested in the commercial industry at the Boston City Club at which plans will be made to attend the legislative hearing and give facts and figures to support the contention of the motor interests that the proposed legislation is a blow at the indusry.

The National Association of Automobile Manufacturers last week took a hand in the Massachusetts fight against increased taxing of commercial vehicles by circularizing the state with its resolutions, as follows:

"We are emphatically of opinion that the enactment of any legislation increasing taxation of commercial vehicles or imposing any restrictions other than present police regulations and existing general state automobile laws is unnecessary in the public interest and will retard the development of motor trucking and the growth of the motor truck industry.

"As other states have a habit of copying the legislation of Massachusetts and other Eastern States, a very dangerous and pernicious precedent will be established if these bills are allowed to become laws, and, as a result, years of agitation along this line throughout the country may confidently be expected.

"A critical situation confronts the motor truck industry at this time. Every legitimate means should be employed at once to forestall the entering wedge by preventing all objectionable legislation during the development stage of the industry.

"Any fee imposed on motor trucks in excess of the cost of registration as a police protective measure, is double taxation, class legislation and therefore unconstitutional.

"There have been 'wide-tire' laws in these states for years to limit the weight per inch of tire width but which never have been enforced. The motor truck should not be singled out now for attack and another law placed in the statutes to become a dead letter.

"No reliable information has been advanced to show that motor trucks, with their broad rubber tires, do any damage to streets and roads independently of other vehicles and in undue proportion.

"The proposed laws will tend to restrict commerce and industry by destroying part of the economic advantage of the commercial automobile.

"The greatest factor in the progress of the United States has been rapid and cheap transportation by rail and water; the next great forward step is quicker and cheaper transportation by highway.

"Obstacles placed in the way of the motor truck will prevent further reduction in the cost of haulage and delivery and tend to maintainn the high cost of living, thus affecting all the residents of the commonwealth.

"Economic conditions and commercial competition must eventually determine the capacity of motor trucks, which will be governed by the relative cost per ton mile of operation.

"Instead of putting sticks in the wheels of progress by limiting traffic to present road conditions, the roads and bridges should be improved to meet traffic conditions, just as the railroads after adopting heavier locomotives and larger cars to move greater tonnages in single trains, found it necessary and economical to reconstruct their road beds and tracks to bear the heavier traffic.

"Legislation that tends to decrease the demand for motor trucks and automobiles will affect adversely one of the largest and best industries of the country. Estimates based on the United States Census of 1910 show that more than 340,000 employees are engaged in the manufacture of motor vehicles and their parts today. Only 1.2 per cent. of these are under sixteen years of age, and only 1 per cent. are women. The rate of wages is unusually high in the trade, and working conditions are the best, most of the factories being of the newest and most approved construction, and the occupations healthful. An industry of this kind should be encouraged as much as possible for the benefit of the working people, instead of being discouraged by objectionable legislation."

Smoke Law Held Constitutional

CHICAGO, ILL., April 21—The Supreme Court of the State of Illinois on Saturday handed down a decision which upholds the constitutionality of the smoke law. There is nothing in the state code which enables the authorities to arrest drivers whose motors are emitting smoke. The city of Chicago passed such a law, but one of the municipal judges held that the city had no right to enact such a measure. Since that time the police have kept their hands off, but now that the Supreme Court has handed down its decision it is anticipated that the city law will be rigidlv enforced. The case was one against the Walden W. Shaw Co., operating taxicabs. The local liverymen, fighting the law, used Shaw for the test case.

South Dakota Has New Law

PIERRE, S. D., April 17—The new motor law for the state has some peculiar provisions which place the instrument in a class by itself. It becomes operative July 1. Applicants for automobile licenses must file registration blanks with the county treasurer, who is to file the applicatioos with the secretary of state, who will forward to the owner two license tags for each application, one to be displayed in front and one in the rear of the machine. Duplicates to replace lost tags may be obtained for $1 each.

The license fee from July 1 to December 31 is to be $3. Thereafter the annual fee shall be $6. After a vehicle shall have been licensed for 5 successive years, the fee is to be one-half the regular rate. Vehicles registered any time between July 1 and January 1, 1914, will cost the owner the full $3 each for tags.

Usual speed and signal requirements are included in the law, excess of 25 miles an hour being presumptive evidence of fast driving in case of an accident. When a passing animal is seriously frightened, the owner of the motor vehicle must stop his engine. Drivers must be more than 15 years old, unless accompanied by the automobile owner. A maximum of $500 or imprisonment of not more than 2 years is provided for first conviction on the charge of leaving an injured person without giving name and address, or in case a police officer is not there, or failing to report to a police or peace officer. Upon conviction a second time for this offense or of the misdemeanor of being intoxicated while driving, the charge is felony and the penalty is imprisonment from 1 to 5 years. Upon recommendation of the trial court, which must report all convictions, the secretary of state may revoke the license of the offender's car.

Kansas to Tax Automobiles

TOPEKA, KAN., April 19—The new Kansas automobile tax will yield about $120,000 a year for use on the rural highways of the state, according to the estimates of Secretary of State Charles H. Sessions. The law becomes effective July 1 next, and it is expected that most of the money will be in the hands of the county treasurers before that time. The tax amounts to $5 a year on automobiles. Of this amount the secretary of state, under whose direction the administration of the law is placed, receives 75 cents for the expenses of administration, providing number tags, etc., and the clerical work required in registering the machines.

There are about 26,000 automobiles in the state.

The tags will be ready for distribution June 1. Information required by the state upon which number plates will be furnished includes the name and address of the owner, the name, style, year of manufacture and horsepower of the machine licensed.

Twenty Entries for Indianapolis Contest

Mercedes-Knight and Mercer Team Latest to Enter

THERE are now twenty entries for the Indianapolis Speedway 500-mile Race May 30. The formal entry of three Mercer cars, with De Palma, Bragg and Wishart driving, has been received. An unexpected entry is that of a Mercedes-Knight made by E. C. Paterson, the Chicago sportsman, who entered the Mercedes driven by De Palma which won the Elgin National a year ago. The Mercedes-Knight, known as the Belgium Grand Prix racer of last year, will be driven by Pilette, the Belgian agent for this car, who is expected to leave Brussels early in May for America. The car is now being overhauled in the Mercedes plant.

The Mercer entry includes two cars of 447.9 cubic inches piston displacement with a bore and stroke of 4.8 by 6 3-16 inches, and one car of 299.7 cubic inches, with dimensions of 4.37 by 5. Caleb Bragg and Ralph De Palma will pilot the first two, while Spencer Wishart will handle the third. All of them carry four cylinders. The delay in the entry of the Mercer team was made necessary by the fact that the factory engineers first wanted to give the 447.9-inch motors a thorough try-out before definitely pinning their faith to them. The largest the Mercer people have raced heretofore have been cars of the 299.7 classification. This is the size Hughes piloted to a third in the Indianapolis race last year.

Valuable cash prizes have already been offered by the accessory people. The Bosch company has posted $1,000, $500 to the winner, $300 to second and $200 the third. The money being given conditional that Bosch magnetos are used.

The Hartford Suspension Co. have offered three prizes: $250 to the winner, $150 to second and $100 to third, conditional if they are fitted with Hartford shock-absorbers.

Homer & Motsinger has offered $1,000 each to every driver finishing inside the money with its carbureter.

SAVANNAH, GA., April 21—Entry blanks for the Grand Prix race have been put in the mails, and as soon as the blanks for the Vanderbilt Cup, and the other small races are approved by the A. A. A. these will be distributed. This year the numbers of the entrant in the different races will be determined by the order in which the entries are received. No. 1 entry running No. 1 in the race. Where more than one car is entered by the same concern they will not receive consecutive numbers.

CHICAGO, ILL., April 21—The Elgin Automobile Roadway Association has already begun work of improving the 8-mile circuit on which the Elgin National and other races will be handled August 29 and 30. One of the latest entries received is the Belgian Grand Prix Mercedes-Knight, entered by E. C. Paterson, of this city, whose entry won the National Trophy last year.

There is at present a total of eight entries in the Chicago-Boston non-stock reliability, June 25 to 29.

Official A. A. A. Reliability Itinerary

MINNEAPOLIS, MINN., April 21—The official itinerary for the A. A. A. national reliability tour from the Twin Cities to Glacier Park Station, Mont., issued by Chairman C. E. Dutton, of the touring board, showed a distance of 1,233 miles between those two points. Leaving Minneapolis on July 11, the next stop will be Alexandria, 144.4 miles. Starting out from here the next day the tourists will cover 123.8 miles, in all 268.2, reaching Fargo. On July 13, the next station will be Devil's Lake, about 66.5 miles. From here the tourists will start out on July 16 and go to Minot, averaging about 68.8 miles. Williston is to be the next stopping place after Minot, a mileage of about 89 miles, reaching this place on July 17. After Williston comes Glasgow, about 63.9 miles, which will be reached on July 18. Havre is the last town, about 98 miles from Glasgow, ending the tour on the 19th.

Louis W. Hill, chairman of the Board of the Great Northern Road, is planning a spectacular finish of the tour. He will have stationed on the mountain peaks along the picturesque Rocky range just back of the world's unique log hotel at Glacier Park station, a score of men who at a given signal will touch off tons of red, white and blue Roman fire. The striking illumination of the mountain scenery will be a spectacle without question the greatest thing in connection with the tour, with the possible exception of the reception by 3,000 Blackfeet Indians as the motorists enter the reservation. After driving days over the prairies, the last night of the tour at the entrance to the Rockies is expected to be an event long to be remembered.

Chicago Truck Run Abandoned

CHICAGO, ILL., April 21—The motor truck demonstration which the Chicago Motor Club undertook to promote for April 28-30 has been abandoned, it was announced today, because the concerns which handle the larger commercial vehicles were lukewarm on the proposition and the prospective entry list was not representative of the industry.

INDIANAPOLIS, IND., April 21—Members of the Indiana Automobile Manufacturers' Association met at the Claypool Hotel in Indianapolis on the evening of April 15 to discuss arrangements for the Indiana-Pacific Tour, which will start from Indianapolis July 1. There have been fifteen entries for the tour and many more are expected.

COLUMBUS, O., April 21—Because of the damaged condition of the bridges in many parts of Ohio and Indiana due to the recent floods the Ohio State Journal Reliability contest, which was scheduled for April 29 and 30 and May 1, has been postponed until June 16, 17 and 18. The route has also been changed owing to the flood and the tour will be from Columbus to Detroit, to Cleveland, to Akron and back to Columbus.

Many Dealers at Pittsburgh Show

PITTSBURGH, PA., April 19—The pleasure vehicle and commercial truck show which opened in the big East Liberty market building April 5 and which closed tonight has been in many respects one of the most successful shows ever held in Pittsburgh. It was put on by the Automobile Dealers' Association of Pittsburgh, Inc., of which W. N. Murray is president.

Dealers report an unusually large number of out-of-town agents were represented in the crowds.

The officials of the show gave out the following data:

The number of exhibits was 150. Individual pleasure cars displayed numbered 160 and trucks fifty.

Number of high-powered electric lights, 8,000.

Square feet of mirrors in chandeliers and set in lattice work, 500.

Square feet of lumber used as ground work for decorations, 75,000.

RACINE, WIS., April 21—Every motor car and motorcycle dealer in Racine County was represented in the 2-day motor show given under the auspices of Racine city dealers in Lakeside auditorium on April 18 and 19. It was the first motor show to be held in Racine, and the attendance was much larger than anticipated.

Ohio Senate vs. I.W.W.

Radical Practices Condemned—Strike Could Have Been Averted by Confabs

COLUMBUS, O., April 17—Condemnation of the teachings of the I. W. W. and criticisms of practices of employers in the rubber industry form the keynote of the report of the Ohio Senate investigating committee on the Akron strike. Sabotage, as taught by the Industrial Workers who conducted the strike, is declared by the committee to be alarming and dangerous and closely akin to anarchy. Criticism of the employers is concerned especially with the "speeding" of employees and with the air of aloofness maintained by employers toward their employees. The committee opines that if the rubber companies had been willing to confer with their employees at the beginning of the controversy the strike might have been averted.

The committee, comprising Senators Green, Seward and Howard, is unanimous in its findings, excepting only in reference to the tariff on manufactured rubber goods. The two Democrats on the committee hold that the present duty of 45 per cent. is prohibitive and should be greatly reduced. Senator Howard dissents from this.

The committee begins by commenting critically on the attitude of the employers originally in refusing to treat with the employees and to confer with the State Arbitration Board. It finds that in the rubber factories there is a general fear on the part of the employees to make complaint owing to the belief that dismissal might result. The committee members hold that rules should be posted in all the factories advising employees to report their grievances. It is held that the failure of the rubber companies to correct grievances is the cause of a general feeling of discontent among the employees.

The committee finds that employees at night are required in some cases to work as long as 13 hours and this practice it holds unjustifiable. Women employees are paid between $5 and $12 a week, in exceptional cases less or more than this amount. The wages generally paid in the rubber factories are found to compare favorably with other industries and in the tire finishing department to be better. On the other hand, the earnings of the rubber companies are found to be large and to warrant high wages. The rubber factories themselves are found to be airy and well ventilated.

No conclusive evidence of the existence of blacklisting was found by the committee, although there was evidence showing that before employing applicants, the companies take a minute physical description and then call by telephone the company where the applicant was previously employed. The committee found instances wherein an applicant was rejected after the employer had telephoned to the company of last employment.

The condemnation by the committee of the principles of the Industrial Workers is scathing. However, the committee finds that a large majority of the rubber workers joined the I. W. W. solely to win the strike and that they did not believe and in many cases did not even know the principles taught. The committee tells the senate that the I. W. W. do not believe in contracts between employers and employee and that they encourage "sabotage," or the principle which teaches the workmen to shirk his work, turn out a poor product or injure machinery when he cannot remedy his condition by other means. The committee holds this teaching dangerous and a matter of grave concern to both the state and nation. It finds also the I. W. W. teaching against labor contracts is a menace. It holds that the interference of the I. W. W. injured rather than helped the cause of the rubber workers.

Postal Truck Contracts Held Up

WASHINGTON, D. C., April 19—The fact that the contracts for furnishing the Post Office Department with 100 motor cars for use in the parcel post service are being held up is causing some little uneasiness among the successful bidders. Approval of the contracts was one of the latest official acts of Postmaster-General Frank H. Hitchcock before turning over the office to his successor, former Congressman Oscar Burleson.

The reason given for holding up these contracts is that at the time they were awarded there was no purchasing agent in the Post Office Department and the soundness of the transaction is now before the Department of Justice. It is believed, however, that the contracts as originally made will be sustained.

Philadelphia Automobile Mart Proposed

PHILADELPHIA, PA., April 19—The Philadelphia Automobile Trade Association has under consideration comprehensive plans for the establishment of a huge automobile mart—a co-operative automobile station of sufficient proportions to handle practically all makes of used cars and also built to accommodate the annual automobile shows conducted by the association.

The project as proposed and outlined by an active member of the association, E. C. Johnson, comprehends the purchase of a tract of ground and the erection thereon of a building sufficiently large to house the cars taken in trade by members of the association, who comprise a majority of the dealers and branch managers in Philadelphia. A fixed schedule of prices for these cars would be determined, each car to be under jurisdiction of the trade body.

HARTFORD, CONN., April 19—At a meeting of the incorporators of the Automobile Insurance Co., of this city, held today, it was voted that the first capital stock of the company be fixed at 3,000 shares, par value $100 per share, with stock to be offered for subscription at $200 per share, $100 to be capital and $100 surplus. The entire amount of capital stock was subscribed for and paid in cash. This new company will write automobile insurance and will begin business at once. The following officers were elected: Morgan G. Bulkeley, president; Morgan B. Brainard, vice-president; J. Scofield Rowe, secretary; Charles H. Remington, treasurer; Herbert R. Clough and J. C. Barden, assistant secretaries. Morgan G. Bulkeley, Samuel G. Dunham, John O. Enders, Morgan B. Brainard, Joel L. English, J. Scofield Rowe and Walter C. Faxon were elected directors.

Owen, Defendant, Wins $31,315

BUFFALO, N. Y., April 22—R. M. Owen & Co., sales agents for Reo automobiles, was awarded a verdict of $31,315.33 against Gustave Poppenberg, plaintiff, by a jury in the supreme court here last Saturday, Justice Wheeler presiding. Mr. Poppenberg, of the Poppenberg automobile firm sued for alleged violation of a contract to handle Reo cars made by the defendant company. The defendant had a counter-claim against the Buffalo motor car concern, also alleging violation of contract, which claim was granted. Gustave Poppenberg will make motion for a new trial of the action.

MILWAUKEE, WIS., April 21—Milwaukee oil distributors and refiners have won a victory in their fight against increased freight rates on petroleum and products from oil fields in the vicinity of Emlenton, Pa., to Milwaukee. The Interstate Commerce Commission has heard their petition and suspended the advanced rates until August 9, pending investigation. The advanced rates were claimed to form a discrimination in favor of Franklin and Oil City producers, as the rates from these points were untouched, while a boost was given the rates from Emlenton.

WASHINGTON, D. C., April 19—The Imperial Motor Co., through its president, E. A. Garlock, has filed suit against the Motz Tire & Rubber Co. and F. C. Fickling, its branch manager here, to enjoin them from attempting to establish a branch store in this city for the sale of Motz tires throughout the District of Columbia. The plaintiff claims it has the exclusive right to sell Motz tires here under a contract made in December, 1911. An injunction and accounting is asked by the plaintiff.

Connecticut Has 3,815 Building Cars

HARTFORD, CONN., April 19—According to latest reports 3,815 men are employed in the manufacture of cars and parts in the state of Connecticut with an annual value of $11,668,000. The automobile industry represents a shade more than one-half of the silk industry, one-sixth of that of foundry and machine shop products and a little more than one-half of the valuation of arms and ammunition manufactured in the state. Under the circumstances, Connecticut when compared with other states figures small as a car-producing community.

WASHINGTON, D. C., April 19—The district commisioners have under consideration a proposed regulation establishing an annual license fee of $2 for motor vehicles in place of the present perpetual fee of $2. This change in the license arrangement for Washington motorists would add $40,000 annually to the revenues of the District of Columbia, it is claimed. It would also enable the license clerk to keep an accurate list of the cars owned here, something that now is out of the question.

Increase in Trucks—Figures compiled by the Electric Motor Car Club, of Boston, Mass., show that for the first 15 weeks of the present year, the registrations of electric motor trucks show an increase in sales of 27 per cent. over the sales of the same type of vehicles registered during an equal period in 1912. The electric pleasure car registrations exceeds the total registered up to August 1, 1912.

Illinois Motor Law Invalid

New Bill Introduced Also Provides for Disposal of $600,000 Fund

SPRINGFIELD, ILL., April 22—*Special Telegram*—Measured by the pattern by which the Supreme Court knocked out the omnibus appropriation bill in the Neiberger case against the University of Illinois, the motor car license law of Illinois, under which approximately $600,000, has been collected by the state was found today to have been passed unconstitutionally and is therefore declared invalid, after an investigation in which it was found that the motor car bill was left out of the three remedial bills which went to the three special sessions under the Deneen administration. Representative Homer J. Tice, chairman of the House Goods Roads Committee, declared this morning that the motor car license fees in his judgment and according to his legal advisers had been collected under an unconstitutional act and argued it was highly important that an emergency bill be passed at once.

Mr. Tice introduced a new bill carrying all the old law and in addition providing that the $600,000 lying in the state treasury which cannot be expended without specific appropriation be paid out to the respective counties for "State Aid" roads, the latter to be specified by legislation now pending. No opposition was made until the bill had been advanced to the second reading. Then the opponents of the Tice Good Roads Bill got into action and had the emergency license act recalled and referred to the proper committee. The consensus of opinion is that there is no chance for any persons who have paid into the $600,000 fund to regain their payments unless protests were filed when payments were made.

WILMINGTON, DEL., April 18—Following out a wish expressed by Governor Miller at the banquet which was held by the Delaware Automobile Association, several months ago, the New Castle County commissioners today took the initiative toward the construction of a continuous public road through Delaware, and it is expected that the two lower counties will follow suit.

Alabama Tax Is Constitutional

BIRMINGHAM, ALA., April 18—By a ruling of the Supreme Court of the state of Alabama automobile tax has been declared constitutional. Justice Pelham, representing the court, handed down the decision, which holds that section 7 of the automobile regulations, which provides for the privilege tax, does not conflict with section 221 of the constitution, which forbids double taxation.

ALBANY, N. Y., April 22—The Assembly Rules Committee reported today on the bill recommended by the secretary so amended as to provide for the licensing of all operators of motor cars without fee or examination, and authorizing the secretary to revoke or suspend licenses for cause, after a hearing, subject to a review by the courts. No license-fee change has been proposed.

McAneny Bill Framed for Cash

NEW YORK CITY, April 21—At the last meeting of the Motor Truck Club, Deputy Consulting Engineer Gregory, of the city department of highways, explained to the members the reasons for the McAneny proposed ordinance of taxing vehicles which use the city streets, ranging from $75 to $1,000 per vehicle per year, for cars having capacities between 6,000 and 10,000 pounds. A brief review of historic taxes of this nature showed that from $5 to $30 was levied by various municipalities on trucks of various capacities.

The opposition, represented by a number of truck experts, brought up the point that the McAneny measure left speed entirely out of consideration, which, however, is fully as important in determining street depreciation as truck weight. Furthermore it was argued that if a score of municipalities in Long Island, New Jersey, Westchester county and southern Connecticut—where many trucks do regular work—would levy similar taxes on vehicles, such a course would prove a serious obstacle to truck operation in New York City.

COLUMBUS, O., April 18—The Warnes automobile license bill was enacted into a law by both houses of the Ohio General Assembly and now goes to the Governor for signature. While there was a large amount of opposition in the house, it was not sufficient to defeat the measure, which had the support of Governor Cox, who made it an administration matter. The aggregate fees, which is expected to be in excess of $600,000 yearly, will go into the general fund and will not be used for the repair of the roads of the state.

Fees fixed by the measure are: Motorcycles, $3; electrics, $3; gasoline or steam automobiles up to 20 horse power, $5; from 20 to 30 horse power, $6; from 30 to 40 horse power, $9; from 40 to 50 horse power, $12; from 50 to 60 horse power, $15, and above 60 horse power, $15. Manufacturers and dealers are compelled to pay $10 for each license to be used only on one make of car.

TRENTON, N. J., April 21—Beginning May 1, every applicant for a driver's license, whether chauffeur or owner, will have to undergo an examination before being granted permission to operate an automobile in the state of New Jersey. The purpose is to increase the safety of public highways, and as the legislature this year has granted a much larger number of inspectors than before, it will be possible to devote more attention to this new branch of the automobile department.

New York's Taxi Situation To Be Cleared

NEW YORK CITY, April 23.—Mayor William J. Gaynor's committee presented to him a report yesterday in which the taxicab situation as it exists in New York at present is sized up and numerous radical improvements are suggested. These include a cut of the rate schedule to practically one-balf of its present height, the abolition of private hack stands in front of hotels, a fixed penalty eode for overcharges to passengers and license fees varying with the class and carrying capacities of the taxies.

The recommended rate schedule follows:

One or Two Passengers:	
First balf-mile or less	$0.40
Each succeeding balf mile or less	.10
Three or More Passengers:	
First half mile or less	.50
Each succeeding sixth mile or less	.10

The now existing schedules of two leading taxicab companies of the city are as follows, compared with the new schedule:

Schedule	Yellow	New York	Proposed New
First mile	$0.80	$0.80	$0.80
Each following fifth mile	.10	.10	.04
Standing time per hour	1.50	1.50	1.50
On time rate:			
First two hours, each	....	3.00	No bourly
First three hours, each	3.00	....	rates for
Each hour after these	2.00	2.00	taxicabs
Closed cars, time:			
Per hour, week days	4.50	....	Ordinary
Per hour, all days	....	5.00	provisions
Per hour, Sat., Sun., holidays	5.50	(Standing	apply to
Limousines, week days	5.50	time at	larger mo-
Limousines, S. S. & H	6.50	$2 p. br.)	tor taxis

It will he readily seen that while 1-mile trips or other snort jaunts will cost almost as much as before, longer trips will show a saving to the passenger.

It is proposed to have hackstands in the streets, open to all cabs alike, whether company-owned or independent.

All cabs will bave to get eity licenses for $5, and owners or drivers operating cars not properly licensed are liable to a penalty of $50 fine or 30 days in prison or both. An overcharge of more than 5 per eent. may result in $50 fine for every such offence; improper lighting after sunset may incur a fine of $10 and operating a meter from a wheel, driven by power, $25.

NEW YORK CITY, April 23—At a meeting of the Electric Vehicle Association last night in the Engineering Societies building, a paper by Daniel J. Tobin, president of the International Brotherhood of Teamsters and Chauffeurs was read in the author's absence by William H. Ashton, general organizer of the same body.

Mr. Tobin's paper was chiefly devoted to explaining that the teamsters' organization fully recognized the inevitability and commercial value of the power truck and was therefore not opposed to its introduction. With reference to the transfer of drivers from horse drawn to motor vehicles it was stated that "90 per cent. of our chauffeurs in every city and town who are members of our organization were formerly teamsters or drivers. We are thoroughly satisfied with the change, and the work in nearly every instance is becoming easier."

The meeting was addressed by Arthur Williams, president of the Electric Vehicle Association, who dealt with the problem of the education of drivers taking up the new calling. An educational committee of the association has been formed to consider the possibility of providing training facilities for these men. In the discussion on this matter which followed it was the general opinion of the meeting that the teamster who showed some aptitude at picking up a knowledge of the mechanical side of truck operation proved a more efficient man in the driver's seat than one whose knowledge was confined to the motor itself.

Detecting Resistance—Saving Fuel

PART II.

Construction of the Accelerometer and Some of the Results Actually Secured from Its Use Are Explained in This Article—Comparison of Three Touring Cars on Road Shows Wide Differences of Resistance

By W. C. Marshall

THE first of Professor Marshall's articles on the accelerometer appeared in THE AUTOMOBILE for April 17. In that issue the use of the accelerometer and its value to the automobilist were discussed. This week the construction of the instrument is explained and some of the results of tests made upon actual cars are given.

The accelerometer is an instrument used to measure the acceleration and retardation of the car. Its readings are given in pounds per ton for the retarding force and in feet per second per second for the acceleration. The gradient in per cent. of the road is also indicated by the instrument. The dial is arranged so that the single needle indicates grade and acceleration. A clear conception of the appearance and method of operation of the instrument may be gathered from a reading of Part I of this series.

The general internal construction and principle of the accelerometer are illustrated in Fig. 1.

A copper frame A moves in a plane perpendicular to a vertical spindle B. The spindle forms the axis of rotation of this mass of copper and supports it. The center of gravity of the mass of the copper frame is to the left of the axis. The spindle B carries a gear wheel C, meshing with a second gear of the same size fastened to another vertical spindle D, which is attached to a hair spring E.

Any acceleration in the direction of motion tends to make the mass of copper lag,

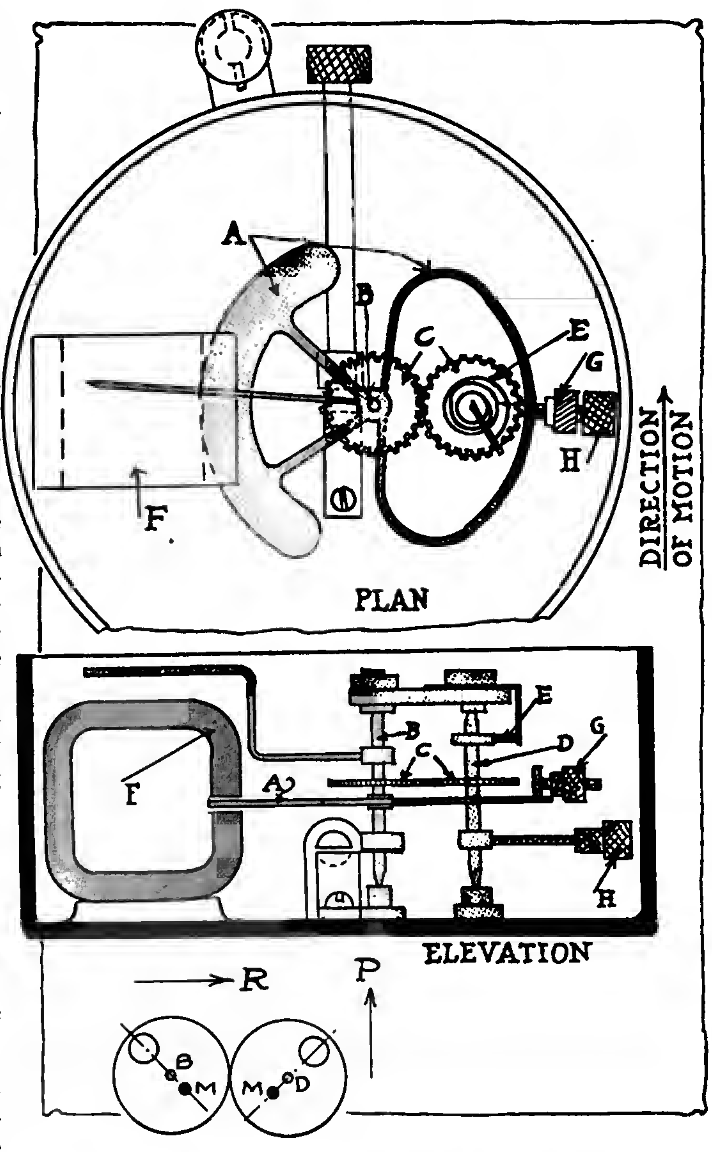


Fig. 1—Sectional elevation of the Wimperis accelerometer showing its construction. Below is given a plan of the instrument and a diagram showing the action of the counter-balance eliminating the effect of changes of level or curves upon the readings. The readings are given by the lag of the weight A, in rotating about the vertical axis B, when the car is speeded up or retarded. The action of the weight, which consists of a copper framework, is controlled by a hair spring similar to that in a watch. It is indicated in the illustration by E, and is shown in plan and elevation. The magnet F prevents the movement of the frame A in a vertical direction and gives the metal steadiness in a horizontal plane.

due to the posiiton of its center of gravity to the left of the spindle B.

This lag rotates the spindle B, which, through the co-relation of the gears, rotates also the spindle D and winds up the hair spring E. It is evident that the greater the lag of the mass of copper the greater will be the amount that the spring is wound up, and hence the acceleration is measured by the degree to which the spring is wound up.

The needle is not affected by any changes of grade because the downward acceleration is neutralized. This can be explained mathematically.*

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*Let the slope be α and the weight of the moving parts of the accelerometer be w.

Let the distance traveled be x and let g be the acceleration due to gravity.

Then the acceleration of the car is $\frac{d^2x}{dt^2}$ and the forces acting to produce acceleration of the car in the direction of motion are $+ (w \sin \alpha + F)$, supposing the slope downward, but F = mass times acceleration, or $w \sin \alpha + F = \frac{w}{g} \frac{d^2x}{dt^2} - g \sin \alpha \therefore \frac{d^2x}{dt^2} = \frac{g}{w} (w \sin \alpha + F)$.

On account of the slope the needle will not rest at zero, but at a reading denoting the slope as $- g \sin \alpha$.

The needle has to move through this amount before it shows any reading beyond zero on the opposite side.

The actual acceleration will therefore be $\frac{g}{w} (w \sin \alpha + F) - g \sin \alpha$, or an acceleration of $\frac{Fg}{w}$ feet per second per second.

To find F multiply this reading by $\frac{w}{g}$.

If we wish to read F in pounds per ton multiply the acceleration by $\frac{2000}{32} = 62.5$. This multiplication is avoided by graduating the dial directly in pounds per ton of 2000 pounds.

A permanent magnet F, whose vertical field tends to check any oscillation of the copper frame A in a horizontal plane, may be seen in both the elevation and plan view given in Fig. 1. In order to make the instrument measure correctly when traveling around curves or on a heavily crowned road two compensating balances G and H are fitted in the manner shown in the accompanying illustration.

The forces acting at the center of mass of the copper frame of disk are directly proportional to the impressed acceleration, but, as the disk rotates through angles of 30 degrees, 40 degrees, etc., the lever arm of the force grows less. This decrease of moment produces less twisting effect on the hair spring, causing the angle of rotation to decrease in proportion to the increase in acceleration. The scale has to be graduated in accordance with this fact, which gives closer divisions at the end than at the center of the scale.

A study of the compensating balances shows their method of actuation to be as follows: While the disk is deflected by a certain amount of acceleration, say in the forward direction of the car, and a second acceleration, such as would be caused by a slope in the road, acts at right angles to the first, it would tend to add or substract from the force, causing the hair spring E to wind up, which, of course, would give a false reading on the needle.

The gear wheels are so arranged by their connection to the balance weights G and H that they are, in effect, disks. The moments of the mass of these disks about the axes B and D are equal. The centers of mass of the disks, if at M equally distanced from B and D, will produce revolution of the disks about the centers B and D when a force acts upon them in the direction of the arrow P. A force, however, acting in the direction of the arrow R will produce no effect on them. Forces perpendicular to the plane of the page will have no tendency to cause or produce rotation. Therefore the only acceleration recorded will be that which is produced by a force acting in the direction indicated by the arrow P or opposite.

In taking the acceleration readings no effect is produced by a down grade. This is so, because the gravitation effect on the needle on account of the slope is neutralized by the acceleration due to gravity acting upon the car when the latter descends a slope.

In Fig. 2 a series of curves made from accelerometer readings on a five-passenger touring car with a torpedo body are shown. The car held two persons and weighed, during the tests, 3,925 pounds. The road surface was of macadam and was in good condition, being hard and level.

Curve 1 was obtained from the readings taken on the accelerometer at speeds varying from 10 to 40 miles an hour. In each case the clutch was thrown out and the retardation noted at each speed on the instrument.

After taking these readings the horsepower was calculated and plotted by taking ordinates as horsepowers, with the abscissæ representing speed in miles per hour. The spots on the curve were first laid down as per the calculations and a fair curve, representing an approximate result of all the calculations, was run through. This horsepower is the actual horsepower developed by the motor and required by the car when actually upon the road.

Horsepower Obtained from Accelerometer Readings

In this set of curves given in Fig. 2 the curve marked 2 was obtained by bringing the car up to various speeds and then cutting off the ignition. The horsepower was then calculated from the readings given on the accelerometer. The curve was plotted through average spots and indicates the trend of the resistance.

The vertical distance between curves 1 and 2 represents the difference between these curves and hence indicates the frictional horsepower loss in the motor and clutch.

This is approximately 1.5 horsepower at 15 miles per hour and 4 horsepower at 30 miles, showing an increase in friction with increase in speed. This agrees with the laboratory experiments on motor friction in internal combustion engines.

The revolutions per minute of the motor are given on the line above the miles per hour. The wheels in this case were 36 inches in diameter and the gear ratio on direct speed was 3.5 to 1.

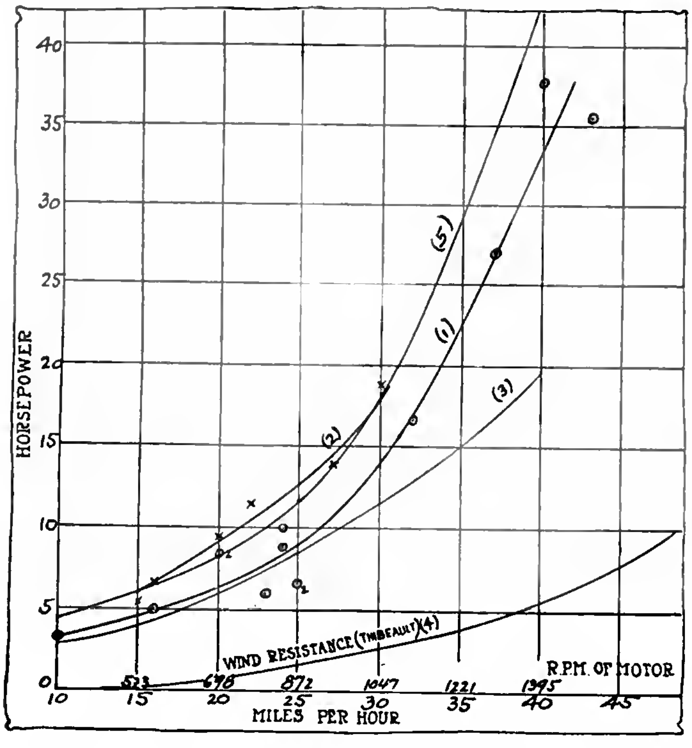


Fig. 2—Curves from accelerometer readings taken on touring car

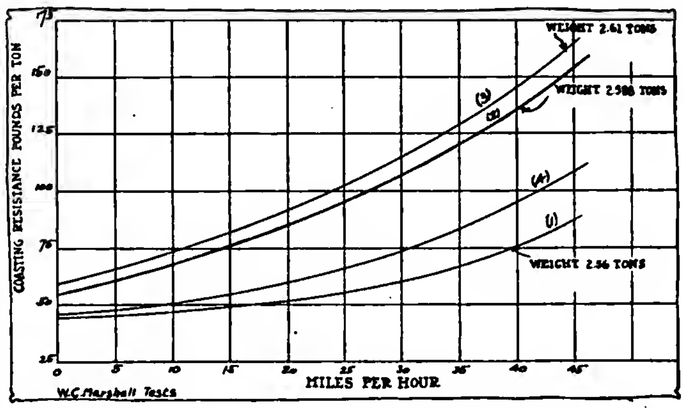


Fig. 3—Coasting resistance curves of cars at various speeds

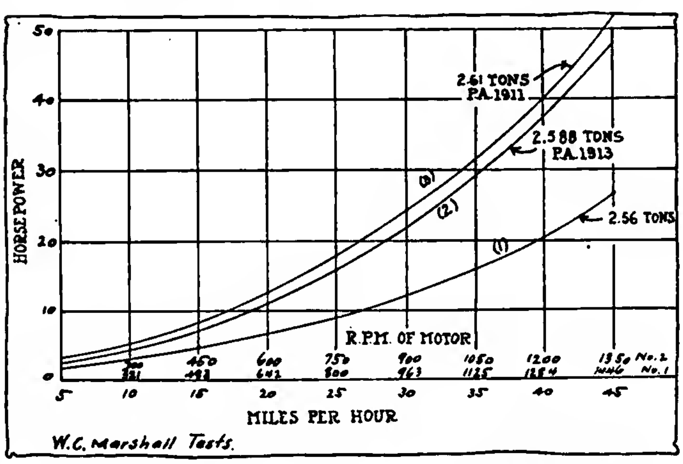
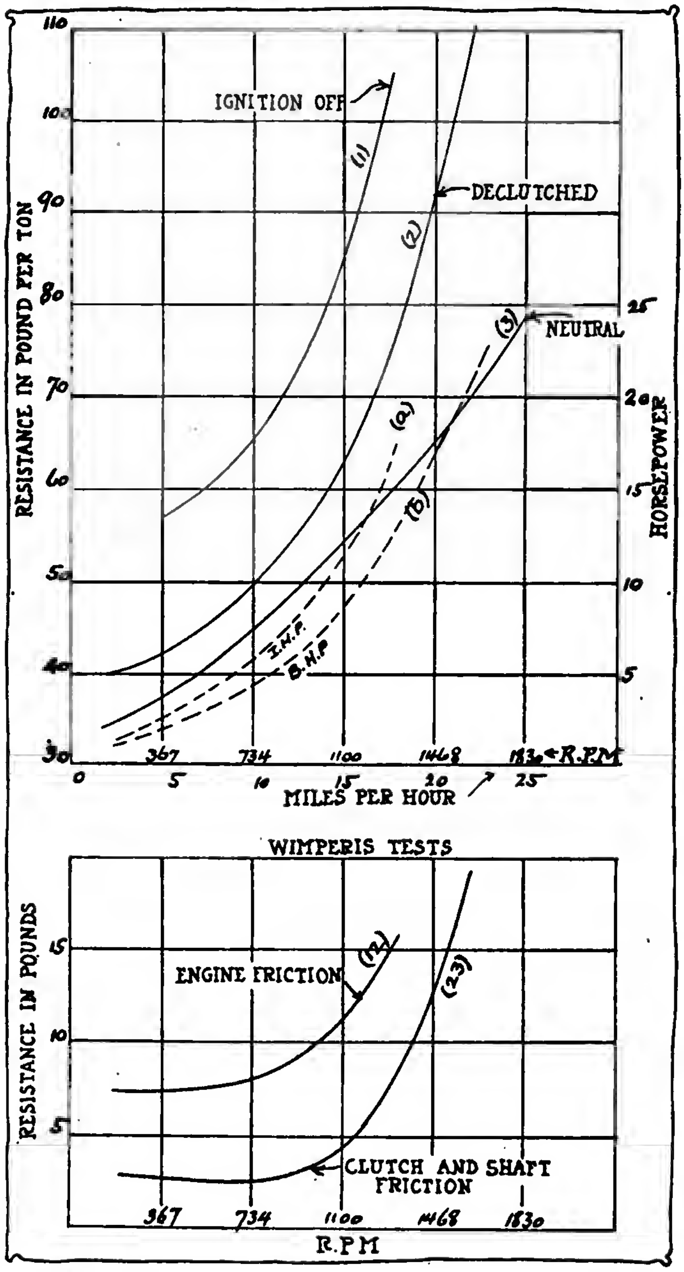


Fig. 4—Horsepower curves of three six-cylinder cars tested



Figs. 5 and 6—Coasting resistance curves of 3-ton wagon at various speeds. Engine and clutch friction curves

Curve 3 is the theoretical curve of resistance of the car plotted from the formula $R = 47 + 12\left(\frac{V}{20}\right)^2$ and the equation $HP = \frac{R \times 1.96 \times V}{375}$ **

This equation has been derived from experiments which show that the resistance per ton to rolling is 47 pounds and that the resistance due to wind resistance would be $\left(\frac{12\,V^2}{20}\right)$. The horsepower formula is deduced from the fact that 33,000 foot pounds per minute make 1 horsepower and therefore the pounds per minute exerted by the motor in overcoming the car resistance divided by 33,000 give the equation for the horsepower. This simplifies itself to the expression given above.

**Thibeault's experiments on wind resistance resulted in this formula: $R = \Theta\,EAV^2$ where Θ is a constant .0625; E is the length of the car in proportion to its front area; i.e., 1.1A is the area in surface of car presented to the wind in square meters. R is the resistance in kilograms. V is speed of the car in meters per second. Reducing this to English measure gives $R = .014A \left(\frac{V}{28}\right)$. A is in square feet and V is velocity in feet per second.

The resistance of the wind is shown by the curve marked 4 on Fig. 2. The rolling resistance is the difference in vertical height between the curves taken with the clutch thrown out from readings on the accelerometer, or, in other words, curve 1 and the curve of wind resistance 4. On this car it will be noted that below 25 miles per hour the resistance is low.

To obtain the horsepower curve which shall show the true horsepower at the clutch it will be necessary to divide the ordinate by the percentage which the coasting resistance bears to the power resistance at the clutch. That is, to be specific, 70 per cent. at 30 miles per hour. Curve 5, Fig. 2 shows the horsepower at the clutch.

Comparative tests to demonstrate the easy or stiff running qualities of a car are given in Fig. 3 by curves 1, 2 and 3. Curve 1 shows an easy running car as compared to that in which the resistance is higher. See curves 2 and 3.

Curves 1, 2 and 3 are coasting resistances of three six-cylinder cars weighing respectively 5120, 5176 and 5225 pounds. Curve 4 is the theoretical resistance curve. The low resistance shown by curve 1 is remarkable and far above the average, denoting excellent condition regarding frictional and air resistance. These curves were made over the same stretch of road having good hard macadam, curves 1 and 2 being plotted from tests made the same day.

The high resistance of car 3 was found to be due to dragging brakes which produced excessive friction. The car would have undoubtedly been run without any knowledge of this trouble had it not been tested by the accelerometer.

Horsepower Required for Driving

The difference in horsepower required to drive these three cars can be easily seen by referring to Fig. 4. At 20 miles an hour car number 2 requires 72 per cent. more horsepower than car number 1. At 30 miles 83 per cent. more and at 45 miles 81 per cent more. Reduced to actual horsepower this amounts to 4.5 at 20 miles an hour, 10 at 30 miles an hour and 21 at 45 miles an hour. This is enough to produce a large increase in car mileage costs of gasoline, oil and tires. The gear ratios on direct were 3.43 to 1 on car 1 and 3.3 to 1 on car 2.

The tires were 37 by 5 inches on the rear wheels of both cars and on the front wheels of car number 2. Car number 1 had 36 by 4.5 inch tires on the front wheels.

The motor dimensions of both cars were the same as regards stroke, but in diameter car number 1 had a bore .25 inch smaller than car number 2. The revolutions per minute at the various car speeds for 1 and 2 is placed above the speed in miles per hour on the chart given in Fig. 4.

In Fig. 5 the coasting resistance of a 3-ton wagon are plotted with reference to various speeds, under running condition, marked on each curve. The horsepower curve a is calculated from the resistance with the ignition cut-off. Curve b representing the resistance at the clutch can be called the brake horsepower. The sharp rise of the curves in Fig. 6 show the increased power required at high speeds.

The remarkable variations in coasting resistances shows that this part of the design, while carefully worked out theoretically, has never been subjected to actual test. The accelerometer offers a method of comparison between different cars and also for the same car at different speeds. In a series of tests recently made the coasting resistance of twelve different pleasure cars, all having pneumatic tires and windshields, and two trucks with solid rubber block tires, was measured. The tests were made on smooth wood block pavement in New York City at speeds of from 10 to 25 miles an hour. The results were as follows:

Speed, miles per hour	Maximum resistance	Minimum resistance	Average
10	50	40	45
15	60	45	50
20	70	56	60
25	100	65	80

This shows a difference of 35 per cent. between the highest and the lowest at the common speed of 25 miles an hour.

(To be Continued.)

The Engineering Digest

A Digest of Technical Information from the Engineering Journals

¶ *Either to criticize or to admire, motion-views form of automobile manufacture loom up as a new necessity—a spur to better methods or an advertisement of a success achieved—How to get them.*
¶ *Some of Dr. Riedler's cameo-cut ideas dressed for the instruction of the populance—Not without flaws.*
¶ *A rifle-lock mechanism, quickly operated, for a demountable wire wheel.*
¶ *Lubricating news—important if true—returned from abroad—Muslin gears—what they claim for them.*

MOTION Pictures from the Shops.—Kinematograph views now play a notable part in manufacturing operations, being useful for two very different purposes. One is to assist in the study of the motions of both men and machines, and the other is to furnish captivating and up-to-date advertising material, the latter mainly for use in connection with lectures and conventions and of course mostly of value for industries, like the automobile industry, whose output and methods of production are in the public eye. With regard to the use of the pictures for motion study and the improvements of methods and machinery which should be the result of such study, it is becoming recognized that observation of the views is more fruitful of results than direct observation of the work, even if it may need to be supplemented and verified by the direct observation in some cases, partly because the successive views, which may be unrolled before the screen or the eye with any desired slowness, naturally dissect the movements, and partly because they may be filed and indexed and taken out at any convenient time when the subject which they illustrate is under debate.

G. A. Fritze writes on this subject with special reference to the details of the electric lamp installation which must be provided in a factory, if the management prefers to operate its own kinematograph outfit or wishes to be in a position to call in an operator for quick special work at any time and with short notice. The more usual situation is that the kinematograph firm provides the necessary portable artificial light equipment for the interior views and that the manufacturer plans to have all the processes which he wishes to investigate or advertise covered in motion pictures consecutively during one short period. In some places, however, such as rolling-mills where the camera cannot be placed very close to the subject, on account of the progression of sputtering red or white-hot strings of metal which interpolates the space, or as drop-forge plants, where the intermittent concussions call for special suspension methods to protect cameras against shocks, the burden of providing a suitable installation for kinematograph work will largely fall upon the works-management.

In the choice of subjects for the motion-camera there is room for judgment and experience. Not all processes or machines are rendered well in films. Wheels with spokes, such as flywheels, or machines whose operative movements are merely rotary, show too little motion or even may seem to run backward if the wheel movement happens to coincide in speed with that of the films. The observation of a large number of machines in whose operation the attendant plays only an inconspicuous part is usually tiresome to a lay spectator. Machines of this kind should be singled out for separate views, showing the movements of the parts of one machine only and on a large scale, which means a nearby-view with carefully directed illumination. Strongly reflective surfaces are likely to spoil the whole effect of a film, and it is often necessary to paint them over in lime colors or cover them with dark paper in some inconspicuous manner. Large black parts, on the other hand, leave an inpenetrable blotch of nothingness in a picture and are better painted gray. A color atomizer serves these purposes. Step ladders should be on hand to facilitate high views.

It is a considerable advantage of kinematographic work, as compared with ordinary photography, that it need not interfere with the daily manufacturing routine, if the preparations are made in advance, the night before or during the noon hour. Workmen are not temporarily turned away from their machines and tools; on the contrary, they must continue at their tasks if good films shall be produced. In practice the work must, however, be laid out with some reference to the pictures, in order to get everything into them that is wanted. Articles like oily cotton waste in odd places, lunch cans and bottles may be lifelike, according to the customs of a factory, but they rarely look well in pictures. Like the actions in a drama, these should be confined to essentials. The appearance of any person who seems to be idle in motion-views of a shop, even if he is a foreman or an inspector, is a mistake.—From *Werkstattstechnik,* April.

DR. RIEDLER'S Science Popularized by Riedler.—The complete popular review of automobilism given by Professor Dr. Riedler in the latest German technical encyclopedia continues to attract attention, because it is understood that the facts and views presented in it agree completely with the large stock of technical data which have been sifted out through several years of scientific testing of cars and their parts, on the road and in the laboratory of the author at the Technical Highschool at Charlottenburg, and because it brings these data into relations with questions of wide general interest. Some extracts from this review, in addition to those presented last week, speak for themselves in showing to what extent the conclusions of the foremost German specialist on the subject agrees with the American development, in which respect it may be noted, however, that Riedler cannot be fully acquainted with the very latest improvements in such things as motor-starters and is inclined to push to one side as too cumbersome (*umständlich*) any device which seems to him too costly and elaborate for the importance of the special purpose it serves, particularly if that purpose is not yet fully and infallibly served by any of the devices in the market. He thus takes cautious distance, for the present, from wire wheels, new valve systems, silent chains and motor-starters while refraining from judgment on other points such as the relative values to the public of small motors with high piston pressures and larger motors with lower pressures and greater flexibility (meaning by the latter term a wider power range under the throttle without recourse to gear-change). The extracts follow:

Noiselessness.—The silent running of a car depends upon the machinery as a whole, upon the distribution of forces and masses in the vehicle, upon the oscillations and vibrations of machine and vehicle parts, upon the balancing of motor forces and finally, in relatively small degree, upon the valve movements. Details of a motor, such as the magneto-drive, the pump-drive, etc., may cause more noise than the motor proper. Silence can be secured with poppet valves, if they are raised gradually with short lift and are closed gradually, which is only a matter of correct design [including larger valve dimensions, other things equal—Ed.]. The main cause of noisy running at high motor speed lies in the vibrations of machine parts. Every part has its own radius and period of vibrations and a critical vibration at which the noise becomes maximum. When the critical vibrations of several parts coincide, the noise can become intolerable. The principal means for securing noiseless running is therefore: To avoid or to break up and muffle the vibrations of individual parts. Subsidiary means for the same purpose consist in: The use of slide valves (sleeve or rotary) instead of poppet valves, the encasing of valve action, etc. The main causes of the noise are entirely independent of the system of valve control. It is one of the results of the introduction of sleeve valves that now noiseless running is demanded of all automobiles, and this demand can be met with any correctly designed and built poppet-valve motor. But there are many experienced drivers who do not wish complete silence, so far as the motor is concerned, and on the contrary much prefer that the motor shall have something to tell them of its inner workings during the running.

Motor-starters.—Cranking of large motors may become a very laborious task in cold weather. Injection of gasoline into the cylinders or other expedients must then be employed. Hence the many efforts at perfecting motor-starting devices. All of them, including those operated with compressed air, have however so far proved too cumbersome. In many cases, for that matter, the difficulties in cranking are not to be ascribed to the motor but to the carbureter; to the faulty gas mixture produced in it at low-speed suction, particularly to over-saturation of the mixture.

Brakes.—Front-wheel brakes are dangerous because they suddenly change the resistance to rotation of the steering wheels [Dr. Riedler here takes distance from certain theories to the contrary, which are advocated in France and practiced to a very limited extent in British cars—the Argyll, for example—and not unsuccessfully, it seems—Ed.]. . . . By driving in the mountains, extensive use of the rear-wheel brakes may result in overheating and even in the failure of the brake action, but the driver can always avoid this effect by timely use of other means for retarding the car. The motor especially can serve this purpose. By closing the throttle and letting the motor be dragged idly by the car, a certain brake effect is produced, and this can be increased by throwing the high gear into mesh, so as to force the idle motor to run faster [the reader will readily correct the slip in Riedler's statement on this point—Ed.], thereby easily reaching a degree of resistance by which the brakes may be dispensed except for an occasional equalization of the forces where the gradient of the slope changes. No water-cooling of brakes is then required. No objection to the use of the motor as a brake in this manner can be raised on account of any alleged tendency to overheating, as the cooling water in the motor disposes of the heat generated by the brake effect. Arrangements are also in the market by which the carbureter is so transformed as to make the motor act as a compressor-brake.

If in many cars the motor is not utilized as a brake, it is because the automatic lubrication continues unabated and fouling of the spark plugs easily ensues. But this can be avoided by a correct lubrication system. Failure, excessive wear and overheating of brakes are always the result of unsuitable construction or unskilful handling. Sprags are always an unsafe means for arresting a moving car, and should be used only to permit the previous release of brakes at the starting of a car uphill—like a stone chocked under a rear wheel.

Speed.—Fast driving is a mere matter of sport and brings no average gain in transportation results. With a small car, an average of 40 kilometers per hour can be attained; with a powerful car perhaps 50 kilometers. To reach a materially higher average it is necessary to drive at times as fast as 80 kilometers, and road stretches fit for this speed are not commonly available. Even speeds of 60 kilometers usually result in a waste of time, as the delays incidental to tire troubles caused by such speed should be taken into the count.—From *Automobil-Rundschau*, March 30.

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HELIOS Demountable Wire Wheel.—The many new wire wheels now offered in the French market are said to differ mainly in the means employed for locking the demountable hub, to which the wire spokes and the rim are secured, to the inner hub, which is mounted by ball-bearings upon the axle-end and remains there when a wheel is replaced. A description of the Helios wheel, which is of this type, is limited to the locking mechanism used in it, and it is mentioned as a notable advantage that the parts of this mechanism belong to the fixed and not to the demountable portion of the wheel, by which provision the spare wheel becomes simpler and cheaper. The time required for mounting or demounting is represented as 30 seconds. The construction, as shown in the sketches (drawn from half-tones) in Fig. 1, seems to apply to front wheels only; at least no means for keying a wheel-shaft to the interior of the fixed hub or to the locking-device are explained or indicated.

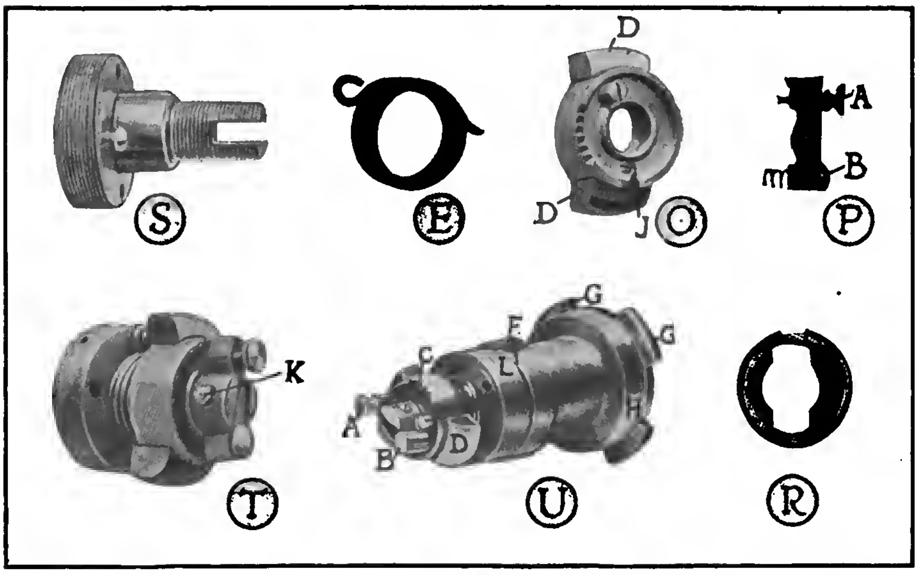

Fig. 1—Parts of fixed hub and locking-mechanism of Helios demountable wire wheel

Among the sub-figures, U represents the fixed hub with the locking-parts secured upon it in the position they occupy when a wheel is to be placed upon it or removed from it; T represents the pieces S, E, O and P put together, and R represents the design of the outer end of the demountable hub, the keyplate having an opening admitting of passing the locking-parts through it in one position while locking against them by a quarter turn.

The fixed hub has four lugs G interlocking with four corresponding lugs on the inward flange of the demountable hub. This constitutes the rotation-lock. Otherwise the demountable hub is seated upon the two conical zones H and F of the fixed hub. Outside of F there is a short cylindrical extension of smaller diameter upon which the part S is threaded, and upon the latter there is in turn threaded the ring L which serves as a locknut. The coil spring E is passed over the slotted shank of S and mounted loosely upon the cylindrical boss of the same piece, one end being looped and secured under a screw-head. The lock-piece O is screwed upon the slotted shank and when nearly home engages the bent-out free end of spring E by means of a hole in its inward face. If the lock-piece O is now turned to the left, the movement must be made against the strong torsional resistance of the spring E. The piece P may be looked upon as a key to the locking-device. It rides in the slot of the threaded shank of S, and a spindle K permits it an oscillating movement therein. At one end it has a small coil-spring attached to a screw-button B, at the other a setscrew with a knurled head A and, beyond this, a projecting beak adapted to engage one of the notches C in the raised edge of O or else the deeper notch J in the same circumference. The spring at B serves to tecter the key around spindle K so as to engage the beak in one of the notches. The setscrew A, on the other hand, serves to release this engagement.

When the key-piece has been placed in its position, with the setscrew tight, the lock-piece O is turned with a spanner against the resistance of spring E until the beak of P is opposite notch J. Then A is released and the beak falls into the notch, holding the lock-piece in the position given it. The keyplate R in the demountable hub is now passed over the locking-mechanism, so that the jaws D come on the outside of the plate, registering with the aperture in it. When now the setscrew A is applied, the beak is released from notch J, and spring E snaps the lock-piece around about a one-quarter turn, locking the jaws D against the segments of the keyplate and forcing the demountable hub firmly against its seat. By releasing the setscrew A again, the beak of the key drops into one of the small notches C. Demounting takes place by reversing this order of operative movements.

The customary screw-cap upon the outside of the demountable hub adds the usual protection.—From *La Vie Automobile*, March 22.

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HOME News—about Lubricants—from Abroad—Owing to a peculiar mix-up of scientific data and commercial conditions, news relating to the experiences which makers and owners of automobiles are gathering with reference to lubricants must frequently be obtained from European sources, although the lubricants themselves are generally of American origin and manufacture. Thus *Omnia* has lately received a number of communications relating to the practice of mixing 3 to 7 per cent. of lubricating oil with the gasoline supply while at the same time reducing the splash feed to the cylinders and piston pins to a minimum, the object being four-fold; namely, (1) to have the quantity of oil deposited on the cylinder walls proportionate to the force and heat development of each explosion, (2) to make sure of having fresh oil for each explosion, (3) to economize and (4) to avoid smoky and nauseous exhaust. The practice is admitted to be of American origin and is said to be especially in vogue for small two-cycle boat motors in which the explosive charge is transferred from the crankcasing to the combustion chamber. Nearly all of the reports by French experimenters to the journal mentioned above are decidedly favorable. Only one of them complains that a marked gain in the sweetness of the running of his motor was followed by a stubborn clogging of the carbureter nozzles, and this is tentatively ascribed to the presence of resin oil in the lubricant employed.

With regard to the use of deflocculated graphite in the lubricant, notes of commendation and even of enthusiasm are frequently seen in the European automobile and engineering journals and in scientific periodicals of wider scope. Colonel Kurt Bilau devotes to the subject a lengthy article in *Automobil-Rundschau* of March 30, based in part on tests made by the Automobile Club of America and by the Automobile Club of France, the results of which were published in THE AUTOMOBILE at the time when they were made. But Col. Bilau adds information derived from other sources and which may be considered as important if true. He says:

"The poorest oil is good enough for carrying deflocculated graphite to the point of lubrication. Kerosene, for example, will do, although it has scarcely any lubricating value. Nay, where it is practicable to use an ungreased bearing, even water can be employed. A little preparation of the graphite with tannin enhances the stability of its emulsion in oil. There is only this to be observed, that the oil or water which acts as a vehicle for the graphite must be free from acid, as otherwise the graphite does not remain entirely in suspension. But the requirement consisting in freedom from acidity is met in even the poorest automobile lubricating-oil, so that the automobilist, by adding this grade of graphite, may reduce the quality of his lubricating-oil without worrying. He may freely employ any oil which he can buy at the roadside; and this is an advantage not to be underrated. It will surely take the graphite to all the bearings."

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SPURWHEELS of Muslin.—A great many sheets of muslin—the number depending on the width of gear teeth that is wanted—are piled in a stack and soaked in machine oil, whereafter round blanks are stamped out of them. Each of these is placed between steel disks of equal diameter and powerfully compressed to the required thickness, then riveted or bolted. The gear teeth are then milled in the usual manner. The method is American, and the gear wheels so produced are 20 per cent. stronger than rawhide gears, according to data furnished *Werkstattstechnik* (April issue) by Otto C. Reymann of Pittsburgh, Pa. The durability of the muslin gears is said to be extraordinary and due to (1) the elasticity of the teeth (the confining steel plates taking no direct part in the work), (2) their indifference to mineral oil which is injurious to rawhide, (3) a certain self-oiling property derived from the oil used in their production and (4) their indifference to such overheating as may be caused by overloading and neglected lubrication. On the last point, it is claimed, the superiority over rawhide is marked, with the result that the dimensions of a muslin gear—and therefore also those of its metallic mate—may be figured without the large allowance for possible overheating which is necessary with other silent gears. Similar gears made from textile material are made in Germany by F. Stolzenberg & Co., of Berlin-Reinickendorf, adds the editor of *Werkstattstechnik*.

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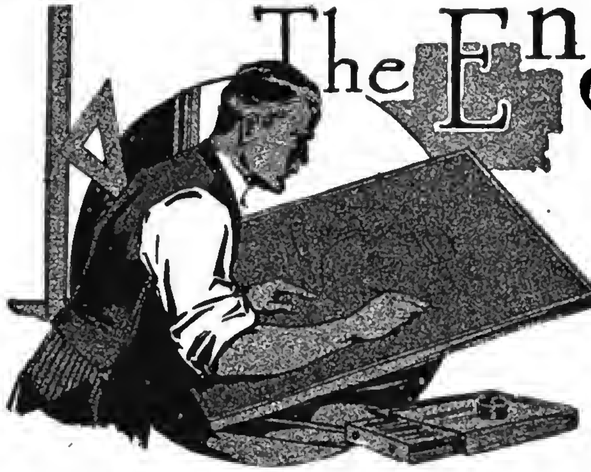
ONE More Elastic Wheel—The industrious inventor has again evolved and materialized a new idea in elastic wheels. In this case the wheel contains no element which in itself would be recognized as elastic, but a certain and not inconsiderable degree of elasticity is obtained, anyway, by having very many elements, each almost rigid, and coupling them together in such manner that a pull on one of them is transmitted at once to all of the others. Thus, if each of 100 elements is made to yield under a shock 1/10 of one millimeter the total cushioning effect which may be produced in one spot may approximate 10 millimeters or 2/5 of one inch. In addition, the rim has a slight yield of its own. Imagine forty round steel links secured pairwise by twenty clips to the inner circumference of a loose rim with a tire band, each clip holding two links, and imagine further that the pairs of rings so suspended are joined by twenty other clips which are pivotally secured to a wheel rim considerably smaller than the loose rim with the tire band. The rings supplemented by the two opposite sets of clips, one fixed and the other capable of pivoting in the plane of the wheel, now form a complete chain anchored inwardly to the wheel rim and outwardly to the rim with the tire. At one point of the wheel rim the pivoted clip is replaced by a very substantial fixed one, so that the mere traction resistance shall not make all the pivoted clips lie down. The contacts of each clip with its pair of rings are designed to afford a rolling action and 160 places where wear may be taken up by eccentric adjustment.—Illustrated and described in *Omnia*, April 5.

The Engineers' Forum



Horsepower As Basis For Tax Discussed

Part IV

Prominent Engineers Agree in Opinion That Taxation of Cars Should Not Be Based on Horsepower of the Motors

Watts Favors Basis of Weight and Power
Schimpff Points to Power and Speed Variation
Schnitker Considers Conditions on the Road
Metz Finds S. A. E. Rating Manifestly Unfair
Brockway Wants Taxation on Horsepower Used
Nutt Says Engineers Should Get Together
Kelsey Doubts Power of Long-Stroke Motor
Wadsworth Proposes Combustion Chamber Basis

THERE is a widespread interest among the automobile engineers today in the problem of horsepower rating in general and in the question of basing of taxation on automobiles on the rated horsepower of the motor. The article entitled "Cars Taxed on Unused Horsepower" which appeared in THE AUTOMOBILE for March 27 called forth a great many letters on this subject, so many, in fact, that the discussion will be continued in THE AUTOMOBILE for May 1.

S. A. E. Horsepower Rating Is a Joke—Watts

DETROIT, MICH.—Editor THE AUTOMOBILE:—It would seem as though both horsepower and car weight should be considered for taxation purposes, as probably both of these have their effect upon the rate of wear of the road. If, on the other hand, taxation is to be based upon money invested, it should certainly vary with the year in which the car was produced.

From an engineering standpoint the S. A. E. horsepower rating has been a joke for some years past. There is only one logical method of rating horsepower for general purposes and that is a classification based solely on piston displacement.—F. E. WATTS, Hupp Motor Car Co.

Little of Available Power Used—Schimpff

CINCINNATI, O.—Editor THE AUTOMOBILE:—Taking motor block test, Sprague dynamometer, as a basis and assuming the different rates of speeds that people will drive, we arrive at the following:

Our car has a motor rated at 45-50 horsepower, and at 1,625 revolutions per minute actually develops 45 horsepower. But show me the average owner that drives his car with a motor turning over at this speed. Consequently, assuming he drives at different speeds, we can give the highest horsepower in proportion possible by taking it off of our shop chart. For instance, at 20 miles an hour with our car his motor could be turning over 660 revolutions per minute, which would show a motor equivalent at that speed to only 20 horsepower. At 25 miles per hour it would be equivalent to a motor of only 26 horsepower, and even at a speed of 35 miles per hour, very seldom traveled at by the average driver, it would only be equivalent to a motor of about 36 horsepower.

Of course, it is a boon to the automobile dealer to be able to rate his motor at a high horsepower. It is a pride of the car owner that he have a high powered motor and very few people ever stop to reason or think that the horsepower lowers or increases according to the speed, thereby using more or less gasoline, being more or less wear to the road, and being more or less liable to accident with the traveling public.

The above figures we consider are very high, as the average owner never drives over 15 to 18 miles per hour, so that the horsepower would certainly be much less than any of the above.

If necessary we can give actual figures and duplicate bench tests showing horsepower curve at different speeds.—H. SCHIMPFF, Schacht Motor Car Co.

Bench Test Not a Fair Driving Test—Schnitker

CHRISMAN, ILL.—Editor THE AUTOMOBILE:—Every builder of motors knows that a bench test is not a fair driving test and that the horsepower developed in the actual work of pulling a car on the road is far below the bench test, being very similar to theory and actual practice.

Everything is favorable to a test of horsepower in the factory, because you have no road conditions to contend with, so that we know and feel that there is no comparison with that kind of a test and the actual test of developing the horsepower on the road.—A. E. SCHNITKER, Rayfield Motor Co.

Consistency Is Imperative—Metz

WALTHAM, MASS.—Editor THE AUTOMOBILE:—It is manifestly unfair to rate a motor such as ours, which is a four-cylinder, 3.75 bore and 4-inch stroke, at 22 horsepower, and a four-cylinder, 3.5 bore and 5-inch stroke under 20 horsepower.

There is no sense in the manufacturer claiming to the public that he has a 30-horsepower motor, then going to the highway commissioners and arguing that he has only 19 horsepower for the sake of a lower cost in his license. In order to get fair treatment we must be consistent in our claims. If the total revenue is considered too high then let us work for a reduction on a fair and sensible basis.

You will never accomplish anything by trying to pull the wool over the eyes of an intelligent commission. You can only accomplish results by placing the matter before them in its true light.—CHAS. H. METZ, Metz Co.

Motor Could Not Continue at Rated Power—Brockway

MUNCIE, IND.—Editor THE AUTOMOBILE:—I wish to say on the subject of automobile motor horsepower, that I believe the S. A. E. rating to be very fair and I do not consider that the maximum horsepower which can be produced from a motor should be its rating. We do not rate a horse by what he is able to exert but by the amount of work which he is capable of doing consistently and stand up under the load.

I do not think that a long-stroke type should be rated as giving greater horsepower than the ordinary stroke motor, since in order to gain this extra horsepower the piston speed has to be increased. A long-stroke motor that is developing horsepower greater than is usually obtained in the ordinary stroke motor could be compared with a trotting horse and the ordinary stroke motor could be compared with a trotting horse and the ordinary stroke motor to a horse walking. One will last longer than the other if this demand is made on the motor by increasing the piston speed.

A motor in a car on the road very seldom develops anywhere near the S. A. E. rating but the ordinary speed the horsepower develops is only a small per cent. of what the motor is capable of doing. We all know that a motor could not live long working at its rated horsepower.

I believe that an automobile should be taxed according to the amount of power it takes to run it in ordinary use rather than taxing it for power it may have in reserve, that is, if horsepower is to be considered at all by the secretaries of state.—C. P. Brockway, Inter-State Automobile Co.

Stroke Should Be Considered—Nutt

Kokomo, Ind.—Editor The Automobile:—I do not think that the S. A. E. rating is proper on account of the stroke not being taken into consideration. I think all engineers should get together and work out a formula that would take into consideration not only the stroke, bore and revolutions per minute, but also mean effective pressure. I realize that to work out a formula that would be fair to all would be quite a task. Perhaps it could be done in this way: Take five or ten motors of each size and get the dynamometer pull at different speeds, and strike an average. This would involve a great deal of labor, but would enable us to work out a formula that would be an average or comparative formula for all motors. Of course, this would make it unfair for the companies having a very efficient motor on account of proper valve sizes, proper compression ratio, etc., so after all is said and done a formula made up, taking into consideration valve size, ratios and other details which have an important bearing on power would perhaps be the best and only way to work it out.

On the other hand, we are up against the laws of the country regarding license fees for operating automobiles. Here is also an opening for somebody to get busy and determine the average horsepower that is used for legitimate road driving, especially when you realize that when a car is driven over the road at a speed of 20 miles an hour, it only requires from 5 to 8 horsepower to do the work, so you can see that the horsepower rating is a problem not easily adjusted.—F. N. Nutt, Haynes Automobile Co.

Should Rate Motors Under Normal Conditions—Kelsey

Hartford, Conn.—Editor The Automobile:—The horsepower of the various automobiles as advertised, ourselves included, I think is deceiving. In our own case we list our car at 10 horsepower, the A. L. A. M. rating being 11 1-4. Under most favorable conditions, such as never pertain to automobile practice, we could for a few moments show more than the 11 1-4 horsepower. Actually in practice we doubt very much whether our motor shows over 8 horsepower, and as our motor is built with extremely large intake and exhaust valves, with well-proportioned timing, with the valves themselves arranged with an angle with reference to the opening of the cylinders, so that a very free intake and exhaust is had, we are convinced that our motor will give equal results with any motor with similar piston displacement.

Any test for horsepower, to our minds, should be taken with the normal work the motor can stand for 10 hours already running. The writer has seen a great many tests made of cars which are catalogued at high horsepower, and these tests are generally made in the following way.

The motor is put on a block, circulation of the water is arranged by the water being run through from outside sources, so that the pump of the motor is not employed; the fan is not used. This alone on high speeds on a motor of 45 horsepower will consume from 1 to 2 horsepower. Lubrication is the very best. Every possible arrangement is made for speeding the motor up. The motor is brought to its maximum speed, and the brake applied for a few moments, possibly 5 minutes. Under these conditions, you are able to get an enormous horsepower. Actually, with even all these conditions perfect, if you will allow the motor to go down to its normal load, it would drop fully 33 1-3 per cent.

The maximum amount of horsepower that can be squeezed out of a motor under abnormal conditions, to our minds, is not the legitimate horsepower of a car, although this is the rating most American cars use. The normal working horsepower is what should be used.

If we have not been improperly informed, our term horsepower is based on the work one normal dray horse can do, working 10 hours a day, under normal conditions. This, after a series of horses were tried out and after a series of tests were made, worked out to 33,000 foot-pounds a minute, in other words, one horse could lift continually for 10 hours working 33,000 pounds 1 foot for each minute of the ten hours.

This is the normal work of the horse. The spasmodic effort that he can make to pull a wagon out of the mud is not his true power any more than the spasmodic effort an automobile engine can make is its true power.

Power of Long-Stroke vs. Short-Stroke Motor

Now with regard to the long-stroke motor, there are many engineers who are not at all convinced that the long-stroke motor will develop as much power as the short-stroke motor. The whole thing resolves itself down to piston speed, and the mean effective pressure in relation to the piston speed. It is not good practice on a long-stroke motor to run any higher compression than on a short-stroke motor. You are limited with regard to your compression to get proper results. On the long-stroke motor your mean effective pressure will be lower than on the short-stroke motor, as you have a longer time for the gas to expand and it will exhaust at lower pressure than on the long-stroke motor. This will mean greater efficiency, but not more power. The short-stroke motor will start off with the same initial pressure and will exhaust at a much higher pressure and will have a very much higher mean effective pressure. A large part of the power will be wasted in the exhaust.

Of course, the short-stroke motor will develop a much higher revolution per minute than the long-stroke motor. In this way the piston speed is made equal or greater than the long-stroke motor, and a greater mean efficiency pressure is had. Under these conditions the short-stroke motor will show more horsepower than the long-stroke motor.

The advantage of the long-stroke motor has, however, is greater efficiency per pound of fuel consumed, for the long-stroke motor does not exhaust its gas at such a high pressure, uses its gas for a longer time and gets more horsepower out of the same amount. The long-stroke motor is undoubtedly more efficient from an economy standpoint, but there is no reason to believe that we know of that it will develop any more, if as much, horsepower as the short-stroke motor. If this be true, as I believe it is, the long-stroke motors should not be catalogued at any greater horsepower than the short-stroke motors, possibly at lower horsepower.—C. N. Kelsey, Kelsey Motor Co.

Combustion Chamber Contents as Basis—Wadsworth

Cleveland, O.—Editor The Automobile:—I believe that in event of dissatisfaction with the present taxation system that the only logical basis for a new method of taxation must be that of cubical contents of the combustion chamber. One taxation is determined by such a method, the problem of designing an economical, powerful and efficient motor of small bore and stroke is put squarely up to the designer.—G. R. Wadsworth, Peerless Motor Car Co.

(To be continued.)

Runabout Body for Pathfinder Chassis

Double-Dropped Frame Permits Low Body Position—Large Gasoline Tank and Ample Luggage Space Provided

RUNABOUT body designs vary to a greater degree and present a wider range of ideas in car superstructure than any other form of body classification. This is no doubt partly due to the low first cost of a runabout body, and the opportunity that this opens up of having a body built to suit individual taste, rather than to purchase a stock article. Also it is more particularly a man's car and a man is not bound by conventional lines when ordering a body that is to be used exclusively for his own pleasure and requirements.

The design here illustrated is not freakish in any way and will be found suitable for the purpose of a general knockabout for a great many people.

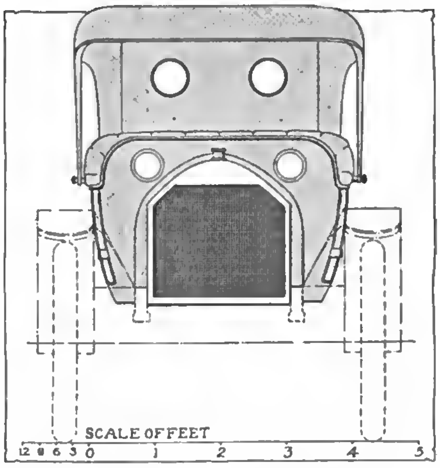


Fig. 1—Front view of body design, showing hood in raised position

The runabout body can be divided into two general classifications: those with and those without doors. The design presented is one with doors and is shown mounted on a Pathfinder 40 chassis, having 120-inch wheelbase, 36 by 4-inch tires and right side drive. The chassis frame is of the double-drop pattern, permitting a low body position and low center of gravity.

The stock chassis requires no alteration to accommodate the new body. The horn, which is under the hood, the electric lighting system, the dual tire carriers at the rear and the fenders, both front and rear, also remain normal as in the stock car. This use of the regular equipment as much as possible cuts down materially the cost of installing the new body.

Fig. 2 shows the side elevation of the complete assembly. It will be observed that the doors on this body are large and set well back, and though the steering wheel is on the right side, neither this nor the change and brake levers prevent a reasonably easy right-side entrance. The distance or space allowed under the wheel to the top of the seat cushion is 7.5 inches and from the rear edge of the wheel to the seat back 16 inches is allowed. The seat cushion is 7 inches thick, well sloped toward the rear and the seating size as shown on Fig. 3 is 39 inches long by 18 inches wide, providing ample accommodation for two people. The legroom from the seat to the dash is also generous and coincides with the other ample body dimensions.

Again referring to Fig. 2, it will be noted that the cowl is not fitted with a windshield. There is, however, a good, strong, four-bow, close-fitting top, that is shown both in its raised and folded down positions on this drawing. In stormy weather, curtains are fitted to the top on the front and sides, being fastened at the lower edge to the body. These curtains have celluloid lights and give the protection required. Under the driving seat, the space is utilized for carrying these curtains when not in use, as well as locker space for wraps.

At the rear of the passenger compartment the space is occupied by a combination gasoline and oil tank and the luggage hamper. The tank has a total capacity of 30 gallons, the divided compartments allowing space for 27 gallons of gasoline and 3 gallons of oil. This tank can be removed for repairs very easily, and the hamper to which it is attached furnishes space for carrying one suit case as well as the tool kit. The cover of this hamper is made watertight and in addition there is a small door on each side that allows the space forward of the tank to be

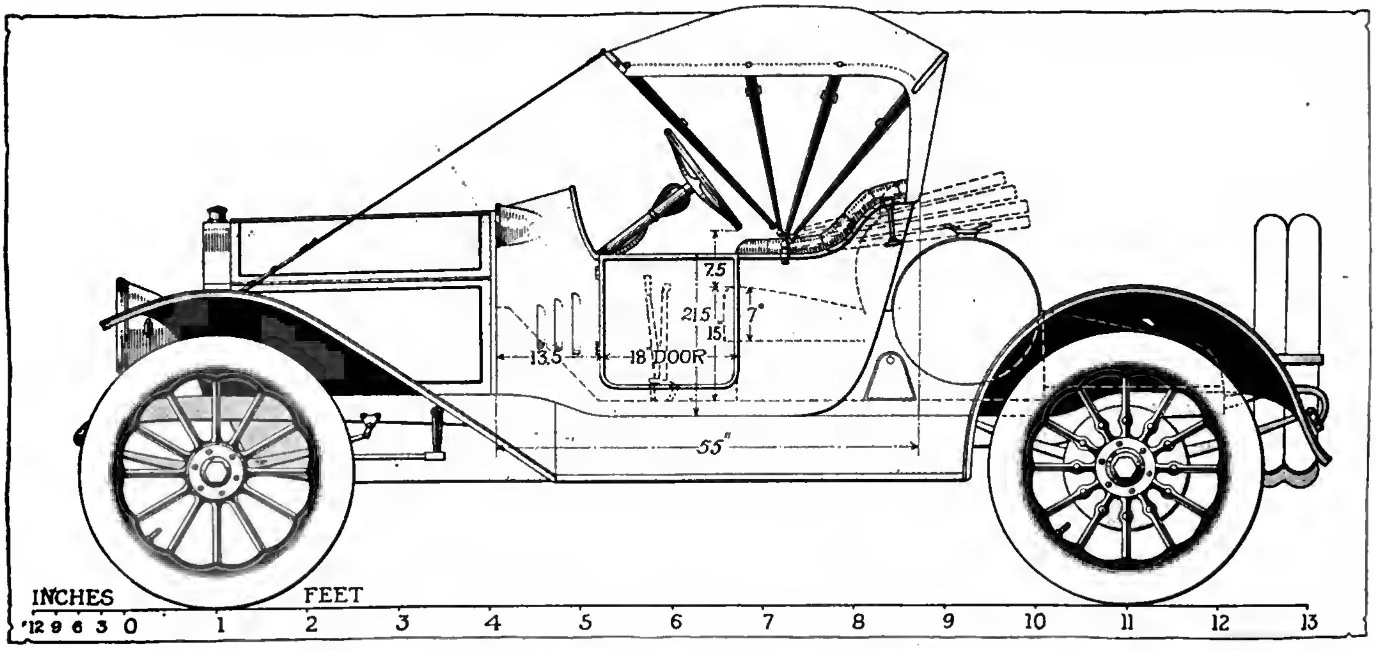


Fig. 2—Side elevation to scale of suggested runabout body with doors, adapted to chassis of Pathfinder 40

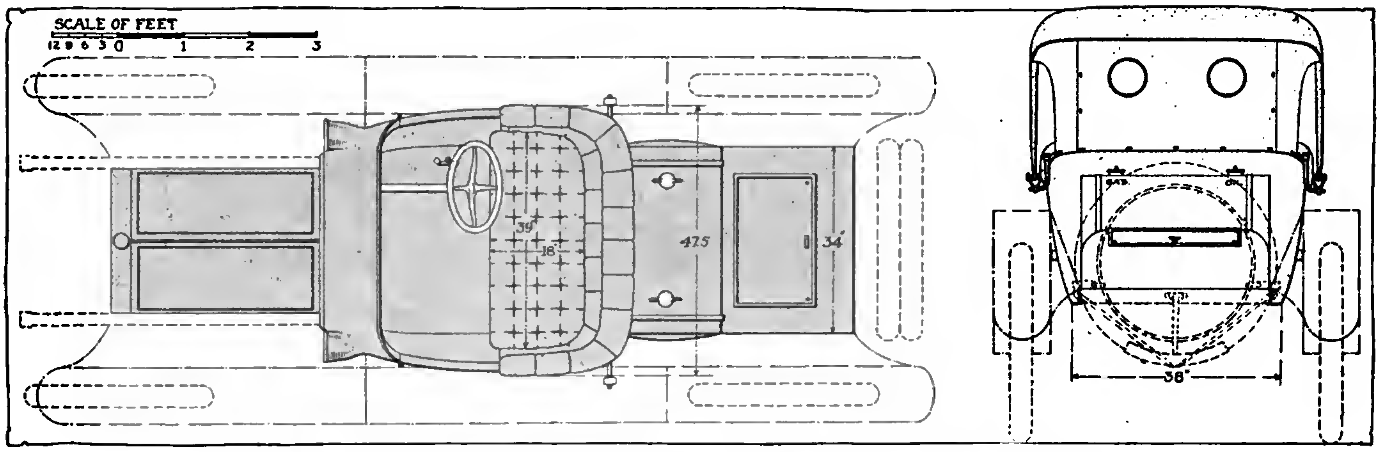


Fig. 3—Plan and rear view, showing location of tank and locker space at rear of seat

utilized for locker room also. Front, plan and rear views of the design, all to scale, are given in Figs. 1 and 3.

The construction of the body calls for aluminum panels for the major part of the body. Steel panels can be used where they are sufficiently flat not to require much beating.

The round tank at the rear is made of 22-gauge steel. The heads are soldered in and the joints wiped to give a smooth paint finish. The two steel bands that hold it in place on the hamper are threaded on each end and fastened with nuts below the hamper framing. The filler caps cover 3-inch openings.

A color suggestion for this design would be battleship gray for both the body and the running gear, black striping with here and there a white hairline stripe to relieve the flat color effect. The fenders could be black and the lamps a combination of black and nickel. Wood finish wherever exposed to be mahogany and the bows of the top, which are of wood, fitted to slat irons, are stained mahogany. The irons are blacked. A heavy khaki material would look well for the top, and the storm curtains of the same with celluloid lights.

The trimming material to be black leather, dull lustre and soft, and the trimming or upholstering of the sides, back and cushions to be a durable, moderately luxurious combination. All the materials for trimming, such as hair and springs must be of the best quality if satisfactory wearing results are desired.

The hamper and body are assembled together when going through the shop, and it is not intended to separate them at any time. This is considered necessary in order to make the joints watertight and thus insure the locker space being kept dry. For the same reason, the cutout under the tank is sealed and drainage is put around the piping.

Ventilation in the front is secured by means of flutings in front of the doors.

The Technical Training of Body Designers

ALTHOUGH every automobilist is acquainted with and takes a pride in the remarkable development of the self-propelled vehicle since its introduction, yet it is rather to be wondered at that so important a branch of this progress as the design of automobile bodies should receive comparatively so little attention. It is only necessary to recall the odd-looking vehicles that first ran under their own power, and mentally compare them with the beautiful lines of the modern automobile to realize what strides have been made in this respect. Not that appearance is the only factor to be considered; comfort and utility are even of greater importance, but these qualities have been attained at the same time as artistic tendencies have been introduced.

With the increasing demand for a good looking car as well as one mechanically efficient comes the need of body designers in large numbers to supply the automobile bodies of the near future. The training of men to fill these posts would seem to suggest the desirability of a new line of education in our technical colleges.

In this connection, the recent visit to Europe of Charles A. Heergeist, technical editor of *The Carriage Monthly*, for the purpose of investigating European methods of technical training, is of interest. This investigation was undertaken on the authorization of the Carriage Builders' Association, and Mr. Heergeist's report has just been published. Schools in England, France, Germany and Austria were visited. Among these the report of one at Vienna seems of especial interest:

"The Austrian Bureau of Public Works in Vienna supports an industrial establishment in which sample carriages and automobiles are designed and built by pupils desiring to perfect themselves in the art of constructing high-class, up-to-date work. Five different trades—designing, body building, smithing, painting, trimming and finishing, all most difficult to learn—are taught in this school. This establishment is open to employers, workmen and helpers, and all those between twenty-four and forty-five years of age are eligible.

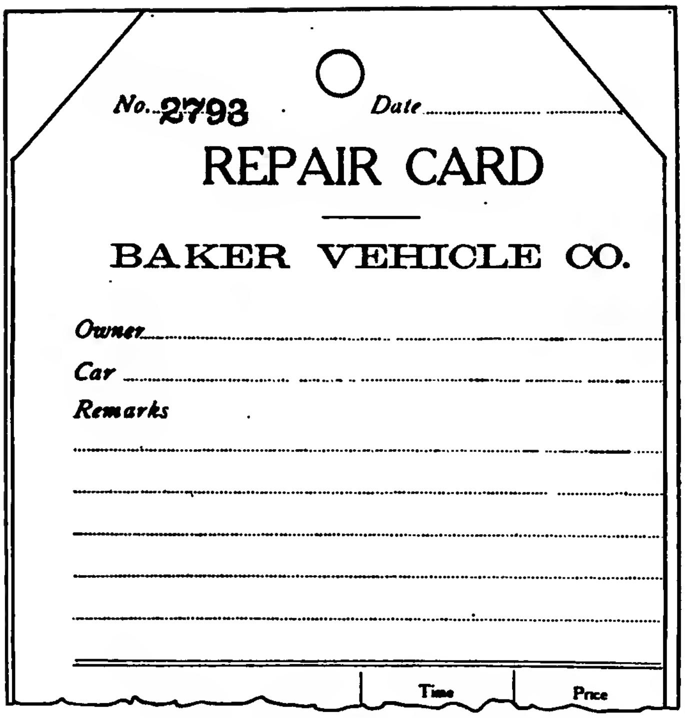
"A full course in building carriages in the white occupies eight weeks; body and smith work, or painting and trimming, six weeks, all ten hours a day. This time may be extended, however, in special cases, and the course may even be repeated when desired.

The circular issued by the Vienna school announces courses as follows:

"Theoretical exercise, drawing, accounting, bookkeeping, machinery, technology, industrial law.—Working in the various branches of carriage and motor car manufacture.—Starting and finishing gear work in wood and iron, building carriage and automobile bodies, movable tops and putting on hinges and lock fixtures.—Gear work and suspending bodies. Top work for limousines, landaus, landaulets and cabriolets, including all the necessary fixtures.—Painting and varnishing carriages and automobiles.—Trimming and finishing interior and exterior of carriages and automobiles.

"Each course in all its branches is free, and, besides, paper, drawing instruments, pens and other necessaries are furnished free of cost. These schools have been established about three years, and the results have been exceedingly satisfactory.

"All the drawings and writings made by the workmen are their own property, while the bodies, finished carriages and automobiles are sold to those who have made them, and are auctioned off to the highest bidder. This is done not only to prevent competition with other concerns, but even to destroy all thought of it.



No. 2793 Date

REPAIR CARD

BAKER VEHICLE CO.

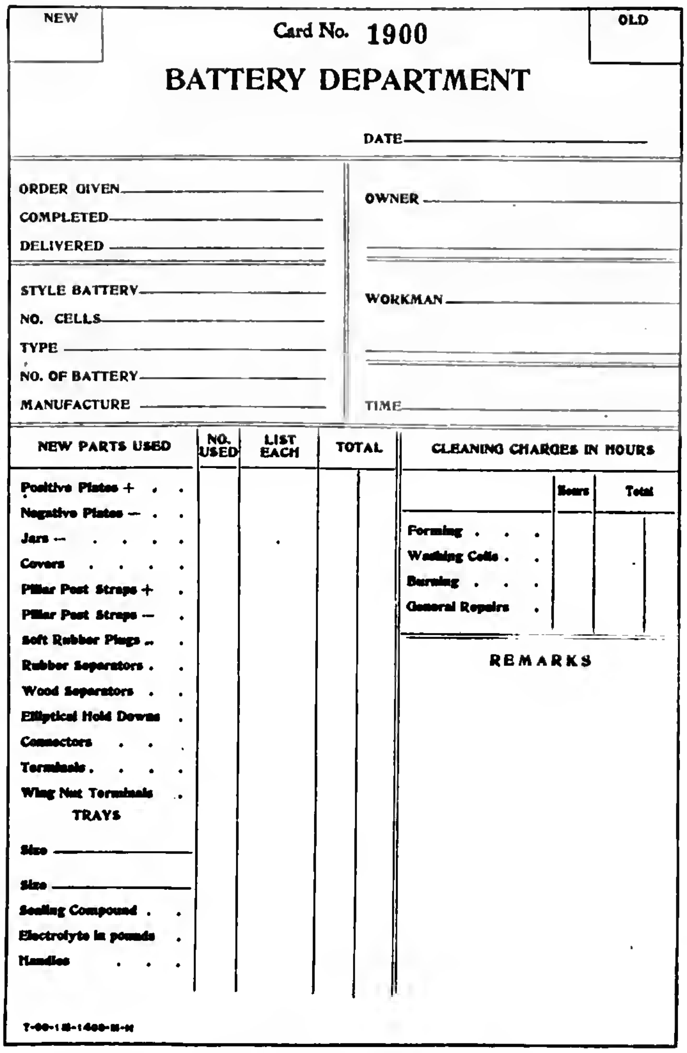
Owner

Car

Remarks

Time | Price

Fig. 1—Baker Vehicle Co.'s repair card



NEW

Card No. 1900

OLD

BATTERY DEPARTMENT

DATE

ORDER GIVEN

COMPLETED

DELIVERED

OWNER

STYLE BATTERY

NO. CELLS

TYPE

NO. OF BATTERY

MANUFACTURE

WORKMAN

TIME

NEW PARTS USED	NO. USED	LIST EACH	TOTAL
Positive Plates +			
Negative Plates —			
Jars —			
Covers			
Pillar Post Straps +			
Pillar Post Straps —			
Soft Rubber Plugs			
Rubber Separators			
Wood Separators			
Elliptical Hold Downs			
Connectors			
Terminals			
Wing Nut Terminals			
TRAYS			
Size			
Size			
Sealing Compound			
Electrolyte in pounds			
Handles			

CLEANING CHARGES IN HOURS	Hours	Total
Forming		
Washing Cells		
Burning		
General Repairs		

REMARKS

7-00-1 B-1400-B-H

Fig. 2—Baker company's battery record

Service for Electrics

Complete Service Agreements Are Common and Simple Record Systems Becoming Popular in Large Cities

Besides special forms for recording repair operations made on batteries, electric-car service departments use much the same style of records as other stations, especially for compiling information which relates to repair work, a most important part of service. Where cars are stored in the service department, using it like a garage, a checking sheet supplements the cards here illustrated.

WHILE gasoline-car service stations are undoubtedly ahead of electric ones with regard to elaborate systematic organization, the latter are fast following. The efforts of the responsible men are best indicated by describing the principal features of service for electric cars given in New York and the surrounding territory.

A number of companies, among them the Baker and the Rauch & Lang, are giving complete service in their own garages. This service includes electricity, lubrication, washing and polishing and delivery of the car to the owner's house as well as calling there for it, both once a day. A charge varying from $35 to $55 a month—which, however, does not include the cost of repair work done without the guarantee—is made for this service; also, if the car is sent to and from the garage more than once a day, the time of the man driving it is charged to the car owner.

As for repair work, in the case of the Baker branch, owners, when desiring a repair job done on their cars, telephone to the manager of the company who is in the salesroom. The latter instructs, also by telephone, the service department's shop foreman and requests the car owners to drive their cars to the department, where the foreman is ready to have the necessary repairs made at once, if they are small, or in the shortest possible time, if they cannot be carried out immediately.

In the case of the Rauch & Lang service, the owner, when confronted with suddenly-arising trouble, communicates with the service department much in the same manner. Incidentally, this company's service includes the inspection, by service department men, of the car every-now-and-then so that necessary repairs may be made before their need has grown too urgent.

The Hupp-Yeats service station in New York City consists merely of a repair shop where inspections of the cars are made upon request of the owner and where broken or misadjusted parts are replaced or put in proper shape. It is a repair department and spare parts store. No arrangement is provided for a full-care scheme as in the case of the other companies.

The systems, too, which are used in these electric service departments, are rather elementary. A repair card for noting repairs made by the owner and checking them off, as they are being executed, together with a battery card for recording details when working on a car battery, are, as a rule, all that is used. Four of these forms are described and illustrated here.

Fig. 1 shows the general repair card used by the service department of the Baker Vehicle Co. This card is in form of a tag so as to be suitable to be attached to the steering lever or any other suitable part of the car, when the latter is brought into the repair shop. The card is 4.25 by 9.25 inches, printed black on tan cardboard and numbered, all cards being issued in series and bearing consecutive numbers. The use of the card is as simple as its design. When a car is brought in to be repaired—it does not matter whether the owner waits for the work or not—the foreman who takes the car over from him makes notes on the card of the owner's name and address, the number of the car and the required repair operations. Of course, the card is dated.

The work having been outlined on the card or tag, and the latter affixed to the automobile, the same is turned over to a shop worker or more to carry out the work. The man who does the work then fills out the lower part of the card—filling practically one-half of it—which is ruled for this purpose, with spaces for three columns. In the first column, the nature of the repair operation and the name of the man doing it are given; in the second appears the time in hours and minutes consumed by the man's work, and in the third the wage paid to the man for this work. If two men are on the job, each fills out a line referring to the operation, giving the name of the same as well as his own, and stating the time spent on the job. Following is a sample of how the card is filled out:

Taking up steering-gear play (Jones)......45 min., 37 cents

In a similar manner, the reverse side of the tag is ruled to form three spaces, for parts or materials used, unit prices thereof and the total price to be charged to the customer for a quantity of material or parts, as per example:

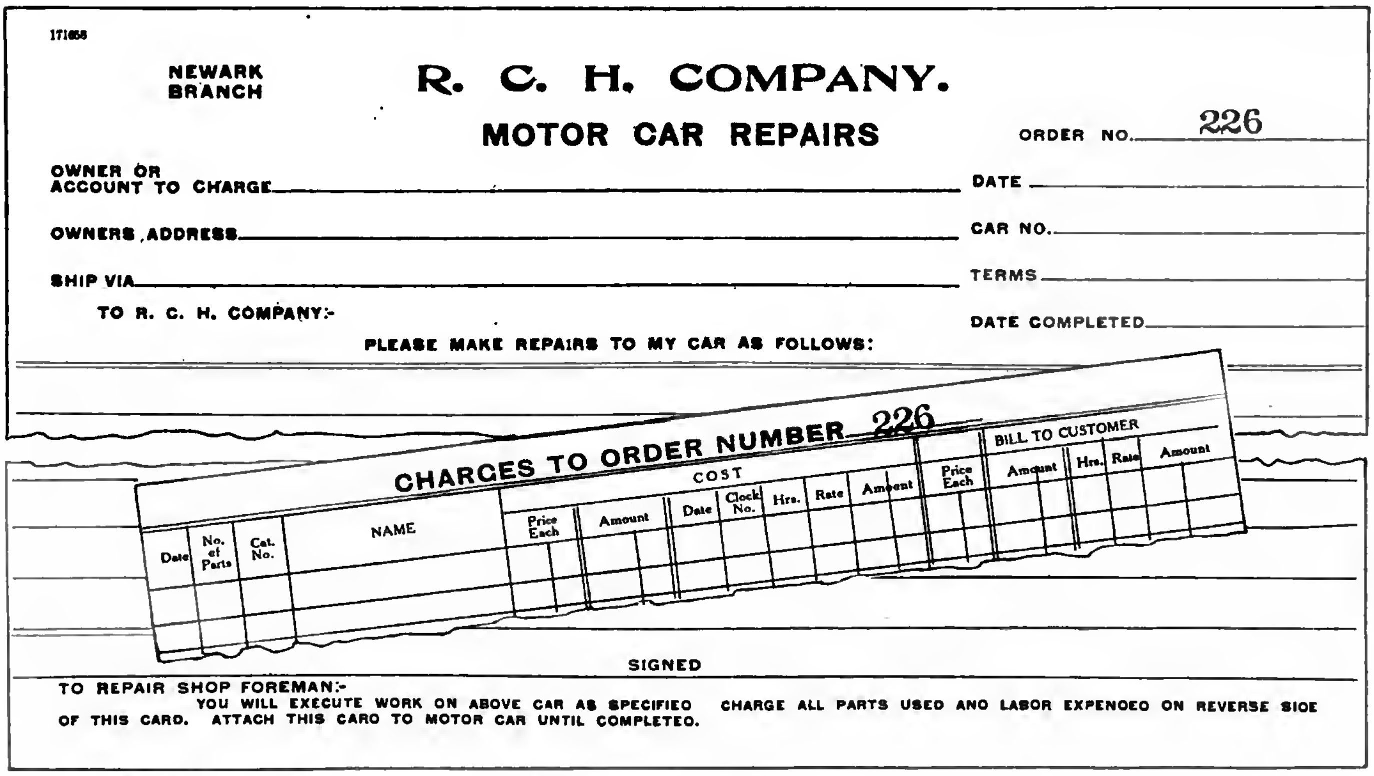
Fourteen feet of wire to motor... ....25 cents, $3.50

It is seen that by thus ruling the card with spaces for recording both time and materials used as well as their costs, a complete record of the cost of a repair job is obtained. Naturally, this card is supplemented by the weekly clock card used by all workers of the shop and requisitions whenever material is drawn from stock. This requisition gives the nature and quantity of the material needed and the number of the job for which it is made out, but it is designed much in the same style as other requisitions, and such having frequently been shown and described in The Automobile, it is thought superfluous to illustrate it here.

The Baker company also uses a special card in connection with battery repairs. This nature of work, constituting one of the most frequent requirements of electric cars, is so apt to run into details of which there are many, that it is worth while to have a special card and not make notes on a general repair card. The Baker company's card is 6 by 9.25 inches, printed black on tan cardboard and numbered. Fig. 2 shows that there are fully thirty-three spaces on the card, to say nothing of those for the date and special remarks. If a battery is brought in for repair, the card is filled out with the date and under remarks facts given by the owner or driver are noted. Then the shop worker taking care of the work fills out the spaces describing the battery and giving details which relate to its distinguishing marks, such as make, number, etc. The names of owner and workman having been filled out, the work is taken up and as it proceeds, the workman makes notes on the card of all parts drawn from stock to replace worn-out battery parts. The unit price to be charged, the number of parts used and the total net price to the owner are filled out in every case of replacement. Definite charges made for forming, washing or burning the cells are recorded and so is the time spent by the worker or workers on the job.

The Hupp-Yeats service forms are also used for R. C. H. cars and consequently do not seem to be specially suited for electrics, although they fill every requirement. The main card of the system is Fig. 3, 9.75 by 8 inches, which is printed black on tan cardboard and is made out with a duplicate on thin white paper. Or, rather, the white copy is made out a carbon duplicate on cardboard. Anyway, the latter copy goes to the shop with the car, while the white copy goes to the office. When making out the form, the repairman fills out the owner's name and address and the work to be done, as well as data referring to the car itself. This having been done, the owner or his representative who brings the car and orders the work, signs the card to authorize the job. Then, as the work is done, the various items are checked off as they are taken care of. On the shop card, no time spent or material used is entered, but time-distribution cards and requisitions serve to record this information, and the latter is put in suitable form when the job is complete and all the relevant forms are turned over to the office.

To put the records in the proper form, the blank, Fig. 4, is used. This is printed on the reverse side of the office copy of Fig. 3, and is so designed that every line permits of recording a repair operation, the number of the employees who did it, the time used and wage paid for the same, the materials used and their price, both the cost to the company and the amount to be charged to the customer. Of course, this side of the blank is also stamped with the number of the repair order and by keeping the various office copies of these orders filed—either alphabetically under the owners' names or by numbers with a cross index for the names—the information relating to all repairs is kept in accessible and tangible form. Naturally, the total labor accounted for must be equal to the total of clockcard times.


171658

NEWARK BRANCH

R. C. H. COMPANY.

MOTOR CAR REPAIRS

ORDER NO. 226

OWNER OR ACCOUNT TO CHARGE

DATE

OWNERS ADDRESS

CAR NO.

SHIP VIA

TERMS

TO R. C. H. COMPANY:-

DATE COMPLETED

PLEASE MAKE REPAIRS TO MY CAR AS FOLLOWS:

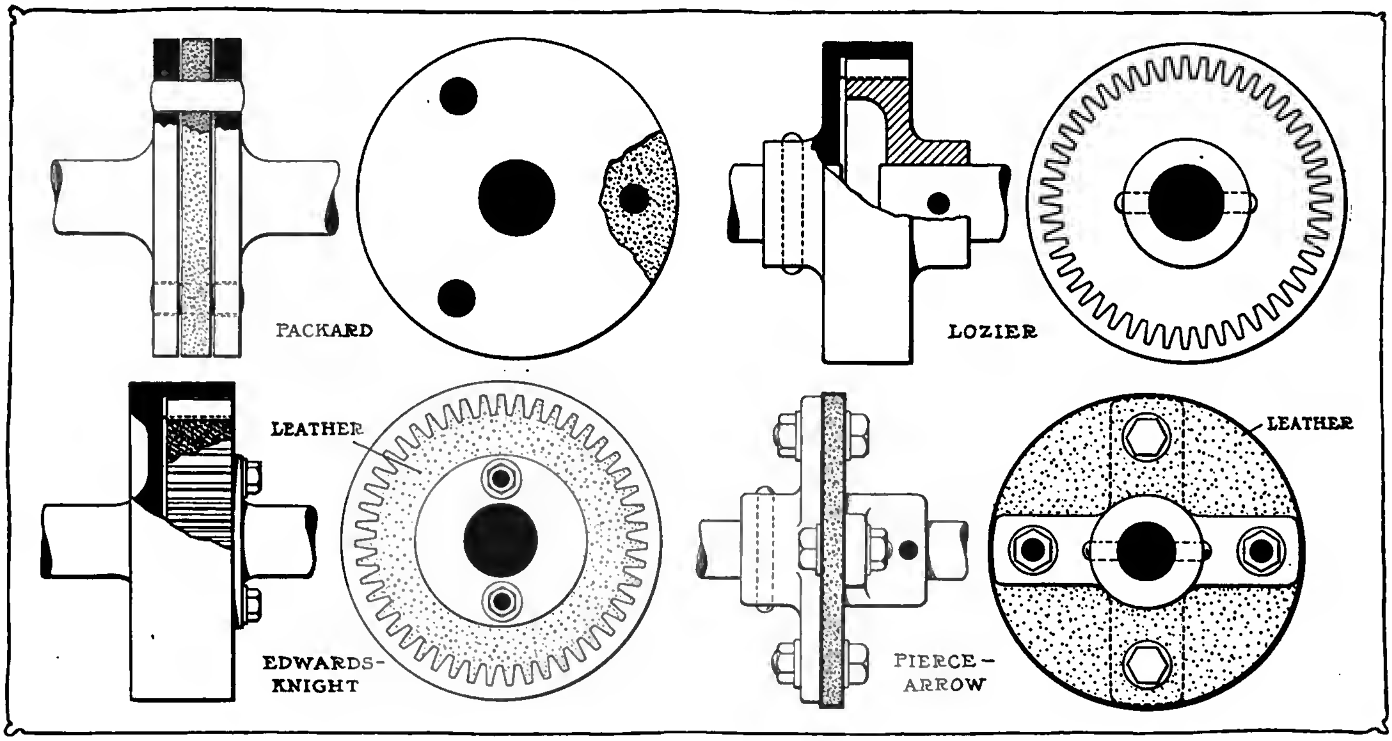
CHARGES TO ORDER NUMBER 226

Date	No. of Parts	Cat. No.	NAME	Price Each	Amount	Date (Cost)	Clock No.	Hrs.	Rate	Amount	Price Each (Bill to Customer)	Amount	Hrs.	Rate	Amount

SIGNED

TO REPAIR SHOP FOREMAN:-
YOU WILL EXECUTE WORK ON ABOVE CAR AS SPECIFIED CHARGE ALL PARTS USED AND LABOR EXPENDED ON REVERSE SIDE OF THIS CARD. ATTACH THIS CARD TO MOTOR CAR UNTIL COMPLETED.

Fig. 3—Repair work record used for Hupp-Yeats electrics. Fig. 4—Accountant's cost record on back of office copy of same



Novel Magneto Couplings for 1913

SILENCE, accessibility and flexibility are the three big requirements of a magneto or water pump shaft coupling. Automobile manufacturers have tried in various ways to secure this combination and many ingenious forms of shaft connection are to be seen on the cars that have been produced during the past few years. Leather has proved a popular material for transmitting the turning effort on account of its toughness and flexibility. The feature of silence is also one of the points for recommending this material. Among the important car manufacturers who employ leather in the magneto couplings may be mentioned Pierce, Packard, Stevens, Stearns, Premier, Haynes and Columbia.

Other concerns have pinned their faith to rubber. The Velie is prominent in this respect, employing a magneto coupling in which the drive is transmitted through a solid rubber disk.

Others have various arrangements in which metallic devices of a more or less flexible nature are used. Laminated springs have been found excellent and the Bosch Magneto Co. has brought out a device of this type.

A few years ago the use of the Oldham coupling for magneto work was very extensive. It was found that after a few hundred miles of running this type of connection became noisy through wear. The Oldham coupling, in order to be efficient, needs a close engagement between the splines and grooves, otherwise a small knock will develop.

Packard

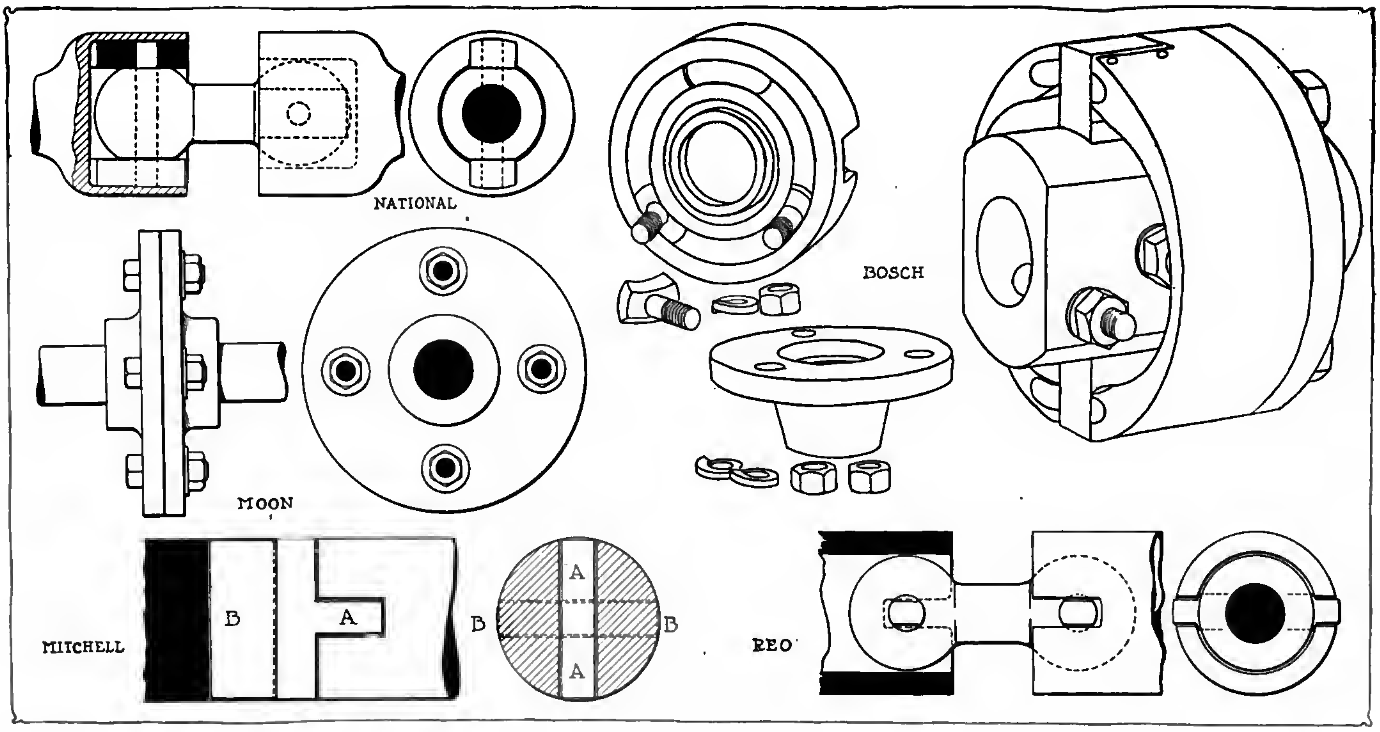
The Packard magneto drive is through two flanges which are pinned together by three pins and a leather washer which is inserted between them. This forms a rigid drive, none of the power being transmitted through the leather as the two shaft flanges are pinned firmly together. The use of the leather disk in this instance is merely for the sake of silence. There is no metallic contact between the two flanges and hence, even if a certain amount of wear should take place, there would be no clashing of metal. The Packard magneto drive is illustrated in two views herewith. The cross-sectional view shows the two shaft flanges with the leather disk placed between and the end view shows the arrangement of the drive-transmitting pins.

Lozier

Lozier uses a different scheme in transmitting the drive to the magneto. A study of the above sketch shows the Lozier scheme, which is along the lines of an internal gear. The gear is not used as such, it must be understood, as the teeth merely mesh with a toothed annulus. The gear is of bronze and the teeth of steel. It is evident that with such a large bearing surface, the drive is not likely to ever work loose. The drive is transmitted directly through these teeth from the magneto drive-shaft to the driven shaft. The annulus is supported by a collar which bolts to the magneto shaft. When it is desired to change the timing it is only necessary to slip the gear wheel out and slip it back so that it is rotated one or two teeth. This renders an indefinite number of adjustments possible with this type of connection.

Bosch

One of the most notable couplings to be found among those now in use is that brought out by the Bosch company. The drive in this coupling is transmitted through a laminated spring and the timing adjustments can be made directly at the coupling. The coupling is shown in some detail at the right on page 897. It consists primarily of three parts, a driving member, coupling sleeve and driven member. The driving member is a slotted block through which passes the laminated spring. The spring projects through the block and is held within it by bolts. The coupling sleeve is slotted and the laminated spring which projects from the block engages with the slot in the coupling and forms the transmitting feature of the drive. The driven member is bolted to the slotted coupling in such a way that it can be adjusted. The adjustment feature is secured by passing the bolts through slots and in adjusting it is merely necessary to loosen the bolts and to slip the sleeve around on the bolts the required distance. This form of magneto drive is more elabo-



rate than that usually seen because it includes both the flexibility and the adjustment features, one being secured by the spring and the other by the bolts passing through the slots.

Moon

For motor-generator drives the flexibility feature need not be considered because all the connections are rigid and since a large amount of power is transmitted by the cranking motor rigid connections are used. For instance, the Moon motor generator connection is that shown above, over the name Moon. The magneto drive has the additional feature of a leather washer slipped between the two flanges of the coupling. All the 1912 Moon cars had double-jaw universal joint connections for the magneto coupling, but in mounting the motor generator on the 1913 cars the designers have used the same type of drive for the magneto. The leather washer gives the touch of flexibility and silence to the magneto coupling which has been sought in the campaign against noise which has been instituted by automobile engineers in the past few years.

Edwards

Similar in many respects to the Lozier gear is the one employed on the Edwards-Knight car. On the latter, however, the gear wheel is of rawhide and further obviates any possibility of noise. The leather gear is carried by two stud bolts on the driveshaft from the timing gears and the collar containing the annulus into which the gear meshes is a fixed flange on the magneto shaft. The drive is thus in a measure flexible as it passes through the leather. It must be remembered, however, that the leather is of such thickness and toughness that there is no perceptible yielding to its action and no stretch whatever. The part sectional view given on page 896 shows the rawhide gear to be of considerable width giving sufficient beating surface to prevent the possibility of a loose connection. To make a change in the timing it is only necessary to pull the rawhide gear out of the annulus and advance or retard it a couple of teeth. No metallic contact exists between the driving and the driven members of this connection.

Pierce

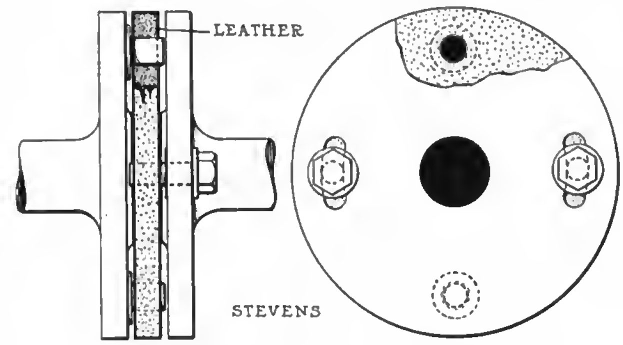
Another method of employing leather and one which has met with success in the Pierce-Arrow and other makes is that shown under the name of this concern in Fig. 1. The members in this drive are so arranged that there is no metallic contact between the driving and the driven members. The adjustments are not made at the coupling proper, but by means of an internal gear at the end of the shaft at the point at which the shaft passes through the timing gear casing. The connection used is in reality a cross-connection because the driving support and the driven are at right angles to each other. The drive is all transmitted through the leather and the strain equally distributed between the four quadrants of the leather disk. The leather is thus held at four points, equally spaced, on its circumference. The points at the extremities of one diameter are the driving members and the points at the extremities of the other diameter are the driven members.

National

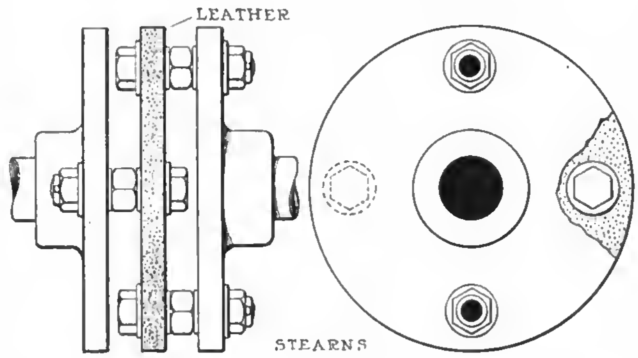
Radically different from any of the preceding types is the magneto connection on the National car. This is shown at the left top of the page. It is purely and simply a universal joint of the double-ball type. The driveshaft and driven shaft each terminates in a jaw into which is fitted a liner. Between these shaft terminals is a short universal shaft with each end terminating in a ball. As may be seen in the illustration, the jaws slip over these balls and a pin passed through each. It will be noted that the pin in one ball passes through at right angles to the pin through the other ball. This gives flexibility in two directions and takes care of any changes of alignment in the shafting. The National coupling is not adjustable as far as changes in timing are concerned; these are made independently. The big feature of this type of connection is its flexibility and its tendency to avoid wear because it automatically takes care of any misalignment which may take place.

Stevens-Duryea

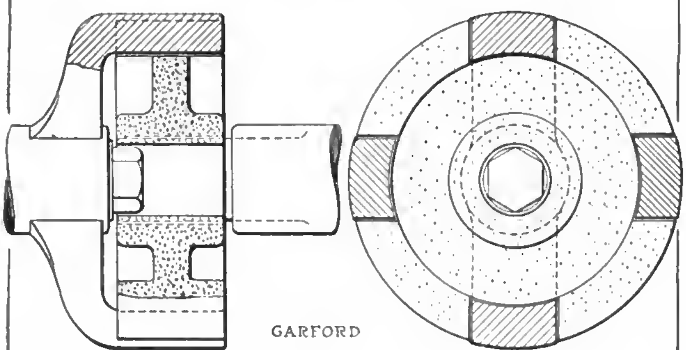
On the Stevens-Duryea cars an adjustable drive through leather is employed. At the top of the illustration on page 902 two views of this drive are given. It will be seen that the leather is in disk form and is placed between the driving and driven shaft flanges. Each shaft flange is connected to the leather at two points, one on the vertical and the other on the horizontal diameter of the leather disk. This arrangement makes a positive drive through the leather itself as there is a quadrant of the leather disk which separates the connecting point of the driving shaft from the connecting point of the driven shaft.

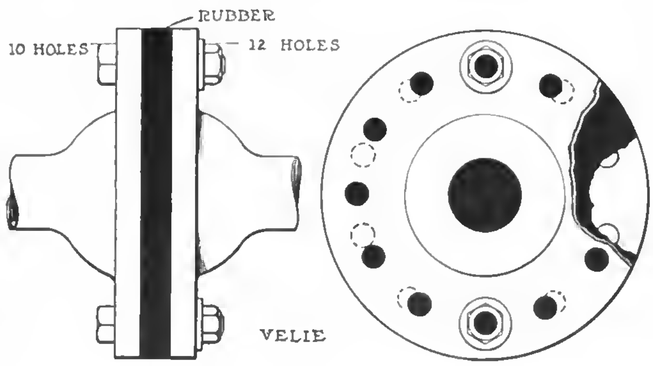


STEVENS

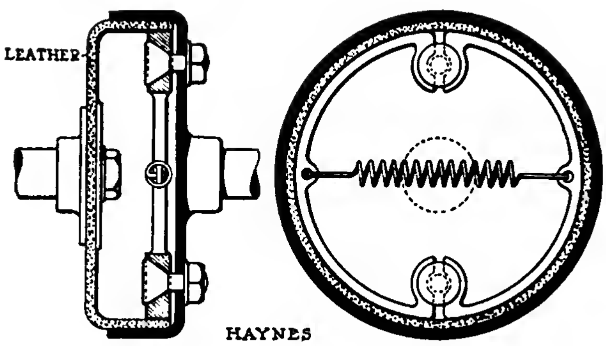


STEARNS


GARFORD



VELIE



HAYNES

This gives a slight flexibility in the drive itself and at the same time takes care of any changes in alignment which may occur in the shafts. The adjustment feature is included by having slots instead of holes through one of the shaft flanges. To make the adjustment the nuts on these bolts are loosened and the flange slipped around a short distance. A drive of this kind can be quickly taken down for removing the magneto, it is only necessary to remove the bolts and pull the connection apart.

Mitchell

A coupling similar to the Oldham type is used on the Mitchell car. It is a much more rigid proposition than the common form of Oldham, the flanges being much stronger. The main feature of the connection is a central disk with two rigid diametric flanges at right angles to each other. One flange is mounted on the driving side of the disk and the other is mounted on the driven side. These flanges act as splines and engage with grooves in the driving and driven shafts. This is an exceedingly light type of coupling, the finished job not having a greater diameter than the shaft itself.

Reo

The Reo magneto coupling is somewhat similar in appearance to the National coupling just described. Instead of the pins in the universal joint passing through at right angles to each other they are parallel. This is a flexible joint and readily takes care of the 1-32-inch misalignment that sometimes occurs between the drive and magneto shafts. Although the Reo magneto coupling is not adjustable, slight changes in timing can be effected in a shop by slightly twisting the universal ball shaft. One of the balls is clamped in a vise and a 12-inch wrench put on the other and a slight degree of change in timing can thus be secured. Other changes can be made at the timing gears in the usual manner by slipping the gears around one or more teeth in the order of meshing.

Stearns

A unique method of employing the leather disk between the shaft flanges is that seen on the Stearns cars. With this drive the leather takes all the power transmission and no metallic contact exists between the driving and the driven shafts. There is no chance for any noise to develop or a knock to occur because the bolt holes have become worn. The flange connections are at the extremities of opposite diameters, as in the case of many other leather-disk drives, but the novel feature is the use of a nut as a separator between the leather disk and the flanges. A longer bolt than usual is used. Each bolt passes through three parts, the shaft flange, the leather disk and a hexagonal nut placed between the flange and the disk. This gives an extremely flexible connection because the leather has enough clearance to get all the play that could ever develop in practice. Owing to the method of assembling this connection it is comparatively easy to take it down. It is only necessary to remove the bolts which hold the leather disk in place because the flanges are so far apart that the shaft can readily be slipped out when this is removed.

Garford

The Garford coupling is a variation of the cross coupling with the drive transmitted through a fiber block. As may be noted in the sketch, a collar carrying two arms is slipped over the magneto shaft and keyed thereto. The arms of the collar engage with the slots in the fiber and transmit the drive to them. The fiber block is keyed to the driving shaft. This is not an adjustable coupling and any changes made in the timing are made at the gears. There is no metal-to-metal contact between the driving and the driven parts of the connection and no noise can occur as the result of wear.

Velie

Instead of rawhide or leather, the Velie magneto coupling includes a disk of rubber. This elastic material fulfills the same purpose as does the leather in similar couplings. The Velie coupling consists of two metal flanges, one on the driving and the other on the driven shafts. Between these two flanges is the rubber disk used for silencing the drive and at the same time for giving it the necessary play. The adjustment feature of the timing is an actual part of the coupling and is arranged as follows: One of the metal flanges is pierced by ten holes all equally spaced around the circumference and the other flange is pierced by twelve holes. Since both the circumferences are the same size the holes form a sort of Vernier adjustment. One circumference is divided into tenths and the other is divided into twelfths, the minimum amount of variation that can be made will be the difference between 1-10 and 1-12 of the circumference of the circle, or 1-60 of the circumference. Since there are 360 degrees to a circle the adjustments can be made in spaces of 6 degrees.

Haynes

The Haynes coupling, although driving through leather, employs a different method of rendering the coupling flexible. The leather, as shown in the sketch at the bottom of page 898, is of cup shape instead of a disk. The cup is clamped at the bottom to the driven shaft and is fastened to the driving shaft by squeezing the flanges of the cup between a metal flange and a retaining ring. The retaining ring is split and through the openings made by the split there passes a small cone, as shown in the sketch. This cone acts in the nature of a wedge. The wedge action is secured by taking up on the nut passing through the axis of the wedge cone. This spreads the ring apart and holds the leather tightly. If the adjustment is to be changed it is only necessary to loosen the locking ring and slip the coupling around as much as desired and then retighten the wedges. The spring passing across the locking ring holds the segments tightly against the little cone-spreading wedges.

Studebaker

The Studebaker is a positive adjustable drive. The sketch at the top of the page shows it to consist of two metal flanges bolted together by two through bolts. One of the flanges is pierced by several holes spread around the circumference to make it possible to change the timing if desired. The power from the driving to the driven shaft is transmitted through the two bolts, which thus perform the double function of driving members and adjustment points.

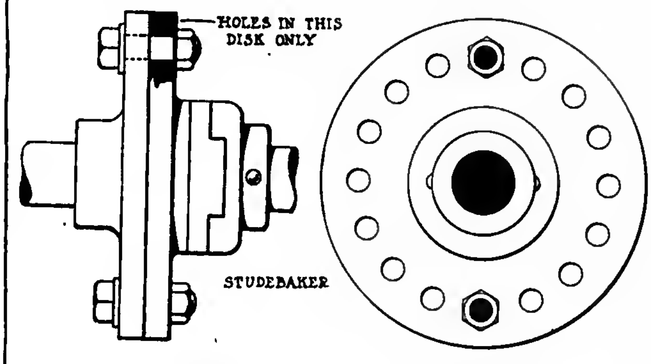
Marmon

A cross-coupling type with fiber filling blocks is used on the Marmon for 1913. As may be seen in the illustration at the right, the principle employed is somewhat similar to that used in the Garford design, except that the fiber filling blocks are separate pieces instead of being a single piece cut to take the jaws of the coupling. The Marmon device consists of a housing, shown in black in the illustration, and two collars secured to the drive shaft and the driven shaft respectively by means of key pins. The jaws of the coupling are integral with the collars, two jaws forming a part of each collar. One of the distinguishing features of the Marmon design consists of the tapered face on the fiber filling blocks through which the drive is transmitted. The tension between the faces of the blocks and the housing of the coupling is regulated by loosening the lock screw shown in the illustration and turning the right side of the housing face as indicated by the thread lines in the sketch. This coupling is designed for durability and silence in operation.

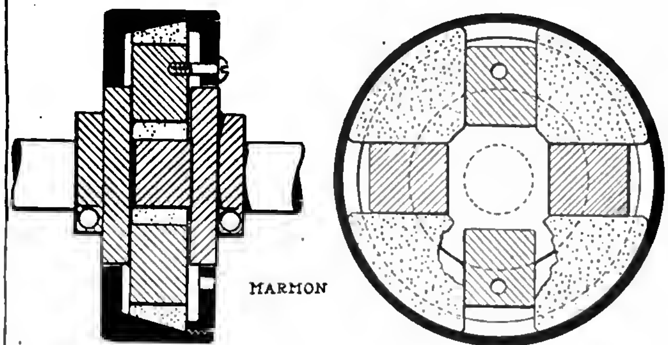
Premier

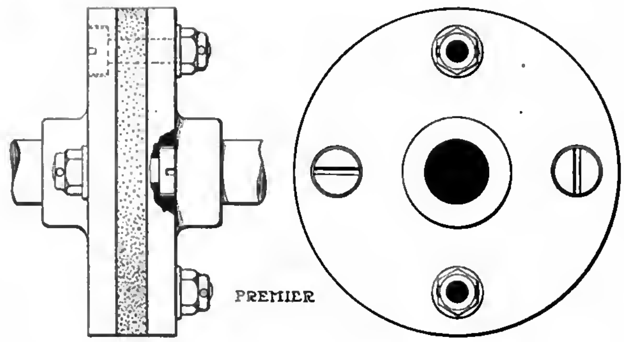
The Premier magneto coupling consists of two flanges keyed respectively to the driving and driven shafts. Between these two flanges is inserted a leather disk to fulfill the purpose of deadening the sound. This is a rigid connection, the drive is transmitted through the bolts which pass through the two flanges and through the leather disk between them. No need of play is felt to be necessary on the Premier car as the part carrying the

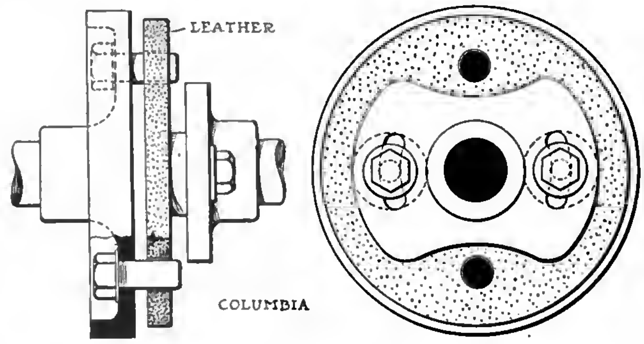
(*Continued on Page* 907.)



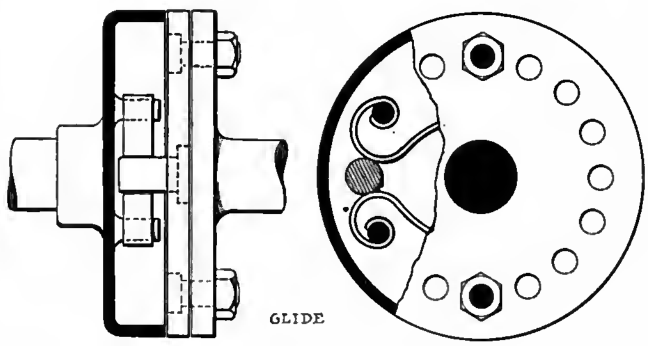
STUDEBAKER


MARMON


PREMIER



COLUMBIA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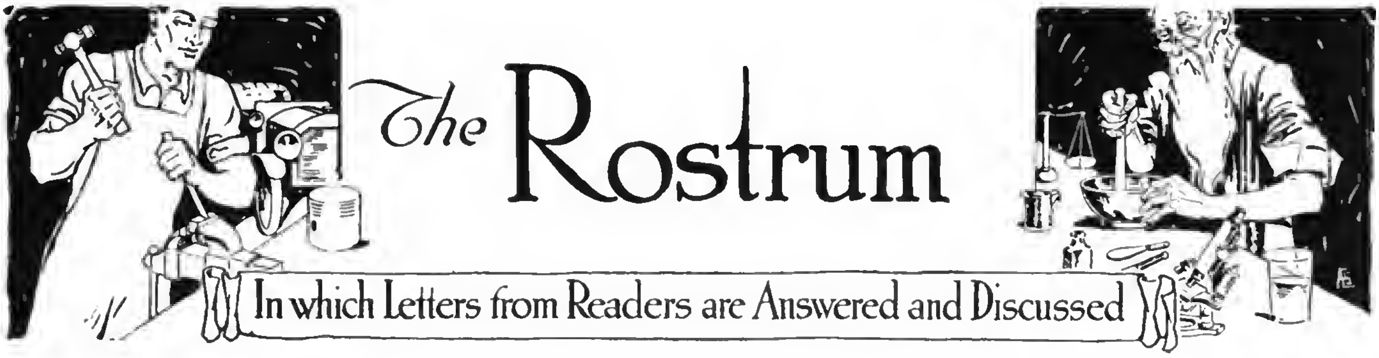


Effect of Wheel Size on Speed—Decarbonizing with Kerosene Vapor—Packard School of Salesmanship — Latent Heat

More Speed with Bigger Wheels

EDITOR THE AUTOMOBILE:—What would be the difference in speed of two cars, one gear ratio 3.5 to 1 with 32-inch wheels and one with 3.5 to 1 with 34-inch wheels. How much faster would the one with 34-inch wheels go? Both cars have the same bore and stroke, 4.00 by 4.50.

Lee, Ill. E. W.

—Assuming that both motors are turning over at the same speed, the speed of the cars would vary as the square of the diameters of the wheels. Calling the speed of the car with the 32-inch wheels A and that of the 34-inch wheels B, the proportion $A : B :: 32^2 : 34^2$ or $A : B :: 1{,}024 : 1{,}156$.

At any speed the car having the 34-inch wheels would be traveling 1.13 times as fast as the car having the 32-inch wheels. At a speed of 30 miles an hour for the 32-inch wheel car the 34-inch wheel car would be going 33.9 miles an hour. This is 13 per cent. faster than the car with the smaller wheels.

Pinching Inner Tubes with Iron

Editor THE AUTOMOBILE:—I have noticed that several of the inner tubes on my car have an appearance as if they had been chewed by the tool when putting on the tire. The tubes blow out through these weak spots and I would like to know if the rubbing of the iron against the tubes would be sufficient cause for these blow-outs? It is quite an expense and if I could check it with a little extra caution I would like to do so.

Yonkers, N. Y. SUBSCRIBER.

—Ten per cent. of the inner tubes on clincher tires are bruised by careless handling of the irons. The tube can be actually punctured in this way or weakened to such an extent that it will blow out shortly. In putting on a tire the tube can be pinched by the iron and also by the bead of the casing, as shown in Fig. 4. Lifting up on the iron will give the tube a bad squeeze and when the bead slips into place it is apt to catch the tube in the manner shown. In working the tire off it is easy to keep away from the inner tube with the tool if it is used in the manner shown in Fig. 5. The iron is first worked in vertically and then rotated about the rim to a horizontal position.

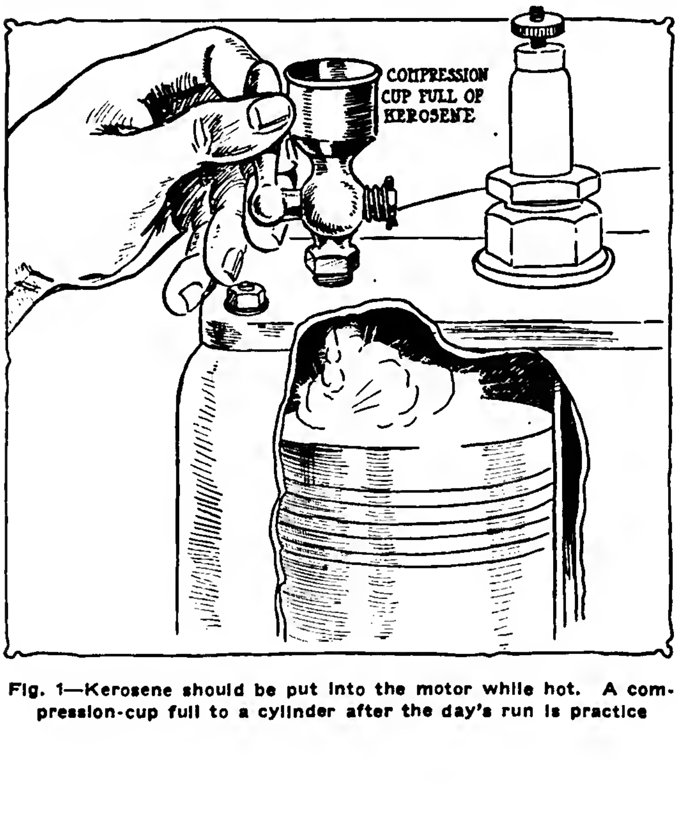


Fig. 1—Kerosene should be put into the motor while hot. A compression-cup full to a cylinder after the day's run is practice

Kerosene for Decarbonizing

Editor THE AUTOMOBILE:—Kindly let me know the following in regard to the use of kerosene to prevent carbon in motors: I read in THE AUTOMOBILE that you recommend putting a tablespoonful of kerosene in each cylinder after a run. I do not use my car for 3 or 4 days at a time and would like to know if it is necessary to start the motor the following morning or could I leave the kerosene in motor from one run to another.

Stockbridge, Mich. JAS. McC.

—There are two ways of applying kerosene as a decarbonizer. First, directly into the cylinder, and, second, through the intake. The wide difference between these methods is that the motor must not be running when the kerosene is applied directly into the cylinder, because if the petcock were opened when the motor was running the kerosene would be blown back. On the other hand, when applied through the intake the motor must be running in order that the kerosene be sucked directly up into the cylinder.

Fig. 1 shows the application of the kerosene to the cylinder direct. A compression cup full of kerosene is allowed to run into each cylinder after the end of the day's run and while the motor is still hot. As has often been explained in these columns, kerosene vapor is one of the strongest of carbon solvents. It is far stronger than the liquid kerosene which, however, is also a good solvent. When the kerosene runs down on the hot piston and comes in contact with the hot walls it is vaporized and then commences to attack the carbon. The carbon which is dissolved is deposited when the motor becomes cool in a thin, dust-like form. If the compression cup is opened and the motor cranked briskly this dust is blown out. As an experiment, treat the motor in the manner described and then hold a handkerchief over the petcock opening when the motor is spun rapidly.

The other method of applying kerosene is illustrated in Fig. 2. Many old and experienced automobilists swear by this method, stating that it is one of the best methods of freeing the cylinders of carbon. The motor is started and allowed to run briskly. Through the air intake of the carbureter, kerosene oil is slowly poured, a little at a time. This will cause the motor to sputter and misfire and allow huge volumes of gray smoke to come rolling out of the exhaust, but the misfiring is only temporary and the motor soon frees itself of the smoke. About a gallon of kerosene can be profitably poured through the carbureter this way, putting just enough in at a time that the motor will not die.

Many car owners are now using the patented compounds for removing carbon. Some of these are excellent and there are experienced men who prefer them to scraping the cylinders because it is a cheaper process and because the cylinders are left practically as clean as if they were scraped. These liquid and solid carbon removers are either very strong solvents or they burn the carbon out of the cylinders in the same way that the application of salt will burn the black off a gas mantle.

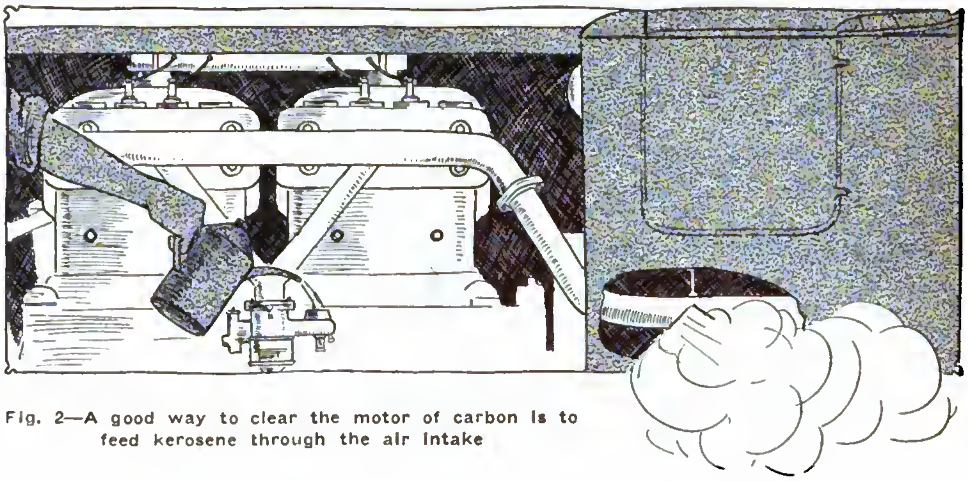


Fig. 2—A good way to clear the motor of carbon is to feed kerosene through the air intake

It is an excellent combination to follow the use of the carbon remover with an application of kerosene, allowing the latter to flow through the air intake of the carbureter in the method just described. The kerosene will positively destroy all the carbon that has been loosened by the stronger solvent or by any other process. If you live in a municipality where it is against the law to allow the car to smoke you should get out into the country before carrying out the work as the objectionable feature to the use of the kerosene in the manner described is the smoke which it causes. It would be well to go some place where noise of the motor is no objection so you will be able to open the muffler cut-out and allow all the smoke to escape to the open air in that way rather than through the motor. The muffler becomes clogged rapidly enough without adding any cause to make it absorb more soot. If the cut-out is opened the soot is deflected and the muffler escapes the heavy discharge.

Weight Affects Fuel Consumption

Editor THE AUTOMOBILE:—Does a car give more speed and milcage to gallon of gasoline with a light detachable rim than a heavier or a demountable? Also what would be the difference in running if the tire was one-third lighter than the average pneumatic? What kind of rims are used on racing machines? Do they have a special tire?

Brockton, Mass. J. W. CLAPP.

—The weight of a car affects the fuel consumption of that car because it requires a greater effort on the part of the motor to take it along the road, and effort on the part of the motor means the consumption of fuel. Every pound added to car's weight means so much taken off the highest attainable speed and also means so much added to the gasoline consumption at any given speed. The difference between the weight of a demountable rim and a quick detachable is so slight that the owner of the car would not notice any great difference in the cost of operating his car when he changed from one type of rim to the other. A difference of one-third in the weight of the tires would make an appreciable difference in the weight of the car and hence a somewhat greater economy as regards fuel consumption, although the difference would be scarcely perceptible. A 34 by 4.5-inch shoe weighs 24 pounds. According to this, the saving in weight would be only 32 pounds on all four tires. The addition of a passenger makes very little noticeable difference in the running of a car and therefore a saving of tire weight would make still less. On racing cars demountable rims are generally fitted, although cars fitted with wire wheels have used the Rudge detachable wheel to good advantage. The reduction of tire wear in races is accomplished by buffing the tires. An ordinary plain tread tire is taken and the surface of the tread removed on an emery wheel to allow the car to be carried practically on the fabric. Instead of decreasing the service of the tire in the race its service is increased instead. The heat can be radiated much more rapidly and blow-outs are prevented. The tires do not give way until worn through the fabric.

Criticizes Morley Spring Suspension

Editor THE AUTOMOBILE:—In your issue of February 20, 1913, you published an article on "A New Spring Suspension," by E. M. Morley. There are a few points concerning his suggestion which I believe make it impractical. He states that the object of using the system is to permit the end springs to oscillate about their supports, thus saving the car from sudden lurches, etc. I cannot see in just what manner this arrangement is to accomplish the desired result. Suppose we consider the accompanying sketch, which represents a frame with two end springs mounted so as to oscillate about their centers, and a center spring shackled to the other two, but rigidly secured to the frame in its middle.

Suppose points A and H to rest solidly upon some support, such as the axle and wheels, and suppose the frame to be depressed vertically. The tendency of the end springs is to revolve on their pivots and pull down C and D on the center spring. At this instant, however, the entire center spring, being fastened to the frame, is also descending and will drop a distance equal to the drop of the pivots of the end springs. Now reversing the process and supposing the wheel to strike a bump: A is forced up and in turn pulls down B and therefore C. But the frame, being rigidly secured to C, is likewise pulled down. In other words, the support N is forced up with exactly the same force with which M is pulled down. The same thing happens, of course, when either of the other wheels goes through the same disturbing process.

Now taking the first case above, in which the frame is descending: it is readily seen that M drops just as far as B and C; A rises through the same distance as the spring is hung at its center. In other words, the effect on the center spring is practically nil as it performs no part of the actual springing of the car. The same effect would be obtained by securing B to the frame immediately above. Even in case the spring were of actual value it should be hung in the opposite direction so that the curve would straighten out with load, and not increase in curvature.

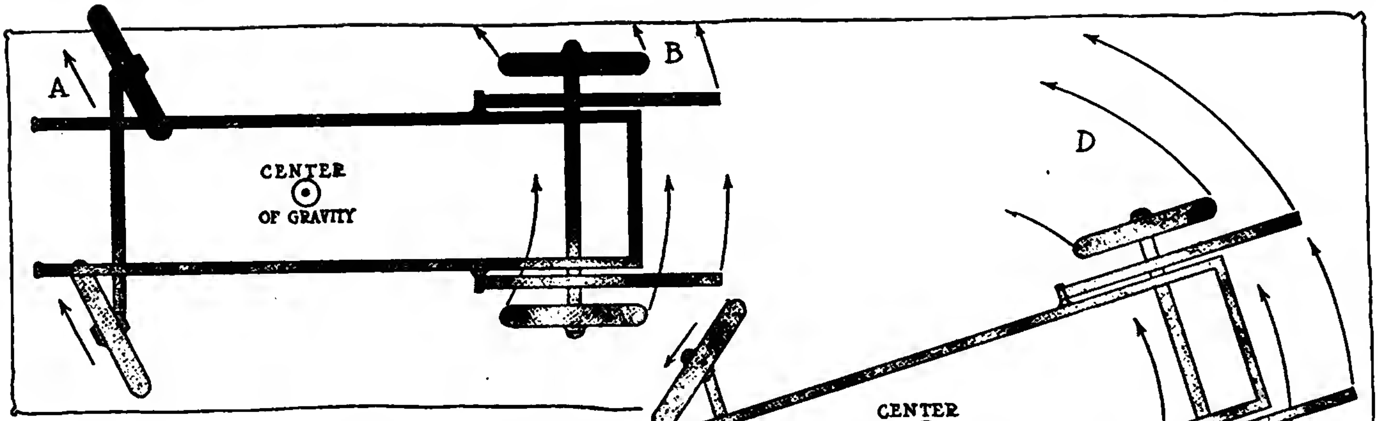
This problem could have been taken up from the graphical standpoint and the different forces and their directions determined, but I think that such treatment is unnecessary, on account of the simplicity of the arrangement.

Ann Arbor, Mich. O. W. HALL.

Packard Company Maintains School

Editor THE AUTOMOBILE:—Does the Packard company maintain a school for the education of Packard salesmen, and what system should an applicant use to get a course in Packard salesmanship?

Lexington, Ky. WM. B. B.



—The Packard company maintains a school for salesmen at its plant in Detroit. The men who graduate from this school are taken into the Packard organization as salesmen. To enter the school, the applicant is appointed through his local dealer and on the dealer's or branch manager's recommendation he is taken into the school, provided there is a vacancy. For your benefit it may be stated that there is always a demand for entrance and a waiting list generally confronts applicants.

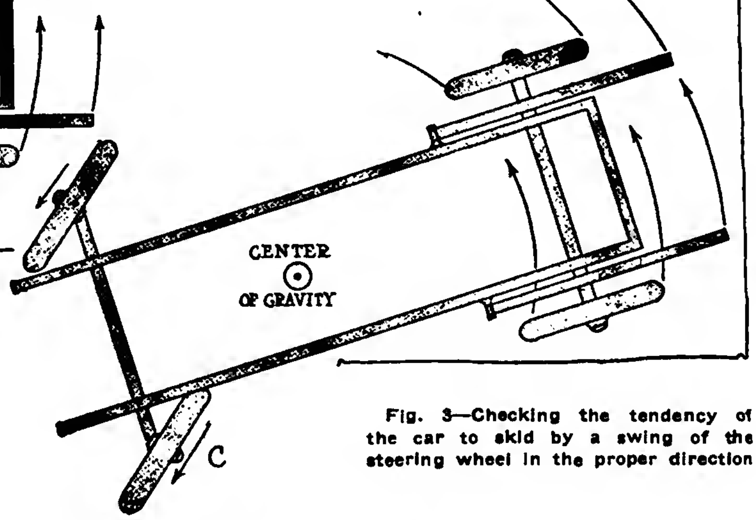


Fig. 3—Checking the tendency of the car to skid by a swing of the steering wheel in the proper direction

Preventing a Dangerous Skid by a Twist of the Wheel

EDITOR THE AUTOMOBILE:—There is nothing so fraught with danger to the automobilist as the skid. At this time of year when both the city streets and the country roads are often covered with a coating of slime which allows the wheels to get but a light grip on the surface of the road, the dangers under certain circumstances cannot be over-estimated. In view of this fact every one that drives should know the simple method of checking a skid by a simple manipulation of the steering wheel. As shown in Fig. 3, the car skids when there is a momentum tending to turn it about the center of gravity. When the forces about the center of gravity are balanced the car cannot skid. If the steering wheel is immediately turned in the direction of the skid, the skidding will cease because this will cause a tendency to rotate in the opposite direction. Following the diagrams, with the steering wheels turned as at A, the wheels B and A tend to swing in opposite directions and neutralize each other. When turned the other way C only tends to increase the skidding effect at D. After a little practice this swing of the steering wheel becomes instinctive.

New York City. L. BOURGETTE.

Can Make Money Running Car

Editor THE AUTOMOBILE:—According to a few advertisements in your paper one can run a car free of expense, as follows:

1—Ajax Tires, "5,000 miles."
2—Fit with Interlocks, "double mileage."
3—Repair with Tire-Dob, "double mileage."
4—Paint with Tirenew "Add 30%" Total; 26,000 miles.
5—Carry Gilmer pliers, "Pays for a set of tires every 4,000 miles."
Result, four surplus sets every 26,000 miles.

6—Feps carbureter saves	50%
7—Mondex Helix saves	40%
8—Stewart Gas Saver saves	40%
Total	130%

Thereby making on an average 3 gallons per 100 miles run. Why?

Philadelphia, Pa. G. W. B.

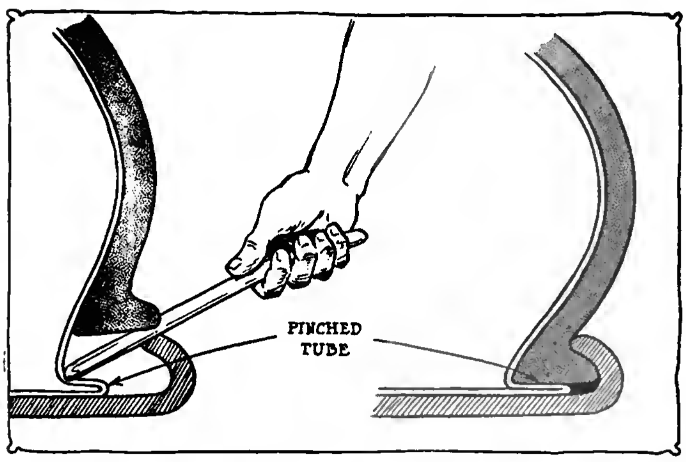


Fig. 4—How tubes are pinched by the iron and by the tire bead

Latent Heat of Vaporization

Editor THE AUTOMOBILE: What are the variations in the specific heat of gasoline and its effects in its vaporization? What is the latent heat of vaporization of gasoline? SUBSCRIBER.

New York City.

—The specific heat or amount of heat measured in British thermal units necessary to raise 1 pound of gasoline 1 degree Fahr. is .500. Hence a drop of 1 degree Fahr. in the temperature of 1 pound of gasoline corresponds to the dissipation of .5 British thermal units. The specific heat of air at constant pressure is .2375; and a drop of 1 degree Fahr. is attended by the dissipation of .2375 British thermal units per pound of air. Taking the mixture proportions as 1:15.39, as above, the heat available per degree Fahr. of drop in the temperature of the mixture is $1 \times .500 + 15.39 \times .2375 = 4.155$ British thermal units.

Since the latent heat of vaporization is very approximately 210.5 British thermal units, it follows that this 210.5 British thermal units must be supplied by the ingredients or by heat from some outside source applied directly to the fuel.

Consider the heat supply in the mixture ingredients themselves. Since the mixture 1 : 15.39 is capable of supplying 4.155 British thermal units per degree Fahr. of drop, it will require a drop of $\frac{210.5}{4.155} = 50.66$ degrees Fahr. in the mixture to completely vaporize the 1 pound of fuel contained therein. The mixture 1: 15.39 cannot exist below 1.5 degrees Fahr., so it will be necessary that both the air and the gasoline have a temperature of at least 1.5 degrees + 50.66 degrees = 52.16 degrees Fahr. before the commencement of vaporization. If the mixture is 1 : 18, it can exist at — 5.8 degrees Fahr., and the initial temperature of the ingredients must be at least 38.3 degrees Fahr.

If the requisite amounts of fuel and air are placed in a vessel insulated from outside heat, the above initial temperature values will hold only when the time allowance for vaporization is unlimited. Compared with the short time in which vaporization must be completed in an automobile engine, the passage of time before vaporization would be completed would be almost infinity. However, there are three methods whereby the rate of vaporization may be accelerated; either the fuel may be introduced in a finely divided form; or the initial temperatures of the mixture may be made higher than the above values; or a combination of both methods may be employed.

In any case, the temperature drop can be no more than 45 degrees Fahr. in any mixture of gasoline and air. Therefore, if an increase in initial temperature is resorted to, the final temperature will be higher than that necessary to support the mixture proportions by just the amount that the initial temperature is raised. Suppose an initial temperature of 100 degrees Fahr. and a drop of 45 degrees Fahr. The resulting final temperature in the mixture will be 55 degrees Fahr.

In consideration of the form in which the fuel is presented to the air in the average carbureter, this final temperature will be higher than 55 degrees Fahr. because the total amount of fuel will not have been vaporized, and the amount of heat necessary to complete the vaporization will remain in the mixture as a temperature value. But suppose the vaporization to have been completed in two cases with the final temperature of 55 degrees Fahr. in one and 1.5 degrees Fahr. in the other. Since the same amount of fuel is present, the volumes per pound of the two mixtures, at the same pressures, may be taken as bearing the same relationship to each other as the volumes per pound of dry air at equal pressures and the two temperatures given. Thus, the ratio of volumes per pound of mixture may be expressed 1 : 88, for the two mixture temperatures of 1.5 degrees and 55 degrees Fahr. respectively. Therefore an engine can aspirate only .88 the amount by weight of 55 degrees Fahr. mixture that can be aspirated of the 1.5 degrees Fahr. mixture. Loss in weight of charge will be greater than here indicated, since the efficiency of the pumping strokes will vary with density of the fluid.

The power of an engine varies as the weight of charge, being greater with a lower mixture temperature.

Making a Cadillac Raceabout

Editor THE AUTOMOBILE:—I have a 1910 Cadillac which I am remodeling into a raceabout. The seats are on the frame, and the steering column lowered, but the car is still too high. Would it be possible to lower the frame a couple of inches by taking two or three leaves from each spring, or would that weaken them to such an extent as to cause them to break?

New York, N. Y. J. B. ALLISON.

—You cannot take out any spring leaves even in consideration of the lighter weight of the body and still have a suspension which will be satisfactory. The best way of going about this job would be to swing the front springs under the front axle making an underslung construction here and then having the rear spring members flattened.

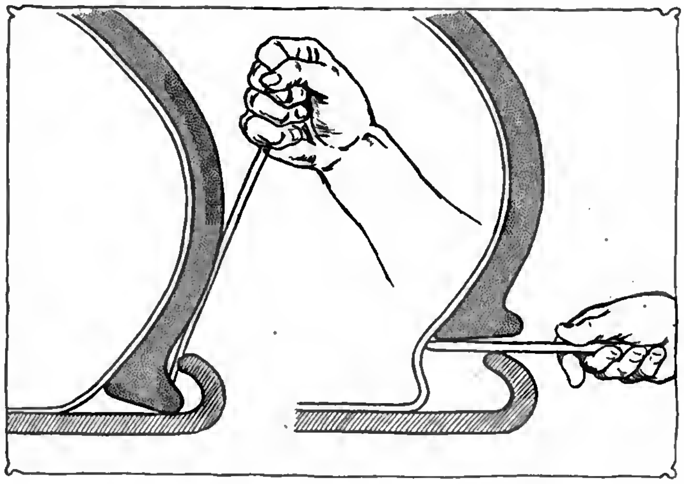


Fig. 5—Removing the tire with a downward movement of the iron

Novel Magneto Couplings for 1913

(*Continued from page 899*)

magneto is machined especially to take the base of the magneto and the entire fitting is so arranged that the drive is aligned permanently, that is, there is but one place to put the magneto and any shifting of this would cause the drive to be out of line. The flanges for the magneto coupling are slipped over a taper in the shaft and are held by a key and a nut over the end of the shaft.

Columbia

The magneto coupling on the Columbia cars is flexible and adjustable. The flexible feature is secured by having the drive transmitted through leather and the adjustable feature by having the connecting bolts pass through slots instead of holes. A study of the sketch will show that the leather disk, which is somewhat smaller in diameter than the shaft flange, is held to the latter by two bolts. These stud bolts are only threaded at the point at which they pass through the metal flange and are not threaded into the leather. The connection of the leather disk to the driving flange is by means of two bolts also, but in this case the bolts pass through slots. By loosening the nuts on these bolts they can be slipped around for a short distance to make minor timing adjustments.

Glide

A novel drive for the magneto is employed on the Glide cars. This drive has both features of being adjustable and flexible. The drive is transmitted through a spring. Unlike the Bosch drive, this is a modified lever spring and not a laminated spring. The adjustable feature is secured by a series of holes through which pass two bolts. By loosening these bolts and slipping the flange around in either direction the adjustments for timing can be made.

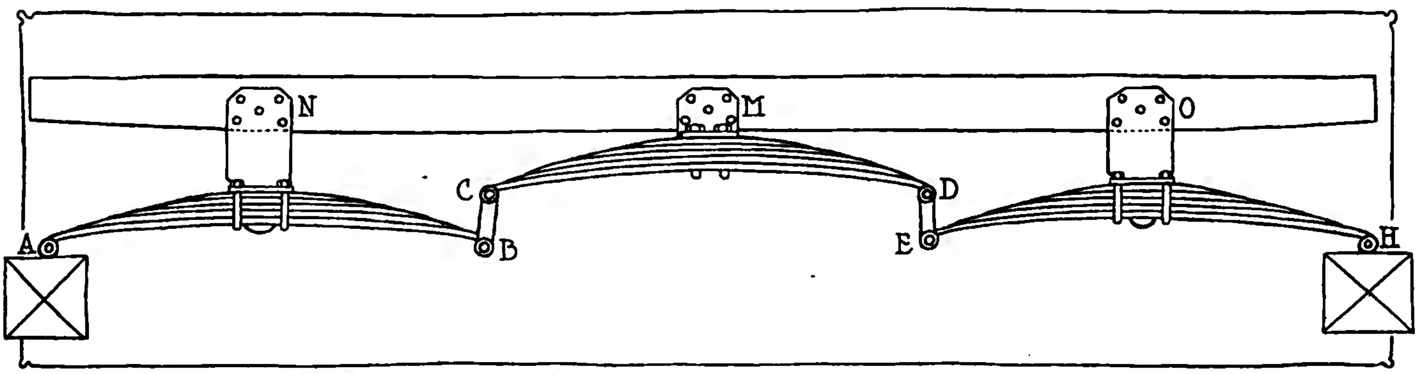


Fig. 6—Spring suspension of E. M. Morley criticized by a reader as wanting in flexibility

Filling special fuel tank in Harroun carbureter test

Test Harroun Carbureter on Kerosene

Road and Track Tests Made by "The Automobile"—New Instrument a Marked Success

By Darwin S. Hatch

INDIANAPOLIS, IND., April 21—Ray Harroun, one-time champion of the Motor Speedway, today completed another 500 miles on the famous oval in a much less spectacular manner than when 2 years ago he was hailed as the winner of the International Sweepstakes; but today's finish of the 200 laps has a meaning manifold greater to the motoring world at large than did the one that crowned him Speed King. It means the completion of a series of accurate tests that show beyond doubt that the cost of motoring can be more than cut in two and that without sacrificing anything in the way of easy starting or clean plugs or anything else that makes the operation of a motor pleasant and efficient. It means that there is at least one carbureter that will handle kerosene.

Harroun has turned from the profession of speed merchant, and for the past 2 years has devoted his energies to the manufacture of carbureters. He makes the carbureter that is stock equipment on the Marmon car.

The new carbureter is almost the same as this except that it is arranged so that practically all the exhaust gas passes around the venturi tubes, that is, the pipe that surrounds the spray nozzle is in the path of the exhaust gas.

The same automobile and carbureter were used throughout the tests. The carbureter was Harroun's new design, 1.25-inch size. It is exhaust-jacketed and the primary air is heated, though the secondary air, which is by far the greater proportion when the motor is running at normal speeds, is not heated. A means is provided for raising and lowering the needle valve by a little lever on the dash. This is not a special feature as it is a part of the older type of Harroun carbureter.

The car was an Overland, model 69, five-passenger touring car, with four-cylinder motor, 4 inches bore and 4.5 inches stroke, cooled by thermo-syphon water circulation, and fitted with U. S. L. electric cranking and lighting system. On the running-board is a small tank which holds 2 gallons of gasoline. This is connected through a foot valve at the dash to the intake manifold and is used to run the motor until the exhaust warms up the low-grade fuel. The operation of starting simply resolves itself to holding in the foot valve for a moment while the electric cranking button is pushed. The average time required to run on gasoline when kerosene is used was about 2.5 seconds; the longest time was 6 seconds. This was in the early morning after the car had stood outdoors all night. The auxiliary gasoline tank simply is a primer, and may be replaced by an acetylene primer. It also may be replaced by an electric heating coil, which would make the outfit start on the low-grade fuels.

A road test under average touring conditions was the first event staged. The course was from Chicago to Indianapolis by way of Logansport and Kokomo. At the beginning of the test the fuel tank was drained of its contents and filled with kerosene at a garage at $0.15 a gallon. This was 44 degrees Baumé Perfection oil, being the kind that is sold the country over at 10 cents retail. Lubricating oil and radiator tanks were filled and about 4 o'clock last Thursday afternoon we started. The party consisted of Ray Harroun, driver; the writer beside him, and Dillwyn M. Bell, president of the Ward-Bell Co., Chicago, as supercargo.

Fitted out with supplies, our driver put his heel on one button, his toe on another for an instant and the motor was running as sweetly on coal oil as though that were its natural food. Starting up in a garage can be depended upon to bring out the smoking capabilities of a motor, but even this did not develop excessive smoking. The smoke could be noticed, but it was not as evident as with the major portion of gasoline-burners.

Two miles north of Highlands, Ind., we struck some heavy sand where the road was being repaired after the late deluge. Most of the distance into the town was made on first or second speed, but the motor did not seem overly warm at the end of the stretch.

We made Valparaiso for late dinner and then over sand roads through the swamps to Knox, where we spent the night. The car was left standing out under the trees and when we started in the morning the primer button had to be held for 8 seconds. This was the only time that the engine did not take hold almost instantly.

At Logansport we took on 1 quart of oil after a run of 136 miles; stopped at Kokomo for lunch, and at Westfield for 2 gallons of kerosene. This also was Standard Perfection grade, but cost only 10 cents a gallon. It had a gravity of 43 degrees Baumé at a temperature of 60 degrees Fahrenheit. Indianapolis, the end of this cross-country kerosene cruise, was reached in the afternoon. After considerable running about town, the fuel, lubricating oil and water tanks were again filled to determine the amount used on the run. The total distance recorded was 224.2 miles and the consumption of kerosene for the run was 17.25 miles per gallon. Complete results of this part of the test are appended.

The second half of the tests were conducted on the Speedway to determine the relative values of four different grades of petroleum fuel products as handled by the new Harroun carbureter. These fuels were Crown gasoline of 60 degrees gravity, the Standard Oil Co.'s new product, Stanolind Motor Spirit, of 62 degrees gravity; Palacine oil, which is the highest grade of kerosene and tested at 49 degrees gravity: and Perfection oil, which is the ordinary kerosene you buy in every country grocery, testing at 40 degrees Baumé.

These fuels were drawn direct from the storage of the Standard Oil Co. at Indianapolis, tested for gravity at 60 degrees Fahrenheit, and the cans sealed. Then the main fuel tank was disconnected and a special tank attached to the outside of the car, where it could be filled and drained readily. After each test, the special tank was drained and the motor run until the carbureter ran dry before another fuel was put in the tank.

Before tests were commenced the odometer was checked over measured distances on the Speedway and found correct.

In the economy tests, 1 gallon of the fuel was put in the special tank and the car run at a practically constant speed of 25 miles per hour till the fuel was exhausted. The miles thus covered on the Speedway with 1 gallon of each of the four fuels was recorded as the miles per gallon economy of that fuel. The necessity of a stop during Test No. 1 for a tire change necessitated a similar stop in each of the succeeding economy tests. Had it not been for these stops it is probable that the economy on all of them would have been a shade better. These tests were made with driver and observer, top down and windshield up.

Next the four fuels were tested for their relative values as speed producers. No attempt was made to show the speed possibilities of either the car or the carbureter. No adjustments had been made on either. Speed economy and acceleration tests were all made with the same adjustment of the carbureter, except as it may be controlled from the driver's seat. By tuning up car and carbureter after the tour, it is certain that speed and acceleration showings would have been still better than they were.

Speed tests of the fuels were made by timing the car with a stop-watch over a measured mile and a measured half-mile on the Speedway. Occupants of car on these tests were driver and observer; top and windshield down. Kerosene showed 5 per cent. more speed than Motor Spirit and 12 per cent. more speed than Crown gasoline.

Acceleration tests on the fuels were made by timing with a split-second stop-watch the number of seconds necessary to increase the speed from 10 to 20 miles per hour and from 10 to 30 miles per hour. In this one test alone kerosene conceded first place, Motor Spirit making the best showing and gasoline next best. Results of these tests are given in the accompanying tables.

In general the deductions to be drawn from this series of tests are that:

1. As handled by Harroun's new carbureter, the low-grade kerosene known as Perfection oil and selling practically everywbere at one-half tbe cost of gasoline gives better mileage gallon for gallon than any of the other fuels tested; gives more than twice as much mileage dollar for dollar than gasoline; gives more speed than any of the other fuels; acceleration almost as good; carhonization, nil; smoking negligible; general action the same as gasoline except for the necessity of preheating the fuel.

2. The lower the gravity of the common petroleum distillates, the better economy in miles per gallon and cents per mile—excepting Motor Spirit, which seems to fall between gasoline and Palecine oil in these considerations.

Speed Tests Over Measured Mile and One-half Mile

Fuel	Gravity	Miles per hour ½	Miles per hour 1 Mi.	Ave. M.P.H
Kerosene	43	47.3	51.1	49.2
Motor Spirit	62	46.5	....	46.5
Gasoline	60	43.0	43.4	43.2

Acceleration Tests

Seconds to Accelerate from Miles Per Hour

Gr.	Fuel	10 to 20	10 to 30	20 to 30
43	Kerosene	8.2	16.4	8.2
60	Gasoline	7.3	16.1	8.8
62	Motor Spirit	7.3	16.0	8.7

Economy Tests of Four Fuels

Test No.	Fuel Used	Gravity Degrees Beaumé	Miles per Gal.	Price per Gal.	Ton-Miles per Gal.	Cost per Ton-Mile
1	Kerosene	43	22.2	$0.08	26.64	$0.0039
2	Kerosene	49	21.6	.10	25.92	.0038
3	Motor Sp.	62	20.4	.13	24.48	.0054
4	Gasoline	60	20.0	.16	24.0	.0067

Note—Prices based on quotations on tank wagon lots at Indianapolis April 19. Speed constant at 25 miles per hour. One stop in each test.

Kerosene Vaporizer Cuts Down Fuel Expense

THE G. C. vaporizer is a device just introduced into America for the use of the heavier products of petroleum. The heat of the exhaust is used to vaporize the heavy fuel and the latter is fed to the motor in the form of a gas. The motor is started on gasoline and runs with it until the vaporizer has become warm enough to do its work.

The vaporizer is a unit with the muffler or silencer and works in conjunction with it. The fuel passes through a regulation float feed arrangement on the way from the tank to the vaporizer. It is fed through a perforated pipe and passes over a bed of gray iron slugs, which act as a heat retainer and which absorb the heat from the exhaust. The resulting gas is sucked through a pipe by the motor and is mixed with air through a dash-pot arrangement, thus forming an explosive mixture.

The action of the entire system is exactly parallel to the action of a suction gas producer. The exhaust enters the muffler V and passes through the center into a cylindrical opening E. Surrounding this central pipe is a layer of the gray iron slugs D. Above the central passage and through the slugs passes a pipe F which carries the fuel supply. This pipe is perforated and permits the kerosene to seep through the hot iron. The heat contained in the slugs is sufficient to vaporize the kerosene and the result is that a gas is formed which fills the passage above the iron. Through the bottom of the muffler-vaporizer there is an air passage B, as shown in the diagram. Connecting the passage containing gas with the motor is the suction pipe.

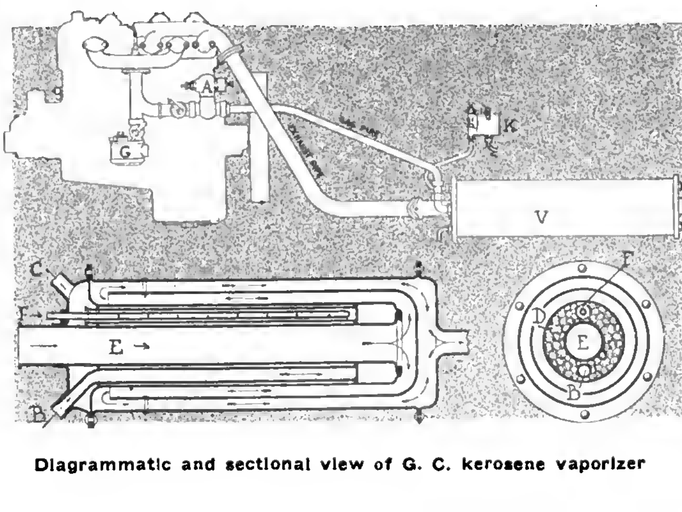
The suction of the motor on this pipe draws the air through the hot kerosene vapor which mixes with it and the mixture passes on to the motor, drawn there by suction. The gas passes through a mixing valve A of dashpot pattern on its way to the motor and is there further mixed with air. The amount of gas and air drawn in is regulated by the demands of the motor. When the motor speeds up it naturally exerts more suction and also opens the dashpot further, thus getting a heavier charge into the cylinders.

To fully comprehend the action of the vaporizer the sectional view may be noted. The center is the exhaust passage into which the exhaust gases of the motor flow on leaving the cylinders of the motor. Surrounding this passage is a layer of cast-iron slugs through the top of which passes the fuel intake pipe and through the bottom passes the air intake. Outside of this is the baffled exhaust which is silenced by gradually reducing its pressure through expansion.

The car does not have to be changed in any of its salient features to accommodate the G. C. outfit. A small gasoline tank is added and the former gasoline tank used for kerosene or heavier fuel. The hand throttle is used to govern the gasoline flow for starting purposes and the accelerator pedal controls the flow of kerosene vapor to the motor. When using the kerosene system, the gasoline system is so arranged that a closed throttle absolutely closes the throttle valve instead of leaving a partial opening.

Owing to the construction of the vaporizer it is claimed that it will maintain its temperature for a period approximating 2 hours on the average. This means that within 2 hours after the stop was made the motor would start on the kerosene instead of going through the process of restarting with gasoline. The

(Continued on page 911)



Diagrammatic and sectional view of G. C. kerosene vaporizer

The Automobile

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The Field of the Cyclecar

THE British Isles, parts of Germany and other European countries are motor-mad over the new cyclecar which made its advent a year ago. This car, which has been responsible for the phrase, "new motoring" which is now becoming general abroad, is infusing not only a new life into the motorists themselves but into many in the manufacturing end. It is infusing new life because it appeals to a class of buyers who, up to the present, have been overlooked by the European makers, namely, the man of moderate means who has $800 for a car, but not enough money to maintain the present-day machine with its high consumption of gasoline, which sells at 43 cents a gallon, and its heavy tire wear.

The new cyclecar comes as a bonanza to this class of buyers, who are more concerned in the cost of annual maintenance than first cost. The European owner has always been a stickler on maintenance in that he has had his prescribed income to live on, outside of which he must not go under danger of financial embarrassment. Naturally, such a buyer wants the lightest car that will meet his requirements; wants the speediest car that he can receive, and wants the cheapest to maintain. Now that the English manufacturer has at least realized that there is such a purchasing clientele in Europe he has set out with extra endeavor to meet the requirement but to-day the demand is so great that many of the factories sold out their entire 1913 output during the Olympia show. Premiums are actually being offered for not a few of the best cyclecars.

While the movement had its inception in England, it soon spread to Europe. Germany took it up with avidity, and one manufacturer after recently announcing his new cyclecar through the European trade press, had his entire output contracted for on the first mail after the date of publication.

The exact status of the cyclecar has been largely dictated by the buying public. It wants a two-passenger car, with a space in the rear of the seat on which packages can be carried if necessary. A small motor is desired, the popular design being a four-cylinder block type, with a gearbox a unit with it. Cylinder dimensions rarely exceed 2.5-inch bore, and 3.5-inch stroke, so that 25 to 30 miles per gallon can be obtained in regular use and speed possibilities of 40 to 50 miles also within reach. The wheelbase averages 86 to 90 inches, tires are generally 28 inches and carried on light bicycle-type wire wheels.

All of these cyclecars are four-wheel designs. There is no demand for a three-wheeler. The farmer and market gardener, who are to-day buying these cyclecars in large quantities, want a real miniature car. It must have four wheels; it must have a steering wheel, and the body must be along standard lines. The three-wheeler is not meeting with success, although at one time it was looked upon with favor.

The side car attachment for motor-cycles is not considered because the buyer objects to its general arrangement.

The present construction of cyclecars favors a three-speed selective-type gearbox with shaft drive to a bevel-driven rear axle. Once again must be noted the desire for a real miniature car. Belt transmission was advanced by a few makers as a satisfactory system for a cheap car of this nature, but it has not met with ready response so that few manufacturers are even considering it to-day. Friction drive, which has been taken up by several French concerns, was looked upon as a coming type of cyclecar, but it, too, has failed to meet with acceptance by the buying public. Again, what is needed is the smallest, lightest, most economical, speediest, miniature car that can be marketed at approximately $900.

This cyclecar movement offers a fruitful field for the American maker who considers the export field. At present there are several European representatives traveling through America in search of agencies for cyclecars and the first inquiry with all of them is, Why has not the American builder taken up the cyclecar movement?

While America occupies a unique place in the cheap-car field, there is still much room for the cyclecar movement, which is bound to come, and which when it does come will serve as a feeder to the present low-priced car industry. Cyclecars will have to be produced in large quantities in order to be sold at a sufficiently low price to compete against regular cars of American build, and should the price of fuel increase in America, buyers will begin to give more consideration to the cost of maintenance, and consequently will not object to a fairly high original investment, providing they are assured of good fuel economy and low mechanical maintenance.

Big Plans for Joint S.A.E.-I.A.E. Sessions

NEW YORK CITY, April 21—The Society of Automobile Engineers has announced the program which will be carried out by way of entertaining for the visiting automobile engineers from England who will be returning the visit of the American Society made to Europe nearly 2 years ago, by spending 3 weeks with the American industry in and connected with the annual midsummer session of the S. A. E.

The Englishmen, of whom twenty-five are expected, will arrive in this city Monday, May 26, and the round of visiting factories, entertainment, etc., will continue until Saturday, June 14. During these 3 weeks a circuit will be made of the more important centers of the automobile industry, a day will be spent watching the 500-mile race on the Indianapolis Speedway and a week will be consumed in Detroit and on Steamer Detroit III, which will be the scene of the midsummer sessions of the Society. This will be followed by a circuit through Cleveland, Buffalo, Providence, New Haven and Hartford.

The itinerary among the industrial centers will begin at Pittsburgh, Wednesday, May 28, and on the following day, Thursday, May 29, the Carnegie Homestead Steel Works will be visited and also an inspection made of the works of the National Tube Co. at McKeesport, Pa.

The engineers will arrive at Indianapolis, Friday morning May 30 to view the 500-mile race.

On the following Saturday the Wheeler & Schebler plant will be visited before noon and also the Prest-O-Lite factory. The afternoon will be spent in entertaining.

The party will leave Indianapolis for Detroit at 9 p. m., and will arrive in Detroit Sunday morning, June 1.

On Monday morning, June 2, activities will begin, the forenoon being spent in a visit to the Ford plant and the afternoon at the Cadillac. There will be a party at the Temple theater in the evening.

Tuesday, June 3, will begin with a forenoon visit at the Packard plant followed by a luncheon at the factory and in the afternoon a visit to the Timken-Detroit Axle Co. In the evening there will be a banquet at Hotel Pontchartrain.

Wednesday, June 4, the Hudson Motor Car Co., and the Continental Motor Mfg. Co. will be visited in the forenoon. Luncheon will be had at the Chalmers plant and at 3 p. m. the party will embark on City of Detroit III for the trip to Sault Ste. Marie and return. Professional sessions will be held on board.

Professional Sessions on Boat

The boat will arrive at the Soo Thursday afternoon June 5, and will leave on the return trip at 6 p. m. the same day. There will be professional sessions on board.

Friday, June 6, will be spent in professional sessions, the boat arriving at Mackinac Island at 2:30 p. m. It will remain at the island until 7 in the evening when the return trip to Detroit will begin.

Saturday, June 7, will be occupied by professional sessions until the arrival in Detroit at 3 p. m. A stop will be made until 10 p. m., when the engineers will start by D. & C. steamer for Cleveland, O.

Sunday, June 8, will be spent at Cleveland, the arrival being at 7 a. m. Headquarters will be at Hotel Stattler and the day occupied in motor car drives around the city and to nearby country clubs.

Monday, June 9, will be taken up with visits to the Peerless, White and Winton plants in the forenoon. For those who desire arrangements will be made to visit one of the large Akron tire factories which is 1 hour distant from Cleveland by electric car. At 8 p. m. the party will leave for Buffalo by C. & D. steamer.

Tuesday, June 10, on arrival at Buffalo at 7 a. m., breakfast will be served on the boat. The Pierce-Arrow Motor Car Co. will provide the entertainment for the entire day including a trip to Niagara Falls to see the newest and largest hydraulic electric power plants.

This brings to an end the regular program and those of the foreign contingent desiring to sail on the Mauretania, leaving New York at 1 a. m. Wednesday, June 11, will have an opportunity of doing so but will be required to leave Buffalo at 1 p. m. Tuesday, eliminating the trip to Niagara Falls. An alternative trip through New England is provided.

Kerosene Vaporizer Cuts Fuel Expense

(*Continued from page 909*)

length of time that this could be done would depend on the temperature of the atmosphere. With average conditions the above time would be about correct.

Since the kerosene is vaporized completely before entering the cylinder of the motor it is stated that there is no tendency to form carbon. It is also stated that with this device worked on a 3.16 by 5.12-inch motor, the fuel consumption with a touring body figured 25 miles to the gallon. As there are no comparative figures for this same motor with gasoline these figures are only used to show that a good economy can be expected.

The passage of the kerosene vapor, mixed with ordinary air is at a very low speed—about 10 inches per second—and at a very high temperature of from 550 to 750 degrees Fahrenheit. A complete distillation of the kerosene in contact with the air is thus effected, producing a very light gas, which mixed with atmospheric air, gives a very homogeneous explosive mixture. The mixture thus obtained at the comparatively low temperature of about 122 degrees Fahrenheit, owing to the introduction of outside air, is drawn into the cylinders, compressed and burnt in the ordinary way. The horizontal perforated pipe has a large number of holes .145 inch in diameter, and the liquid is thus distributed by gravity to the hot metal parts, in the chamber in the form of about twenty-five small drops at a time.

The G. C. Vaporizer Co. of America has recently been incorporated and has established itself at 1790 Broadway, New York City. Stephen C. Wolcott is president of the concern, F. T. Blakeman secretary and treasurer and Arthur Waterman, formerly of the Hartford suspension company, general manager. This company has secured the American rights to the G. C. patents and will shortly run official tests through the Automobile Club of America laboratory and road tests under the sanction of the A. A. A.

REPORT

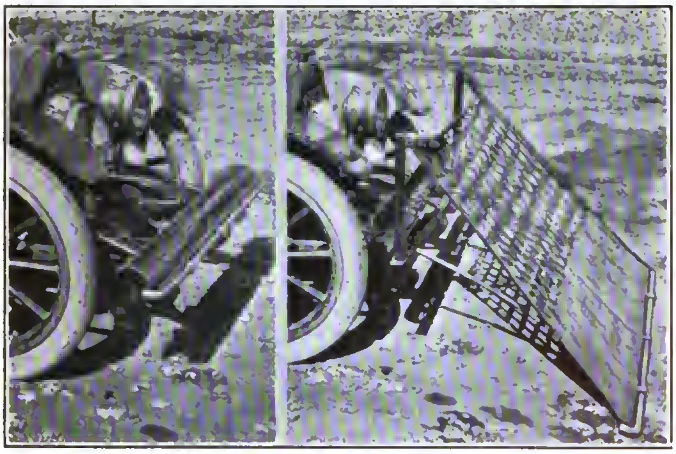
LONDON, ENG., June 3, 1912.

The G. C. Vaporizer, Limited—I have concluded a comparative test between gasoline and kerosene oil, on a 30 h.p. Aster engine, the engine while running on gasoline being under ordinary conditions, and fitted with a G.C. Vaporizer while running on kerosene oil, with the following results:

1. The full load consumption in gallons was the same with kerosene as with gasoline, and rather less at partial loads. The improved running at light loads was due to the more perfect carburetion with the G. C. apparatus as compared with an ordinary high-class gasoline carbureter.
2. Owing to improved carburetion the heat loss to the cylinder walls is less than in the case of a gasoline carbureter and consequently the engine runs cooler.
3. For the same reason the flexibility and acceleration of the engine are increased.
4. There is no apparent carbon or greasy deposit in the engine as a result of using kerosene in the G. C. apparatus.

I have also run a 28 h.p. Straker-Squire lorry, weighing 3 tons 12 cwt., to Brighton and back, fitted with a G. C. Vaporizer using kerosene, with the same mileage per gallon of kerosene as can be obtained for a gallon of gasoline in the ordinary gasoline carbureter. The lorry managed 95 per cent. of the road in top speed and only 5 per cent. in the second gear, proving that full power can be obtained from the engine.

The results of the above tests are clearly of such a satisfactory character that in my opinion there are very great advantages to be derived from the use of the vaporizer. the cost for fuel being halved; it is easily fitted, has no moving parts to wear out, and requires practically no attention.—ROBERT W. A. BREWER.



Figs. 1 and 2—Views of the National automatic bumper-fender in open and closed positions. It is brought into scooping action by means of a lever on the dash or through interconnection with the emergency brakes

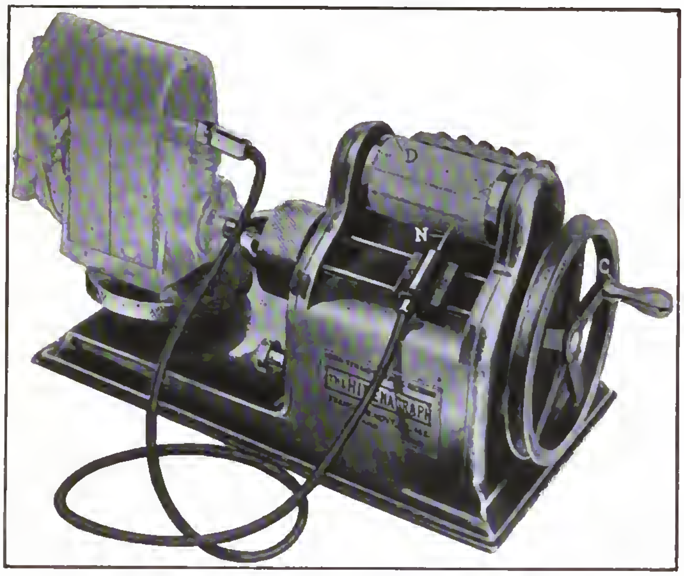
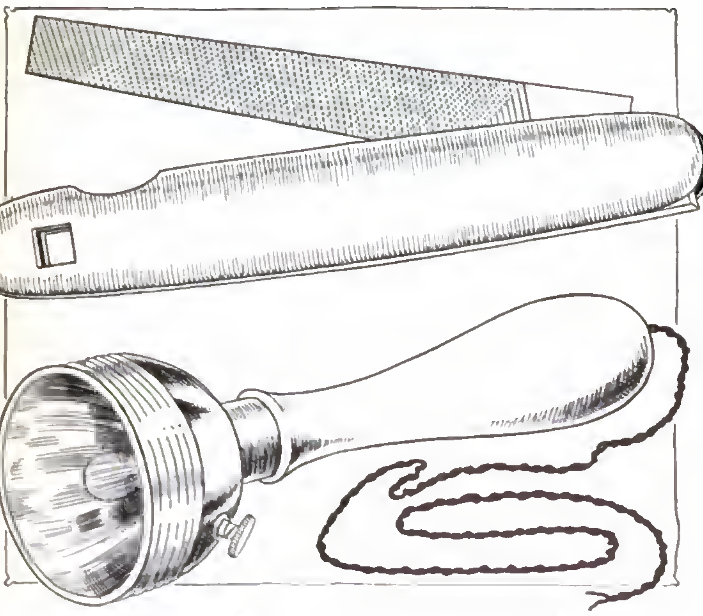


Fig. 3—The Hitenagraph is an instrument by which the timing of the sparks produced by a magneto can be accurately recorded by electrical action on chemically prepared paper



Figs. 4 and 5—Liveright pocket file for touring automobilists and Niagara trouble hunting lamp, in which the button switch is conveniently placed on the handle

Accessories for the Automobilist

NATIONAL **Bumper-Fender.**—What might be termed a scooping bumper is being manufactured by the National Automobile Fender Co., Omaha, Neb., the device being shown in Figs. 1 and 2. Ordinarily the bumper resembles the common steel-tube type, but Fig. 2 indicates the fallacy of this appearance, for when a lever on the dashboard is moved or the emergency brake is thrown on—either construction may be used—the seemingly normal bumper assumes the exterior depicted in the second illustration and is ready to scoop up whatever is in the way of the car, much on the principle of the old street-car fender.

The Hitenagraph.—An instrument that should prove of considerable value in the testing of magnetos is announced by Francis R. Hoyt, of Cleveland, Ohio. This recording device has for its principal purpose the determination of the synchronism, or lack of it, in the timing of the sparks produced by any magneto placed under test. Fig. 3 shows the general appearance of the instrument. The magneto is placed on the left in direct connection with a horizontal shaft carrying a handwheel, C. Above the drum, D, is geared to the shaft with a two-to-one ratio and carries a strip of sensitized record paper. A needle, N, mounted on guides and automatically carried along in close proximity to the sensitized surface by means of a traveling screw, is placed in electrical connection with the high tension terminal of the magneto as shown. The passage of a spark produces a clearly defined mark on the chemically prepared paper. The relative size of this mark incidentally affords some indication of the intensity of the spark. It is by noting the positions of these impressions that the spark timing is ascertained. A little consideration will show that since the recording drum is rotating at double the speed of the magneto, and further, that the magneto produces two sparks per revolution, the drum turns exactly a complete revolution between each spark. And therefore if the needle were fixed and the magneto accurate the recorded impressions would always be made at the same point on the paper. By causing the needle to move over the surface, however, a line of dots is produced, and according as to whether the line is strictly straight so is the magneto sparking accurately. If the dots alternate zig-zag fashion, the sparks are not occurring at 180 degrees apart, and the exact amount of error is correctly shown by the distance between the marks measured along the diameter. The paper is marked with horizontal lines representing degrees so that this measurement can be easily read. The makers state that with this instrument it is possible to test more than twenty magnetos an hour.

Liveright Pocket File.—Liveright Bros., Philadelphia, Pa. have designed a small pocket file, Fig. 4, which is made of a file steel blade and a nickel-plated casing. The blade is a fine-cross cut and of hard steel, therefore applicable to all sorts of work where care is a requirement and intricacy one of the conditions. The nickel-plated casing is cut with a square hole through it, so that it may be attached to a chain or key ring, making the instrument very handy, especially for touring motorists.

Niagara Trouble Lamp.—In Fig. 5 is shown a new trouble-hunting light made by the Niagara Searchlight Co., Niagara Falls, N. Y. This outfit consists of a dry cell, 6 by 3.5 by 2 inches, the poles of which are connected by insulated wiring to a trouble lamp. The circuit is closed by pressing a button, as a result of which the filament of the bulb is set aglow, the insulator handle permitting of applying the lamp at any point about the car, as the length of the wire is sufficient for this purpose. The device is neatly finished.

Vaile-Kimes Tire Pump.—An air pump designed to pump up the tires of accessory-stores' customers has been constructed by the Vaile-Kimes Co., Dayton, O. Fig. 6 shows the device, which is 28 inches long, 10 inches wide and 16 inches high, and is capable of pumping up a 40-inch tire from flatness to 75 pounds in 4 or 5 minutes, according to the maker. The combination of a motor with a small pump permits of rapid operation of the latter, so that the necessary tire pressure is easily attained; and in this point lies the advantage of this little machine over a heavy compressor serving a storage tank and working at all times to keep it full.

LBA Storage Batteries.—New methods of construction are incorporated in the latest LBA batteries produced by the Willard Storage Battery Co., Cleveland, Ohio. Instead of cell connectors of the ordinary lead pattern with sealed covers to the cells, a new design of bolted connector and cover sealed with pure, soft rubber gaskets is used. A big advance in accessibility is thus secured, and the resealing and reburning of connectors, etc., is obviated. In Fig. 7 a partial section of one of these new cells is shown, together with larger views of the special gasket, A, and cover, B, C, is the latest type of cell connector. The jars are built with heavy walls to insure against breakage. They are supplied with two depths of mud spaces, M, that shown in the illustration being the standard. In the other this space is twice as deep. Special vent plugs, designed to condense the gas produced in charging by breaking the bubbles before they escape, are used. Throughout all the LBA batteries the individual cell unit principle is employed, so that any one cell can be inspected or repaired without disturbing the others. As all connections between cells are above the top cover, the possibility of local action between cells is reduced to a minimum. There are no exposed parts subject to corrosion.

Essex Blow-out Sleeve.—The Essex Rubber Co., Inc., 258 Broadway, New York City, is the manufacturer of the Essex Double Strength Blow-out Patch or Inner Sleeve. It consists of several layers of high-grade cotton duck, securely vulcanized together by means of pure rubber and formed with two flaps which go between the bead of the casing and the rim to insure the patch's staying in place after being installed. This patch is shown in Fig. 8.

Hercules Car Lock.—A new lock for preventing the theft of the car has been placed on the market by the Hercules Lock Co., 1559 East 85th street, Cleveland, O. The lock operates on a principle similar to the cock of a gun, controlled by a Yale lock-and-key instead of a trigger. The lock, Fig. 9, is a casing containing the lock mechanism and sliding on the gearshift to which it is screwed. The casing is formed with two arms, A, reaching down into the quadrant cut. When the lever is in neutral, the lock casing may be pressed down by hand or foot until the arms enter the quadrant, when the lock snaps and the lever automatically locked in its place. It is only by applying the Yale key to the lock that the engagement may be released, whereupon the casing returns by spring pressure to its original position, leaving the gearshift lever free to move. The lock is guaranteed to be not removable without breaking it or the gearshift mechanism.

Ten Eyck Automatic Air Pump.—This device, shown in Fig. 10, and designed for use in connection with air starters and tire inflation, attaches to the side member of the chassis alongside the pump shaft, to which it is geared. The special feature of the pump is an automatically controlled gear meshing and clutching device which is operated by the pressure of air in the storage tank or tire being charged. This clutch and meshing gear is actuated by a small cylinder, C, incorporated in the crankcase. When in use the back pressure from the air receiver slides the pump gear into mesh with the driving gear, after which the clutch is engaged. Disconnecting the pump from the air tank or tire allows the pressure to escape from the automatic cylinder, withdrawing the gears by means of a return spring contained in the cylinder. It will be noted that all these operations are automatic. The danger of clashing gears when meshing is avoided by the combination of clutch with sliding gear wheels, the teeth being partly in mesh before the clutch is allowed to come into action. When used in connection with a storage tank for engine cranking purposes, a special air valve is inserted in the pipe between the pump and the tank, and is usually mounted on the dash. In recharging the tank this valve is opened, allowing the air pressure to enter the automatic cylinder of the pump and slide the gear into mesh. When the gauge registers sufficient pressure the valve is closed, thereby retaining the pressure in the tank, but permitting the air in the automatic cylinder to escape through a vent in the valve provided for that purpose. The return spring in the cylinder then forces the gears out of mesh into the idle position. This pump is being placed on the market by the Auburn Auto Pump Co., Boston, Mass., in two models, one as described, and the other not furnished with the gear meshing device, but otherwise identical.

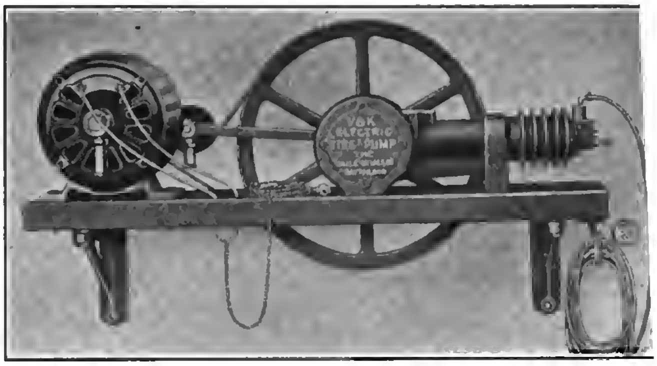


Fig. 6—Electrically driven air pump of Valles-Kalmes Co. for ti charging in garages and accessory stores

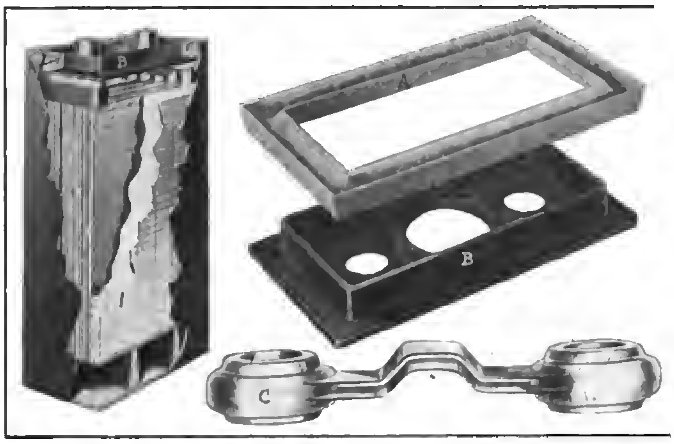


Fig. 7—Latest LBA battery with new form of top sealed by us of rubber gasket. Special cell connector also shown

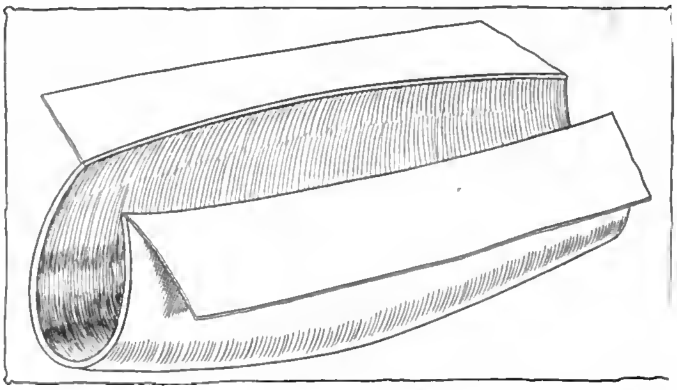
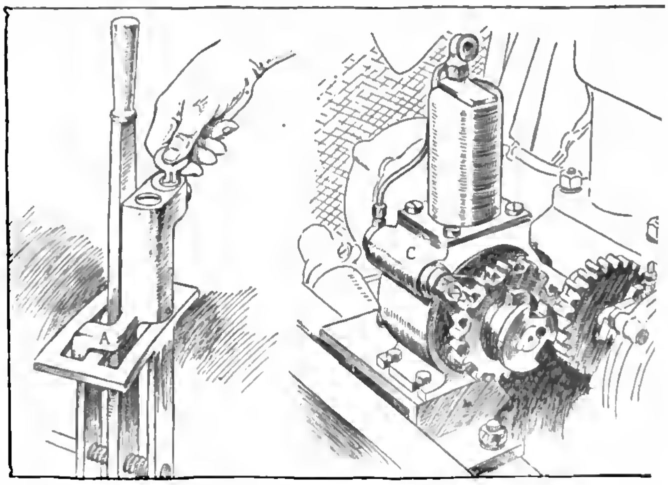
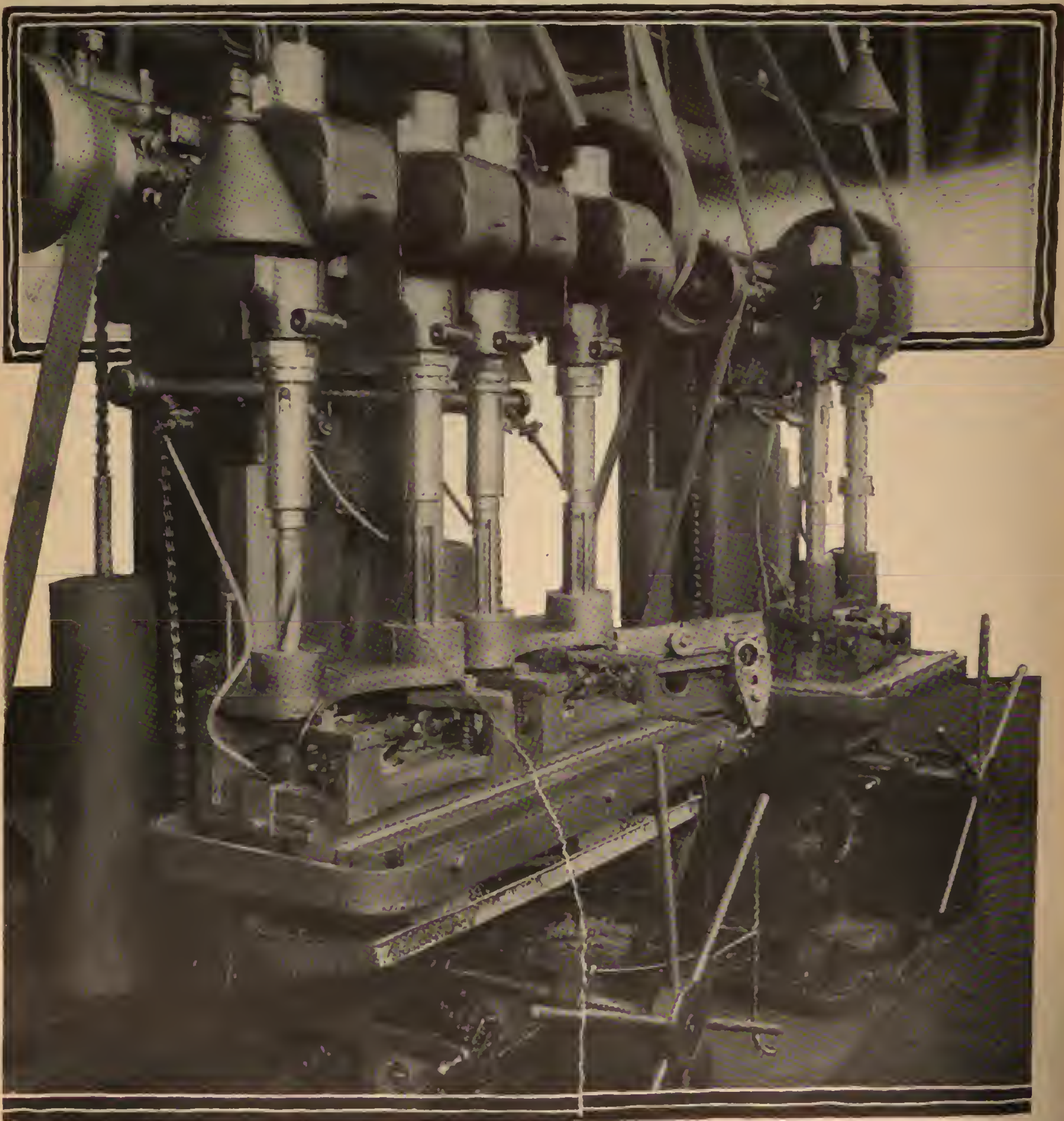


Fig. 8—Essex blow-out sleeve with flaps for fixing in place



Figs. 9 and 10—Hercules car lock on gearshaft lever and Ten Ey air pump with automatic declutching device

Factory Miscellany



THE above illustration shows a general view of the tools used in machining connecting-rods for the Case 40. The machine in the foreground is a four-spindle Moline drill press. The heavy fixtures having hardened bushings are clamped to the table of machine and the jigs for holding the rods, of which there are four, are located by means of hardened pins and an eccentric pin in a bushing on the base of the jig. The first two spindles drill the wristpin and crankpin holes respectively, and at the same time a second jig with a rod is completing the second operation, which is boring to reaming size.

The machine in the background is a two-spindle machine, having a fixture similar to the first, and whose locating points bring the rod into perfect alignment for the reaming operation. The fixture for holding the rod has a hardened nut with a taper working between two hardened plates. These plates are gibbed to the base, and by means of the nut a universal motion is imparted, thereby centering the rods. All previous operations are located by means of this same device. One man operates both machines loading the extra holder during the operations, thus saving time and increasing efficiency.

Werra Aluminum Foundry's Addition—The Werra Aluminum Foundry Co., Waukesha, Wis., has leased the Wisconsin Railroad shops and will change same for foundry purposes. The building has a floor space of nearly 35,000 square feet with additional buildings covering in all 55,000 square feet. This company manufactures automobile castings. It employes about 500 men.

Rambler's 13-Hour Shift—A 13-hour factory shift was put on recently by the Thomas B. Jeffery Co., Kenosha, Wis.

South Bend Wheel to Erect—The South Bend Spring Wheel Co., South Bend, Ind., recently organized, is planning to erect a factory building.

Automobile Clothing Factory Moved—The Summer and Auto Clothing Mfg. Co. has moved its factory to the old Alchular factory building, College Point, L. I.

Ryder Planning Addition—The Ryder Motor Co., Poughkeepsie, N. Y., is having plans prepared for the erection of a 90-foot two-story and basement addition to its present plant on Market street to be used for storage purposes.

For Automobile Frame Factory—The Parrish & Bingham Co., manufacturer of automobile frames, Cleveland, O., is having plans drawn for a new factory 900 by 100 feet. It will cost about $100,000.

Panama Rubber Seeks Plant—The Panama Rubber Co., Los Angeles, Cal., is seeking a location for a new plant to engage in the manufacture of automobile tires, and a building will be erected as soon as a site is decided upon.

Independent Tire Starts Operations—The Independent Tire Co., Ltd., Guelph, Ont., started operations recently. This concern manufactures the Independent security tread tire, and the general manager of the factory is H. H. Hastings.

Renault Frères L. I. Factory—At the junction of Jackson, Third and Beebe avenues a plot of 17,500 square feet, Renault Frères, automobile builders, will erect a two-story factory and repair shops. These structures will occupy about 10,000 square feet. On the Jackson avenue end the firm will put up an office building. It is intended to improve the whole site eventually.

Keeton Uses Tent—The Keeton Motor Co., Detroit, Mich., has erected a tent 100 by 100 feet to take care of its present business while its factories are being constructed. Plans to remove the body building, top building and upholstering plants to another factory temporarily are being concluded to still further add to the size of the assembling floors at the factory.

Tire Without Rubber—The Divine Rubber Co., which was incorporated recently in Utica, N. Y., with $250,000 capital stock, is preparing to erect a plant in that city in which to manufacture a new patented automobile tire. Instead of being made of rubber the new tire is built up of layers of fabric woven and compressed. A binder is used to give the tire a permanent shape. It is said to be adaptable to all sorts of wheels and to have been tested for several thousand miles on a 5-ton motor truck without showing appreciable wear.

Chicago Pneumatic Tool's Plant—The directors of the Chicago, Ill., Pneumatic Co. are said to have under consideration plans for building a large plant in Canada, possibly in Windsor, Ont., for the purpose of handling its orders in the Dominion. If the plan is definitely decided upon it will necessitate an expenditure of around $350,000. The company now has a plant in Montreal, but this is only equipped for repair work and its geographical location is not so well adapted to the requirements of a manufacturing plant as the one the board has now under consideration.

Shows, Conventions, Etc.

April 21-26........San Antonio, Tex., Annual Show, San Antonio Motor Car Show Co.
May 20-21.........Boston, Mass., Convention of Electric Vehicle Makers.
June 2-7...........Racine, Wis., "Made in Racine Exposition," J. I. Case Co.'s foundry.
June 5, 6, 7.......Detroit, Mich., Midsummer Meeting of Society of Automobile Engineers.
October ....Paris, France, Automobile Show, Grand Palais; 10 days.
November ....London, Eng., Annual Automobile Exhibition, Olympia.

Race Meets, Runs, Hill Climbs, Etc.

April 23-27.........San Antonio, Tex., Track Meet, San Antonio Automobile Club.
May 2.............New York City, Secret Time Run to New Rochelle, Motor Dealers' Contest Association.
May 5-8...........Washington, D. C., Motor Truck Reliability, *Washington Post.*
May 14............New York City, Start of 2-Day Hudson and Catskill Scenic Tour.
May 30............Indianapolis, Ind., 500-Mile Race, Speedway.
June 7............Philadelphia, Pa., Inter-Club Reliability, Quaker City Motor Club, Automobile Clubs of Delaware County, Philadelphia and Germantown.
June 16, 17, 18.....Columbus, O., Reliability Contest, *Ohio State Journal.*
June 25-28........Chicago, Ill., Non-Motor-Stop Reliability, Chicago to Boston, Chicago Automobile Club.
July 1.............Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Association to the Pacific Coast.
July 1-16..........Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.
July 4-5...........Sioux City, S. Dak., Track Meetings, Sioux City Automobile Club and Speedway Association.
July 5-6...........Tacoma, Wash., Road Race, Montemara Festa Automobile Committee.
July 8-16..........Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager.
July 27-28........Tacoma, Wash., Tacoma Road Races.
Nov. 24...........Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 27...........Savannah, Ga., Grand Prize Race, Automobile Club of America.

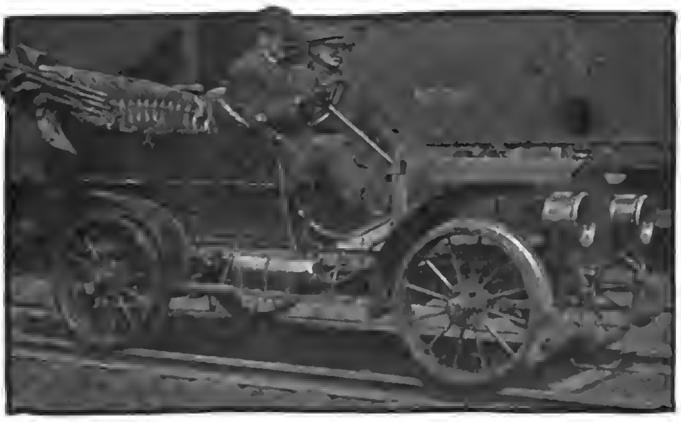
Foreign.

April ....Barcelona, Spain, International Exhibition.
May ....St. Petersburg, Russia, International Automobile Exposition, Building of Michael Maneze, Imperial Automobile Club of Russia.
May 7-10-11.......Paris, France, Sarthe Automobile Meeting and Speed Hill Climbing.
May 11-12.........Palermo, Sicily, Targo-Floria Race.
June 23-28.........London, England, International Road Congress.
July 12............Amiens, France, Grand Prix Race.
July 13............Paris, France, French Grand Prix Cyclecar Race.
July 18-26..........London, Eng., Imperial Motor Transport Conference.
Sept. 21...........Boulogne, France, 3-Litre Race.
Sept. 25...........Isle of Man, International Stock Car Race.
October ....Paris, France, Paris Automobile Show.

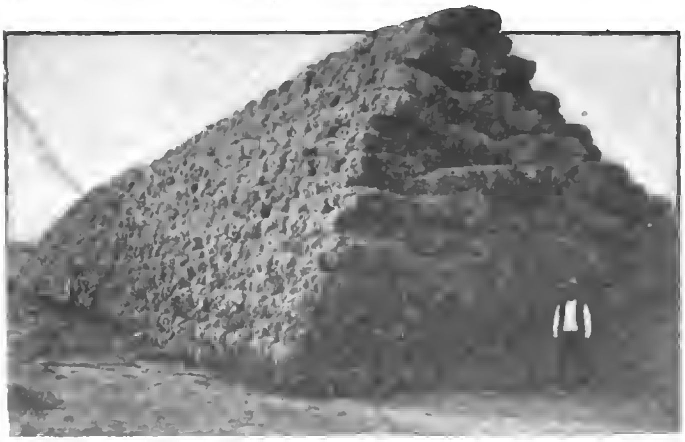
View of the factory of the Hupp Motor Car Co., Detroit, Mich.

The Week in the Industry

Engineer — Dealer — Repairman — Garage



Gasoline railroad inspection car used at Hartford, Conn., by the superintendent of the old Central New England Railroad. An old two-cylinder Pope Hartford car provided the chassis. A four-cylinder E. M. F. motor was installed. The regular wood wheels were displaced by iron flanged wheels. The car can travel about 60 miles an hour on the level



Big stack of guayule rubber shrub. Manufacturers of crude rubber out of the guayule shrub in Torreon and tributary section are preparing to greatly enlarge their operations as soon as the present chaotic condition of political affairs in this part of Mexico is improved. The price of guayule rubber is now double what it was a year ago, and urgent orders have recently been received by several of the independent manufacturers for shipments of all available stock as rapidly as possible. These orders came both from Europe and the United States. It is stated that the cause of the remarkable advance in the price of crude guayule rubber is that it has finally been definitely established that this product can be used instead of Para rubber in the manufacture of automobile tires and electrical equipment

Drawback Extended—The treasury department at Washington, D. C., has made a ruling to the effect that its regulations of November 27, 1907, providing for the allowance of drawback on motor cars manufactured by Brewster & Co., of New York City, with the use of various imported materials and parts, shall be extended to cover the exportation of motor cars manufactured by A. T. Demarest & Co., of New York City, with the use of imported engines, leather, cloth, carpet, plate glass and other materials and parts, in accordance with their sworn statement, filed with the collector of customs at New York.

Open New Garage—J. W. Nelson and Walter Sanford have opened a new automobile garage at Franklin, Neb.

Magee Sales Manager—M. A. Magee succeeds P. M. Pontius as sales manager of the Motz Tire & Rubber Co., Akron, O.

Doolittle Continental Advertising Manager—The Continental Motor Mfg. Co., Detroit, Mich., has engaged A. H. Doolittle as advertising manager.

Coles for Fire Department—The Philadelphia, Pa., Fire Dept., has ordered five Cole roadsters for the use of battalion chiefs.

Shadrick Manager—R. H. Shadrick has been made manager for the Viehman Auto Co., Minneapolis, Minn. He has been on the road.

Seattle Reo Moves—F. A. Mitchell and Co. has recently moved into new and larger quarters at 1010-12 East Pike street, Seattle, Wash.

Open Columbus Supply House—C. E. Justus and E. E. Parket have opened automobile supply house at 45 North Third street, Columbus, O.

Motor Import Co. Moves—The Motor Import Co., Montreal, Que., will shortly remove to new premises at 971-973 St. Catherine street, West.

Motz Tire Agency Moves—The Philadelphia, Pa., branch of the Motz Tire & Rubber Co., in charge of W. M. Stubbs, has removed to 207 North Broad street.

Appointed Republic Tire Distributors—Grenier Warrington & Co., Ltd., Montreal, Que., have been appointed Provincial sales agents for the Republic tires.

Philadelphia Oakland Moves—The Philadelphia Pa., branch of the Oakland car, of which E. K. Leech is manager, has removed to 227 North Broad street.

Kelly Tires in Montreal—The Kelly Tire Co., Montreal, Que., has been formed to act locally as distributors for the Province of Quebec for the Kelly-Springfield tires.

Washington Auto Service Moves—The Washington, D. C., Auto Service Co. has moved from 1610 Fourteenth street to larger quarters at Fourteenth and W streets

Philadelphia Firm Moves—The General Motor Car Co., Philadelphia, Pa., has removed to new quarters on Twenty-first street, below Market. It is 60,000 square feet in size.

Tremme Joins Millen—Arthur Tremme, formerly with Chandler and Lyon, Seattle, Wash., has become manager for John Millen and son, at Vancouver and Victoria, B. C.

New Motz Tire Branch—The Motz Tire and Rubber Co. has opened a branch at 1012 Fourteenth street, N. W., Washington, D. C., with Frank G. Fickling as manager.

Truck Club's New Headquarters—The Motor Truck Club, New York City, has leased a new office of the United States Rubber Bldg., Broadway and Fifty-eighth street. Its number is room 1,004.

Open Columbus Supply House—C. E. Justus and E. E. Parker, under the partnership name of Justus and Parker, have opened an automobile supply house at 45 North Third street, Columbus, O.

Coleman Resigns from Atterbury—J. R. Coleman has resigned as chief engineer and designer of the Atterbury Motor Car Co., Buffalo, N. Y. It is his present plan to locate in Detroit, Mich.

Appointed Automobile Supply Manager—N. S. Stinchcomb has been appointed manager of the automobile supply department of the Rudolph & West Co., Washington, D. C., in place of E. L. Wilson.

Coburn in New Location—R. F. Coburn, New England district manager of the United Motor, Boston, Mass., Co., announces the removal of that company to its new warehouse, 410 Newbury street.

New Garage at Ulysses—D. C. Chase has purchased the lower floor of the G. A. R. building, Ulysses, Pa., and will soon open as a garage. Automobiles and motor trucks are to be sold and a repair shop will be maintained.

Pilgrim Motor Truck Branch—E. N. McNabb, president of the Pilgrim Motor Truck Co., is in San Francisco, Cal., establishing a branch assembling plant, where the various models of the Piggins truck will be assembled.

Merchants' Association's New Quarters—The Merchants' Assn., of New York, has moved into its new headquarters in the Woolworth Bldg., 233 Broadway. The new quarters occupy the greater part of the ninth floor of that building.

Fire in Peerless Branch—A fire broke out in the paint room of the Boston, Mass., branch of the Peerless Motor Car Co., recently, but it was confined to the upper floor where it started, because the building is one of the modern fireproof structures. The loss is estimated at $25,000.

New Locomobile Manager—E. R. Travis, until recently assistant manager of the New York City branch of the Locomobile Company, has been transferred to Boston, Mass., as manager to fill the position made vacant by the resignation of K. M. Blake, who has gone with the International Motor Co.

Frontier Transportation Co.—The Frontier Transportation Co. has been incorporated in Buffalo, N. Y., to operate motor buses over the principal streets of that city. The stock is being marketed along the business interests of Buffalo and the operation of vehicles will be started in the near future.

Mail Collection by Automobile—The first automobile to be used in the mail collection service of Omaha, Neb., made its initial trip recently. The trip included fifty-four stops, and the 3.8 miles recorded by the speedometer was made in 43 minutes, just over half the time required for the same trip by wagon collection.

Parkway for Storing Automobiles—Safety Director Mooney, of Toledo, O., has announced the opening on Monday, April 21, of a parkway for the storing of automobiles, now crowded into public streets and left standing for hours while owners transact business at their offices. The new parkway covers an area of 40,000 square feet and is capable of parking 300 machines.

FISCHER WITH BOSTON MICHIGAN—J. Fischer has become manager of the retail sales department of the Boston, Mass., branch of the Michigan Motor Co.

GARAGE IN RICHLAND CENTER—The Pier Automobile Co., of Richland Center, Wis., has broken ground for its new garage and sales building, to cost about $7,500.

CLARK NEEDS ADDITIONAL EQUIPMENT—The Clark Motor Car Co., Louisville, Ky., will need additional equipment for the repair shop of its new garage at 206 East Broadway.

U. S. TIRE IN WORCESTER—The United States Tire Co., New York City, has opened its new branch in the city of Worcester, Mass., under the management of L. C. Havener.

TRACY PROMOTED—R. B. Tracy has been appointed manager of the Central district by the Michelin Tire Co., of Milltown, N. J. His territory comprises the Chicago, St. Louis and Minneapolis branches.

PURCHASE ECONOMY GARAGE—J. W. Tyler, of North Fond du Lac., Wis., and Walter Kisk, of Wausau, Wis., have formed a partnership and purchased the business of the Economy Garage Co., at Harvard, Ill.

N. Y. DE DION MOVES—Emanuel Lescaris, manager of the De Dion Bouton selling branch, New York city, will move the same on May 1 to larger quarters at 1672 Broadway. The present address is 1649 Broadway.

RED WING ORDERS TRUCK—The city council of Red Wing, Minn., has ordered a $5,600 Seagrave combination chemical and hose motor cart. An expert will instruct the firemen how to drive, and by May 1 the machine is expected to be in operation.

TWIN CITY COMPANY MOVES—The Twin City Motor Car Co., St. Paul, Minn., has moved to a new location, 163 West Sixth street, where it has a service department in charge of Gustav Michaud. A. F. Williams is in charge of the truck department.

LAWRENCE LEAVES NYBERG—Clarence Lawrence, advertising manager of the Nyberg Automobile Wks., Anderson, Ind., has resigned his position to enter the advertising department of the National Cash Register Co., Dayton, O. Victor Washborn succeeds him.

KELLY BOSTON GOODRICH MANAGER—A. J. Kelly, formerly in charge of the B. F. Goodrich Co's. Syracuse, N. Y., depot, has been transferred to the Boston, Mass., branch. Mr. Kelly has been succeeded by Mr. F. G. Mossop, formerly located in the Buffalo, N. Y., branch.

PITCHER COLUMBUS ELECTRIC MANAGER—L. W. Pitcher, 5 years with the electrical department of the Columbus Buggy Co. branch, Minneapolis, Minn., has been made manager. A. E. Archer, for many years the manager, has gone to St. Louis, Mo., where he will sell Ohio electrics.

ST. PAUL ORDERS APPARATUS—For protection of the outlying Midway district the fire commission of St. Paul, Minn., has ordered a Waterous motor-driven and motor-pumping fire engine, manufactured in that city, and a La France combination chemical and hose motor wagon. The two will cost about $12,500.

MINNEAPOLIS BUYS VELIES—The city of Minneapolis, Minn., has bought two Velie 3-ton trucks for use by the city sewer department. The price was $3,165 each. The health department is considering purchase of a Martin tractor to collect garbage from stations and haul to the incineratory. The bid is $3,750.

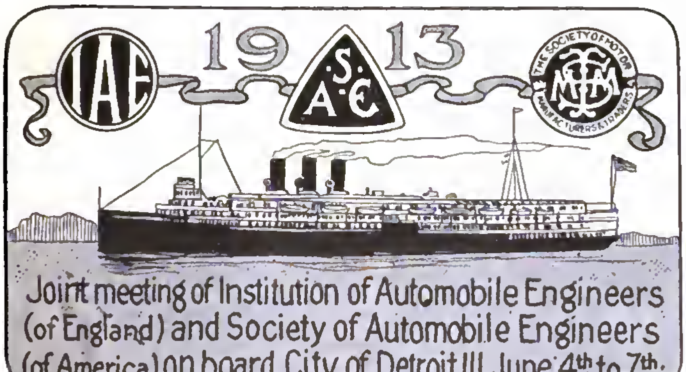
WAGNER AND NICHOLS HANDLE SPARTONS—F. J. Wagner and J. C. Nichols, of New York City, have taken the distributing rights for Sparton horns in the East. They will handle the business from a Broadway headquarters adjoining the General Automobile Supply Co. and the Schebler distributing agency, at 1671 Broadway.

AUTOMOBILE OWNERS IN JOHANNESBURG—A list of the 810 owners of automobiles in the city of Johannesburg, South Africa, and also of the dealers in automobiles and the garages there, has been received from Consul E. N. Gunsaulus, and will be sent to inquirers by the Bureau of Foreign and Domestic Commerce, Washington, D. C.

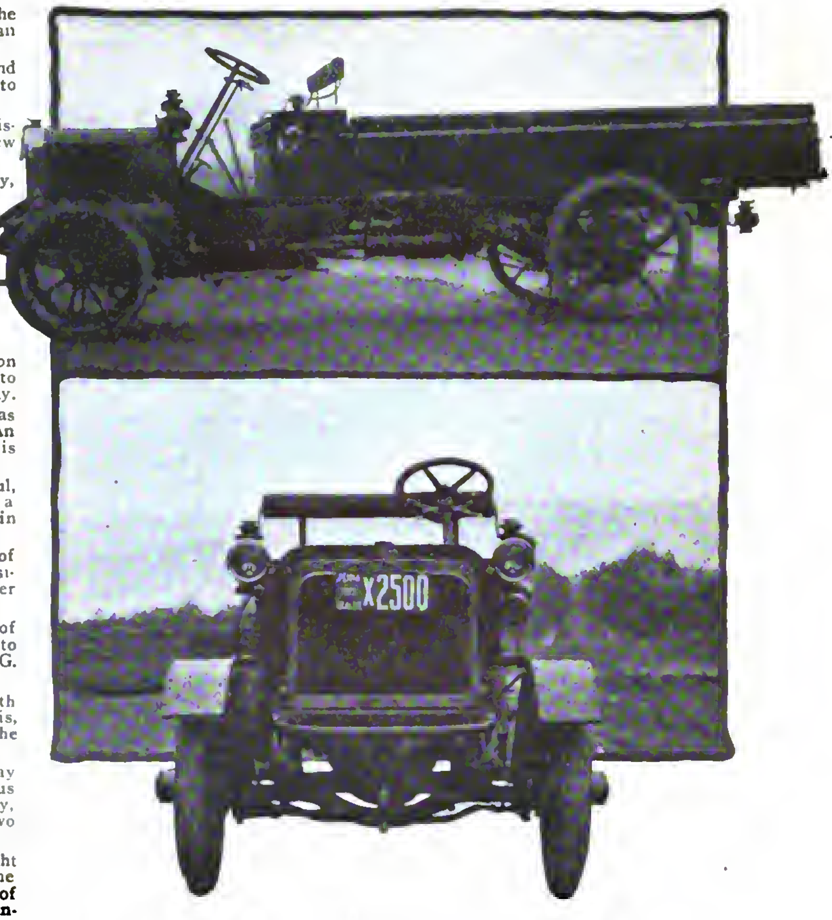
ARGENTINA'S AUTOMOBILE REPAIR SHOP—It is proposed to start a cooperative mechanical workshop in Mendoza, Argentina, to attend specially to the constant repairs required by the numerous automobiles which traverse the city and outlying districts. The idea is likely to be taken up and will serve as a corrective to the very high charges at present in the repair business.

TRADE BETTER THAN EVER—Automobile dealers in Kansas say there never has been a year when the prospect of business was better than it is this year. Much of the patronage in Kansas is from the prosperous farmers, and when the farmers are making good crops they not only buy machines, but they are disposed to buy second and third cars, and better and better cars.

MONTREAL WANTS MORE TRUCKS—The controllers are asking the City Council, Montreal, Que., to vote money to buy a dozen motor wagons of various makes for the road department. Each will have a capacity of about 6 tons and will move about four times as fast as a team, doing the work of 8 dozen horses. The price is $6,200 to $6,500 each. Three types of machines, four of each make, will be purchased.



Poster of the joint meeting of the I. A. E. of England and S. A. E. of America. This is being used at present on all S. A. E. correspondence. On June 4 to 7 these two societies will be on board the steamer City of Detroit III.



Side and front views of the first truck to be manufactured by the Delahunty Dyeing Machine Co., Pittston, Pa. It is of 1.5 tons capacity

NEW OMAHA STUDEBAKER BUILDING—B. J. Scannell, agent for the Studebaker car in Omaha, Neb., recently leased a new building at Twenty-fifth avenue and Farnam avenue. It is said that it will be the largest automobile building in the city. The building will cost $75,000. It is 75x140 feet, four stories high, the first story built of reinforced concrete and the stories above of brick and terra cotta.

NEW BUILDING IN INDIANAPOLIS—Another building has been added to Motor Row in the Capitol avenue boulevard, Indianapolis, Ind. The building has been occupied by Brandt Bros., who have the Lozier agency; the Detroiter Sales Co., which has the Briggs-Detroiter agency and by the McCullough Motor Supply Co. The building is at Vermont street and the boulevard.

MOTOR OMNIBUSES IN PITTSBURGH—Eight large motor trucks, said to be the largest in the world, will be placed in service in Pittsburgh, Pa., on May 1. The Pittsburgh Auto Transit Co. is the purchaser. Each of the vehicles will have a seating capacity of thirty-four passengers. The exterior and the interior strongly resemble street cars. They are of the pay-as-you-enter type and passengers may step from the curb directly into the bus vestibule. A six-cylinder motor is used.

ADDITION TO AUTOMOBILE SALESROOMS—Kahn & Greenberg, Philadelphia, Pa., have purchased properties 107-109 South Twenty-fourth street, 32x50 feet, and will use the sites as an outlet for the garage buildings and motor salesrooms they are building at 2302-12 Chestnut street and 103 South Twenty-third street. When completed the buildings will have a frontage of 174 feet on Chestnut street, and 240 feet on Ionie street. The entire operation will represent an investment of about $300,000.

BUILDING INCREASE IN MILWAUKEE—Broadway, from Mason street to Martin street, which has during the last 5 years assumed pretentious proportions as a motor row in Milwaukee, Wis., will strengthen its position as such with the addition of the Overland-Wisconsin Co., and George W. Browne, Inc., in June. A large garage and sales building will be erected at once at the northeast corner of Broadway and Biddle street by a large investment interest which recently acquired big frontages on Broadway, with an idea of inducing an influx of dealers and garage men in that direction. George W. Browne has taken a 10-year lease on the new building, which will be three stories high, 100x100 feet in size, of reinforced concrete construction.

SEATTLE'S AUTO ROW EXPANDING—Four new buildings involving the expenditure of upwards of $63,000, are to be constructed in the Broadway district, Seattle, Wash. All will be ready for occupancy within the next 90 days. A one-story brick 112x100 feet, will house automobile and supply stores at Broadway and Pike, costing $15,000. Across the street is another building which will rise three stories and cost $15,000. Also L. W. Roe is building a two-story garage and salesroom at Twelfth avenue and East Union, which will represent an outlay of $25,000. Alexander Pierce now has in course of construction at Boylston avenue and Pike, a one-story brick building which will serve as an auto house and will cost upwards of $8,000 and will be completed within 60 days. With the occupation of the four sites mentioned in the foregoing there remains but a few vacant lots in the Broadway district that are suitable for automobile trade. The automobile and supply industry in Seattle, Wash., has grown so rapidly that building operations have not kept pace.

COLE SERVICE STATION ALTERATIONS—Extensive alterations on the Cole service station and electric garage of C. W. Robinson, in Peoria, Ill., have been completed.

CRAWFORD RESIGNS—J. W. Crawford has resigned his position as assistant engineer for the American Motors Co., to start in the experimental department of the Chalmers Motor Co., Detroit, Mich.

WHITE IN DETROIT—C. M. White, Jr., of the Firestone Tire & Rubber Co., Akron, O., has recently located in Detroit, Mich., as pneumatic tire representative to the automobile manufacturers of Michigan.

LEAVITT WILL BUILD GARAGE—J. W. Leavitt & Co., Seattle, Wash., have announced the purchase of a lot at East Pike street and Eleventh avenue, on which they will build a garage, which will cost in the neighborhood of $35,000.

UNITED MOTOR SERVICE PLANT—The Long Island City, N. Y., colony of service buildings and departments has been added to by the United Motor, New York, Co., which has taken space amounting to 20,000 square feet in the Galvin Bldg., Thirteenth street and East avenue.

CONVENTION IN BOSTON—Makers of commercial and pleasure electric vehicles are to meet in Boston, Mass., at a convention to be held there May 20, in conjunction with other big electric interests. Papers will be read on various subjects, among them the New England Motor Field, Advertising, Trucks vs. Pleasure Cars, and Gasoline vs. Electrics.

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS.

BROOKLYN, N. Y.—Noden's Auto Trucking Co.; capital, $10,000; to do automobile trucking. Incorporators: Abraham Noden, Ada Noden, Benjamin H. Noden.

BURGAW, N. C.—Pender Auto Co.; capital, $15,000; to deal in automobiles. Incorporators: C. B. Sodergrist, F. M. Lewis.

CINCINNATI, O.—Imperial Auto Livery Co.; capital, $2,000; to conduct an automobile and livery business and deal in automobiles. Incorporators: S. F. Glassemeyer, William Shullman, N. A. Michelson, Joseph Lemkuhle, O. T. Ryan.

CLEVELAND, O.—Krit Motor Sales Co.; capital, $10,000; to deal in automobiles an daccessories. Incorporators: R. S. Smith, C. A. Smith, O. A. Sell, C. P. Tampier, D. Hakes.

NEWARK, N. J.—Carlough & Mallon, Inc.; capital, $50,000; to deal in automobiles. Incorporators: E. D. Carlough, F. V. Carlough, W. L. Mallon.

NEW YORK CITY—Indiana Motor Truck Sales Co.; capital, $10,000; to manufacture and repair automobiles. Incorporators: W. A. Schwarzkoff, Rosalind Lovy, L. O. Knoegel.

PLATTE CENTER, NEB.—Platte Center Automobile Co.; capital, $15,000; to deal in automobiles. Incorporators: E. J. Macken and others.

RALEIGH, N. C.—Dixie Motor Co.; capital, $10,000; to manufacture and sell automobiles. Incorporators: J. C. Arbagast, J. E. Craddock, J. B. Anderson.

SAN FRANCISCO, CAL.—Pacific Kissel Kar Co.; capital, $500,000; to deal in automobiles. Incorporators: W. H. Hughson, G. N. Emmons, H. K. Butterfield.

SCHENECTADY, N. Y.—Schenectady Auto-Car Co.; capital, $10,000; to deal in automobiles. Incorporators: Emmett Fisher, A. Lengenauer, L. Ruonfigilio, W. S. Carman, F. Howenstein, Lee Foy, C. A. Mulleo, O. S. Wagner, J. Wagner, B. Kling.

TARRYTOWN, N. Y.—Motokart Co.; capital, $250,000; to manufacture light commercial automobiles. Incorporators: A. R. Gormully, B. J. Knerr.

WILMINGTON, DEL.—Commer Truck Co. of America; capital, $3,000,000; to manufacture motor trucks. Incorporators: J. F. Curtin, H. O. Coughlin, J. M. Satterfield.

GARAGES AND ACCESSORIES

ASHEVILLE, N. C.—Phillips Tire Co.; capital, $10,000; to manufacture automobile tires. Incorporators: W. L. Phillips, E. Craddock.

BIRMINGHAM, ALA.—Birmingham Motor and Country Club; capital, $150,000; to carry on an automobile club. Incorporators: Oscar Turner, Solon Jacobs, G. A. Binn, Jr.

BROOKLYN, N. Y.—Self-Generating Motor Co.; capital, $250,000; to manufacture machines for generating steam. Incorporators: O. G. Holahansen, R. T. Mani, H. B. Wood.

CINCINNATI, O.—National Automobile School of Cincinnati; capital, $50,000; to conduct an automobile school and garage and repair shop and to manufacture and deal in motor vehicle supplies and accessories. Incorporators: G. A. Hewley, H. G. Williamson, W. A. Evan, C. R. McComas, J. D. McCrecken.

CLEVELAND, O.—Elastic Tread Tire & Wheel Co.; capital, $25,000; to manufacture patented elastic treaded tire wheels. Incorporators: J. A. Murrey, R. E. Mollenkopf, F. J. Axel, Peter Schneider, F. O. Joss, W. J. Young.

DETROIT, MICH.—American Lamp & Stamping Co.; capital, $100,000; to engage in the manufacture of automobile lamps and plumbing supplies. Incorporators: G. E. Edmonds, William Jones.

EAST PALESTINE, O.—McGraw Tire & Rubber Co.; capital, $1,000,000; to manufacture automobile tires. Incorporators: J. C. Chaplin, C. H. Bolton, J. S. Wilson, George Fiaccus, E. O. McGraw, L. N. McGraw, Robert McGraw, John Morgan, R. F. Taggart, R. B. Taggart, J. C. Chemberling, H. O. Fraser, C. I. Merwin.

HOLYOKE, MASS.—Auto Accessory Mfg. Co.; capital, $25,000; to manufacture automobile accessories. Incorporators: W. J. Shannon, E. N. Frary, E. A. Frary.

JOPLIN, MO.—Arnold Motor and Supply Co.; capital, $2,000; to deal in automobile accessories. Incorporators: J. L. Arnold, Ida Tweed Arnold, Flora Arnold Snider.

MORAVIA, N. Y.—Auburn & Moravia Auto Bus Co.; capital, $7,000; to run an automobile bus line. Incorporators: E. C. Weaver, E. D. Parkhurst, F. W. Ackerman.

NASHVILLE, TENN.—Card Taxicab Co.; capital, $1,000; to engage in an automobile taxi business. Incorporators: C. O. Card, Glenn Taylor, W. O. Taylor, C. W. Carle, O. S. Mayfield.

NEW YORK CITY.—Allied Motor Accessories Co.; capital, $10,000; to deal in automobile accessories. Incorporator: Annie Harroun.

NEW YORK CITY—Mottlau Transmission Inc.; capital, $250,000; to manufacture transmission, etc. Incorporators: A. J. Mottlau, W. L. Post, T. F. Conrad.

NEW YORK CITY.—National Spark Plug Co.; capital, $10,000; to manufacture spark plugs. Incorporators: R. L. Oherburg, C. B. Bennett, Agnes Boselman.

NEW YORK CITY.—Schermerhorn Garage Co.; capital, $20,000; to carry on a garage business. Incorporators: Jacob Ginsburgh, Leo Rosett, P. A. Lee.

NEW YORK CITY.—Still's Automobile & Accessories Co.; capital, $10,000; to deal in accessories. Incorporators: G. M. Still, George Edwin Still, Josiah H. Still.

NEW YORK CITY.—Wegner Specialty Co.; capital, $5,000; to deal in automobile accessories. Incorporators: A. F. Wagner, Frederick Walsh, Moses Morris.

PITTSBURGH, PA.—Federal Auto Supply Co.; capital, $10,000; to deal in accessories. Incorporators: O. O. Herr, G. M. Newmyer, C. D. Greene.

PITTSBURGH, PA.—Pittsburgh Auto Transit Co.; capital, $5,000; to carry on an automobile transportation business. Incorporators: A. V. Crookston, H. B. Ouraler, W. A. Feltyberger, O. R. Beatty.

PITTSBURGH, PA.—Transmission Engineering Co.; capital, $13,000; to [illegible] an electric transmission. Incorporators: G. N. Lemmon, A. W. Burke, H. L. Patterson, V. H. Ely, B. W. Kerr, M. Epstein, L. C. Hart.

PRINCE ALBERT, SASK.—Owners' Garage Co.; capital, $20,000; to carry on a general garage business.

RICHMOND HILL, N. Y.—Richmond Hill Garage & Machine Co., Inc.; capital, $6,000; to carry on a garage business. Incorporators: M. E. Tunca, [illegible] H. Ryan, A. F. Ryan.

ROMNEY, W. VA.—Hampshire Garage Co.; capital, $5,000; to carry on a general garage business. Incorporators: J. J. Cornwell, T. F. Martin, W. [illegible] McClane.

SASKATOON, SASK.—Standard Auto & Supply Co.; capital, $50,000; [illegible] manufacture automobile supplies.

TOTTENVILLE, N. Y.—Tottenville Garage Co.; capital, $500; to carry on a general garage business. Incorporators: I. A. Silver, Jr., G. W. [illegible] E. L. Silver.

WHEELING, W. VA.—Belleaire Automobile Garage Co.; capital, $10,000; [illegible] carry on a garage business. Incorporator: Hart Morris.

WORCESTER, MASS.—Worcester County Automobile Owners' Assn.; [illegible] $5,000; to conduct an automobile club. Incorporators: J. W. Healy, [illegible] Divoll, H. A. Wood.

CHANGES OF NAME AND CAPITAL

AKRON, O.—Stern Double Cushion Co.; capital decrease from $200,[illegible] $10,000.

DEKALB, ILL.—DeKalb Wagon Wks.; capital increase to $50,000.

NEW YORK CITY.—Joscelyn Stable Co.; change of name to the J[illegible] Garage, Inc.

WASHINGTON, D. C.—G. R. Cowie Co.; change of name to G. R. [illegible] Co., Inc.

New Automobile Agencies Established During the Week

PLEASURE VEHICLES

Place	Car	Agent
Austin, Tex	Henderson	W. L. Heiermann
Avon, Ill	Henderson	O'Donnell & Sailer
Bakersfield, Cal	Henderson	C. P. Wilkes
Bar Harbor, Me	R-O-H	O. L. Brewer
Bay City, Mich	Cole	Miller Co.
Bay Head, N. J	Henderson	Applegate's Garage
Bennington, Vt	Cole	B. A. Quinlan
Boston, Mass	Columbus	Imperial Auto Co.
Canajoharie, N. Y	Henderson	E. B. Burnap
Chicago, Ill	Henderson	O. R. Wolfe
Cincinnati, O	Henderson	Armstrong Motors Co.
Columbus, O	Detroiter	Batdorf & Corbett
Corpus Christe, Tex	Henderson	J. O. Cline
Danville, Va	Cole	Virginia City Motor Co.
Denton, Tex	Cole	B. L. Taylor
Des Moines, Ia	Henderson	Guarantee Motor Co.
Dunkirk, N. Y	Henderson	Dunkirk Boiler & Mch. Co.
Falconer, N. Y	Henderson	Falconer Garage
Frankfort, Ind	Henderson	C. M. Anderson
Great Falls, Mont	Cole	Dr. J. A. Niles
Hackensack, N. J	Henderson	G. W. Conklin
Halifax, N. S	Franklin	O. L. Newman, Ltd.
High Springs, Fla	Henderson	H. McL. Grady
Hillsboro, O	Chalmers	D. S. Durnell
Hollister, Cal	Henderson	R. L. Allen
Jacksonville, Fla	Henderson	Central Garage
Jersey City, N. J	Henderson	Wacker's Garage
Lewiston, Mont	Cole	S. C. Weaver
Lorain, O	Reo	F. S. Rathwell
Los Angeles, Cal	Touraine	R. del Valle
Mason City, Ia	Cole	Murray & Daniels
Melbourne, Aus	Moon	Moon M. O. Co.
Montpelier, Vt	Cole	Laue Mfg. Co.
Montreal, Can	Henderson	Fred Ritchie
Nashua, N. H	Henderson	H. C. Lintott
Nashville, Tenn	Henderson	R. O. Hopper
Norfolk, Neb	Henderson	M. C. Howell
Oakley, O	Henderson	John Rempe
Oklahoma City, Okla	Henderson	H. D. Willcox
Paterson, N. J	Henderson	E. A. Browne Auto. Co.
Phoenix, Ariz	Henderson	N. Friedman
Philadelphia, Pa	Moline	Walter Harper Co.
Philadelphia, Pa	Pilot	Raymond McCormick
Philadelphia, Pa	S. G. V	J. P. Bonsai
Portland, Ore	Regal	Sieret & Peterson Co.
Portland, Ore	Studebaker	Oregon Motor Car Co.
Providence, R. I	Henderson	Henderson Motor Sales Co.
Rensselaer, Ind	Franklin	Alter & Kannal
Rockford, Ill	Henderson	August Miller
Salem, Ind	Cole	C. M. Crim & Son
San Diego, Cal	Henderson	Griffin & Anderson
Santa Barbera, Cal	Henderson	Harry Wood & Son
Savannah, Ga	Franklin	J. C. Lamb Auto. Repair Co.
Seattle, Wash	American	Miller Auto. Co.
Sheffield, Mass	Cole	A. H. Tuttle
Silverton, Tex	Henderson	Fred Biffle
Stamps, Ark	Cole	H. M. Hodgens
Tacoma, Wash	Henderson	H. W. Doherty
Tampa, Fla	Henderson	Lee McDonell
Washington, D. C	Cartercar	O. A. Reed
Wellsville, O	Henderson	E. Whitacre Auto. Co.
West Hoboken, N. J	Henderson	E. P. Guenther
York, Pa	Metz	J. P. Lecrone

COMMERCIAL VEHICLES

Place	Car	Agent
Columbus, O	Blair	Columbus Mill & Mine [illegible]
Los Angeles, Cal	Smith-Milwaukee	M. S. Bulkley & Co.
Milwaukee, Wis	Menominee	Denster & Tellier Auto. [illegible]
Minneapolis, Minn	Kelly-Springfield	W. L. Davis
Ottawa, Ont	Indiana	B. F. Benson
Pittsburgh, Pa	Dorris	W. D. Morris

MAY 1, 1913

10c A COPY

The AUTOMOBILE

BAILEY
ELECTRIC SYSTEM

The Coming Light

With the arrival of the perfect electric generator, electric lighting for motor cars is unquestionably displacing all other forms.

Electric generatars have heretofore been subject to criticism on account af their inefficiency and unreliability.

The Bailey Electric Generator, a wonderful dynamo only 5½" high, 5½" wide and 7½" long, weighing 17 pounds, designed by Benjamin F. Bailey, the famous Electrical Engineer, furnishes the first logical solution of the electric lighting problem.

In its construction, all unsatisfactory and trappy devices, such as reverse current relays, magnetic switches, vibrating contacts, delicate rheostats, slipping clutches, corroding platinum points and other trouble making appliances have been entirely eliminated.

Furthermore, there are no moving parts involved in the Bailey System of Regulation.

A patented mercury switch, the very simplicity of which has foiled other inventors, makes the construction of this generator so simple and compact, that in spite of the fact that its output running from 10 to 15 amperes is almost double that of other generators, the entire mechanism is little larger than a man's hand.

Another thing—due to its peculiar construction, when the big headlights are thrown on, it automatically supplies the additional current required for their lighting.

You are always assured of brilliant lights on all your lamps, and a sufficient reserve in the battery to take care of emergencies.

Prices of Complete Outfit

Model L 1, suitable for car lighting systems requiring 60 candlepower or less, $75.00.

This price includes generator, wiring, harness, 60-ampere hour storage battery and all controlling switches ready for installation. Price f.o.b. Grand Rapids.

Model L 2, suitable for car lighting systems requiring 60 to 100 candlepower, $125.00.

This price includes generator, wiring, harness, 80-ampere hour storage battery and all controlling switches ready for installation. Price f.o.b. Grand Rapids.

The above outfits can be attached to any existing type of car having an exposed rotating shaft on the power plant.

Send for our booklet, "Electric Lighting Explained," which shows in detail how the generator is made and what it will do. Also describes the Bailey Combination Ignition Starting and Lighting Unit.

WILSON & COSGROVE—Exclusive Sales Agents,
Suite 6—Goldberg Building,
DETROIT, MICH.

THE BAILEY ELECTRIC CO.
GRAND RAPIDS, MICHIGAN, U.S.A.

VOL. XXVIII NEW YORK—THURSDAY, MAY 1, 1913—CHICAGO NO. 18

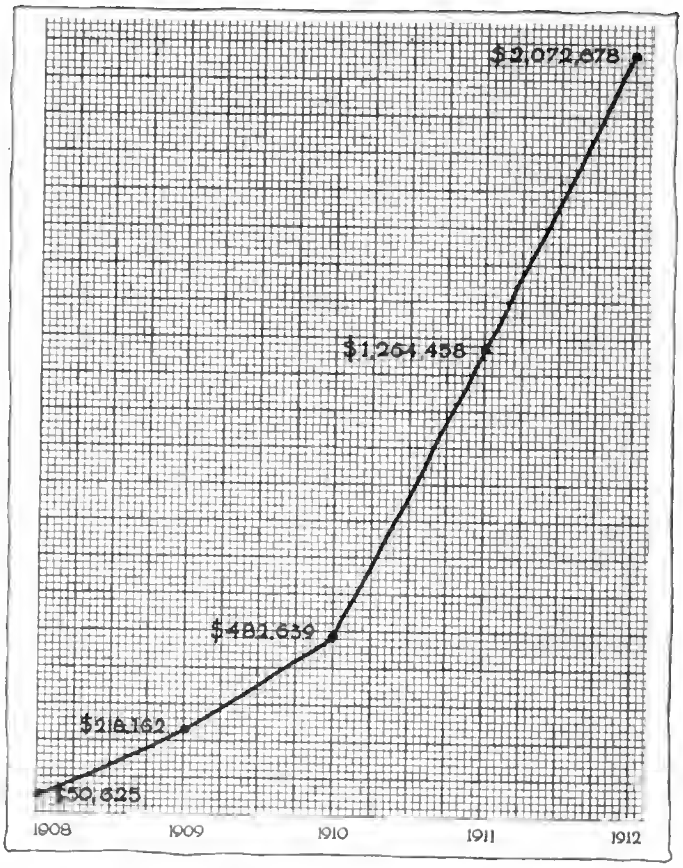
The AUTOMOBILE

Australia—A Fine Export Field

Total Imports Rose from $6,007,943 in 1911 to $9,334,627 in 1912, an Increase of 55.5 Per Cent.—America Leads in Bodies and Is Second to England as Chassis Seller

TWO territories there are in the New World which are just being thrown open to the commerce and industry of the world: South America and Australia. The former, largely in the hands of the original Spanish settlers, is not as quick as its natural resources and possibilities would warrant it; while the latter, under the hands of the British, most successful of colonizing nations, is making most astonishing headway. Agriculture, mining and a variety of industries make Australia a territory of very considerable buying power, and that the automobile industry of the world is getting its share will be shown in the following article.

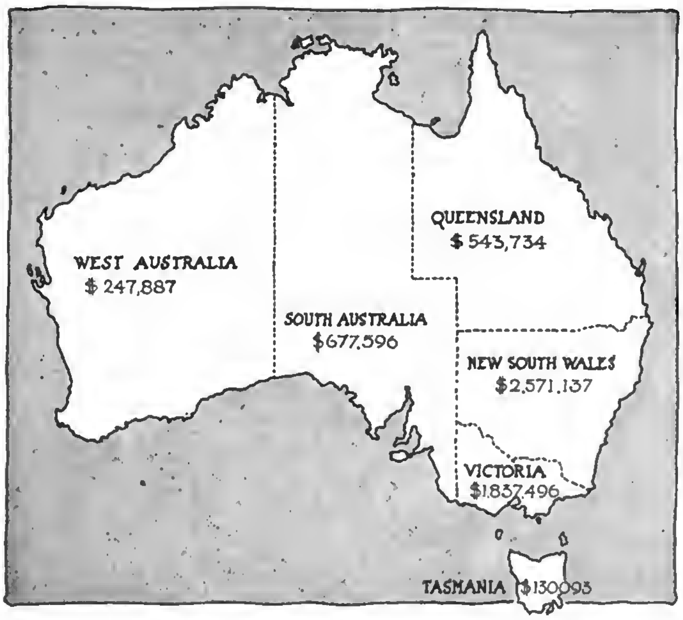
The present status of automobilism in Australia has been dealt with statistically in an article published in THE AUTOMOBILE of October 31, 1912. It will now be shown how the number of automobiles in Australia is on a rapid increase, as a fitting illustration of the good chances and the success of American automobile exporters. Australian automobile imports during 1911 and 1912, according to government figures, are our material used in this article.



Curve showing the steady rise of American exports to Australia, which increased fortyfold in 4 years

The most interesting phase of the whole situation—the import of American automobiles—is illustrated by the curve appearing on this page. From the modest figure of $50,625 of the cars imported from the United States in 1908, this value has risen during the subsequent 4 years to forty times its magnitude, or $2,072,678. The rate of increase of American exports to Australia has been rising continually, as is shown by the steepening slope of the curve.

Details of automobile imports from America to Australia are shown in the diagram on page 920. The total amounts for the last 2 years have been dissected in the case of this diagram, showing the value of chassis, bodies and of motorcycles, including cyclecars, for both years, the 1911 values being represented by spaces filled with dot-shading and those of 1912 by line-



Distribution of 1911 imports through Australian states

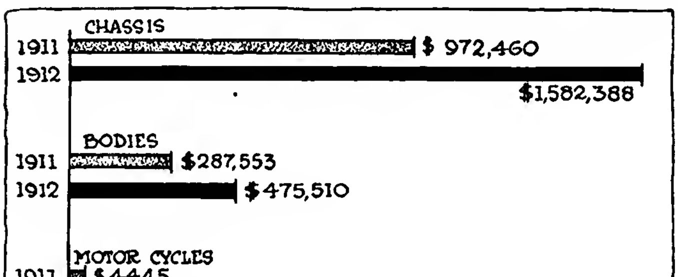
shaded spaces. The value of chassis imports in 1911 was $972,460 and in 1912 $1,582,388, equivalent to an increase of 62.5 per cent. Bodies imported from the United States rose in value from $287,553 in 1911 to $475,510 in 1912, the increase amounting to $187,957, or 65 per cent. Motorcycle and cyclecar imports rose from $4,445 to $14,780, an increase of $10,355, or 233 per cent.

America Supplied 10 Per Cent. in 1912

The total value of automobile chassis and bodies, including both passenger and commercial types, exported from the States to Australia during 1912 is $2,057,898. Assuming that the average value of each car exported was $1,000—a reasonable estimate—this means that somewhat more than 2,000 automobiles were sold in Australia in that year. If the total number of cars in Australia at the close of 1912 was 20,000, which is very close to the actual number, **one-tenth of this respectable number had been purchased from American manufacturers during that very year.** It should be borne in mind, too, that the values given in the diagram on this page do not include the prices paid for tires on the cars, but merely those of the products of the automobile industry proper.

So far as bodies are concerned, the United States was the leading exporter to Australia in 1912, but in respect of total chassis value it ranked second to the United Kingdom, while in regard to motorcycles and cyclecars it was only fourth, Great Britain, France and Belgium being leaders. But that America is making good progress even in these two regards is shown by comparing the tabulations showing Australian imports for 1911 and 1912. In 1911 America ranked only as second body exporter and was fifth in the motorcycle field, Germany being then ahead of it, which has been left behind during 1912.

The tables on this page and on 921 show imports of automobiles into the various states of the Commonwealth of Australia,



Comparative diagrams of 1911 and 1912 American imports

with the exporting countries arranged in the order of their export values. Even a superficial inspection of these tabulations brings out the fact that America's principal rival is Great Britain, who controls Australian imports in many fields and therefore holds supremacy in automobiles as well. But the steady advance of American exports, as shown by its first position on the 1912 body table, cannot be denied. Another fact shown by these tables is that France ranks among the principal exporters, although she seems to be falling behind. Indeed, her chassis exports increased by the amount of $176,058 during 1912; her body exports increased $11,744, but the small-car trade shows a falling-off amounting to $690. This may seem to be a small amount, but as every country has been trying its best in its Australian trade during the past 2 years, even this decrease is significant. A different and pleasant situation obtaining with regard to the United States' exports is revealed by comparing the French figures with those illustrated by the diagram at the bottom of the page.

An extraordinary gain in chassis exports is seen in the case of Canada; her 1912 trade exceeds that of 1911 by $437,521, the gain being 205 per cent. This puts her fourth among chassis-supplying countries. Italy is making reasonable progress and Belgium's trade develops at about the same rate. Germany showed a gain of just $100,000 during 1912. Swiss trade fell off, the loss being $8,671. Austria-Hungary's exports fell $3,108 and those of the Netherlands $8,558, or 91 per cent. Sweden, however, showed an increase of $11,354, or 96.5 per cent.

The tabulation of Australian body imports shows a similar situation. Except for the fact that the United States took first place in 1912 and the United Kingdom second, reversing the positions of the preceding year, the order of countries that exported to the Commonwealth remained much the same as before. Canada remained third, more than doubling her trade: France retained fourth place, although she lost $11,744, or 26 per cent. of her exports; Germany followed in both years, gaining slightly during 1912; in that year Italy overtook Belgium, the former gaining $4,238, or 159 per cent., while the latter's export business fell from $7,757 to $4,704, the loss being 39 per cent. New Zealand almost doubled her trade and that of Switzerland rose

AUTOMOBILE CHASSIS IMPORTED INTO AUSTRALIA DURING 1911

Country	N. S. W.	Vict.	Queen'd	S. Aus.	W. Aus.	Tasm.	Total
U. Kingdom	893,700	519.600	215,000	309,300	82.960	55,560	2,076,120
U. S. A....	477,300	200,700	152.500	84,920	35.750	21,290	972,460
France	320,300	377,800	58,390	83.850	38,300	9,196	887,836
Italy	133,200	146,700	2.659	15,060	13,610	9,585	320,814
Belgium	114,000	95,190	4,631	13,000	......	998	227.819
Canada	67,200	113,100	1,281	30,110	2,830	......	214.521
Germany ...	73,810	79.320	502	11,711	53	9,010	174,416
Switzerland.	6,822	21,740	1,057	7,291	4	......	36,914
Austria	20,460	......	......	......	......	......	20,460
Sweden	11,710	......	......	......	......	......	11,710
Holland	......	9,428	......	......	......	......	9,428
	2,118,502	1,563.578	436,020	555,242	173,517	105,639	4,952,498

BODIES AND PARTS THEREOF IMPORTED DURING 1911.

Country	N. S. W.	Vict.	Queen'd	S. Aus.	W. Aus.	Tasm.	Total
U. Kingdom.	143,170	88.694	31,008	39.907	35,765	8,030	346,574
U. S. A....	141,398	59,923	46,483	21,298	10,392	8,059	287,553
Canada	13,858	26,837	466	9,523	8,179	......	58,863
France	16,690	13,358	5,640	3,965	4,104	1,325	45,082
Germany ...	13,027	4,622	134	2,400	62	67	20,312
Belgium	2,947	3,475	......	1,109	226	......	7,757
Italy	912	1,450	10	139	139	......	2,650
Austria	1,181	......	......	......	......	......	1,181
N. Zealand..	341	......	......	......	......	......	341
Holland	......	......	211	......	......	......	211
Sweden	53	......	......	......	......	......	53
Switzerland.	......	24	......	......	......	......	24
	333,577	198,383	83,952	78,341	58,867	17,481	770,601

MOTORCYCLES AND SMALL CARS IMPORTED DURING 1911

Country	N. S. W.	Vict.	Queen'd	S. Aus.	W. Aus.	Tasm.	Total
U. Kingdom.	94,190	67.070	18,050	40,800	13.190	6,492	239,792
France	15,490	1,228	......	2,371	1,183	......	20,272
Belgium ...	5,454	2.664	4,996	165	1,130	......	14.409
Germany ...	2,571	2,016	......	677	......	243	5,507
U. S. A....	1,353	2,557	297	......	......	238	4,445
Switzerland..	......	......	419	......	......	......	419
	119,058	75,535	23,762	44,013	15,503	6,973	284,844

to five times of what it had been in 1911. Austria lost somewhat and Sweden disappeared entirely; the same applies to the Netherlands. On the other hand, Japan and the Commonwealth are new additions to the list.

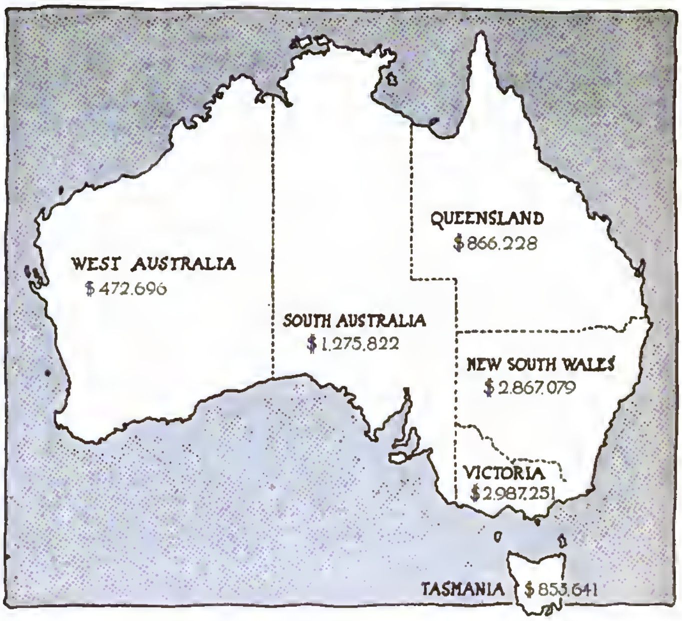
In the motorcycle and cyclecar class, the United States advanced from the fifth to the fourth position, displacing Germany. France was the only loser in this class of imports, all other countries showing gains. In 1912 New Zealand appeared on the list for the first time.

It would be utterly wrong, however, if anyone would be inclined to consider Australia as one uniform territory throughout which the same conditions hold good. The Australian continent is divided into five states which, together with the island of Tasmania, constitute the Commonwealth. The following tabulation shows the total imports of all sates for 1911 and 1912, with the percentage of increase during the latter year, the states being arranged in order of the automobile registrations:

State	1911	1912	Increase Per Cent.
New South Wales	$2,571,137	$2,867,079	11.5
Victoria	1,837,496	2,987,251	57.2
South Australia	677,596	1,275,822	89.6
Queensland	543,734	866,228	59.4
West Australia	247,887	472,696	90.6
Tasmania	130,093	853,641	556.5

This shows that the demand for automobiles is very strong all through the Commonwealth, but that the import rates rise most in the territories which have the least numbers of cars, Tasmania having about 600 at the end of last year. New South Wales, on the other hand, had some 6,500 cars, or ten times as many as Tasmania; but the rate of import increase is only one-fiftieth of that of the latter. This indicates that the island is a specially hopeful territory which has hardly been touched yet. Queensland's registration is just in the middle between the numbers of West and South Australia, so that her percentage of rise should be about 90; instead it is only about 60, showing either that the state has not received proper care from automobile dealers or that conditions there are not as favorable for automobiling as elsewhere.

In the previous article mentioned above, which treated of the status of the automobile in Australia, it was stated that Ford registrations were about 50 per cent. ahead of any other make, showing the prevalence of low-priced American cars. It was also stated then, that Australians have a preference for American bodies due their greater comfort. That there is truth in this argument, is now being shown by the lead of the United States in the line of body imports. The other arguments in favor of American cars, low price, easy-riding suspensions and full equipment are also of great consequence in introducing United States made products in the Commonwealth.



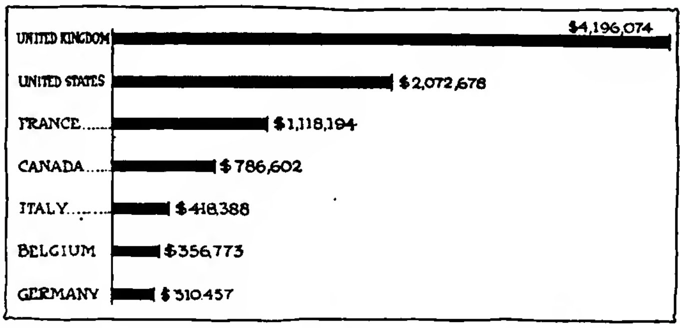
Distribution of 1912 imports through Australian states

How To Go About Australian Trade

It may not be out of place to state here that British exporters to Australia as well as patriotic importers of English origin have grave apprehensions with regard to the American trade. The danger, so-called, of an invasion of the land by American products is felt more in Australia than in many other countries, because the Commonwealth is still very much in its growing period.

Information about Australia is continuously coming in, especially through the United States Consulates established in the various cities. It will be advisable for any maker who desires to export to the Australian continent, to communicate with the Department of Commerce and Labor for information regarding the local conditions obtaining in the various states and their parts, as such a knowledge is a requisite in making a success in automobile exporting.

Judging from general conditions in Australia, which are favorable to business, it is more than highly probable that American automobile exports to that country will increase during this year at no lesser rate than they have grown during 1912 and perhaps at an even greater rate. America will probably still be second among chassis-supplying countries, but closer to England.



Car imports of 1912 arranged by manufacturing nations

AUTOMOBILE CHASSIS IMPORTED INTO AUSTRALIA DURING 1912

Country	N. S. W.	Vict.	Queen'd	S. Aus.	W. Aus.	Tasm.	Total
U. Kingdom	785.808	817,978	332,861	427,075	121,498	762,816	3,248.036
U. S. A.	545,122	460,834	229,512	221,779	88,013	37,128	1,582,388
France	298,022	526,848	96,715	126,427	11,048	4,834	1,063,894
Canada	159,749	242,314	25,493	147,202	77,083	......	651,841
Italy	205,935	173,808	7,406	17,098	7,253	......	411,500
Belgium	126,442	158,270	18,475	26,323	1,666	1,243	332,419
Germany	121,032	138,346	82	9,987	4,397	164	274.008
Switzerland	5,400	13,685	3,192	5,966	......	......	28,243
Sweden	23,064	......	......	......	......	......	23,064
Austria	12,797	3,902	653	......	......	......	17,352
Holland	878	......	......	......	......	......	878
N. Zealand	......	19	......	......	......	......	19
	2,284,249	2,536,004	714,389	981,857	310.958	806,185	7,633,642

BODIES AND PARTS THEREOF IMPORTED DURING 1911

Country	N. S. W.	Vict.	Queen'd	S. Aus.	W. Aus.	Tasm.	Total
U. S. A.	149,584	129,078	68,381	81,509	35,510	11,448	475,510
U. Kingdom	137,611	115,882	33,739	75,917	35,323	10,306	408,778
Canada	34.824	32,117	5,314	37,594	24,912	......	134,711
France	13,751	9,610	4,197	2,261	2,813	706	33,338
Germany	12.754	10,330	......	......	1,795	......	24,879
Italy	4,253	1,296	......	......	1,339	......	6.888
Belgium	2,208	2,074	......	......	......	422	4,704
Austria	1,126	......	......	......	......	......	1,126
Japan	662	......	......	......	......	......	662
N. Zealand	360	269	......	......	......	......	629
Com'nwealth	201	......	......	......	......	......	201
Switzerland	158	......	......	......	......	......	158
	357,492	300,656	111,631	197,281	101,692	22,882	1,091,634

MOTORCYCLES AND SMALL CARS IMPORTED DURING 1911

Country	N. S. W.	Vict.	Queen'd	S. Aus.	W. Aus.	Tasm.	Total
U. Kingdom	192,400	142,100	36,760	94,100	52.060	21,430	539,260
France	13,420	2,717	195	657	3,934	39	20,962
Belgium	10,330	4,719	3,238	1,363	......	......	19,650
U. S. A.	3,959	4,276	15	399	3,526	2,605	14,780
Germany	4,757	6,609	......	165	39	......	11,570
Switzerland	472	......	......	......	487	......	959
N. Zealand	......	170	......	......	......	......	170
	225,338	160.591	40,208	96,684	60,046	24,574	607.351

Bay State Hopes To Defeat Truck Bills

Automobile and Motor Truck Interests Present Solid Phalanx of Opposition to Attempt to Tax Commercial Motor Vehicles Without Levying on Horse-Drawn Wagons—Decision Regarding Duties of Automobilists in Case of Accident—New York Cuts Chauffeur's Fee from $5 *to* $2.

BOSTON, April 28—The fight of the motorists of Massachusetts assisted by the National Association of Automobile Manufacturers to prevent the increase of motor truck registrations to $5 per ton, has progressed so that today it looks as if the proposed legislation will be defeated and, if so, a good work will be done for the entire truck industry, in that it is certain that if Massachusetts were to pass such a law it would be followed by other states in the near future.

The meeting of the motor committee last Thursday brought together a large gathering of men identified with different lines, and the sentiment was unanimous to conduct a general fight to entirely bury the scheme of taxing the commercial truck industry when horse-drawn trucks are not taxed. The purpose now is to make a political campaign as there are enough men identified with the motor industry to swing an election if opinion were molded so that the electorate would get the real facts, and already a few of the progressives are at work on it to take advantage of the situation.

Commissioners Go Out of Their Field

The opinion is general in this state that the highway commission was responsible for giving the committee on roads and bridges, which has the proposed legislation in hand, a wrong idea which led this committee to report favorably on the $5 per ton tax. From the opinions of many of the legislators and senators there is a strong feeling that the highway commission would make better progress by sticking to its executive duties and leaving legislative matters alone.

The state house was fairly seething with opposition last week when the work of the motorists began. Constituents began to let members of the legislature hear from them. It was learned that the motor truck increase is one of the measures that the Republican party intended to push across when its legislative members had a meeting recently. So notice was served on the Republican leaders that it will be held responsible for what happens. The Democratic party does not favor it, and from the political viewpoint it begins to look like another of the little jokes of Governor Foss that will prove a jolt to the G. O. P. this fall.

The motor interests are now united so that next fall literature will be sent out to all the districts throughout the state, to every voter, giving a résumé of what has happened during the past few years. There is a general feeling that this literature will have its effect, and with the progressive party moving forward shrewd followers of political affairs look for a change in governorship, with the motorists' vote united.

There has been further opposition in Massachusetts to the appointment of a commission for uniform motor legislation throughout New England. The committee on roads and bridges reported "No legislation necessary," on Governor Foss' recommendation to have a committee appointed to confer with commissioners from other states on uniform motor laws. When Governor Sulzer of New York made the suggestion that he was ready to appoint such a commission, Colonel Schier, of the Massachusetts Highway Commission, in an interview in a Boston paper, stated there was no need for such a commission being appointed, as the Massachusetts law was adequate for present needs. Today Maine has appointed such a commission; New Hampshire will probably follow suit, and possibly Rhode Island. In view of this, the action of the Massachusetts commission came as a surprise, and the motor interests wondered if it were to checkmate any plan to have the present truck bill dropped to such a commission for consideration during the coming summer. Under these conditions it means now a fight on the part of the motorist to kill the bill entirely, and having been fooled once through compromise another one will not be accepted.

That such an interstate commission on uniform laws is necessary is shown by the progressive amendments passed in Maine and New Hampshire this year whereby a neutral zone of 15 miles has been established, to offset the "10 days in one year" clause that was jammed through the Massachusetts legislature by the highway commission and caused other states to adopt it, only to find out it was a boomerang needing a change. The stand-pat feeling that has permeated the atmosphere of Massachusetts for a number of years has woven itself into the motor legislation with ill effect.

The Massachusetts Highway Commission, in a recent decision, has made it plain that it does not consider that when a motorist figures in an accident whereby he causes damage to a person or property that to merely stop so that the number of the car may be taken does not constitute a compliance with the law, but that he must not only stop, but give his name and address in order to make himself known.

The Automobile Legal Association of Boston to make it clear to motorists about this law states that a number of motorists in the past year have been so unfortunate as to kill dogs, and because they failed to stop and make themselves known they have been liable to criminal prosecution, but rather than take the chance of a conviction they have paid various sums as damages for killing the animals, which they would not have been obliged to pay had they stopped and made themselves known as provided by law. A person cannot be held liable for killing a dog unless he is operating his machine recklessly or in a grossly negligent manner.

N. Y. Reduces Chauffeurs Fee

ALBANY, N. Y., April 29—*Special Telegram*—At the hearng this afternoon before the committee of Internal Affairs of the Senate on new motor legislation, it was agreed that the license fee for chauffeurs will be reduced from $5 to $2, and that there will not be any fee for renewal. Heretofore there had been a fee of $2 for renewal.

Beyond this little of importance by way of change came up. Secretary of State Mitchell May, desired additional power in his hands for revoking licenses, but it was shown that under the present Callan law there is ample power for such revocation if the causes are specified. There was general opposition to the amendment requiring all operators, whether owners or chauffeurs, to be licensed. The movement to create a Bureau of Inspection and Investigation in the state was entirely killed. The general feeling was that the existing Callan law is entirely satisfactory with the exception of chauffeurs' registrations as mentioned.

ALBANY, N. Y., April 29—Proposed automobile legislation is moving slowly these days. Senator Loren H. White, chairman of the Internal Affairs Committee of the Senate, which is handling all of the legislation, says that there will be little if any effected this session. Chairman White expects that his bill authorizing three committeemen of the state to confer with other committeemen from Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New Jersey, Pennsylvania, Delaware and Maryland to obtain uniform motor laws will be passed.

Chairman White expects that legislation will be enacted giving Secretary of State May power to revoke a license for cause; and, further, that an amendment will be passed which would license all operators without fee or examination.

A public hearing was held on April 23 and at this the Secretary of State was willing to give in on all questions of legislation excepting two. These were: (1) License owners without an examination and without a fee; (2) he wants power to revoke a license of either chauffeur or owner for any cause, a clause which would give him more power than the Czar of Russia, a clause which would give him power to revoke a license if the tail light happened to be blown out by the wind.

At the hearing, Frank D. Lyon, secretary of the New York State Automobile Association, favored levying a wheel tax or issuing licenses to all vehicles using the public thoroughfares with the exception of vehicles of the farmer used by the farmer for his own direct and personal benefit in delivering his product to the market, this exemption being urged because the farmer already pays a direct tax upon his land property for the purpose of maintaining the highways and bridges of the state.

Lippincott Favors Joint Commission

New York City, April 29—J. H. Lippincott, of New Jersey, favors a commission of states to draft uniform motor laws and is emphatic in his views that the present motor laws are mere patchwork. In an interview with The Automobile he said:

"In reference to the possible work of the joint commissions appointed by the Eastern States for the purpose of drafting recommendations for the adoption of a uniform automobile law, I can, of course, only speak for the policy which New Jersey would probably adopt in such a conference.

"The question of proper registration fees to be charged, the proper regulation of drivers of motor vehicles generally, the disposition of the revenue, and the reorganization of the rules of the road would seem to be the first question which would be taken up by such a commission.

"A matter of equal importance would seem to be the relation which each state should adopt toward the licenses issued by sister states and the adoption of some system which would be an improvement to the present reciprocity acts which have proved only partially satisfactory. No real results can be obtained in this class of legislation without concerted action on the part of all states similarly located.

"I think it is very generally conceded that our motor vehicle laws have been little better than a series of patchwork legislation and unsatisfactory compromises. The motor vehicle has now arrived at a point where the need for scientific laws governing its use and controlling the relation with which the state or states regard it is absolutely necessary.

"For instance, the place which the business automobile should occupy in our laws has been very generally disregarded. The great increase in the use of automobiles for business purposes makes it absolutely necessary that there be a standard law on this subject.

"The various forms of licenses which are necessary should also properly come before such a conference, as well as the question of the exemption of owners of automobiles from personal taxation on them.

"Some method should be developed of automatic regulation and control by some central authority in each state over all licenses, whether they be granted by the state in which they are at the time touring or whether they be granted by a sister state. In fact, there is hardly a provision of our present motor vehicle acts which could not stand considerable revision and simplification.

"It would seem that the first duty of the commission would be to determine on a model law, dealing with the questions generally and capable of being adopted by each and every state represented at the conference.

"The preliminary work of this commission must, of course, be one of investigation, and I would suggest as a member of the commission from New Jersey, that the automobile laws of all the states in the Union, together with similar laws in the foreign countries, be compiled and classified as to subjects, with the idea that the model act which would be drawn would contain the best features of all the laws on this subject."

Mitchell May, secretary of state for New York, is opposed to such a commission as he has expressed himself as follows:

"It is my opinion that there is no necessity for uniform automobile laws in the various states, so far as they concern the home automobile, because it would be an unnecessary interference with the internal affairs of the various states. There should, however, be some plan adopted by all, and by which automobiles could be operated in foreign states. This would avoid unfair discrimination and bring about that comity among the states which is so desirable. The question, however, pertaining to license fees, speed of automobiles, powers of secretary of state, and such, must of necessity be determined by each state for itself."

Colorado Has State License Law

Denver, Col., April 25—Colorado's first law for a state license tax upon motor vehicles has been signed by Governor Ammons, and it is estimated that it will add in the neighborhood of $40,000 annually to the state road fund. If the measure is not subjected to a referendum vote of the people it will go into effect the middle of July.

The law provides for a yearly license tax of $2.50 for automobiles of less than 20 horsepower, $5 for 20 to 40, $10 for more than 40, and $2 for motorcycles. It also requires all paid operators to secure a license costing $2. To encourage tourists visitors will be allowed to register their cars without charge for 90 days

New York Mayor Signs Objectionable Ordinance

New York City, April 30—Mayor Gaynor yesterday signed the Folks ordinance, lowering the speed limit to 10 miles in congested sections of Manhattan and Brooklyn, 15 miles in other sections and 20 miles an hour in outlying parts of the Bronx, Richmond and Queens. The ordinance will go into effect June 1. The mayor vetoed the original Folks ordinance because it placed the burden of proof on the city.

The point in the ordinance which will be most disliked by automobilists is that in the case of any accident, driving faster than 15 miles an hour in any locality will be considered *prima facie* evidence of negligence, and the burden of proof will be upon the automobilist who must show that he is not guilty or become liable to penalty.

Columbus, O., April 28—The attorney-general for Ohio has held that the amendment to the present automobile law for an equal distribution of the surplus money derived from the registration of automobiles in the state among the various counties of the state for road improvement is constitutional. The attorney-general holds that as roads may be considered both of a local and state-wide nature, the principle that taxes are to be spent where raised may be disregarded.

New Orleans, La., April 26—Automobile owners, dealers and agents of New Orleans have made a decided protest against the speed limitations provided for in the traffic ordinance shortly to be introduced in the City Council. The ordinance places the speed limit at 8 miles in the business district, 15 miles in the residence section and 20 miles in isolated parts of the city.

Gilbert Is Lozier President

Succeeds H. M. Jewett, Who Leaves Lozier Company To Devote Himself to Paige-Detroit Organization

Harry Lozier Elected Vice-President of Lozier Firm with Fred Gies Secretary and Assistant Treasurer and N. R. Sultes Treasurer

DETROIT, MICH., April 29—Joseph M. Gilbert, who last week resigned as general manager of the United States Tire Company, was today elected president of the Lozier Motor Company, succeeding Harry M. Jewett, whose active connection with the Lozier company will cease, and who in the future will largely devote his efforts to the Paige-Detroit Motor Car Company, of which he is president.

Harry Lozier was elected vice-president of the company; Fred Gies, secretary and assistant treasurer, and N. R. Sultes, treasturer. Mr. Sultes was connected with the Morgan & Wright Company for 20 years, being president of that concern for 10 years, and when the United States Tire Company was formed March 1, 1911, he became assistant treasurer.

No other changes have been made in the Lozier organization. J. G. Perrin remains as engineer, and Works Manager Pollard will continue in that capacity. The output of the factory is to be largely increased. Paul Smith, who was appointed sales manager a few months ago, will continue in that capacity.

The resignation of Mr. Gilbert as general manager of the United States Tire Co. came as a great surprise last week. He was one of the moving spirits in bringing together Hartford, Morgan & Wright, G. & J. and Continental into this new organization a little over 2 years ago, and since that time he has been general manager. Mr. Gilbert has been connected with the trade for 12 years.

No announcements have been made of Mr. Gilbert's successor as general manager of the United States Tire Company.

Postal Truck Contracts Declared Void

WASHINGTON, D. C., April 30—*Special Telegram*—Contracts for the purchase of more than $100,000 worth of automobiles for the parcel post were declared void today by the Comptroller of the Treasury. Award of these contracts was the last official act, March 3, of Postmaster-General Hitchcock. New bids will have to be advertised for and accepted. Postmaster-General Hitchcock made the award on the theory that he was entitled to advertise for bids and award the contract by provisions of the parcel post act of August 24, 1912, which permitted the expenditure of money for special equipment, but automobiles are not special equipment for the post office department in the opinion of the comptroller of the treasury. "Having no authority to advertise for bids," says the comptroller, "he had no authority to award contracts and the bidders cannot be held to their bids. That they would like to be held and would furnish promptly the 100 automobiles concerned makes no difference." Postmaster-General Burleson is advised by the comptroller that the whole business will have to be undertaken anew.

Boston May Hold Truck Show in March

BOSTON, MASS., April 28—The question of whether or not Boston will join the ranks of New York and Chicago and discontinue the annual motor truck show will be definitely settled next Wednesday when the matter will be taken up at the annual meeting of the Boston Commercial Motor Vehicle Association. Following the show in March, Manager Chester I. Campbell stated that there would be another show next year at the same time, the only difference being that it would open on Tuesday evening and close Saturday night instead of starting Wednesday and running through to Wednesday of the week following. At that time he had twenty-four applications for space.

To Make Washington Cars and Trucks

HYATTSVILLE, MD., April 28—The Washington Motor Car Co. has been incorporated under the laws of Delaware with a capitalization of $300,000 to continue the manufacture of Washington passenger cars and motor trucks on a large scale. A. Gary Carter, president of the company, and Frank L. Carter, secretary, have purchased the plant and assets of the Carter Motor Car Corp., of this city, and will make extensive improvements. The new models will be out by September 1.

Railroads Clamor for Freight Raise

NEW YORK CITY, April 30—The railroads operating between New York and Chicago have decided to ask the Interstate Commerce Commission for an increase of freight rates. It is stated that the recent flood disaster, together with almost general wage increases, make such a step necessary.

To Make Slide Valve Motor

CHICAGO, ILL., April 28—The Beller Slide Valve Motor Co., Chicago, has been incorporated for the purpose of manufacturing a non-poppet motor. With a capital of $20,000 the company will market a motor with sliding valves. The inventor is Esten B. Beeler. Facilities for the building of the engine are not yet at hand but it is expected that a factory site will be selected shortly.

Automobile Securities Quotations

As a result of very weak trading there was a general decline in market values during the past week. But six quotations showed any gain at the end of the week and the greatest gain made by any of these was two points. Maxwell first preferred and Goodyear Rubber each fell off 20 points.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	150	160
Ajax-Grieb Rubber Co., pfd	..	..	94	98
Aluminum Castings, pfd	..	..	98	100
American Locomotive Co., com	44	44½	34	35
American Locomotive Co., pfd	108½	109½	102½	103½
Chalmers Motor Company, com	..	..	126	133
Chalmers Motor Company, pfd	..	..	98	102
Consolidated Rubber Tire Co., com	11	20	15	18
Consolidated Rubber Tire Co., pfd	20	40	60	75
Firestone Tire & Rubber Co., com	258	262	260	266
Firestone Tire & Rubber Co., pfd	108	110	104	106
Fisk Rubber Company, com	..	..	..	..
Fisk Rubber Company, pfd	..	..	..	100
Garford Company, preferred	..	..	99	100½
General Motors Company, com	35	36	26¼	29
General Motors Company, pfd	73½	74½	70	74
B. F. Goodrich Company, com	..	..	30	31
B. F. Goodrich Company, pfd	..	..	94	97
Goodyear Tire & Rubber Co., com	238	242	310	322
Goodyear Tire & Rubber Co., pfd	108	110	100	101⅛
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	5	10
International Motor Co., pfd	..	..	20	40
Lozier Motor Company	..	..	..	20
Maxwell Motor Co., com	..	..	3	5
Maxwell Motor Co., 1st pfd	..	..	40	50
Maxwell Motor Co., 2nd pfd	..	..	12	16
Miller Rubber Company	..	..	155	160
Packard Motor Company	104	107	98	102
Peerless Motor Company, com	..	..	35	45
Peerless Motor Company, pfd	..	..	95	100
Pope Manufacturing Company, com	35	38	16	20
Pope Manufacturing Company, pfd	75	78	52	56
Portage Rubber Co., com	..	..	35	41
Portage Rubber Co., pfd	..	..	85	90
Reo Motor Truck Company	8	10	11⅝	12⅝
Reo Motor Car Company	23	25	20¾	21¾
Rubber Goods Mfg. Co., pfd	100	105	100	105
Studebaker Company, com	..	..	27½	29
Studebaker Company, pfd	..	..	88	90
Swinehart Tire Company	..	..	84	87
U. S. Rubber Co., com	60	60½	60	61
U. S. Rubber Co., 1st pfd	114	114½	103½	104
White Company, preferred	..	..	107	109
Willys-Overland Co., com	..	..	57	62
Willys-Overland Co., pfd	..	..	90	97

Clark Co. Factory Is Sold

Interests Represented by Maurice Wolf of Chicago Purchase Personal Property for Appraised Value of $11,219

Real Estate Is Taken at Appraised Value by the Citizens' Industrial Club, which Held a Lien Against It for $26,000

SHELBYVILLE, IND., April 28—Interests headed by Maurice Wolf, of Chicago, have bought the plant of the Clark Motor Car Co., at Shelbyville, Ind., subject to the approval of the court. The sale was made by Herbert C. Jones, receiver for the company. The personal property was sold for the appraised value of $11,219, while the real estate will be taken at appraised value by the Citizens' Industrial Club, which held a lien against it for $26,000. Mr. Wolf will organize a new company which will continue the manufacture of the Clark car in Shelbyville.

Appraise Schacht Company Plant

CINCINNATI, O., April 28—The Schacht Motor Car Co., which went into receivership a week ago is being appraised under the order of the court which as soon as completed will be filed in the court files for the inspection of all who are interested. All creditors have been requested to furnish statements of their accounts.

It now develops that practically all of the stockholders and 85 per cent. of the creditors joined in the receivership proceedings. The corporation has assets of the book value of approximately $600,000 and it is stated that the total liabilities will not exceed $175,000. It is expected that all creditors will be paid off in full and leave a good margin for stockholders, even in the event it becomes necessary to wind up the affairs of the company which course is not definitely decided upon as yet. For the meantime the business will be continued under direction of Receiver J. F. Deitz, who will make all efforts to pay off the indebtedness and get the affairs back into sound shape.

To Sell Bergdoll Company's Factory

PHILADELPHIA, PA., April 28—The plant of the Louis J. Bergdoll Motor Car Co., at the corner of Sixteenth and Callowhill streets, this city, will be sold, together with its contents, at receiver in bankruptcy's sale on May 14 and 15.

On March 17 three creditors of the concern instituted proceedings in the United States District Court to have the concern adjudged an involuntary bankrupt. The creditors who petitioned the court and their claims were as follows: W. C. Rhodes, Inc., $1,696.85; Chilton Co., $505; and the Castle Lamp Co., $1,772.85. It is alleged that just previous to that date the Bergdoll company had made preferential payments amounting in the aggregate to over $33,000 to Erwin R. Bergdoll, C. A. Bergdoll Coal Co. and the North Broad Street Realty Co. This action by the three creditors has resulted in the bankruptcy sale.

Creditors May Buy Columbus Buggy Co.

COLUMBUS, O., April 28—Considerable interest has developed in the coming sale of the property of the Columbus Buggy Co., Columbus, O., which has been set for May 14. The committee of creditors which has been working on a plan to buy in the property has not yet secured the required number of agreements to carry out the plan, although approvals are coming in daily. It is believed by members of the committee that sufficient agreements will be in by the time of the sale to permit the committee to carry out the plan proposed. Inquiries concerning the earnings of the company show that most of the prospective purchasers want to use the plant for the manufacture of electric automobiles almost exclusively.

NEW YORK CITY, April 30—The movement to organize a national association of motor car dealers is gaining headway. Fifteen or twenty trade associations in the East are expected to send representatives to this city for a meeting the end of the week when the possibility of such an organization will be gone into and the matter definitely decided whether a call will be issued for a national convention to be held at Indianapolis May 29 for the purpose of perfecting such an organization.

Public Service Corp.'s Welfare Scheme

NEW YORK CITY, April 30—The Public Service Corp. of New Jersey is putting into practice an employees' insurance and sick benefit plan, designed along the following lines: The sum of $300 becomes payable to relatives, dependents or beneficiaries of deceased employees of the Public Service Corp. or any of its allied companies, if a man has been in the company's employment since January 1, 1911. If no such beneficiaries are known, the employee will be buried at the expense of the company not exceeding $75. In the case of sickness of employees who receive from $365 to $1,800 a year, the sum of $1 for each day including Sunday, during the first week of absence will be paid. If the wage is less than $7 a week, the benefit is limited to that weekly wage. The sick benefits during 1 year are limited in every case to $90. This arrangement only refers to regular employees of the corporation and its allied companies.

Studebaker Profit-Sharing Plan

SOUTH BEND, IND., April 26—The Studebaker Corp. has decided to introduce a profit-sharing plan among its salaried department managers, assistant managers, superintendents and foremen. After all dividends have been paid, a part of the remaining net profits will be set aside for the profit-sharing fund and Studebaker stock will be bought for it at market prices. After 3 years, the stock will be distributed among the employees who have been employed by the company during that time.

Market Changes of the Week

The most important changes of this week's markets occurred in copper and tin. Electrolytic copper declined $.00 1-10 per pound while tin rose $.25. The tin market was dull, though on Tuesday, little if any interest apparently being taken. Though the prices were quoted slightly higher, the buying was very inactive. The copper market was quiet, the buying being reduced to a minimum. Lead remained constant at $4.50. There was a good volume of trading reported. The petroleum products remained at last week's prices and continued firm, Pennsylvania at $2.50 per barrel and Kansas at $.88. Cottonseed oil experienced a decline of $.04, due to further weakness in the provision markets. No new developments arose in the scrap rubber market, automobile scrap remaining firm at $.10 per pound.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb....	.07⅝	.07⅝	.07⅝	.07⅝	.07⅝	.07⅝	....
Beams & Channels, per 100 lbs...	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Copper, Elec., lb.	.15⅝	.15⅝	.15⅝	.15⅝	.15½	.15½	—.00 1/10
Copper, Lake, lb.	.15⅝	.15½	.15⅝	.15⅝	.15⅝	.15⅝	....
Cottonseed Oil, bbl.......	7.04	7.07	7.00	7.00	6.99	7.00	—.04
Cyanide Potash, lb........	.19	.19	.19	.19	.19	.19	....
Fish Oil, Menhaden, Brown.	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 gals.........	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime.	.95	.95	.95	.95	.95	.95	....
Lead, 100 lbs...	4.50	4.50	4.50	4.50	4.50	4.50	....
Linseed Oil......	.48	.48	.48	.48	.48	.49	....
Open-Hearth Steel, ton.....	29.00	29.00	29.00	29.00	29.00	29.00	....
Petroleum, bbl., Kansas crude..	.88	.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa. crude.....	2.50	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	....
Silk, raw Italy...	...	4.35	....	....	4.35	4.35	....
Silk, raw Japan..	....	3.75	....	....	3.72½	3.82½	+.07½
Sulphuric Acid, 60 Baume.....	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb......	49.50	49.50	49.63	49.61	49.60	49.75	+.25
Tire Scrap......	.10	.10	.10	.10	.10	.10	....

A.C.A. To Test Packard Motor 200 Hours

NEW YORK CITY, April 28—A 200-hour motor test on a 1913 six-cylinder Packard motor is to be made at the testing laboratory of the Automobile Club of America in this city some time between May 1 and 5. The test has already been arranged for by the Packard Motor Co., of Detroit, but it will be conducted by the testing corps of the club laboratory under the direction of Herbert Chase, laboratory engineer. The motor will be run on a block for this time and probably 300 hours with the throttle wide open and operating at a constant speed of 1200 revolutions per minute. The power output will be measured by the club's electrical dynamometer and records will be taken of fuel and oil consumed together with other data.

The real object of the test will be to demonstrate the durability of Packard motors under prolonged and exacting service and it is proposed to show the material and workmanship of these motors. Visitors will be admitted to the laboratory at any time during the test by securing a pass from the laboratory office. At the conclusion of the test full reports will be published.

Will Be a Record-Making Test

This test if successful will be the longest official performance of its kind ever recorded in this country, if not in the world, and will exceed in duration the test of the Knight sleeve motor made by the Royal Automobile Club of Great Britain in 1909. The test will continue day and night without interruption, the motor being under the constant supervision of the laboratory staff working the three 8-hour shifts.

Rules covering the test have been drafted, and some excerpts from these follow:

RULE No. 4—If the entrant or technical committee shall order an interruption of the run because of actual or impending failure or breakage of a vital part of the motor, the test shall be considered incomplete and the facts, together with the reason for the stop, shall be fully stated in the report and certificate. The entrant may elect to begin the test anew after effecting repairs or adjustments. The total number of hours running in an interrupted test shall not be considered as equivalent to an equal period of uninterrupted running.

RULE No. 6—No control device which is not a standard equipment of the motor shall be used in the test, except with the approval of the committee. During the test those controls which are operated by the driver from the seat may be used.

RULE No. 8—In no case shall the piston speed be less than 1,000 feet per minute nor the power less than 70 per cent. of the maximum which the motor is capable of developing.

RULE No. 9—The following tests shall be required in the order named: Test A—Wide throttle runs. A series of short runs with wide-open throttle and of sufficient duration to determine the maximum power the motor is capable of developing. The speed at which this maximum power is developed shall be known as speed M in revolutions per minute. Test B—Non-stop run. A continuous run of not less than 100 hours duration at a speed selected by the entrant, but which shall not be above the speed of maximum power M or below a 1,000 feet per minute piston speed.

RULE 10—During the run the following observations shall be recorded: Air consumption of motor; rate of flow of water through jackets; section in inlet manifold; temperature of air entering carbureter, mixture leaving carbureter, exhaust leaving manifold, water entering and leaving carbureter jacket and gasoline entering the carbureter. Observations of the atmospheric conditions with respect to the barometric measure and humidity shall be made at intervals of not less than 2 hours during test speed. The specific gravity of the fuel used shall be taken each time the supply in the weighing tank is renewed.

RULE 11—The fuel will be supplied by the committee but lubricating oil by the entrant. The report will show the nature and quality of both.

RULE 12—The temperature of the water entering the cooling system of the motor shall not be less than 120 degrees Fahrenheit. A draft of air may be used to cool the motor or any portion thereof when necessary.

RULE 13—Following the dynamometer tests the committee will upon application of the entrant, conduct such road test as will demonstrate the performance of the motor in the chassis under a wide range of conditions.

RULE 3—The entrant shall, prior to the test, specify the length of the endurance run when the motor is to run longer than the minimum required under rule 9. He may elect while the test is in progress to continue it without stop for any longer period, but shall in this case give written notice more than 8 hours previous to the end of the run being made.

RULE 5—Ample time prior to the official test will be allowed for preliminary runs to make necessary adjustments. No adjustments of the motor or its accessories which directly affect the quantities being measured will be permitted after the first official test run has been started except as provided in rule 9. This rule shall not be construed as covering adjustments classified under rule 6.

Peerless Announces Three 1914 Sixes

CLEVELAND, O., April 28—The Peerless Motor Car Co. has announced its new models for the coming season, which are three, all sixes, and listed 38-six, 48-six and 60-six. All are alike in design. Several improvements are included: Gasoline tanks are carried under the chassis rear and give a lower center of gravity. Springs are made with thinner leaves and more of them than formerly. Shock-absorbers are fitted front and rear.

The motor improvements include lighter pistons, using three rings instead of two. The practice of using T-head cylinders in pairs, with exposed valve parts, is continued. Semi-steel spiral gears are used for driving the camshaft, magneto and water pump. There is a universal joint between the clutch and gearbox which takes the place of the former flexible coupling.

All three models are listed with complete equipment, including power-driven tire pump, electric starting and lighting. The body designs are similar to those of this year, with all metal parts finished in nickel instead of brass.

The other general features of design are continued, namely, four-speed gearbox, arched rear axle, etc. Right-hand steering is used. Firestone demountable rims are stock equipment, and there is a tire bracket on the rear for supporting the two additional rims with tires.

SYRACUSE, N. Y., April 29—A full line of closed bodies will appear on the Franklin little six chassis next fall. There will be a limousine seating four inside, a berline seating four inside, a sedan seating five people and a coupé seating three.

Is Now Tarrytown Motor Car Co., Inc.

TARRYTOWN, N. Y., April 29—Owing to the recent strict interpretation by the New York state authorities regarding inclusion in corporate names of words not in the English language, the application by organizers for a charter for The Motokart Co., Tarrytown, N. Y., has been refused, the new concern therefore being incorporated as the Tarrytown Motor Car Co., Inc. It will retain, however, the word Motokart as its trade mark.

NEW YORK CITY, April 29—E. H. Broadwell, who recently resigned the vice-presidency of the Hudson Motor Car Co., Detroit, Mich., has assumed the vice-presidency of the Fisk Rubber Co., New York City, with whom he was for years associated before going to the Hudson. His headquarters will be at Chicopee Falls, Mass.

Prest-O-Lite Refillers Fined

NEW YORK CITY, April 28—It is illegal to fill a Prest-O-Lite gas tank with any but Prest-O-Lite gas, according to a decision rendered here in the Municipal Court today against two dealers who had filled such tanks with Searchlight gas and had been sued by the Prest-O-Lite Co. for alleged violation of the trademark section of the New York business law. Justice Spiegelberg, who rendered the decision against the defendants, Smith-Haines and Norman Brickner, based his opinion on the statute of the law forbidding the refilling of receptacles which bear trade marks, making each violation punishable to the extent of $100. This penalty was imposed upon each of the defendants. Louis Lande, their attorney, has entered an appeal against the decision and the case will be heard in the Appellate Term of the Supreme Court on June 2. Winter & Winter represent the Prest-O-Lite Co.

Three Isottas for Indianapolis Race

INDIANAPOLIS, IND., April 30—Although the entry lists will not close till Thursday, May 1, there are twenty-two cars entered in the third annual 500-mile International Sweepstakes race which will be held at the Indianapolis Motor Speedway May 30. This is eight more cars than were entered at this time last year when the contest was such a great success.

The latest entries to be received are three 36-horsepower (S. A. E.) Isotta-Fraschini cars. The Isotta-Fraschini Motors Co., New York City, states that two of these machines will positively appear in the race and will be driven by Teddy Tetzlaff and Harry Grant. The third machine entered will also probably appear on the course with either Gilhooley or Trucco, from the Isotta factory, at the wheel. The entrant of the first car is William Ziegler, Jr., while the second racer is entered by E. E. Hewlett, of Los Angeles and G. M. Heckscher, of New York City, its joint owners.

PARIS, FRANCE, April 23—Booked to sail from Havre Saturday, May 10, on the French liner La Provence, Albert Guyot and his mechanician Grossmann, will doubtless reach Indianapolis with the six-cylinder Sunbeam racer, about May 19. The Sunbeam racer, which has been tuned up by Guyot on Brooklands track, is being crated to be shipped to New York via Liverpool. It will reach America a few days ahead of the driver, thus being ready to be put at once on the fast train for Indianapolis. Guyot counts on having 10 clear days during which to carefully tune up the car on the Indianapolis Speedway. Immediately after the race it is the intention of Guyot to return to Paris, for he is under a contract to drive for Delage, in the French Grand Prix. It is quite possible, however, that the Sunbeam racer will remain in America and that Guyot will come back toward the end of July in order to take part in other American races.

LONDON, ENGLAND, April 18—Fast time was made when two wheels were changed at the time of the recent Peugeot record exhibition. At the end of the first hour the car stopped for 35 minutes, during which two Rudge-Whitworth wire wheels were replaced with the car jacked up. This space also included the substitution of Boillot for Goux as driver.

English to Hold Benzol Contest

LONDON, ENG., April 24—In view of the fuel problem the announcement that the Brooklands Automobile Racing Club are to run off a race for cars running exclusively on benzol is extremely interesting, while the first prize of $500 and $250 and $100 for second and third prizes are to be presented by the Royal Automobile Club, the Society of Motor Manufacturers and Traders and the Automobile Association and Motor Union respectively, is also arousing interest as these bodies are at present investigating the possibilities of alternative fuels to petrol. No effort is to be spared to make the event thoroughly representative, and to draw the attention of the public to an alternative fuel that at the present time is available only in limited quantities. Not only is benzol to be supplied to competitors free of charge for the race, but also free of charge for the purpose of practice. Not more than twelve cars will be able to compete, and a special cup is to be presented to the entrant of the car which, having also competed in the 100 miles an hour race for cars running gasoline, accomplishes in the benzol speed test for a flying lap of the track a speed that will compare with its highest speed lap in the race for gasoline cars. The race is to be included in the program of the Brooklands Whitsun meeting, so that there will be a very attractive program with this event figuring as the principal and the usual handicaps, and from the main event one will be able to form some idea as to whether better speeds are to be obtained by running on benzol than on gasoline.

Grand Prize Conditions Announced

NEW YORK CITY, April 28—The Automobile Club of America has given out information relating to the conditions under which this year's—the fifth annual—Grand Prize run will be carried out. The race will be over the Savannah course, 11.44 miles long, so that thirty-five laps will give a total run of 400.4 miles. Outside of the Grand Prize trophy there will be four money prizes, amounting to $3,500, $2,000, $1,000 and $500 respectively.

Each car entered in the race must have a reverse gear driven by the motor, an exhaust outlet not directed toward the ground and an overall length not exceeding 146 inches. The cars will be started according to their order of entries.

The entry fees are as follows: A single care of one make, $1,000; a two-car team, the cars being of one make, $1,500; three cars of the same make, $1,750.

Oldfield Makes Record Mile

NEW YORK CITY, April 28—News was received here today that Barney Oldfield yesterday broke the world's record for the mile made on a 1-mile dirt track by making the distance in 46 2-5. The feat was accomplished at Bakersfield, Cal., on the new $100,000 race track during a sanctioned meeting. The previous record time was 47.85, made by Bob Burman in the 300-horsepower Benz on the Brighton Beach track on September 7, 1912.

The mile was timed by an electrical device, but the latter will have to be submitted to the A. A. A. and tested to their contentment, before the time made by Oldfield's bill will be recognized as an official world's record.

Tetzlaff in the Fiat went 5 miles in 4:22 2-5. The 25-mile free-for-all for $2,000 cash prize was won by Tetzlaff in a 120-horsepower Fiat in 23:38. Cooper, in Stutz, second, and Hill, in Fiat, third. Ten-mile race won by Nikrent in Buick.

Hope for Another Fairmount Race

PHILADELPHIA, PA., April 26—There is a possibility of the resumption of the Fairmount Park road race. A committee from the Quaker City Motor Club waited on Mayor Blankenburg yesterday and urged him to reconsider his opposition to the event and to recommend to the Fairmount Park Commissioners that permission to use the park course be granted for the purpose of conducting a 200-mile road race under the same rules and regulations as governed the chassis in the past. Mr. Blankenburg said that while he would not stand sponsor for the race nor accept any responsibility in connection therewith, if the Councils were to pass a resolution requesting the Park Commission to grant the Quaker City Motor Club the necessary permission he would not oppose it. Accordingly, Common Councilman Hardart will introduce such a resolution at the next meeting of the City Councils.

NEW YORK CITY, April 30—The first automobile contest to be held this year by the Motor Dealers' Contest Association will take place Friday, May 2, and will be a secret time run. Both gasoline and electric cars will compete for the prizes offered to those running nearest to the secret time.

PHILADELPHIA, PA., *April* 26—Thirty-three entries have been received so far for the sixth annual sociability run of the Quaker City Motor Club next Saturday to Atlantic City, N. J. The run, which is a fixture of the organization, will be a secret time schedule event, four prizes being awarded the four contestants finishing nearest a time secured by adding all contestants' guesses together and dividing the total by the number of estimates. Independently of the prizes a silver tie clasp, on which is the club's insignia, will be given each entrant.

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Sample Salesmanship

HERE is an example of how a business man sometimes views the salesman who tries to contort matters and give the impression that his product is the panacea of the industry. Ostrich-like salesmanship is the poorest kind. It occupied a place a few years ago when salesmanship did not exist, but when the so-called salesman was merely a billing clerk for orders. Here is the example, and for every one of these, where the would-be victim takes the trouble to write his experience, there are thousands that pass unheard.

"Yesterday an agent for the —— shock-absorber, one of your advertisers, called on me for the purpose of selling me a set of his devices. Among other things he made the statement: 'They will save their price in tire wear in 2,000 miles of running.'

"A set of tires for my machine costs approximately $70 and is guaranteed to give 5,000 miles per tire. This makes tire cost .00125 cent per mile. If, therefore, the —— absorber devices saved 100 per cent. of tire wear, so that at the end of 2,000 miles running, the tires were as good as new, it would have saved $28. On the contrary, it would not do this and obviously would not save more than 25 to 50 per cent. of the wear at most.

"On the 25 per cent. basis this saving would amount to $7, and the device, which he agreed to sell me for $35, would save enough money to pay for itself in 28,000 miles of running.

"If my calculation is correct, either the salesman in question does not know his business or he deliberately tried to mislead me. In either event, I am offended at this kind of salesmanship."

THE AUTOMOBILE receives letters similar to this nearly every week, drawing attention to how the business man objects to the selling tactics of many salesmen. In view of this, it is to be regretted that the organization of salesmen formed last fall should not be carrying on an active campaign throughout the present season, which is one of the most acute in the selling field.

There is as much need for an organization of salesmen as there is for a society of automobile engineers, but their efforts must not all be centered in a scientific-salesmanship festival once a year, but must be distributed in workable rations, particularly over the acute selling period.

Such an organization could have an active executive committee which would issue monthly bulletins of the practical, get-down-to-business type, which bulletins would reach every dealer in the country, and who could place these arguments in the hands of his salesmen at times when they are working at the greatest capacity. By so doing you will gradually improve the caliber of the salesman. You will not do it on the "annual gorge" plan.

Dealers To Organize

A REPRESENTATIVE of a business house not associated with the automobile industry, excepting through financial relations, recently made the statement that he considered the automobile dealers to be the poorest class of business men in the country. The percentage of failures in their ranks, he went on to say, was abnormally large, and further that a great majority of those at present doing business are not making money.

It is impossible for any line of business, not making a rational profit, to be in a healthy condition, and in the case of the dealers it would seem that the chief responsibility for their failure to make money rests on their poor business ability and poor organization.

Certain dealers have been selling gasoline at a profit of 4 cents a gallon and making money on it, whereas others handling the same fuel at 15 cents a gallon profit have not been making money. This one example proves the necessity for business acumen in the ranks of the dealers.

It is to be hoped that the new national organization of dealers which is being discussed at present will go through. There is need for it. Such an organization will put the dealers on a new plane if it does nothing more than teach them the rudiments of conducting a business. These dealers have to be taught how to handle forces of salesmen; how to conduct repair shops; how to conduct the accessory departments of their business; how to conduct the tire repair department; in a word, how to conduct each and all of their various departments.

Such a national organization has a legitimate field for existence, and those piloting its early life must see that it is launched on a sound financial basis and that the highest-caliber men are obtained to man it. Such an organization is purely a business institution. It is needed as much as the state and national organizations of the banking world. Such an organization must work every day in the year. It is not an organization of seasons but one with a task before it and its efforts will have to be diverted along a hundred channels.

French Road Maintenance Costs $1 a Head

JEAN DE PULLIGNY, chief engineer of roads and bridges in France, made the statement before the recent Roads Convention of the A. A. A. in Washington that France is spending annually $1 a head for road maintenance.

France is about four times as large as the state of New York, its population is a little more than four times the state of New York, consequently with a population of New York state slightly over 9,000,000 in 1910, it means that this state would have an annual expenditure of $9,000,000 for road maintenance. This does not include road construction.

During 1912, twenty-nine of the states of the American Union expended $62,691,425 on the construction of roads. The total population of these states is 61,261,000 so that the expenditure in these states approximates practically $1 per head. Practically all of these states, however, were experiencing abnormal road expenditures, which expenditures will have to be continued for some years. But France spends her $1 per head on road maintenance, and these states have been spending $1 per head practically on road construction. Many of our states have not yet learned the lessons of road maintenance, but if it is on a par with that in France it will practically mean a sum equal to that used on construction.

The original cost of construction of French roads was $12,040 per mile for a hard macadam surface. Hard road construction, and the agitation for good roads in France began 150 years ago, and the beginning of the present network of French roads radiating from Paris dates from 100 years ago. Most of the roads in France, even the earliest, were of macadam construction.

France has to date 340,000 miles of roads, and in the last century has spent $1,300,000,000 on these. Of this amount $400,000 has been supplied by the central French government to the heads of the roads departments throughout the country extending over a period of 70 years, namely 1820 to 1890. Since 1890 the work has been going on at a slower pace with smaller appropriations, most of the useful work having been done prior to that date. This means that the central government of France during those 7 years appropriated $6,000,000 a year in the building of roads. During that time the appropriation for building smaller roads was approximately the same as that for maintaining the national highways. The French government is now expending $45,000,000 per annum for maintenance alone.

But there are other public roads which the central or federal government has nothing to do with, but which work is carried on in different departments. France has department roads and county roads. For some of these roads the money is taken in taxes which belong to the department; for some others it comes from taxes that belong to the county; and for some others from taxes that belong to the townships.

The deparment is divided into units called counties and over each county is a chief engineer. Each county is divided into judicial districts which has a district engineer. Free interchange of ideas takes place among the engineers, the county engineers are taken among the district engineers and the chief engineer is taken among the county engineers. Head over all is the prefect, a political man, who is not necessarily a practical man in road-building but who operates through his chief engineers in the various departments.

The district engineer has charge of the patrolmen who care for road maintenance. That engineer is going nearly all day riding or on foot or using a bicycle, or perhaps a motor car. Every day he goes to the villages, speaks to the people, consults with the mayors, and knows perfectly what the people desire. He knows where the money ought to be spent and is independent and has no reason to favor one any more than the other. In this way he estimates every year for the building of new roads and also for maintenance. He forwards the estimate to the engineer above him who knows the total of his district from such reports and in turn prepares such a scheme for his entire district and forwards it to the chief engineer of the department; and the chief engineer of the department in turn confers with the Prefect. From such reports is prepared a scheme for the complete building of new roads and for maintenance and this scheme is brought into the local legislature.

These departments are really the little states of France that have their own governments elected by the people, and it is these local parliaments that decide where the money shall be spent.

Predicts a Great Demand for the Cyclecar in America

HARTFORD, CONN.—Editor THE AUTOMOBILE:—I have read with considerable interest your editorial in THE AUTOMOBILE for April 24, with reference to the cyclecar, and while I thoroughly agree with you with regard to the tremendous demand and the future of the cyclecar, our concern probably being the first to promote the cyclecar in this country, I want to take exception to that part of your editorial which states, "there is no demand for the three-wheel car," in proof of which I want to say that over a year ago we were unable to fill approximately 3,000 orders which we had on our books for these cars. Since this time the demand for our cars has greatly increased, and while we are great believers in advertising, and the first demand for our car was undoubtedly created by the advertising which we had done, for the last year we have not spent 1 cent in advertising, and yet we have orders on our books today for fully 4 months ahead and every one of these orders has come in to us without solicitation further than answering correspondence, sending out catalogues and literature.

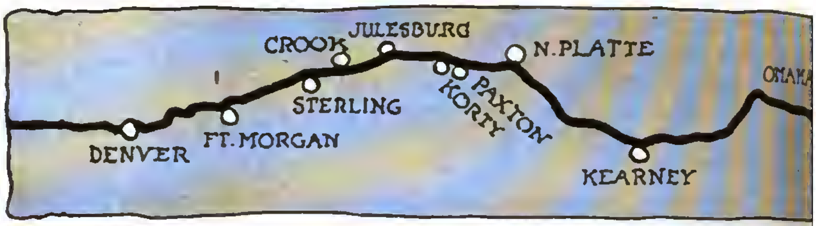
There is a demand all over the United States for cyclecars, either of the construction of the Motorette or other cars as described in your article and this demand is enormous.

We know what we are talking about in this particular. We have been building Motorettes for 3 years and have had ample time to judge the public pulse. It has been my experience that automobile dealers throughout the country do not want to handle three-wheel machines, and that their feelings against them are not due to any real market conditions, but to the fact that there is a lot of pride connected with an automobile dealer, and that he is inclined to believe that the other dealers will make fun of him; but in spite of this the demand exists. The general public wants something along cyclecar lines and it does not care whether it has three wheels or four so long as it is reliable, durable and neat in appearance.

There is a tremendous demand for any reliable cyclecar, which will stand up under American road conditions and which will be easy-riding at the same time.

While we are not given to predicting, we believe that within the next 2 to 3 years there will be built in the United States more cyclecars and cars of the Motorette type than all the other cars put together.

We believed this condition was coming 3 years ago when we first put ours on the market.—C. W. KELSEY, Kelsey Motor Co.



A Transcontinen

By Ernest L. Ferguson

Covering 650 Miles from Omaha to Denver, Constituting the Second Stage

FROM Omaha to Denver is 650 miles. This is the second stage of the 2,600 miles of the transcontinental route between Chicago and the California line. Last week the Chicago-Omaha leg was taken up; next week the Denver-Salt Lake City division will be handled, and the following week Salt Lake City to the California state line.

Omaha to Denver is a river-level route, in that the Platt river and its southern branch are followed or paralelled for practically 90 per cent. of the 650 miles. You are not close to the river side, often several miles distant, but always traveling on approximately the water-level elevation.

This leg of the trip is made up of two types of roads: The first half is a sandy one with the exception of a few miles between Omaha and Fremont. It extends nearly to Julesburg, Col. The second half, Julesburg to Denver, is on an alkaline soil, which makes heavy going when wet.

The first half of this trip is really a virgin sand road. To improve it will need mixing a clay or gumbo with the sand. In local sections this is being started.

The Irrigation Territory

From Julesburg to Denver embraces the irrigation territory, and the people have found it necessary to have good roads in order to get their goods to the beet sugar factories. Consequently, these alkali roads are better looked after than the sandy first half.

The entire route between Omaha and Denver is signposted, thanks to the enterprise of the Platte Valley Transcontinental Good Roads Association, which is also doing much to improve the road.

Of the 650 miles 200 miles may be designated bad roads in case of abnormal rains, which would wash the sand. An ordinary day's rain will not have any effect upon it. In the irrigated section a heavy rain means that you stop your trip for several hours, or perhaps a day, until the soil has dried.

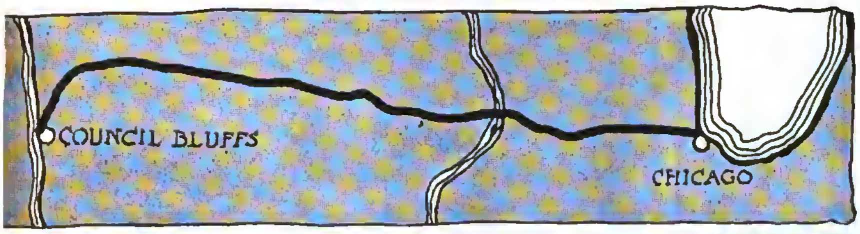
Between the Missouri river and the Rocky mountains the transcontinentalist, in selecting the last leg of this section, is confronted with objective points of interest. Whether to include Denver in the trip or to push straight through via Cheyenne, Wyo., are the selective conditions. Assuming that a day or two extra time is not of moment in a 3,000 or 4,000-mile journey, one should by all means include Denver with its many sur-

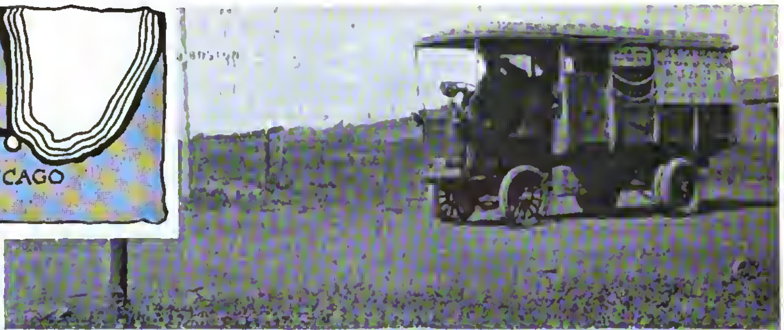
Top—Well-graded and slightly crowned, this road, near Marshalltown, Ia., has its surface maintained by dragging after each rain. Its one fault is that the side growth of weeds and grass should have occasional right-angle gutters that the surface water may flow to the shallow ditches on each side indicated by the arrows.

Upper Middle—A road between Omaha and Central City, Neb., that was well graded, crowned and side-ditched when laid out for improvement. Lack of attention in the meantime has allowed vegetation to encroach on the sides and the crown to become flattened from traffic. Horizontal line shows flattened crown with side slopes.

Lower Middle—Traffic alone defines the traveled way from the fields by cutting two deep ruts in the deep sand. The landowners along the way hope the county authorities will haul in clay (gumbo) and spread it as a blanket 4 inches deep on top the sand. This will give a treacherous road when wet, merely going from one evil to another. By thoroughly mixing the two with a disk harrow then crowning and rolling and side-draining there would be an excellent road as the result. There are 6 miles of this road between Silver Creek and Central City, Neb. The arrow indicates a deep ditch which leads nowhere.

Bottom—Almost bottomless is this sand. The traveled way changes its surface conditions with each rain. The county authorities have promised to some day fix this stretch at Valley, Neb., by claying it 3 or 4 inches deep. In the meantime all traffic struggles through as best it can. The arrow indicates a soft spot.





tal Hodge-Podge

Part II

Of the Entire Stretch, 200 Miles of Road Are Bad in Case of Abnormal Rain

rounding scenic attractions. These will more than repay for the added time.

From Denver west the most traveled route swings to the north and then west. In this touring north a chance is had of keeping to the west of Cheyenne, direct to Loramie, or going via Cheyenne. This latter adds but 2 hours to the trip, and if one has dated the trip to be in that location during the annual fête of Pioneer Days at Cheyenne, then that town should certainly be included in the itinerary.

In touring west from Omaha the transcontinentalist has the choice of two routes. The one that has been most frequented is that following the old Overland Trail along the Platte river, historic with associations of the early fur traders, the Mormons, the Oregon pioneers, the Forty-niners, the pony express, the six-team coaches, and then by the first railroad across the continent. All of these were preceded by buffalos and Indians from time immemorial, making the line of travel for those who came after.

First Route Logged

This route was the first west of the river to be logged in detail during the pathfinding for the annual tour of the American Automobile Association in 1910. The tour first brought it into prominence for automobiling. Since then there has been formed the Platte Valley Transcontinental Good Roads Association which is doing much to improve its conditions.

While the roads for most of the way will require a lot of work upon them, it is now very efficiently marked by a signal made up of a combination of white, black and yellow bands. White is used as the central color and above and below this is a band of black one-eighth the width of the white, then come the top and bottom bands of yellow that are one-third the width of the central white.

In following this route it is at Julesburg in the extreme northeast Colorado that occurs the dividing of the ways. Here the decision must be made whether to hurry on to the Pacific coast by branching off to the northwest across country and direct through Cheyenne, or whether to take in the more worth-while scenery around Denver by branching across country to the southwest. The layout is like a huge Y with the stem reaching from Omaha to Julesburg, the right-hand branch leading northwest and the left-hand leading southwest

Top—The half-way, coast-to-coast air line sign, measured in terms of miles and not in the matter of time, owing to the differences in the roads to the right—east, and to the left—west. It is 4 miles from Kearney, Neb.

Upper Middle—The Platte river has no banks, its boundaries are therefore undefined. For most of the year it is shallow, where it is not a series of sandy flats, and looks like a huge marsh. Four times the river is crossed on wood structures one-half mile in length and well kept as to condition. This bridge is crossed soon after leaving Gothenberg, Neb.

Lower Middle—This roadway between Ft. McPherson and North Platte, Neb., is so heavy with sand that even light buggies require two horses, and they never get out of a walk. It was once the bed of what is now the Platte river. Its only possible reasonable-cost betterment is to discover a clay bed fairly near that the two may be correctly mixed. There is probably one stretch of 8 miles. This is the type of road that surrounds the national soldiers' cemetery at Ft. McPherson. The truck is off the real roadway.

Bottom—Not a plowed field but the regular roadway. A nearby farmer had started to throw the side sod into one of the sand ruts in the effort to reduce strain on the horses and harness, but soon tired of his efforts. This is the approach to a dry creek bed that once was tributary to the Platte, one mile west of Paxton, Neb.

The Engineering Digest

A Digest of Technical Information from the Engineering Journals

Attention of automobile engineers and manufacturers is called to the Bonecourt system of flameless surface-combustion by which gas and liquid hydrocarbon fuels may be converted into power with scarcely any waste of heat units, making steam far more economical as a power source—sometime in the future—than the internal-combustion motor, even on the Diesel plan. Flash and semi-flash generators apparently not out of the question.

Some remarks on double ignition for low-speed motors —and something on deceptive car and motor noises.

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FLAMELESS Combustion and Automobiles of the Future.—While the mechanical perfection attained in well-made automobiles is turning popular attention toward the delicate fuel question and is centering the interest of the industry in improved methods for lowering the cost of producing these high mechanical qualities heretofore secured in too-high degree by painstaking fitting depending upon manual skill, rather than by foresighted and comprehensive engineering of the highest order, new discoveries in thermo-engineering —if such a term is permissible—are already gaining a practical foothold in which there is discernible a steady advance against the supremacy of the internal-combustion engine in all of its applications, including eventually the automobile motor. Although it may require a series of years before anything can be produced on the basis of the new discoveries which will equal the automobile motor in reliability and compactness, the same may be said of the many efforts now actually under way for perfecting aviation motors and for adapting the gasoline motor to the use of kerosene or heavy oils as fuel. Flameless combustion under the "Bonecourt" process, though at present steered toward other more immediately apparent industrial objects, fixes upon the horoscope of the automobile movement an obvious possibility of a widespread return to steam power in the form of a small flameless oil-fed boiler-generator working with a diminutive turbine engine, somewhat of the Wittig type (quite widely used in Germany), with a simple oil-separator, a ventilated condenser and preheating of the air needed for combustion.

Fig. 3—Experimental 500-hp. flameless surface-combustion steam boiler tried in England and Germany. First type tried

Flameless combustion is at present in the hands of powerful corporations in England and Germany and is under the substantial wings of the Standard Oil Company in this country. It is scheduled for extensive trial in special locomotives to be built —or perhaps already under construction—for the New York Central railway company.

Scientific information on the nature of the discovery is given in *Engineering* of May 10, 1912, page 632, and in *Feuerungstechnik* of January 1, 1913, page 118.

It suggests closely the processes of slow flameless combustion taking place in the respiratory organs, the lungs of animals and humans, and has long been foreshadowed in the phenomenon known as catalytic incandescence caused in spongy platinum when a hydrocarbon gas is brought in contact with the air contained in the pores of this substance—a phenomenon which was turned to account for ignition purposes in some early automobiles in France and the principle of which has been applied to cigar-lighters, repeatedly though not very practically, during the past fifty years and perhaps earlier. Flame-retaining wire screens and Welsbach gas mantles also afford parallels for comparison, so that the invention may be considered a natural upshot of contemporary knowledge.

That any danger which flameless combustion involves for a conservative development of the automobile motor means a new chance for greater efficiency and economy in the manufacture and utilization of automobiles, and therefore for further expansion of the automobile movement and of the industry which caters to it, is perhaps self-evident. And to what extent the discovery and the inventions already clustering around it may be entitled to the attention of automobile engineers and inventors, with a view to applying the new methods to road vehicles, and establishing a competing variety of the latter, will appear from a presentation of the subject in the *Zeitschrift des Vereines Deutscher Ingenieure* (Journal of the Society of German Engineers), of February 22, from the pen of Richard Blum, a director of the German corporation which has the industrial development of the matter in hand for German-speaking countries. While nothing is said in this article, which was first delivered as a lecture before engineers in Berlin, of any application to automobile purposes, those familiar with automobile requirements can readily draw interesting inferences from the facts presented and may even form a provisional idea on the important question relating to the amount and weight of the materials which it would be necessary to incorporate in a flameless combustion power plant for an automobile or motor truck of a given power. The most telling passages and illustrations of this articles are reproduced in the following.

—

To burn gas completely in an ordinary gas burner, about twice as much air is required in practice as theory demands. As the extra air must be heated in the flame, and as the air drawn into the flame from the sides also has a cooling effect, the temperatures developed fall far short of the theoretical heating value of the fuel used. If the gas pressure is increased till the speed of the flow exceeds the relatively low speed of backward flame propagation, the flame becomes detached from the burner nozzle and is soon extinguished by the afflux of air behind it. The flame is also cooled by its relatively cold surroundings.

In order to get better results from high pressure and speed of the gas mixture, a different burner must be used. If the end of the feed pipe of the burner is surrounded with granulated highly fireproof materials, and the gas mixture is now sent in under a pressure which would at once extinguish an ordinary burner, the effect is surprising. The fire-proof mass becomes first red-hot, then incandescent. A lively combustion consequently takes place in the interior of the mass. The explanation lies in the larger combustion-zone afforded for a given amount of gas mixture, in the exclusion of cold air from the sides, and in the preheating from the interior of the fireproof material of those surface portions of this material where the true combustion, during continued operation, is found to take place.

The most surprising fact in connection with this surface-combustion is, however, that the amount of air required for effecting it does not exceed that demanded by the chemical theory of combustion by more than about ½ per cent. An experiment is illustrated in Fig. 1. When a mixture of gas and air in the proportion mentioned is pressed, in the direction of the arrow, against the fireproof porous plate A and through it, and is ignited, the most rapid combustion takes place without flame in the pores nearest to the circumference of the plate, and the latter is maintained incandescent, radiating an astounding amount of heat.

The discovery of this effect was made at the same time by Engineer Schnabel of Berlin and by Professor Bone of London. The "Thermotechnische Gesellschaft" was formed in Berlin to exploit it, and in London the "Bonecourt Surface Combustion, Ltd." took charge. In July, 1912, these corporations were merged in all matters excepting territory.

To obtain the full effect, a coarse granulated mass of fireproof material as well as a material with very fine pores is required for some of the applications of the process. A certain grade of chamot has been found suitable for the porous mass, but it was only after many experiments that Schnabel developed a coarse granular material sufficiently cheap for the purpose, and this material, which sustains temperatures of above 2,000 deg. C. without disintegration or fusion, has been adopted by both the concerns referred to.

One of the simplest applications of the method is illustrated in Fig. 2 representing a blacksmith's forge in which no coke or coal is used, the granular mass on top taking its place, so far as covering up the work during heating is concerned, while the gas mixture is led into the porous substance in the center pit under pressures and in quantities varied according to the heat wanted. This clean fire, in which there is no surplus of hot uncombined atmospheric air to oxidize the metal, is especially valuable for the forging of high-speed steel tools.

The Skinningrove company in England has for more than one year had a flameless-combustion steam plant in operation. The gas used is piped from a cokery. Trials made by prominent

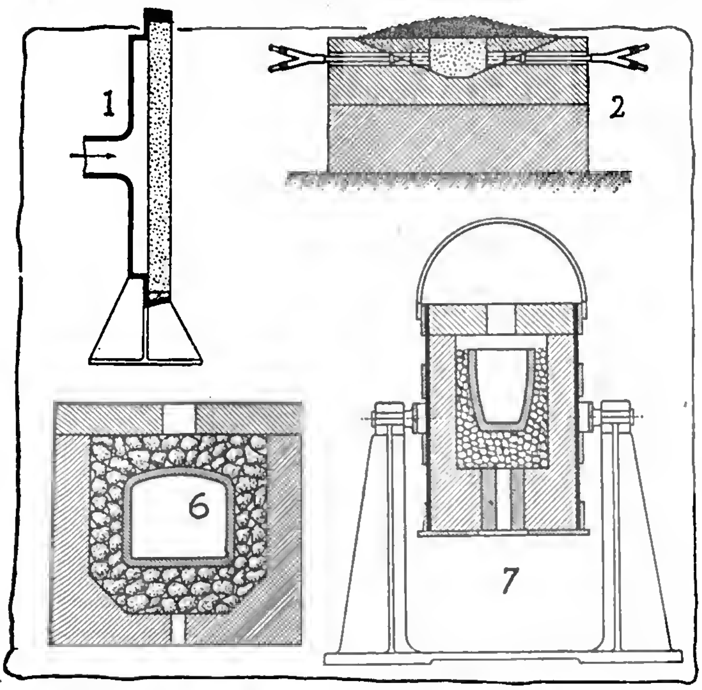


Fig. 1—Experimental chamot flame screen. Fig. 2—Flameless blacksmith's forge. Fig. 6—Bonecourt muffle oven. Fig. 7—Melting pot for crucible steel production by surface-combustion method

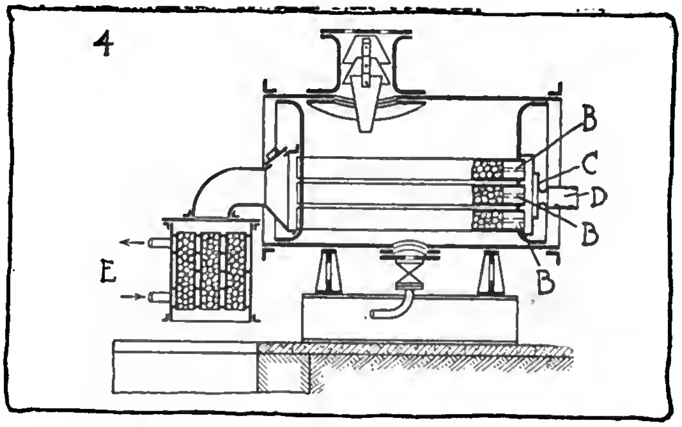


Fig. 4—General plan of flameless surface-combustion steam generator with feed-water heater. Later models much compacter

English and American boiler specialists have demonstrated for this plant the previously incredible steaming capacity of 105 kilograms per square meter. The contrast with the maximum of 45 kilograms for ordinary fire-flue or water-tube boilers is striking. The fuel efficiency varies from 93 to 95 per cent.; or, in other words, there is scarcely any loss of heat units in converting water into steam by surface-combustion of gas. In this case the gas mixture is drawn into the boiler by a suction fan producing 1/20 of an atmospheric pressure. It could of course be forced in, as well, with a centrifugal blower.

A boiler erected in Germany generates steam for 500 horsepowers. It is shaped as a drum, as shown in Fig. 3, and is about 3 meters in diameter and 1.2 meter thick. Each of the flameless-fire tubes generates 20 to 25 pounds of steam per hour with an interior diameter of 75 millimeters and walls 6 millimeters thick. All the fire tubes are in the lower half of the drum, while the upper part is braced with tie-rods. Fig. 4 shows the firing method. At the front end of each tube there is a fireproof [non-porous] stopper with a central bore, 13 millimeters in diameter, through which the gas mixture flows in. This protects the joint with the boiler wall against excessive heat. Adjacently to the stopper the filling with granular material begins. The grains measure about 10 millimeters each. [Blum doesn't mention how far the material extends and does not say whether any of the fine porous chamot is used, as, in fact, throughout his account he refrains from publishing definite details. It seems that the chamot is used only for constructions in which outside air cannot readily be barred and in which the heat is utilized for radiation and light rather than for convection.] In front of the tubes there is a mixing chamber receiving the gas and air sepa-

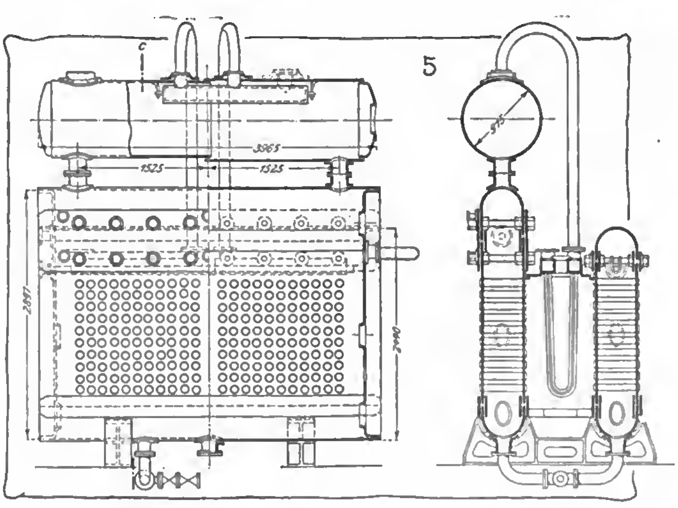


Fig. 5—Vary compact marine flameless surface-combustion generator, tripling ordinary steaming capacity and wasting only 3 per cent. of heat units of fuel

rately from feed pipes D. By shutting off the latter, groups of 5 fire tubes can be taken out of action to vary the steam generation. If pressure-feed is used, there is a chamot plate in front of each stopper, acting as a screen to prevent heat from striking back if the pressure subsides. The feed-water heater E is arranged on similar principles.

The operation is as follows: Air and gas are admitted to the fire tubes and the mixture is ignited by means of a specially arranged torch at the ends of the tubes. This gas burns at first with a flame, but when the proportion between gas and air is adjusted [the air supply reduced] and the pressure is regulated, the flame gradually draws back to the interior of the tube. The real combustion zone begins at the inner end of the fireproof stopper, and here—which is the most important feature—only in the middle of the granular mass. A core of about 100 millimeters long and 20 to 25 millimeters in diameter is here raised to brightest incandescence, reaching a temperature estimated at 1400 to 1600 deg. C. The heat drops rapidly toward the tube walls, and the material adjacent to these is only red-hot. The metal of the tubes thus does not come in contact with the fiercest heat, which explains why they endure the service indefinitely. The cooling of the gases is also very pronounced toward the rear end of the tubes. Measurements have shown that 70 per cent. of the steam is generated by the front 1/3 of the tubes, 22 per cent. by the middle 1/3 and only 8 per cent. at the rear end of the boiler. The temperature of the exhaust gases is only about 200 deg. C., and this is reduced to 95 degrees in the feed-water heater, the water being raised from 20 to 50 degrees. The proper pressure and gas proportion depend upon the type of gas and the nature of the granular material. The radiation losses of the boiler amount to 1½ per cent., while the pressure or suction fan absorbs 2.5 per cent. of the power and the exhaust gases carry away 3 per cent. of the heat value of the fuel. In this radical thermic economy, in comparison with which that of the internal-combustion engine appears as wanton waste, lies the promise of widespread industrial applications.

Fig. 5 shows the construction of a surface-combustion marine boiler of a design much compacter than that shown in Fig. 3. Experiments in England with a plant of this type showed a steaming capacity of 145 kilograms per square meter, and a German commission of incredulous specialists verified this figure by tests extending over a full week.

Liquid Fuels Tried With Success

Encouraged by the results obtained with gas, the engineers of the movement instituted trials with liquid fuels and in fact with tar oil. The success was so epochal that a locomotive in England is now being equipped with a surface-combustion boiler. If the author is correctly informed the New York Central railway company in New York also has the intention of building such locomotives, which by their absence of all smoke promise to make electrification superfluous.

Among other recent progress in the development of the method, it is to be mentioned, that it has been found possible to work with reduced fuel pressures by using suitable diameters of the tubes and by employing other means of which nothing can be said at the present moment owing to the unfinished condition of the patent rights relating thereto. This is of especial importance for applying the flameless method to lighting, heating and cooking purposes. [It also indicates a certain likelihood of adaptability to automobile motor requirements.]

In Figs. 6 and 7 there is outlined a suggestion of how flameless surface-combustion—now generally termed Bonecourt combustion, a copyrighted name and trademark—may be used with enormous saving of fuel for muffle ovens, which are used so largely in the automobile industry for casehardening work and other forms of the heat treatment of steel, and for the melting pots in crucible-steel works, where each crucible usually holds only about 30 kilograms of metal and with the present arrangements never can be uniformly heated.

[The author refers with some detail to a large number of other industrial applications, some of them of wide sweep, but the facts and ideas which bear in any manner upon the possible adaptation of the Bonecourt heating method to automobile purposes are contained in the foregoing extracts.—Ed.]

Double Ignition.—In reply to an inquiry as to the advisability of changing a single spark magneto ignition to a dual spark ignition by arranging two plugs in series H. Féron writes in part: It is not always an improvement when single ignition is changed to double in an existing motor. To be sure, the double spark always hastens the combustion of the gas, but the rate of combustion ought to be proportionate to the maximum piston speed of the motor. If the motor is not adapted for high piston speeds, the rapid flame propagation will result only in inconveniencies. The motor may, for example, be so small in proportion to the weight and gear ratio of the vehicle that a high piston speed on direct gear becomes impossible. The diameters of valves and pipes may be so small, purposely, as to check motor speed, or the shapes of the cams may be such that the valve action cannot "follow." In such cases a double spark will only give very high pressures which cannot be utilized; the motor will run hard, with a tendency to vibrate from the checking of the explosions. Without any compensating advantages, a more rapid wear and tear of pistons and connecting-rod bearings will be experienced.

In certain motors in which the piston speed is too high for the form of the combustion chambers double ignition may take the place of variable spark-timing by quickening combustion, but the case is rare. On the other hand, the writer has seen motors which ran acceptably with fixed timing and only one spark plug and which began to knock desperately at the slightest slowing of the motor when fitted with double ignition.

With two spark plugs in series, a stronger magneto is needed than for ordinary ignition, because the spark must jump the gap between terminals in two places, which involves overcoming about twice as great a resistance as the jumping of one gap, especially if the compression is high.—From *Omnia*, April 12.

Sounds of the Motor.—Unless the silencing of the motor is carried very far—and perhaps farther than desirable—the experienced driver can tell a good deal about the condition of the motor by the sounds it emits. This fact is widely known, but it does not seem to be so well understood that the sounds, or rather the driver's perception of them, is influenced considerably by factors which have nothing to do with the condition of the motor, and that such factors therefore should be taken into account.

A leather cap well pulled down over the head acts as an ear trumpet and magnifies most sounds, while it seems to muffle others. Also, when the ear muffs of a cap are let down, one can frequently tell loose bearings much more plainly than with the ears unobstructed. The raising of the top of a car brings all small noises from the motor out very strongly, unless a windshield is used, and therefore "troubles" are sometimes discovered during a rain which have existed for a long time, but the symptoms of which could not be heard till the top caught the sound The mudpan has a similar influence.

Surroundings and road conditions modify all sounds. A traction chain which seemed almost noiseless on an open stretch of road makes an astonishing "racket" on a narrow paved street. In a very narrow street the noise of the exhaust makes itself heard distinctly in spite of the muffler.

When a car is passing close by a short piece of wall with the cut-out open, the reflected roar will sometimes give a sudden scare to a driver not thoroughly familiar with the cause. On mountain roads the echoes may easily give even an experienced driver an impression of a slipping clutch or of irregular ignition. On a sunken road the motor breathes deep and full, on a dike in a higher key and more faintly. On a hard road the sounds grow sharp, on a soft one indistinct. Sand and snow reduce all noises surprisingly.—From *Auto* (Berlin), March 1.

Detecting Resistance—Saving Fuel

PART III.

Tests Made on Actual Cars with Accelerometer Show Varying Resistance on Similar Cars—Internal Friction May Be Tested

By Professor W. C. Marshall

THIS is the third of a series of four articles on the accelerometer and its use. The accelerometer is an instrument for determining amount of the accelerating and retarding forces of a car under all conditions. By its use the power required to drive a car, the condition of the brakes, the condition of the running gear, the friction of the motor and a number of other important details can be either read directly or be deduced by very simple processes.

In appearance the accelerometer resembles an alarm clock. It is cylindrical in form, 4 inches in diameter and 2.25 inches in height. It is carried in the car and is not attached thereto in any manner whatsoever, except that it must rest on a fixed horizontal platform which maintains a constant relationship to the car.

At a paper read at the Metropolitan section of the Society of Automobile Engineers during the April meeting, considerable discussion took place on the value of electric testing outfits for manufacturing plants. It was pointed out that one of these outfits cost in the neighborhood of $1,400 and that the average factory would require anywhere from ten to twenty instruments. This enormous outlay would not readily be made by a factory unless they were fully assured that the return would be adequate.

With the accelerometer, many details in addition to those learned on the road test would be learned, and while the road test would not be diminished in any way, the additional details could be learned without any additional time being required in making them and they would go to make a more detailed accounting of the performance of the car and would furnish a check on the condition of running gear and the power required to drive the chasis than the simple road test would do.

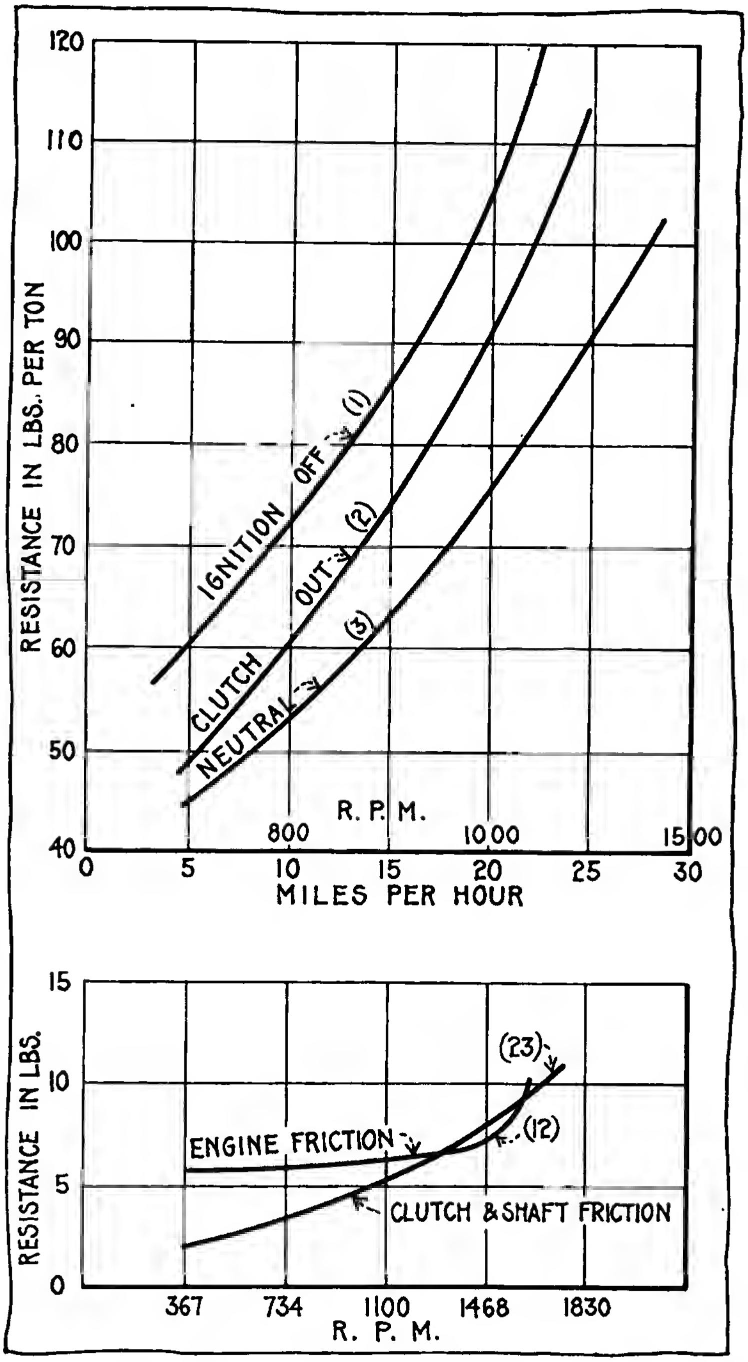


Fig. 1—Two sets of curves, the lower being deduced from the upper, showing the resistance of a given car with the ignition off, the clutch out and the gears in neutral

Actual tests show a wide difference in the resistance of two cars of the same weight and horsepower. This means that these two cars would be using a varying amount of fuel to drive them if the efficiencies of the motors were the same and the carburetion was all that could be desired on both cars.

Knowing the performance of the car the difference made by different road surfaces may be obtained. A car run over asphalt will have less road resistance than a car run over a road which is less smooth. If a test is made with the engine ignition switched off and then with the clutch out the resistance of the motor due to its internal friction may be obtained. Various other data can also be obtained. In the tests which are mentioned below the methods of working out these details are explained.

In the last issue of THE AUTOMOBILE, Part II of this series, the results of several tests made by this

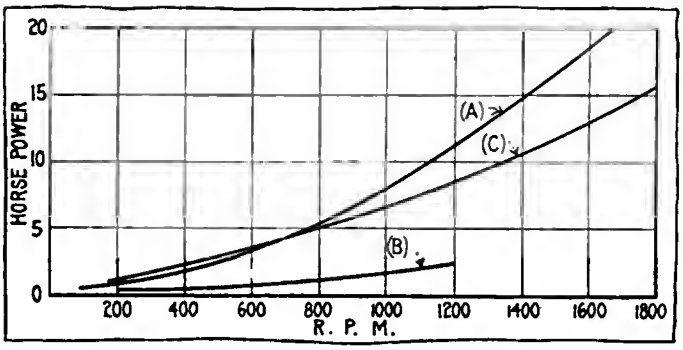


Fig. 2—Curves of engine friction secured by different investigators. The high curve, A, was secured by Reidler

instrument on actual cars were detailed. This week these tests are continued and a clear conception of the value of the instrument may be obtained.

Results of certain tests made by the author on a four-cylinder, four-passenger car are given below. The car weighed 2.077 tons, carried four passengers and had a windshield, which was up.

The road was good, hard macadam and level. There was no wind.

Speed. Miles per Hour	Coasting Resistance in Pounds per Ton				
	Ignition Off		Clutch Out		Neutral
15	90		...		60
20	100		60		70
25	110		70		80
30	120		80		80
35	135		90		100
40	...		100		...
	ON SMOOTH		ASPHALT		
	Readings	Average	Readings	Average	
10	70–70	70	45–40	42.5	..
15	80–70–80	77	55–60	57.5	..
20	80–90–90	87	55–60	57.5	..
25	90–90–80	87	70–70	70	..
30	110–110	110	80–75–80	78	..

There were two or three readings taken in the asphalt tests, as indicated by dashes between the numbers in the above table.

The curves for the resistances are plotted in Fig. 3.

The horsepower curves are broken lines and were only calculated for the resistances on macadam.

The neutral gives more resistance than when the clutch is disengaged, due either to the inertia of the multiple disk, clutch or to the dragging action of the disks of the clutch, which are on the crankshaft.

The friction of engine is shown in Fig. 4, the curve being plotted from the curves A and B in Fig. 3.

The resistance of grades may be read from the accelerometer by noting the percentage grade mark and then the retardation number opposite. For example, opposite 2 on the scale marked downward gradient is read 40 on the retardation scale. This means a 2 per cent. grade is equal to a retarding force of 40 pounds per ton.

Mr. Wimperis has published some results of experiments made on cars fitted with iron and with rubber tires which show the coasting resistance on various kinds of roads at speeds of 10, 15 and 25 miles per hour. These are good so far as they go, but more evidence is needed to accurately determine the laws of resistance at high speeds with pneumatic tires.

Table I following gives the results of these experiments and shows the high resistance of muddy roads, also the low resistance of iron tires on granite blocks.

The results on hard roads appear to be large as compared with those determined by other experimenters.

In the following tests, Table II, also made by Mr. Wimperis, smaller resistances were obtained than those above, even at higher speeds.

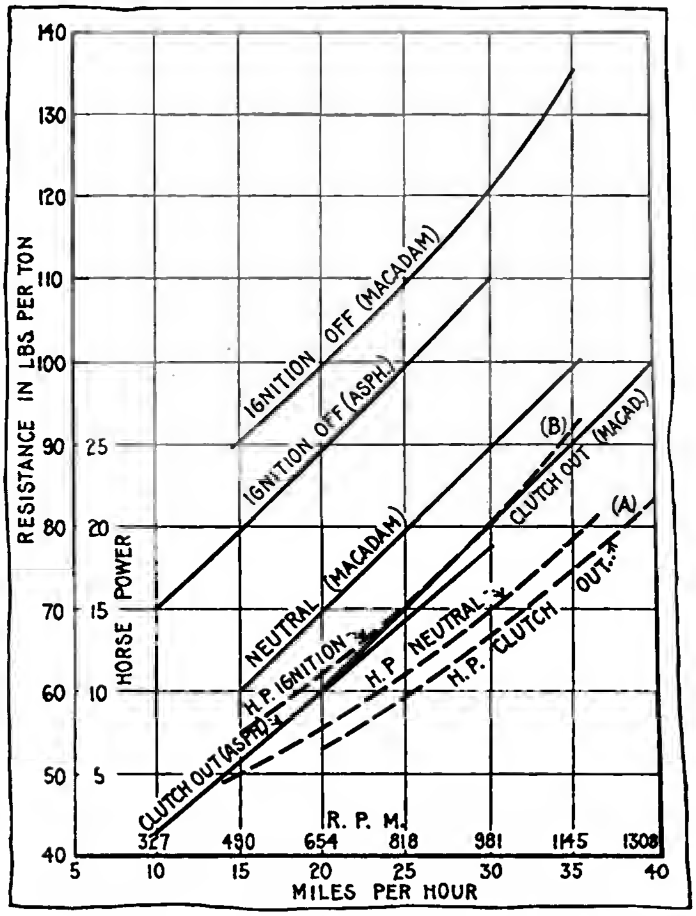


Fig. 3—Effect of road resistance on the total. The above curves show a comparison between macadam and asphalt

The roads had good, hard surfaces, the tires were of solid rubber and there was no wind.

The difference between the resistances at the clutch and with neutral gear is quite marked, due probably to pumping action of gears running in the grease of the gear box.

TABLE I.

Nature and Condition of Road	Declutched Coasting Resistance Pounds per Ton	Speed in Miles per Hour	Kind of Vehicle and Weight in Gross Tons	Tires
Tar macadam road.....	65	10	Motor wagon	Steel rear Front sol.
Tar macadam, soft and cut up..............	140	10	Wgt. 4.3 tons	Rubber
Granite blocks..........	50	10	Wgt. 4.3 tons	Rubber
Hard, dry main road....	73	15	Heavy touring car, wgt. loaded, 225 tons	Solid rubber
Half rolled road metal...	150	15	Heavy touring car, wgt. loaded, 225 tons	Solid rubber
Clean wood pavement...	70	10	Motor wagon	Solid rubber
Tar macadam, dry, hard	70	10	Wgt. loaded 4.35 tons	Solid rubber
Tar macadam, very muddy and sticky....	95	10	Wgt. loaded 4.35 tons	Solid rubber
Road metal partly rolled	[120	10	Wgt. loaded 4.35 tons	Solid rubber
Road metal unrolled....	200	10	Wgt. loaded 4.35 tons	Solid rubber

A car moving up a 2 per cent. grade at constant speed would overcome a resistance of 40 pounds per ton due to grade plus a resistance due to rolling friction, wind, etc. If this latter resistance was, say, 85 pounds per ton, then the total resistance overcome would be 125 pounds per ton.

If the speed was 20 miles per hour on the grade, the probable

TABLE II.—Coasting Resistance on Motor Wagon

Weight loaded 3.28 tons—no wind—hard main road

Speed. Miles per Hour	Coasting Resistance in Pounds per Ton (Gross)		
	Ignition Off	Clutch Out	Neutral Gear
0	55	40	35
2½	55	40	35
5	57	42	40
7½	60	45	40
10	65	50	45
12½	75	55	50
15	85	63	55
17½	105	80	60
20	...	95	65
22½	...	110	70
25	...	...	80

speed on the level would be 37 miles per hour when the engine was exerting the same amount of power.

Conversely suppose a car to run on a level road at 40 miles per hour, its resistance being 90 pounds per ton. What grade can it ascend at 25 miles per hour if the engine can exert the same power?

The accelerometer can be used in conjunction with measurements of gasoline used, to determine the thermal efficiency of the motor, when a car is run over a route the grades of which have been determined. The car resistance is first measured at the speed or speeds to be maintained during the run. The average resistance is then calculated for the whole run, taking into account grades and levels.

The average resistance of the car in pounds, the distance covered and the amount of gasoline used having been determined, we then find the thermal energy in the gasoline and the amount of work performed in driving the car. Expressing the work done in foot pounds gives the expression:

$F = R \times 5280 \times M.$

F = foot pounds of work.

R = average resistance of car in pounds.

M = miles per gallon of gasoline.

The thermal energy in the gasoline would be approximately 15,941,220 foot-pounds per pound, the total energy being 6 × 5,941,220 foot-pounds per gallon.

The brake thermal efficiency of the engine would be, therefore,

$$E = \frac{R \times M \times 5280}{6 \times 15{,}941{,}220} = \frac{R \times M}{18000}.$$

In this formula the specific gravity of the gasoline was assumed to be .72 per cent. and the weight 6 pounds per gallon.

Acceleration measurements are useful in making a comparison of the power of the motor as exerted to produce rapid acceleration at certain speeds. For example, consider two cars running at speeds of 20 miles per hour. The throttle is then opened to give the maximum power of the motor, which at once produces an acceleration of the car.

In one case the needle reads 2 feet per second, while in the other it only moves to 1.8 feet per second.

As force = mass × acceleration, if the cars weighed the same and had the same resistance to motion, the power of the motors would carry it directly as the acceleration, viz.: 2 to 1.8.

There is often found to be a great difference in the power of various cars due, not to the resistance, but to the action of the carbureter when furnishing the gasoline vapor to the motor.

Some carbureters furnish such a rich mixture when the throttle is opened wide that it will not ignite and the motor slows down.

Such a carbureter does not permit the motor to produce rapid car acceleration, whereas a well-designed one giving a uniform mixture, enables it to respond instantly to wide open throttle.

If the torque curve of a motor, previously determined from laboratory tests, is reduced to a curve denoting the power available at the clutch, we have a means of determining the probable power which can be used for acceleration.

In Fig. 5, at A is shown the resistance curve of the Pierce-Arrow touring car.

The revolutions per minute of the motor were calculated from 37-inch wheels and a gear ratio of 3.3 on fourth speed.

From the laboratory test of a Pierce-Arrow six-cylinder motor made by Herbert Chase at the Automobile Club of America, the brake horsepower was obtained at various speeds.

The horsepower curve used was the one marked A in the test, and was obtained with muffler and throttle wide open.

The horsepower at each speed was then reduced to resistance at the clutch in pounds per ton and the torque curves were plotted from gear rations of 5.44 for third, 7.095 for second and 12.639 for first speed.

(Continued on page 949)

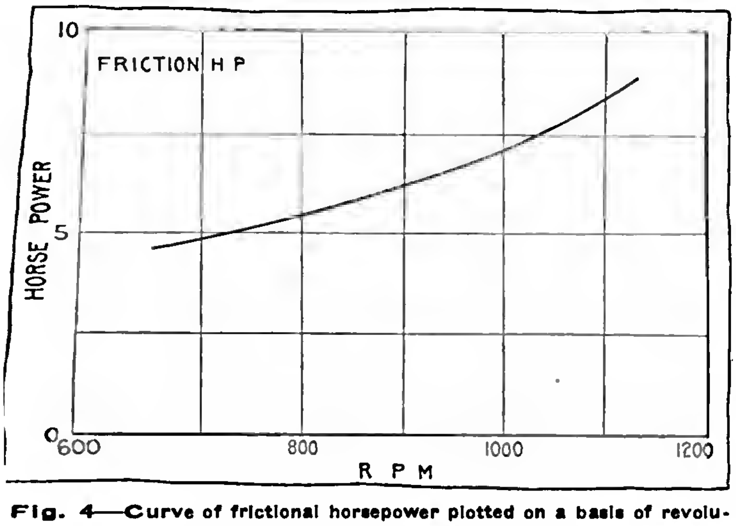


Fig. 4—Curve of frictional horsepower plotted on a basis of revolutions per minute with horsepower ordinates

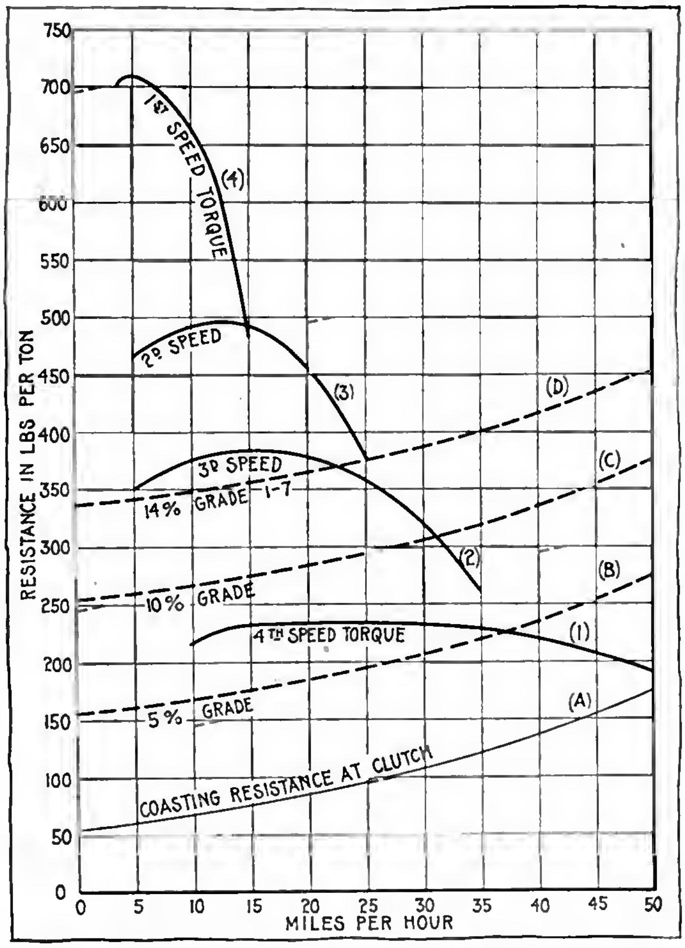
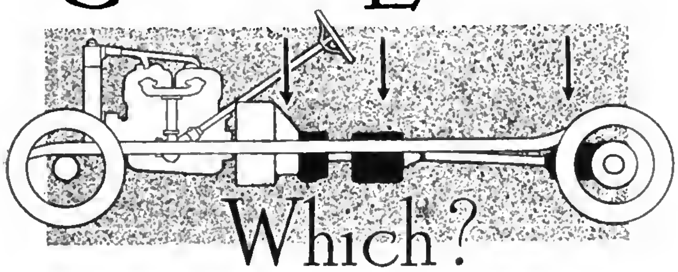


Fig. 5—Resistance curves of a large touring car running on different grades at different gear ratios

The Engineers' Forum

Gearbox Location



Leading Automobile Engineers Show as Much Diversity of Opinion on This Question as on Horsepower

Marmon Favors Location on the Rear Axle
Holmes Calls It a Commercial Problem
Wall Also Likes the Central Location
Planche Is in Favor of Rear Axle Type
Smith Is Another Rear Axle Advocate
Edwards Finds Amidships Type the Best

THE article on "The Rear Axle Gearbox," by S. D. Waldon, which appeared in THE AUTOMOBILE for April 17, excited considerable interest among the leading automobile engineers of the country in this important question of design, and the following responses to inquiries regarding their individual views on the subject are very interesting, especially because of the wide diversity of opinions evident. So many communications have been received that they will appear from week to week in the Engineers' Forum as space is available. The arguments advanced for and against the various types of construction in this particular are those of experts who have studied the situation thoroughly and therefore deserve the attention of everyone interested in the problems of automobile design and construction:

Small Increase in Rear Axle Weight—Marmon

INDIANAPOLIS, IND.—Editor THE AUTOMOBILE:—**The incorporation of a motor car gearset with the rear axle can be accomplished, if a little ingenuity is used, with a surprisingly small increase in the total weight of the rear axle. A 5 to 7 per cent. increase in the weight of the axle is all that is necessary.** This is less than the variation in weight caused by the use of different styles of demountable rims.

The rear axle gearbox eliminates one grease retaining reservoir by utilizing the oil bath already provided for the bevel gear. It results in a quieter operating car than if the same gearset were placed under the footboards which act in the nature of a resonator.

If properly designed, the rear axle gearbox is far more accessible than one located under the body, and if occasion arises that necessitates the opening up of the gearbox, the finely-finished and upholstered portions of the body do not suffer from being covered with the contents of the gearbox. The most important advantage of the rear axle location, however, comes from the fact that the magnification of the torque, due to the use of the various gears in the gearbox, is transmitted directly to the bevel pinion, and not through the universal joints and the propeller shaft. This prolongs life in the universal joints themselves, and permits the selection of a propeller shaft of small diameter that will carry the torque of the motor with some torsional deflection. Such a propeller shaft will perform the functions of a spring drive, and compensate for the variations in angular velocity that take place between the flywheel of the motor and the road wheels during each revolution of the motor, and a decidedly smoother operating car results.

Such construction is, of course, impossible with the gearbox near the motor, as the propeller shaft must be designed to take anywhere from four to eight times the torque necessary in the previously discussed constructions. The effect of the spring drive is then lost.—HOWARD MARMON, Nordyke & Marmon Co., President Society of Automobile Engineers.

A Question of Economy in Tires—Holmes

SYRACUSE, N. Y.—Editor THE AUTOMOBILE:—The location of the gearbox on the rear axle is but one of the points now prominently before the automobile public in connection with the demand for more economical cars.

The total cost of a car, meaning everything paid for same from first to last is in some cases an enormous sum. Tire cost is a very large factor in this account. For this reason the location of a gearbox correctly on a rear axle adding its weight to the unsprung weight of axle is no longer a question of engineering purely—it is a business proposition, or perhaps should be called commercial engineering.

Tire cost, fuel cost, everything that goes to make up the total cost of a car must be reduced in time. This simply means less weight, and especially less weight in the unsprung parts.—A. HOLMES, Engineer H. H. Franklin Mfg. Co.

Racing Shows Amidship Advantages—Wall

INDIANAPOLIS, IND.—Editor THE AUTOMOBILE:—In regard to the proper position of the gearbox on a motor car, while there has been a diversity of opinion in the past in regard to the relative advantages of the three arrangements generally used, attaching it to the engine, placing it amidship, or attaching to the rear axle, it now appears that the majority of engineers are realizing that to place the gearbox amidship has a number of advantages over using it either as a part of the engine or as a part of the rear system.

The disadvantages of placing the gearbox on the rear axle are very evident, as it subjects it to very hard shocks when traveling over rough roads, due to the fact that it is not protected by the springs of the chassis, which also accounts for the severity of this construction on the rear tires. It is in a position where it is very difficult to get to in making any necessary adjustments or repairs, besides the disadvantage of having long control rods running to the hand levers. It is also much more liable to meet with accident when hung low in this position.

Attaching the gearbox to the crankcase of the engine has the advantage of compactness and reduction in expense of manufacture, so that it is generally found on the cheaper cars. It **has the serious disadvantage, however, of inaccessibility to the clutch parts and the difficulty of proper suspension so as to get the maximum resistance to strains, as it is generally designed as a cantilever supported by the rear arms of the engine, or else supported at the rear end and acting as part of a truss to sustain the weight of engine. With either arrangement a great and unnecessary strain is placed on both the gearbox and crankcase.**

Placing the gearbox amidship has a great many advantages, though the slight disadvantage of requiring a little more expensive construction than attaching to the engine; the great advantage of this position, however, is its flexibility and the fact that there is considerable less strain on the bearings of the gearbox in this position, due to the use of universal joints both at the front and rear ends. Hanging it amidship also makes it extremely accessible and allows ready access to the clutch and its parts; it assists in the proper balancing of car, dividing the weight between the two axles, is up out of harm's way on rough roads, and is in a position where even serious accidents can hardly damage it.

Also it makes an extremely convenient design with center control, and does not require the control shafts to slide out of case, necessitating packing boxes; it is in a position where it can be easily lubricated and looked after, and probably receives much better treatment than in any other location.

For a number of years the National car has had the gearbox placed amidship with excellent results, and considerable of its success in the racing field can be attributed to this design. It is a fact, though not generally known, that, with probably one exception, all cars that have become prominent in racing have had the gearbox placed amidship, which is good proof of the flexibility and dependability of this construction.—WM. G. WALL, Chief Engineer, National Motor Vehicle Company.

Rear Axle Type Is More Accurate—Planche

DETROIT, MICH.—Editor THE AUTOMOBILE—The problem that confronts the engineer, who is ready to establish the design of a car, can be reduced to the following simple expressions:

Place the motive power in a chassis and transmit that power to the rear wheels with the least possible loss.

Lower the center of gravity of the car to the minimum height compatible with necessary road clearance.

If these two conditions are fulfilled, the car built by this engineer will be economical, of great stability, easy to drive and comfortable. The first condition is filled when the center line of the crankshaft passes through the center of the rear axle—it is a straight-line drive.

In practice this straight-line drive can be obtained through the building of motor, gearbox and rear axle in a solid unit, with the front of the motor pivoting at the starting crank—the only car built along this line is a French car—the Simplicia. In this case no universal joint is used and the efficiency at the rear wheels is maximum.

The next best solution is the Chevrolet design. It is also a straight-line drive when the car is loaded and rolling on a smooth road. The gearbox is mounted as a unit with the rear axle and the driveshaft is also a unit with the gearbox. This makes a rigid assembly which is bolted to the frame by means of a large pivoting fork and is connected to the motor by a single universal joint. The universal joint operates only when there is a deflexion of the springs, and as the springs deflect very little under load, the loss of power is reduced to a minimum through the universal joints. That first condition is also filled when the motor and gearbox are built as a unit and placed in a straight drive with the rear axle transmitting power to the rear axle through one universal joint.

The most inefficient way of transmitting power to rear axle is when the motor, gearbox and rear axle are all separate units connected together by universal joints because the chances of misalignment increase, more universal joints are needed, consequently more power is lost. Then, if we consider only the question of transmitting power the most efficiently to the rear wheels, we would consider the gearbox, rear-axle unit as equal to the motor-gearbox unit, but both superior to the motor, gearbox and rear axle as separate units. But if we consider the second condition we have formulated above, we find that the gearbox, rear-axle unit answers that question better than any of the other two solutions. Effectively in that type the weight of the driveshaft, torsion tube, transmission is brought closer to the ground consequently the center of gravity of the car is lowered, the load on the rear wheels is increased giving better adherence to the ground and the stability of the car is also increased, affording more security to the passengers for high-speed travel.

One could also say that the building of rear axle and gearbox as a unit, or of motor and gearbox as a unit removes the uncertainties of manual labor in assembling the car and leaves it to the more accurate work of the machine tool.

These are the reasons why we prefer in our own opinion the mounting of driveshaft and gearbox as a unit with the rear axle.—E. PLANCHE, Chief Engineer Chevrolet Motor Co.

Rear Axle Unit Is More Quiet—Smith

INDIANAPOLIS, IND.—Editor THE AUTOMOBILE:—Referring to the discussion recently appearing in THE AUTOMOBILE relative to the merits of the three present methods of installing the gearbox in passenger automobiles, would state that we naturally favor the suspension of the gearbox in unit with the rear axle, for four particular reasons:

First, on your lower speeds it reduces the torque on your universal joint and drive shaft in direct proportion to the ratio of difference between your second or low speed, and engine speed, which is a decided advantage in a stiff pull.

Second, it reduces to the extent of the weight of your gearbox unit the dead weight on your frame, hence the weight supported by the springs, and gives you the advantage of that much more flexibility in your spring suspension.

Third, you can shift gears much more smoothly, due, we believe, to the longer linkage and greater flexibility of your gearshift mechanism to say nothing of the wide range of choice for the enginer in the location of his control levers which may be set practically anywhere to conform to his particular idea of accessibility.

Fourth, the gears are located so far back that the slight growl or hum from the constant mesh gears and idle pinion is nearly, if not entirely, lost. This is one of the reason that the rear axle transmission is quieter than other types.

There are several lesser arguments in favor of the rear axle gearbox, but the four above, we believe, are the chief reasons that are leading the trend of motor car builders today to adopt an ever-increasing proportion of the rear axle gearbox over the other types.—J. M. SMITH, Factory Manager and Engineer, Henderson Motor Car Co.

Is More Accessible Amidship—Edwards

NEW YORK CITY—Editor THE AUTOMOBILE:—Referring to the question as to whether it is better to mount the gearbox of an automobile as a unit with the rear axle, as a unit with the motor, or as a separate unit approximately amidship in the chassis.

As a unit with the rear axle: A disadvantage is that it adds that much unsprung weight to be carried by the axle and the tires. It also adds the weight of the gearbox to a part of the axle where it is least desirable. On the other hand, the mounting of the gearbox on the rear axle has the advantage of deadening the noise of the gears.

As a unit with the motor: This construction has the advantage of clean design and if used with the three-point suspension no trouble should be experienced on account of the length of the complete unit of engine and gearbox.

As a separate unit: The advantage is that the gearbox is a separate assembly as a manufacturing proposition and by the use of universal joints there is no undue strain placed on the bearings of the gearset, due to weaving or warping of the chassis. In case of trouble with the gearset it is easily accessible, removed or replaced.—H. J. EDWARDS, Engineer, Edwards Motor Car Co.

Cost-Keeping System for Warehouse Trucks

Exact Daily and Monthly Records Enable Operating Companies To Get Most Economic Service from Vehicles

Long Time Spent in Loading and Unloading Trucks Causes High Cost Per Mile Traveled

THE closer the profits of a given business the more urgent is the requirement for unerring records, as gain or loss plays a much more pronounced rôle in such an undertaking, owing to its high percentage with relation to the total or net profit. Consequently, if motor trucks are applied in a line of work where profit is small, systematic cost-keeping is a desideratum if not a necessity; whereas, if they are used without profit and merely to the purpose of advertising, by coupling in the common mind the name of a company with the idea of up-to-dateness—which is not unfrequently the case now—the strictest economy, controlled and recorded by exact compilation of data, is needed.

One of the businesses of this nature is the storage-warehouse trade. In this line of enterprise, which often includes the moving of furniture, all work is strictly non-productive, and consequently the profit is small, since profit accompanies principally the making of one product into another. The two sources of income in this business, then, are moving furniture and storing it. The latter department is dependent for its rentability upon the extent to which the buildings of the company may be utilized and is roughly proportionate to the magnitude of the company's business; but the former, being founded upon work, human and animal or mechanical, offers possibilities for a variable profit, which is proportionate to the low cost of transportation on one hand, and to its efficiency—speed, safety and dependability—on the other. Safety refers to the possibility of entrusting a van or truck with goods, feeling certain that nothing ill will happen to them; dependability, that they will be delivered on time.

As the profit on furniture transportation is very variable, the advantage of exact records which are a means to the end of strict economy is obvious. By keeping all information relating to the work done by trucks and their cost of maintenance, the economy of operation can be more and more increased, as waste may be diminished by eliminating its several causes. To put a truck fleet, large or small, on a basis of increasing economy, a cost-keeping system such as that described below may be used to advantage, it being constructed after abstracting the principal features of several schemes in use by various storage business houses.

This system comprises four forms, namely: a daily time-checking sheet, a daily cost-and-work sheet, a monthly trouble-and-repair card and a monthly record sheet. The first is a garage form, the second made out by each driver after the day's work, the third is a ledger form filled out by the garage-and-shop foreman and the fourth by the bookkeeping department.

The checking sheet is 15 inches square, printed on white ledger paper which is ruled red from side to side and blue from top to bottom and printed black, as shown in Fig. 3. The sheet is secured to a board near the garage door on the first of the month, and every time a truck enters or leaves the place, its time is put down on the sheet. Trucks engaged in work of moving furniture do not make more than two trips a day, while machines that do may be recorded on a separate sheet, using two columns instead of one. This sheet serves much the same purpose as the weekly time card in shops.

To account for the distribution of time, in addition to giving the details of the work done by a truck, a daily cost-and-work sheet is used. When a truck returns in the evening or night, the driver fills out a blank, Fig. 2. The latter is 12 by 8 inches, printed on letter stock of medium thickness, ruled according to the same color scheme as Fig. 3 and is made out with a carbon copy. The driver puts down the number of his truck, the date, his name and that of the helper and then proceeds to give all the required data referring to the several trips. The latter are numbered. The

CAR No........ Month of..................191.... MONTHLY RECORD TOTAL EXPENSE $..........

Day	Mi'es	Hrs.	Hrs. Trvld.	Gas $	Oil $	Repair $	Gar'e $	Equ't $	Overhd. $	Driver $	H'per $	Total	Cost Mile
1													
2													
3													
4													
5													
6													
28													
29													
30													
31													

Transferred and Totaled by.............................. Checked by ....

Fig. 1—Monthly truck-cost record

CAR No........ Date..............................191.... DRIVER........................ HELPER........................

Trip No.	Addresses	Checked Out	Checked In	Time spent Ldg.	Time spent Uldg.	Miles	Hours stand.	Gas	Oil etc.	Repairs, Equip., &c.	Cost	Miscel.

Fig. 2—Daily work-and-cost sheet

addresses from and to which furniture was taken, the time of checking in and out of the garage, the time spent in loading and unloading the truck, the miles traveled on the trip as shown by the tripmeter mechanism on the speedometer, and the length of time during which the truck was standing are noted. The quantities of gasoline, oil and grease used are also recorded. If any repairs or the purchase of parts, fuel, etc., on the road were necessary, the driver states this, together with the price. Finally, there is a space for miscellaneous remarks. The original of this report is kept by the foreman, while the carbon duplicate is sent to the office, where it is kept by the bookkeeper.

In order to keep track also of the full history of the trucks, as pictured by repairs, their costs and miscellaneous happenings which have a bearing on the value and ultimate life of the machine, a monthly repair and trouble card is used. The latter is designed like Fig. 4, being 10 by 12 inches, ruled and printed similarly to Fig. 2 and coming in form of pads with duplicate blanks. Every repair is recorded on this form, there being one page—or two or more pages, if necessary—for each car kept in a binder. With the nature of the repair, the cost of the material and parts used are recorded, as is the exact cost of labor spent on the job. Likewise, any trouble which arises, whether requiring a repair or not, is recorded. At the end of the month the foreman signs the report and files it, the duplicate going to the bookkeeper.

The information given on the three forms is compiled on a fourth, the monthly record, Fig. 1. This is a white sheet, 15 by 12 inches, ruled red and blue and printed black. The hours spent outside the company's garage are taken from the checking sheet, and the hours during which the truck traveled are obtained by deducting from this time the standing time given in Fig. 2. The miles traveled are also taken from the latter record. From the amounts of gasoline and oil, Fig. 2, the prices are calculated, while those of new equipment and road repairs are taken direct from that record. Fig. 4 gives the cost of repair jobs whenever they are carried out. A certain amount is charged against each truck daily for garaging. Overhead is calculated in the following manner: After deducting the garage and shop labor accounted for by repairs from the payroll of that department, the remainder of the wages and the salary of the foreman, together with light, heat, power, insurance, etc., are added and divided by the number of cars, the quotient being in turn divided by the number of days in the month. In this way a daily overhead charge is found, which is entered in that column. The day's wages of driver and helper are also recorded. By adding all the money amounts, the total cost of the truck per day is found, and dividing this by the miles traveled, the cost per mile is obtained. Leaving the lost interest and depreciation out of consideration for the reasons of one being not a reasonable charge and the other impossible to calculate exactly in advance, the total cost of the day and that per mile are exact. At the end of the month, all columns are totaled, the form being so designed that the total miles traveled, hours out of the building, hours traveled, total cost for the month and monthly average cost per mile are especially prominent. The bookkeeper who transfers the figures from the other sheets and one who checks his work sign the record.

In New York City, the cost per mile of several concerns in the furniture-moving and storage-warehouse fluctuates between 50 and 80 cents, depending on the good care of the truck and the possibility of keeping it moving, while a horse team costs about half that per mile. If it were possible to keep automobiles moving all day, the cost per mile could be brought down to the horse figure or below it, with the result that all horse teams would at once or very quickly be supplanted by motor-driven freight vehicles.

In the furniture-moving and storage warehouse business, motor trucks have a chance of developing only one-third of their usefulness, due to the long time lost in loading and unloading them. It is in consequence of this disadvantage that the total cost of operating motor trucks averages from 50c. to 80c. per mile, while that of horse vans of about the same size and carrying capacity is in the neighborhood of 25c. or 30c. Therefore, many companies who now use automobiles only to show that they are keeping pace with the times, do not supplant the bulk of their horses, but would do so as soon as the automobile cost per mile could be brought down to the level of the horse figure.

To obtain strictest operating economy, exact records of truck achievements and maintenance expenditures are one of the best means. If the costs are dissected, it is much easier to distinguish between necessary and unnecessary expenses of maintenance than without these details on hand.

CHECKING SHEET Month of..............................191....

Day	Car No. 1				Car No. 2				Car No. 3				Car No. 4				Car No.			
	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In
1																				
2																				
3																				
4																				
5																				
28																				
29																				
30																				
31																				

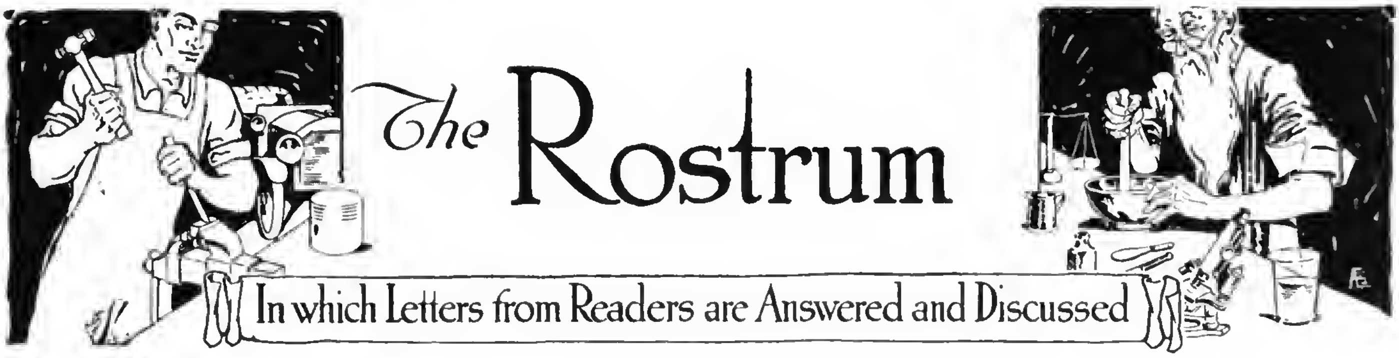
Fig. 3—Monthly truck-check sheet

CAR No.. . . .. MONTHLY REPAIR AND TROUBLE CARD Month of....................191 ....

Day	Nature of Repair	Material	$ c.	Labor	$ c.	Day	Trouble

...................................., Foreman

Fig. 4—Monthly repair and trouble card



No Clutch Adjustment on Maxwell Special—Remodelling for a Speedster—Construction of Acetylene Tank—Money for Roads—Adjusting Oil Level—Speed of Electric Vehicle Motors—Criticism of Present Day Body Design

Cannot Adjust Maxwell Clutch

EDITOR THE AUTOMOBILE:—Would you be so kind as to give me some information on adjusting the clutch on a 1912 Maxwell Special?

We have drained the oil out of the clutch box and washed it out with kerosene, thinking that possibly some of the grease from the gearbox had worked into it, but washing it out did not help matters. We find that the machine will pull all right on low and intermediate gear, but when on high, and a good stiff pull before it, the motor will begin to race and the machine will slow down.

We do not see any way to adjust the spring that holds the clutch in. Is there no way to tighten the spring up so it will throw the clutch in tighter?

New Albany, Ind. FRED KAHLER, JR.

—The 1912 Maxwell Special car used a multiple-disk clutch with a single spring upon which there was no means of adjustment. The spring was made extra heavy and it was thought that adjustment would never be required upon it. There is only one method which suggests itself outside of purchasing a new spring and that is the fitting of a collar between the spring end and the shoulder against which it rests. This would compress the spring slightly and give a stronger contact between the plates. The insertion of cork inserts in the disks would also alleviate your difficulty.

Increasing Speed of Ford Car

Editor THE AUTOMOBILE:—Please inform me if it is possible to change the gear ratio of a Ford model T in order to obtain a greater speed on level roads?

I am thinking of taking the body off, and my experience has led me to believe that a model T Ford, if the gear ratio is altered and, if possible smaller wheels put on, will attain a speed of 48 miles an hour on the level.

I should also like to know if it is feasible to alter the angle of the steering post and if a longer column could be put in. Also the approximate cost of these two alterations.

New York, N. Y. JULIAN R. SPEYERS.

—In order to change the gear reduction of the Ford model T it would be necessary to have a gear made specially. The Ford T is geared 3 3-11 to 1 on high and if this same ratio is used with 32-inch wheels and the body stripped down, a speed of 60 miles an hour is possible. In fact a couple of years ago, a Ford car similarly equipped with a high-tension magneto added made 65 miles an hour on the Brighton Beach track. It is not necessary to change the magneto.

In changing the rake of the steering column it will be necessary if you have a 1912 model or a touring model of any year, to put in a 1911 torpedo steering column. The price of the new steering column is $20.

Asbestos in Acetylene Tanks

Editor THE AUTOMOBILE:—1—What per cent. of acetone and asbestos does the Prest-O-Lite Co. use in its gas tanks to keep them from exploding?

2—Do the overhead valves (as in the Buick) give more power than the inclosed valves?

3—Do iron and steel crystallize?

Norma, Neb. ELMER S. SMITH.

—1—In the style B Prest-O-Lite tanks, which have a capacity of 40 cubic feet of acetylene gas, there are 4.5 pounds of acetone. The acetone absorbs the acetylene gas. The tanks are completely filled with asbestos and the gas is contained in the pores of the asbestos. Very little, if any, of the acetone escapes with the gas so that it is not necessary to replace much of it. The Prest-O-Lite company stencils each tank with its weight when containing the acetone and the asbestos. When the tank is exhausted and returned to the factory it is weighed and any difference in weight represents a loss of acetone because there is no chance whatever of the asbestos getting away. The empty Prest-O-Lite tanks of the style B, of 40 cubic feet capacity, weigh between 25 and 30 pounds, 28 pounds being a good average. Acetylene weighs 14.4 cubic feet to the pound, so that in the 40-cubic-foot tank the difference in weight between a filled and an empty tank is a little less than 3 pounds.

2—The advantages and disadvantages of overhead valves have often been discussed in these columns. It is generally conceded that, owing to the more advantageous shape of the combustion space with overhead valves, the latter furnishes a more powerful engine. On the other hand, motors having valves of this kind are hampered by a more complicated valve mechanism and hence one which is more difficult to keep silent. It is a matter of pick and choose and the intending purchaser will be able to listen to perfectly reasonable arguments from salesmen of both types of engines.

3—The term crystallization is rather vague, but in the general acceptance of the term in implying intermolecular disintegration under repeated shock and alternating strains and stresses, iron and steel do crystallize. There is a crystal-like appearance to a section under fracture after the elastic limit has been materially reduced.

Spark Plugs and Roads Discussed

Editor THE AUTOMOBILE:—From the number of patents for different types of spark-plugs, and the strenuous claims of the makers, it would seem the efficient spark-plug had not yet arrived. Making engine and carbureter experiments, I produced an awful fouling mixture, and using various plugs, fouled them from 3 hours' running and up until I struck the type like the sketch, Fig. 1. This type stands more oil than any I have come across. The bolt on the upper side of the shoulder or collar is wrapped with asbestos, is put into the porcelain and held by a nut on top, the asbestos fitting snugly into the taper in the porcelain makes a gas-tight fit. The porcelain is then put into the nut, the inside of the nut above the thread, has a taper, the outside face of the porcelain collar has also a taper and when they are put together make a wrapped opening. This is filled with asbestos and is then screwed into the bushing and the spark-gap adjusted.

When there is an excess of oil or fuel, from poor carburetion. there is a film of oil deposited on the walls of the cylinder, spark-plugs, etc., the flame not getting between the film and the metal surface only a portion of the outside surface is burned off, a residue remains and absorbs some of the dense smoke, etc., forming carbon deposit, making a path for more or less current and making a short-circuit.

The asbestos being a fuzzy composition has no hard surface, consequently the flame can get back of the oil film, the asbestos acting as a sort of wick, the oil is more readily burned up and keeps the asbestos clear. Since it is a non-conductor, and presents greater resistance than the spark gap, you get the hot spark by the current all going by the gap. Through time, standing, etc., the asbestos may get soaked; it can then be taken apart and new asbestos put in and is as good as a new plug.

This plug was put in oil and sparked, taken out, wiped off, put in a Ford car, and ran several weeks. It was then taken out and put in a ton truck and gave the best of service. I have repeatedly fed an excess of oil until it dripped from the exhaust pipe, but it never feazed this plug. Those who have spark troubles can verify this by giving this plug a trial. It gives a white hot spark. A blue spark indicates a short circuit needs renewal asbestos with battery. One point gives hotter spark than two or three.

The Road Question

The road question now being in the lime-light, a recent editorial in THE AUTOMOBILE made a few rather pointed remarks about the farmer. It would only be fair to get the view of the farmer. Farming is no get-rich-quick scheme. Nature has certain laws the farmer has to go by; hence he is naturally conservative. At a farmer's institute I once attended there was a speaker advocating road improvement by bond issue. He had an apathetical disinterested audience who all felt he was only the mouthpiece of monied man seeking a safe investment for surplus money (the motive and only reason for all bond issues), as bonds meant interest and interest meant increased taxes. Then a farmer got up and said, "roads were the avenues of commerce and that it was unjust to ask the farmers to bear the brunt of that commerce, and the bond issue was only another phase of the present system. There was not enough money now for a cash business and road building would be a new business. There should be new money made and suitably appropriated by the government." Instantly every farmer was a spirited and interested listener, the bond issue man alone looking cross-grained. Briefly the idea was to repeal free coinage, demonetize gold and silver subsidiary coin. The 50-cent piece was to be made of hardened aluminum, the dollars to be made greenbacks without exception; and were to be appropriated to the different states as required, as the mint was a co-operative institution. It being built by the people's money and taxes, it was operated and maintained by the people's money and taxes. Consequently the products belonged to the people, and an owner has the right to the directing of the use and disposition of his property: an unanswerable argument. In less than seventeen years the interest consumes the principal of $100 put out at 6 per cent. It takes it out of circulation, unless new money is put into circulation by the government (no loans); property has to be taken for the principal. This leads to concentration of wealth and no money in the hands of the common people—the trouble with the road question today.

The enormous invested capital of the United States demands such government appropriation to check the ever-increasing concentration of wealth or else abolish interest entirely by establishing government banks or chaos, the lop-sided agitation of government reform, of socialists, prohibitionists, single taxers, etc., adding to the confusion. The assumed privileges of immense wealth is creating such disrespect of law that there is danger of realizing Abe Lincoln's prophecy, the life of the Republic meeting the fate of the ancient Roman empire.

Transcontinental Pike

Take, for instance, the transcontinental pike movement; consider it a moment. Isn't it a thing of great national interest and benefit? Why build it by subscription? Isn't that a retrograde movement? From civilization, organized ability to individual effort like primitive man, the very suggestion seems to savor of hasty impulses, a sort of a lack of comprehension of governmental prerogatives and a magnitude of intellectual decline.

Why not make use of the years of learning and experience and go at it with the organized ability of unlimited government resources and build such a road of efficiency and durability that future ages would point to it as a great feat of accomplishment? Why not assume your sovereignty, instruct your hired men—Congress—to authorize the making and appropriate the amount of greenbacks for the construction of a road of minimum grades and curves, a solid foundation, surfaced with the best vitrolized brick or the best material that science could produce—an ocean-to-ocean road, 100 feet wide, no difference what the cost, whether $50,000,000 or $100,000,000? The mint is there, the operators are being paid, and it is not going to increase cost to turn this money out. We would then have grand roads, and no individual, however humble, would feel an oppression of the burden to the weight of a hair, while it would put money into the hands of the common people who want automobiles and so stimulate the trade that it woud dispense with the present style of strenuous advertisement of the makers and enable them to view Judgment Day with greater equanimity.

If any Pennsylvanian thinks the statement disrespect for law or a pipe-dream he has only to get a copy of his State's constitution and Webster's Unabridged Dictionary to brighten up his so-called education. Read the first article of that constitution, take his dictionary and get the literal meaning of the words used and he will see that the law practically says that a man who discredits time-honored custom and buys an automobile—the deadly menace to life and society—is an anarchist, imposes an annual fine on him, gives him a number as a ticket-of-leave man, scorning the custom of his forefathers—human locomotion by two legs. He must be tabulated like a prize dog at a poodle show or forfeit his liberty. Yet autoists generally considered as representing the better class submit with the same docility as any other boob. The ignorance of the money question is the barrier to civilized motoring. It will require a fine, more subtle knowledge than of the motor, ere realizing Bobby Burns' "Man to man will brother be for a' that."

Bradenville, Pa. JOS. MUNDEN.

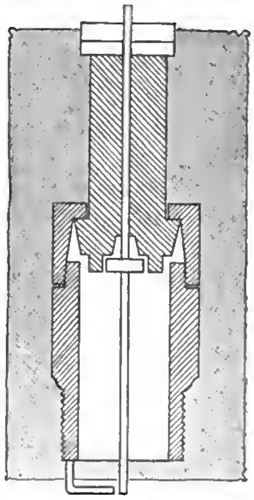


Fig. 1—Type of plug said to possess non-fouling qualities, owing to its method of construction and the material used in making different parts

Fan in Intake Manifold

Editor THE AUTOMOBILE:—Please state the advantages and disadvantages of a revolving fan in the intake manifold. Will it prevent the motor from getting a full charge of gas on high speeds with the throttle wide open?

Ithaca, N. Y. R. A. FREAR.

—It is generally the opinion that the revolving fans or other devices in the intake manifold do decrease the volumetric efficiency of the motor to some extent by increasing the friction in the manifold and hence cutting down the amount of charge entering the cylinder. When the carbuetion is poor and the atomization of the fuel is bad, the fan or other device will act to break up the globules. In other words a device of this kind will help out a poor carbureter by breaking up the fuel. The decrease in volumetric efficiency is a slight consideration because the motor is seldom run at the full power and the difference would not be noticeable. It must be remembered that only a comparatively low horsepower is used on the road.

The difficulties of good carburetion are increased because of the low grade fuel now on the market. With .58 gasoline we cannot get the same rapidity of vaporization as we could with .65. When the motor is running very slowly, it is hard to break this heavy gasoline up into a fine spray and it is also very hard to vaporize it perfectly. Under these circumstances the fan or other device in the intake manifold will do its best work and give the most beneficial results.

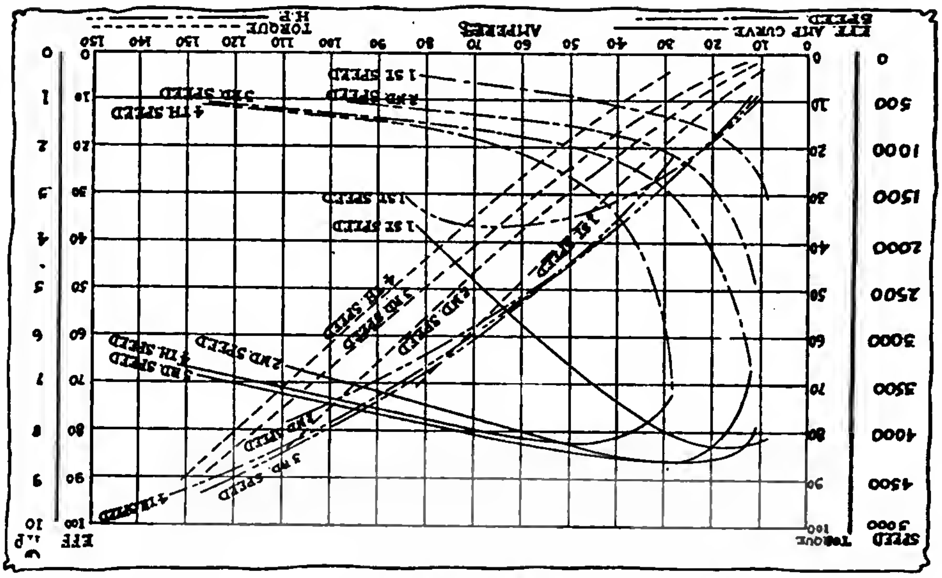


Fig. 2—Diagram showing the performance of the Rausch and Lang electric motor and car at different speeds

Dip of Splash Lubricating Scoops

Editor THE AUTOMOBILE:—1—About how much dip would the scoops have in the oil of a motor, four-cylinder, four-cycle, 2.5-inch bore, 3-inch stroke, same classed as high-speed motor, using a vacuum splash system of oiling?

2—What is the gear ratio of the Ford model T, 1912, 1913?

3—What motor did the Hudson company use in the "33" model?

4—What motor does the Dorris use at the present time? Is it their own?

Fairfax, Mo. A. L. CARTER, JR.

—1—The dip of the connecting-rod scoop should be 1-8 inch.

2—The gear ratio is 3 3-11 to 1 for both years.

3—The Hudson company used their own design of motor. No other concern uses the same design.

4—The Dorris company uses their own motor. It is of the valve-in-head type with the cylinders cast in pairs.

Information on Electric Vehicles

Editor THE AUTOMOBILE—Will you kindly let me have the following information in reference to the motors used on electric cars?

1—Name the revolutions per minute at the different speeds from 4 to 25 miles per hour. State the amount of current consumed in amperes at these speeds.

2—What is the type of motor used; also the voltage at which the motor is run?

3—The capacity of the batteries, volts and amperes.

Newark, N. J. EDWARD FALK.

—The answers to the questions you ask would vary for different makes of vehicles. A few representative makes are considered and the answers as applying to them are given herewith under the name of each vehicle.

Anderson

1—Speed and revolutions of the car and the motor are given in the following table:

Controller Position	Miles per Hour	Revolutions per Minute of Wheel	Revolutions per Minute of Motor	Current at Volts	
2	8	79.1	389	10	40 volts
3	13	128.6	633	18	40 volts
4	17	168.1	828	30	80 volts
5	20	197.8	972	39	80 volts

2—Part of this question is answered under answer 1, as regards the type of motor; this is of the straight series wound type.

3—With lead battery 140 ampere hours, Edison battery 100 ampere hours. The gear reduction is 1:4.92.

Argo

1—The Argo car is geared so that the motor turns 77 revolutions per minute for each mile an hour of the car. This gives the following results:

4 miles per hour— 308 revolutions per minute.
10 miles per hour— 770 revolutions per minute.
15 miles per hour—1150 revolutions per minute.
20 miles per hour—1540 revolutions per minute.
25 miles per hour—1920 revolutions per minute.

The current drawn from each cell of battery for the above speeds will be as follows: 20, 20, 25, 38 and 55 amperes, respectively.

2 and 3—The motor is of the four-pole series wound type, operating at 80 volts, and the rated capacity of the storage battery is 138 ampere hours; and we have found in our car, will average from 160 to 180 ampere hours in normal city running.

Borland-Grannis

1—The number of revolutions per minute at different car speeds from four to twenty-five miles an hour is best answered by stating that the motor which issued is rated at 1200 revolutions per minute, and at this rate at four miles per hour, the revolutions per minute would be about 55.5, and at twenty-five miles an hour, 1387 revolutions per minute.

2—The winding of motor is series-parallel. The voltage of the motor is 85.

3—The capacity of storage battery in ampere hours is 112 for the 40 cells of 9 M. V., and 137 1-2 hours for 40 cells of 11 M. V. Hycap. These two battery equipments are optional in most of our models.

Brock

1—Revolutions per minute at 25 miles an hour is 1711.5, and reduction of speeds is correspondingly, that is, at 5 miles an hour, which is one-fifth of 25 miles, will be one-fifth of the revolutions per minute, or 342.7. Other speeds, of course, are in proportion.

2—Type of winding used on motor is shunt. Voltage of motor, 80 volts.

3—Capacity of storage battery in ampere-hours; 137 1-2 ampere hours, and capable of giving even better under right conditions. The performance of the car is as follows:

Speed	Revolutions per Minute	Miles per hour	Current Consumed	Watts Consumed
5th	1708	25	45 amperes	3600 watts
4th	1400	21	30 amperes	2400 watts
3d	1116	16	20 amperes	1600 watts
2d	686	10	15 amperes	600 watts
1st	350	5	10 amperes	400 watts

Church-Field

1—The revolutions per minute at any speed may be deduced from the fact that the reduction from motor to wheel is 4-1 on direct and 8-1 on low gear, and the diameter of the wheels is 36 inches. This gives 34.3 revolutions per mile an hour.

2—The motor is series wound and the speed is controlled by a variable shunt resistance connected across the field terminals. There is no fixed current at any given speed of motor, i. e., at 800 revolutions per minute the motor might draw 22 amperes or 200 amperes, depending upon the amount of shunt resistance in circuit and torque required. A speed curve for each point of control would be necessary to answer this question. The motor operates at 48 volts.

3—204 ampere hours at 40.8 amperes is the battery rating.

Ohio

1—The motor revolves 160 revolutions at 4 miles per hour; 1000 revolutions at 25 miles per hour. The current consumption, 30 amperes at 810 revolutions 75 volts.

2—The motor is a series wound motor. Voltage of motor 75.

3—Battery capacity in ampere hours is 178.5.

Rausch & Lang

The number of revolutions per minute of the motor may be found by multiplying the miles per hour by 88. Thus at 10 M. P. H. the motor speed is 880.

The motor is over wound and has a set of small shunt coils used to get the electric braking effect and to get a steep torque curve on the high speed position.

The current consumed at various rotative speeds can best be got off the accompanying curve, Fig. 2.

The motor is wound for 80 volts and is used on 40, 41 and 42-cell equipments of 11 M. V. Hycap batteries or their equivalents.

Criticism of American Body Design

Editor The Automobile:—Within the last few years great improvements, both in comfort and appearance, have been made in American motor car bodies. When compared with the latest foreign products, however, the stock bodies fitted on 1913 models by some of our foremost car manufacturers leave much to be desired. It may be maintained that this is but natural, considering that abroad almost all high-class firms have the body work built for their cars by specialists.

Manufacturers of high-grade American cars would be even more successful in competing with the foreign product on home soil if they gave more attention to coach work. At present an owner who wishes a presentable open touring body has to scrap the stock body (or is allowed a ridiculously small allowance for it) and sends the chassis to a coachbuilder to whom he has to pay from $1,200 to $1,800. If the manufacturer would only collaborate with a good body builder and give the purchaser some latitude in regard to his personal desires, the resulting body would be just as comfortable and pleasing to the eye as one built to order.

One of the most obvious points in designing a touring body is the desirability of merging the hood into the body. Yet, how many products of our high-class firms embody this feature? In almost every case we find a sharp line of demarcation between the hood and the body, either as a dashboard exposing an ugly reveal above and on either side of the hood, or as a convex cowl, serving equally well to destroy the smooth sweep from fore to aft so essential to beauty. When will more American manufacturers learn that the smooth and easy transition between hood and body can be effected by tapering the hood and properly treating the dash?

In very few cases is the projection of the top in front of the windshield sufficient. As a rule there is a space between the windshield and top just large enough to allow the rain to drift in and thoroughly wet the occupants. When certain tops are up, it is dangerous to enter the front seat, as one's head is almost certain to come in violent contact with the strut running from a point about half way up the vertical post to the front of the top.

Much has been done recently towards clearing up the running boards and not making them the receptacle for tool and battery boxes, luggage, generators, gas tanks, etc., but there still is room for improvement in this respect. If spare tires must be carried on the running board why are they not sunk several inches in it, so that they will not project above the sides of the body, thus impairing the appearance of the car?

Among the popular double-compartment limousines there are many examples of poor design. In the first place the sudden transition between hood and body produces an even more unpleasing effect than in an open car. Also many of these limousines resemble two independent bodies joined together. This peculiar broken appearance is due largely to the fact that the window-sill line is not carried on the same level throughout, being lower around the front seats than the rear compartment. The whole effect is singularly ponderous, many of these bodies looking as if they weighed tons.

Perhaps the most important novelty in coachwork disclosed at the motor-car shows held this season was the single-compartment body or, as it is generally termed, the sedan. Since this is perhaps the most difficult type of body to design it is not astonishing that very few satisfactory examples have as yet been produced in America. In many cases a compromise between the true single-compartment body and the limousine has been attempted with rather unhappy results. The body illustrated herewith has no partition between the driver and passengers.

One of the objects in designing this body was to reduce the wind resistance as much as possible. To this end the cowl dash forms a continuation of the bonnet, there being no reveal whatever on either side of the hood. The upward flare of the dash, the downward sweep of the roof and the narrowness of the body in front leave very little surface normal to the direction of travel.

The shape of the rear which is almost semi-spherical, reduces the vacuum behind the car, thus minimizing the dust. A segment of the back swings open, giving access to a circular recess for the spare wheel. This arrangement is ideal as the extra wheel is completely protected from the elements and does not mar the appearance of the car.

Some of the dimensions given in inches are as follows:

Wheelbase	136
Ground to top of frame	24
Width of frame	36
Dash to back of frame	108
Dash to front of forward seats	29
Depth of forward seats	17
Back of forward seats to front of rear seats	27½
Depth of rear seats	19
Height of all seats from floor	13½
Height of body, inside	56
Width of doors	24
Height of doors	51

New York City. John Jay Ide.

A Mistake in Mathematics

Last week The Rostrum published a letter signed by E. W. in answer to which it was stated that the speed of two similar cars would vary as the square of the wheel diameters. This should have read, as the wheel diameters. The car with the 34-inch wheels would travel 1.0625 times as fast as the car with the 32-inch wheels.—Ed.

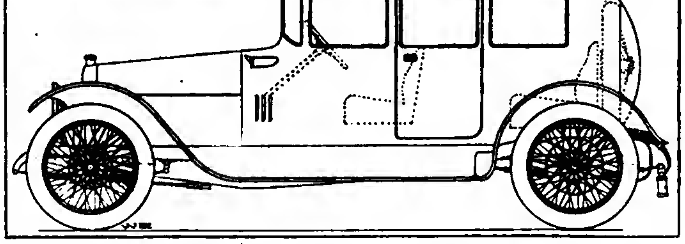


Fig. 3—Suggested lines of a single compartment car with body designed for minimum wind resistance

Dynamometers vs. Road-Testing

Metropolitan Section of the S.A.E. Hears Paper Read by P. P. Dean on Laboratory Chassis Testing Methods and Apparatus

NEW YORK CITY, April 24—At a meeting of the Metropolitan Section of the Society of Automobile Engineers held here, P. P. Dean, of the Diehl Dynamometer Mfg. Co., read a paper on Chassis Testing Apparatus. The idea of the paper was to bring out discussion which would shed light on the possibilities of supplanting a large part of the road testing by stationary work. Many of the small towns about Detroit are passing laws forbidding the cars of the testers to pass within their corporate limits at high speed and the work of the testers is hampered at all times by legal processes. Mr. Dean said in part:

The commercial testing of the finished chassis whereby accurate measurements may be taken seems to have received very little attention in this country, many engineers being of the opinion that it is unnecessary to keep any records or take any such measurements.

Road Test Is Not Sufficient

It is claimed by some that a good road test cannot be improved upon, such a trial providing all conditions that a car in actual use will meet, but I believe that the time has come to look more closely into this, both from a technical and commercial standpoint.

While the majority of engineers admit the stationary test to be ideal, supplemented, of course, by a short road run, they claim that the price of a good rear wheel equipment is against manufacturers adopting them in sufficient quantities to eliminate road testing altogether, and there is not to my knowledge a single concern offering a real good and complete commercial equipment for rear wheel testing at a reasonable price.

The advantages claimed for stationary over road testing are:

1—Actual measurement of horsepower at rear wheels. Loss in drive from wheels to brake is negligible and cannot be readily separated.
2—Speed in miles per hour at any load may be measured, also revolutions of engine.
3—The chassis may be loaded to its maximum capacity, both in horsepower and speed, a limit of say 70 miles per hour being established on account of the speed of the driving chains.
4—The maximum power available may be absorbed through either first, second, third or fourth gear and reverse, through any length of time.
5—Transmission gear may be noted under full load operation as to noise, lubrication, ease of shift, etc.
6—The slightest increase or decrease in power developed, by carbureter adjustment, may be easily noted on the horsepower motor, while running. This also applies to spark setting, and is important.
7—Actual effect of muffler cut-out.
8—Actual load, speed and time of test, limited only by ability of reciprocating parts to stand strain.
9—No abnormal road speed necessary, therefore possibility of speed fine eliminated.
10—One operator can test four or five chassis at once and keep accurate record of every measurement.
11—Actual consumption of gasoline under any condition may be ascertained.
12—No tire expense.
13—Every important part except springs may be watched under full load conditions. Complete record on file for reference or prospective purchaser.
14—The above mentioned observations may be made when using an electric cradle dynamometer, some modification being necessary in the event of a water brake being used to absorb the power.

Now that some of the many possible measurements and facts which can be actually ascertained have been enumerated, the question arises of just how much of this information is really required, and in view of the fact that the road test has been used continually since the beginning, it seems hardly probable that engineers will sink a fortune in testing stands without first being confident of a substantial saving or gain in another direction.

If stationary tests are to be adopted in place of the usual road trials, at least a dozen equipments would have to be installed, but this number would, of course, depend upon the factory output, so that first cost of the installation is a considerable item. The kind of apparatus would depend upon the accuracy of the measurements required, *i. e.*, if actual rear wheel horsepower is desired, either an electric or hydraulic dynamometer is required, and even then the driving chain loss cannot readily be separated.

A fair comparison of the cost of the three methods mentioned of a single equipment designed to take care of 50 horsepower at rear wheels would be as follows:

Hydraulic dynamometer dynamo	$ 900.00
Electric dynamometer	1,400.00

Including all speedometers, measuring instruments and chains but without stands and universal joints.

Against this first cost recognition has got to be taken of the saving of time effected, saving of tires, quality of the results, and facilities for observations not possible while he car is in motion.

The apparatus described by Mr. Dean was illustrated in THE AUTOMOBILE for March 13.

The discussion on the paper did not bring to light any new facts, the attitude of the members showing some skepticism as to the value of a laboratory test as compared to an actual test on the road. Morris Machol asked if the racking and twisting strains on the chassis and its consequent effect on the running gear of the car could be duplicated in such a test.

Mr. McMurtry stated that the value of being able to make the proper carbureter adjustments and ignition, timing, etc., would be great in an installation of this kind. He estimated that 60 per cent. of the road tests could be eliminated.

Professor Marshall stated that one of the great drawbacks in the laboratory methods of testing was the fact that the wind resistance was not taken into account and that this could amount to as much as 20 per cent. at the higher speed of the total resistance of the car. The losses through the tires also are an important factor and cannot be gauged by a chassis testing outfit.

English Trucks May Transport Gasoline

LONDON, ENG., April 22—It was 3 years ago that the Home Office Departmental Committee appointed to inquire into the sufficiency of the regulations relating to the storage of gasoline and the conveyance of it in bulk was issued. In this report the committee recommended that all road tank wagons for the conveyance of gasoline should be horse-drawn. Acting upon later evidence, however, the committee have just published their final report, in which it states that mechanically-propelled wagons should not be prohibited, providing that they are properly constructed for the purpose, and built to regulations.

Whether the recommendations should prove to be any benefit to the motorist if carried out seems doubtful, for there are no measures recommended that will tend to reduce the price of the spirit. With regard to the prohibition of tank steamers to proceed above Thameshaven, by the Port of London Authority, the committee find no reason for this attitude, which does undoubtedly affect the price of imported gasoline as much more handling than is necessary takes place, which only means expense, and should the boats be allowed to travel further up the Thames before unloading the spirit it would greatly facilitate distribution, and have a tendency to reduce the price.

Resuscitating a Dead Storage Battery

Sometimes the Generator Is at Fault—Investigate for Imperfect Switches, Sockets and Wiring—Use Plenty of Distilled Water

CLEVELAND, O.—Editor THE AUTOMOBILE:—The almost universal adoption, by car manufacturers, of electric lighting and starting systems, has necessitated the use of storage batteries to an extent never before reached.

The storage battery, properly handled, is a most efficient and uncomplaining servant, but like a good watch or any piece of machinery, it is neither trouble nor fool proof and will suffer from lack of care or unintelligent handling.

Storage battery ailments are very few, but as the most annoying one is a so-called dead battery; the following instructions for its resuscitation may prove of benefit to users:

Should your battery become dead, first ascertain if the generator is putting up its proper amount of current; a storage battery is not a creator of energy and depends for its supply upon the generator, which is driven by the engine.

If you find your battery dead at any time, introduce an ammeter in the battery circuit and see how much current is being delivered by the generator at different speeds—8, 12, 16 and 20 miles per hour. A generator properly built will furnish at least 10 amperes at 12 miles per hour. If you are only getting 7 amperes at this speed the generator should be adjusted to give its full output.

When a storage battery is allowed to fall behind, it will not store the energy supplied by the generator even though the latter is giving its output, for the reason that the battery has gotten into a stale condition and does not properly take a charge.

If investigation shows that the generator has not been giving its rated output, and the battery has fallen behind, it should be taken to a garage and charged according to directions given on the battery name plate. Adjust the generator so that it delivers the output claimed by the manufacturer of the car or generator; put the battery back into service, and, as long as the generator gives its output there will be no lack of light or power for starting.

Value of Ammeter on Dash

Some manufacturers furnish with their apparatus, an ammeter, which is placed on the dash of the car and shows the amount of current passing into the battery. This is very desirable as it indicates whether there is any interruption of current due to any cause whatever and also whether the generator is giving its full output.

Some manufacturers leave this instrument off the car as a matter of economy, but it will be readily understood how valuable this kind of an instrument is when consideration is given to the fact that a battery may become dead and possibly ruined by lack of knowledge of conditions existing in the generator.

Faulty lamp sockets may also cause a storage battery to lose its current. After proceeding as above, if the cause of your trouble has not been located, examine your lamp sockets and look for looseness and poor contacts, which should be corrected at once.

Investigate the switches in both the lighting and starting circuits and make sure that they return properly to the "Off" position when current is not being used.

Ascertain whether your wires are in good condition. Look for places where the insulation may be worn off from friction, where wires rub against the frame or other metal parts of the car.

Inspect your lamps to determine whether or not your battery is overloaded. The total candlepower of lamps used should be in proportion to the capacity of the battery and if you are using more than you should, get lamps of the proper candlepower.

All parts of your lighting and starting systems being right, remember that if you operate your car mostly at night, when lights are all on, and very little in daytime, you are not giving your generator opportunity to do its work and a dead battery resulting from this cause shows no fault either in generator or battery. To avoid this condition when car is used mostly at night, economize on your lighting when possible and run your engine a while each day to fill up the battery.

Last, but not least, don't neglect keeping your battery well filled with distilled water. Remove vent plugs once a week and see whether plates are covered with solution to the depth of at least 1-2 inch. If not, add pure water, never anything else. This is important, as nothing will more certainly insure loss of capacity and final ruin of a storage battery than allowing the plates to become dry.—C. BARRELL, Willard Storage Battery Co.

Detecting Resistance—Saving Fuel

(Continued from page 939)

The curves B, C and D show the increased resistance offered by 5, 10 and 14 per cent. grades.

The vertical distance between the curves (A) and (1) shows the capacity of the motor to accelerate the car on a level road. At 20 miles per hour the motor can exert at the clutch a force equivalent to 147 pounds per ton, which will produce an acceleration of 2.37 feet per second.

At 40 miles per hour the acceleration will be 1.36 feet per second.

If the car begins to ascend a 5 per cent. grade the force available for acceleration will be reduced by the force necessary to mount the grade. As this is 100 pounds per ton, the force available at 20 miles per hour will only be 47 pounds, which will produce an acceleration of 0.75 feet per second.

The acceleration decreases with increased speed until the resistance and torque curves cross, when the car will run at a uniform and maximum speed.

Thus on the fourth speed the maximum velocity will be between 50 and 55 miles per hour on a level macadam road.

The maximum speed obtainable on a 5 per cent. up grade is 37 miles on fourth gear. The maximum grade surmountable on the fourth gear would probably be about 7 per cent. and that at a speed of 15 miles per hour.

Shifting gears to third would raise the accelerating power at 15 miles per hour on a 7 per cent. grade. The power at the clutch would be increased 150 pounds per ton—a large enough amount to accelerate the car 2.4 feet per second.

The speed of the car could be increased to about 35 miles per hour on this gear and grade.

On a 10 per cent. grade the resistance curve (C) for this grade crosses the third speed torque curve at 31 miles per hour, which will be the maximum speed obtainable at that gear ratio and power.

By drawing the resistance curve for any grade whatever we can determine what gear can be used on this grade and what will be the probable limit of car speed.

(To Be Continued)

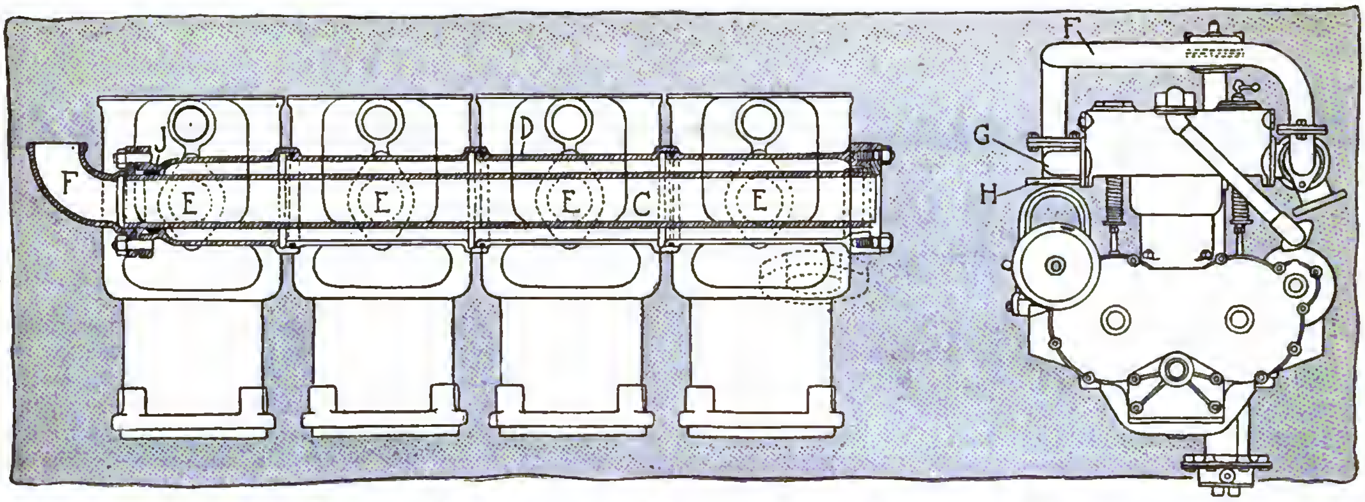


Fig. 1—Elevation and end view of engine fitted with the White and Poppe paraffin system

Paraffin as a Fuel

Heat Necessary To Make Vaporization Sufficiently Complete

THE chief reason why paraffin cannot be used in ordinary motor car engines with existing carbureters is that considerably more heat is required to convert the paraffin into vapor than is the case with gasoline. The same applies in a smaller degree to benzole and other fuels heavier than gasoline but lighter than paraffin, although many gasoline carbureters can deal with these fuels, but not with paraffin unless this is mixed with a lighter fuel.

In the White and Poppe system, which is illustrated in Fig. 1, an ordinary White and Poppe gasoline carbureter is arranged, delivering the mixture through an elbow to the vaporizer pipe C. This passes through the exhaust branch D, to which the exhaust gases are admitted from the cylinders through the four openings E. The fresh gas passes out from the vaporizer tube C by the pipe F to the ordinary induction pipe G, which is arranged in this case on the opposite side from the exhaust branch, and is often fitted with an additional carbureter which is bolted up to the flange H. The supplementary carbureter which is attached at H supplies the inlet pipe with gasoline vapor in the ordinary way, the carbureter A being used for paraffin.

To start up, the gasoline carbureter is used until the vaporizer is sufficiently heated. It is not essential that there should be two carbureters, as one single carbureter can be used, being first supplied with gasoline and then with paraffin. On one car fitted with this system, of which I have had a little experience, the gasoline carbureter was shut off after 2 or 3 miles running, and the paraffin carbureter was then used. By this time the vaporizer was sufficiently hot to gasify the liquid paraffin. As far as one could tell, precisely the same results were obtained with paraffin as with gasoline, and this system is being used on Dennis motor lorries as well as on certain private cars. It is applicable in different ways to suit different types of White and Poppe engines.

The manner in which the objections referred to are overcome is somewhat ingenious. It will be noted that the walls of the vaporizer pipe C are very thick, and the pipe is made of some metal of high heat conductivity, such as copper, and is rigidly attached at one end and held in an expansion joint J at the other. This thick copper tube is therefore free to expand, and, being thick, it retains the heat a considerable time, so that when once heated up the engine can be run slowly for long periods without failure of the vaporizer. Similarly, if the engine be

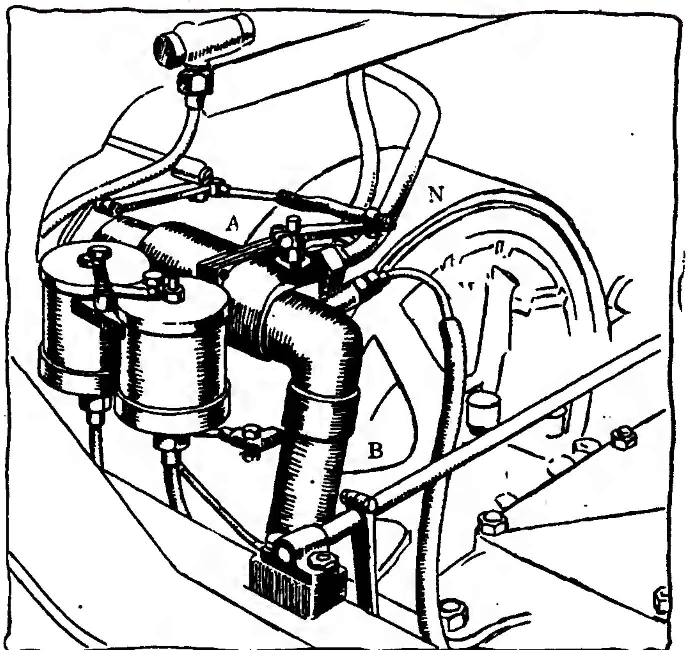


Fig. 2—Carbureter mounted behind flywheel; N is moist air pipe

raced for any length of time the thick copper pipe does not become excessively hot near the exhaust ports E, and firing of the paraffin vapor is prevented.

I have been afforded an opportunity of examining the condition of the pistons and valves of a 28-horsepower Dennis lorry to which the device is fitted. The valves after 1,500 miles running showed no signs of pitting, and the valve heads and piston heads were covered with a slight deposit of fine soft carbon quite different in texture from the usual thick, hard, caked carbon experienced after running on gasoline. The interior of the main supply pipe running through the heater was quite clean, and the oil which had been drained from the crankcase had no smell of paraffin.

It is possible to start without the use of gasoline, as openings are made in the exhaust branch so that a lamp or heater can be used to warm the vaporizer.

Another system is the Halliday paraffin carbureter, which is handled by the Winchester Carbureter Co., 11 Gresham street, London, E. C., and is arranged in a somewhat similar manner to the White and Poppe, but differs in many respects. Fig. 2 is a typical illustration taken from a demonstration car which has been running successfully for many months. It will be seen that the carbureter is arranged just behind the dashboard, and is supplied with hot air from the exhaust box by the pipe

B. It delivers its mixture into a vaporizing tube contained within the main exhaust branch, and the vapor passes off by a vapor pipe to an induction pipe on the other side of the engine. Just before the gas enters the induction pipe it has added to it a small quantity of moist hot air, which is supplied in a manner described hereafter. The carbureter is provided with two float chambers fed with gasoline and paraffin respectively, and from these either fuel is supplied to a jet nozzle which stands vertically in the spraying chamber. A two-way tap beneath the jet nozzle controls the feed of fuel to the jet. Surrounding the choke tube is an automatic air inlet valve and a slow-running by-pass is used, these parts being substantially such as are used in ordinary gasoline carbureters. The lever controlling the two-way tap is coupled to a corresponding lever on the spindle of the water tap. This tap controls the admission of water from the water inlet pipe M to an ordinary jet nozzle. Around this jet nozzle air is drawn from the hot-air pipe passing out through the moist air outlet N, shown in Fig. 2. The quantity of moist air is exactly controlled by the lever which is coupled to the main throttle lever, so that as the throttle is opened more moist air is supplied, and *vice versa.* The control of moist air is, therefore, automatic, and follows the movement of the throttle, and the turning on or off of the water is coupled with the manipulation of the two-way tap. When gasoline is used the water supply is cut off, heing supplied only with paraffin.

The vaporizer itself is of rather peculiar construction. At each side of the vapor pipe is provided a rib which forms a partition preventing the passage of the exhaust gas from one side of the pipe to the other except through the cross tubes. These cross tubes are arranged spirally, and they taper throughout their length. In the vapor pipe they constitute a spiral baffle which breaks up the gas as it passes through the vaporizer, so that ample heating is obtained at low engine speeds.

Those who have had much experience of paraffin in ordinary vertical engines have probably found trouble with their main engine bearings. In fact, with the two-stroke engine referred to three months' running was sufficient to wear out a big end bearing. The reason for this may be that during the last few revolutions, after the engine is switched off, paraffin is drawn into the cylinder, and, as the engine cools down, this condenses and travels down past the piston, and on its way washes away the cylinder oil and on its arrival in the crank chamber it dilutes the oil there and causes the bearings to be scored. Unless provision is made to cope with this, much trouble is liable to be experienced in vertical engines. To prevent trouble from this cause I generally finish the running on gasoline, so that 3 or 4 minutes before I stop the engine I change over from paraffin to gasoline.—From *The Autocar.*

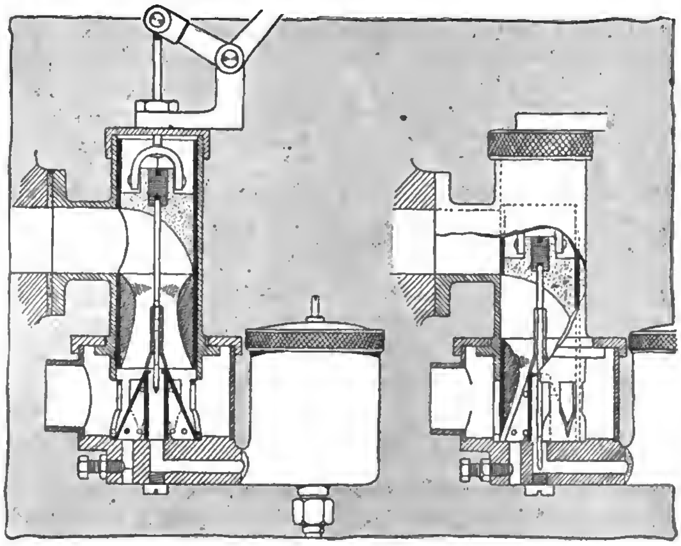


Fig. 3—Part sectional views of Cox carbureter, left with throttle open, right with throttle closed

Cox Carbureter Out

Has Single Jet and Positive Mixture Regulation

A SIMPLE single-jet carbureter has been brought out by Arthur Cox, of Birmingham, England, which has many novel features of construction to recommend it to the student of carbureters. It may be said to consist of an L pipe with a jet in it. The jet takes the form of a .25-inch tube with a cap having an orifice of about .125 inch. Into this orifice a taper needle is entered and withdrawn as the throttle is closed or opened. At its closed position there is still a small annular space between the needle and the side of the jet orifice and, of course, as the needle is raised the area of the orifice and, consequently, the supply of gasoline is increased, Fig. 3. Round this jet is a series of air ports having taper bottoms which are not sharp V-tapers, but slightly curved, and these ports are opened or closed as the needle is moved up and down in consonance with the opening or closing of the throttle. The throttle consists of a tube with a curved passage in it, this passage registering with the inlet pipe. The tubular throttle, further, carries the needle for the jet, and as it is raised or lowered, *i. e.,* opened or closed, it also opens or closes the air ports. When the throttle is fully open the needle is raised high in the jet and the air ports are also wide open, and it will be seen that on full throttle the carbureter is of the most open type, providing a perfectly free passage for the air, both before and after carburetion, into the engine.

Low Speed Provided For

This kind of carbureter is well known to be satisfactory for high speeds and full power, but it is difficult to get easy starting and good slow pulling with it, and the way Mr. Cox has overcome the difficulty is as ingenious as it is simple. In the slow running and starting position the throttle is practically closed, the air ports are closed all but a fraction, only just the fine point of the V being open, and the needle is well into the jet orifice, so that the annular space between it and the jet orifice is very small indeed. It will be noticed that around the jet tube is a petticoat, or cone, in which some small holes are bored, and there are holes beneath it through which air is drawn, in addition to that passing through the tiny apertures at the bottom of the V-slots. The larger of these under holes can be adjusted by means of a bolt and nut, so that the adjustment can be set for slow running.

The throttle is formed in one piece with the choke tube, and consequently the latter moves up and down with it. In the slow-running position, therefore, the most restricted diameter of the bore of the choke is at the same level as the top of the jet, so that the negative pressure is maintained despite the throttle closing and the resultant loss in engine speed. At the other extreme, *i. e.,* full throttle, the choke is raised high and the top of the jet is in the largest diameter of the choke tube, as shown in the left-hand view.

It will be realized that at all times the gasoline issuing from the jet is of annular form—that is to say, it takes the form of a very thin-walled cylinder, or pipe, of gasoline, and, the clearance between the needle and the jet being infinitesimal in the starting or nearly closed position, the atomization is remarkably good, besides which the suction on the jet is very strong, so that plenty of gasoline is obtained for starting, slow running and acceleration.

It will be noticed on studying the drawings that the carbureter has been designed to provide the minimum of resistance to the passage of the air and carbureted air through it; indeed, all its proportions are the result of patient experiment.—From *The Autocar.*

American Automobiles in World's Markets

Latest Consular Report Shows Low-Priced American Car a Fast-Growing Favorite in European Countries—Best Exporting Methods for Manufacturer Outlined

A SECOND special consular report in the form of a supplement to that issued last summer under the title of Foreign Markets for Motor Vehicles has just been issued by the Department of Commerce and Labor at Washington. The first of these publications was dealt with in THE AUTOMOBILE for August 22, 1912. All the separate reports from the various countries received since that time have been incorporated in the booklet just brought out under the title of Development of Motor Trade Abroad.

The reading matter contained is of great interest and should prove of exceptional value to the American manufacturer who wishes to obtain accurate information relative to the conditions of trade and other requirements of contemplated fields for the exploitation of his product.

Figures dealing with the number and value of the imports into each country are included in the separate reports and although those for the year 1912 are not yet available except in one or two cases, the statistical information given, covering generally the last 2 or 3 years, is sufficient to furnish a useful indication of the most profitable market for exported automobiles.

Cyclecar Possibilities

One of the chief foreign markets for low-priced American automobiles is the United Kingdom. This year a prominent feature of the British report is the amount of space devoted to the new light vehicle termed the cyclecar, the manufacture of which is already an industry of considerable importance in England and in one or two other European countries. It is suggested that it may be practical to meet the British demand for these cars by producing an American vehicle of the same type. Cyclecars are built with three or four wheels, with a track of 36 to 40 inches, and as a general rule are two-seaters, though there are a few carrying three or four passengers. The narrower gauge cars are built to carry passengers tandem, but those in which the passengers ride beside each other have been most favorably received. The fact that these vehicles can be run cheaply is a point in their favor that is having far-reaching results, and the indications are that the demand is growing at a faster pace than the production. The average price is around the $500 mark or slightly above.

The motorcycle, too, is a thriving industry in Great Britain and there seems to be no reason why an increased market should not be created for high-grade American motorcycles provided they meet the English demand as to type, construction and price.

Requirements

But while the use of these smaller vehicles may be worthy of some consideration by the American manufacturer, naturally the chief interest of the booklet centers on the progress and prospects of exported passenger cars. American exporters of automobiles have established firm trade connections with several foreign markets, and have overcome, by the excellence of their product, the conservatism which was a feature of the European attitude a few years ago. But if these excellent beginnings are to be maintained, a close study of the special requirements of the foreign markets must form part of the exporter's policy. Some valuable suggestions, gathered from the several consular reports as well as from his own individual observation, are given by the consul-general. These include the following:

The personal visit of some responsible member of the exporting firm is necessary to the establishment of a successful agency in Europe. It is not sufficient to send a subordinate except to collect preliminary information.

2. There must be a complete stock of parts available and facility for quick supply and repair, as our cars are in direct competition with foreign cars, for which spare parts can be had in a few days in any part of the continent.

3. It is essential that the exporter show a real economy in the operation of his car, because of the vastly higher price of gasoline in Europe. It appeals to the thrift of the average foreign buyer, and is the foremost claim that can be made for any car in the first stages of its introduction.

4. It seems desirable to concentrate efforts on a smaller number of cities than is becoming the custom of some manufacturers. Where countries are small and populations compact, better results will be attained by a general agent in each commercial capital. Some countries require more than one agent because they have more than one capital. This is true of Italy and Germany but not of France, where Paris is the natural center from which the entire country may be covered.

5. Exported cars must have a high degree of durability. It is not the habit of the Continental buyer to get a new car every season. In time some arrangement could be made for the exchange of old cars for new, as is done by European makes. But in general the European buyer runs his automobile much longer than is the rule in America.

Following are brief digests of the reports from each of the countries which are considered in this comprehensive booklet.

United Kingdom

The extensive sale of American cars is still a much-talked-of subject in English automobilism, but several British experts now acknowledge that the introduction of the American product has not only stimulated the home manufacture, but has also extended the entire market considerably. The manufacture of low-priced cars here is undoubtedly due in a large measure to the American initiative. Durability is to be insisted on. The slightest deterioration in the quality of a single American make which is sold to any extent abroad will not only affect the particular manufacturer disastrously, but will cause definite injury to the prestige of all American manufacturers selling automobiles in foreign countries.

An important point in connection with the wants of the British buyer is that while the excellent running powers of the engine and operating parts are giving complete satisfaction there are indications that he would be willing to pay a little more for increased comfort in the upholstery and a finer body finish to the car in general. It is for this reason that there appears to be a considerable market for the manufacturer who cares to supply a chassis without body so that the body can be fitted to meet the special wishes of the purchaser.

Chassis Wanted

It is claimed that a good chassis at $500 or slightly more would meet with a ready market. The chassis should include a 15 to 20 horsepower engine, four cylinders, three or four-speed gearset, and be capable of a speed of 25 to 35 miles per hour. Self-starters are said to be in demand but not in supply. An agent for American cars said that if Americans are to command the field in this line they must come quick or lose the market, as many experiments are being tried there and a perfect appliance is looked for at any time.

It is estimated that British manufacturers are supplying two-thirds of the home demand, about sixty firms offering nearly two hundred types of machines, supplying an annual output well over 20,000.

France

According to official statistics, the value of the automobiles imported into France from the rest of the world in the 3 years 1909, 1910 and 1911 was, respectively, $1,453,483, $1,677,556 and $2,223,746. The noteworthy increase in 1911 was due almost wholly to the increased popularity of the moderate-priced American car. This increase was maintained in 1912, the imports of American automobiles in the first 10 months of 1912 being $328,000 greater than in the same period of 1911.

The Paris salon of 1912 will be memorable as the first automobile exposition held there in which American cars and accessories were displayed on a scale which adequately represented the American automobile industry. Formerly, American makers were for the most part absorbed in their home trade. This state of affairs is now changed and there can be little doubt that the popularity of the American vehicle in France will continue to grow.

Belgium

The Belgian automobile industry is enjoying a boom due to an enormous increase in its sales abroad. The import figures for 1910 and 1911 show a decrease while the export trade for the same year shows the enormous increase of 75 per cent. This country therefore does not seem to offer a very profitable field for the American manufacturer. In 1911 only thirty-two automobiles were imported from the United States, while the imports from France, the adjacent country supplying the bulk of the machines imported into Belgium, are declining. The manufacture of automobile bodywork is an important industry in Belgium, many accepted features of present day body design having originated in that country. In 1911 the value of exported Belgian automobile bodies amounted to $1,158,000.

Spain

Although France dominates the Spanish market the United States is becoming a keen competitor and, according to information received from local agents, the American automobile has now gained a strong foothold in Spain in spite of the fact that its introduction was exceedingly difficult. The sale of low-priced American machines in Spain is not, however, as extensive as it might be and one of the reasons given for this restriction of trade is the big profit exacted by the local agent from purchasers, which brings the selling price to almost double that asked by the agent in the United States. As showing that there is a better market in Spain for the lower priced automobile the import figures for the years 1910 and 1911 provide an interesting contrast. In the first of these years the total number of cars exported was 393 at a value of $739,230. For the following year the number of cars reached 612 but the actual value represented a decrease, the figure being $565,422. This latter amount is roughly one-quarter of the total value of automobiles imported into France for the same year. Imports from France into Spain during 1911 totalled $392,973, while those from the United States represented $68,723. The figures for 1912 are not yet available, but the ratio between French and American imports will in all probability show a decided decrease. Machines of high power are not desired by the Spanish people, the average car running from 12 to 20 horsepower.

Russia

Russian roads are unsuitable for automobiles and the streets of all cities, except a few in the capital and Moscow, are even worse, as they are paved with cobblestones. In spite of these conditions, however, the sale of automobiles is increasing rapidly and as the home manufacture so far is only slight the market for the outsider is profitable. There is a real demand for cars of all classes, particularly of the cheap but strong kind, in both the larger cities and the provinces, and few cities in Europe afford better opportunities for the extension of American trade, though there is a certain prejudice to live down due to the introduction a few years ago of some American cars that did not show any conspicuous merits.

Italy

The serviceable low-priced American automobile is also making its mark in Italy. For the 11 months ending November 30, 1912, there were imported into this country 227 cars of American manufacture, as against 145 for the calendar year 1911, only 25 in 1910 and 7 in 1909. While Italian agents are at present manifesting special interest in American machines, complaints have been made that although the American car is an excellent one for the money, the deliveries have been slow. The manufacturing output of Italy is also increasing rapidly. In 1911 the number of machines turned out amounted to nearly 5,000, this figure including trucks. This output is likely to be raised to 8,000 for the year 1912. The actual figures are not yet available.

Argentina

Although France supplies the largest number of automobiles, the sale of American cars in Argentina is increasing satisfactorily. In 1911, automobiles to the value of $330,126 were imported from the United States, a figure which has been exceeded by the imports registered during the first 9 months of 1912, the total value for that period being $392,197. It is estimated that almost half the cars in this country are used in Buenos Aires.

India

The latest figures from India show a remarkable increase in the imports from the United States. For the past official year ending March, 1912, the value of American cars reached $195,925, four times the amount of 1910-11. This puts the United States into second place, the United Kingdom still retaining the bulk of the trade, and shows that our manufacturers are taking a serious interest in the Indian market. The sales from Belgium, France and Italy are falling off, while those of Germany indicate a slow progress.

Japan

In 1912 the automobile business made rapid progress in Japan. This year in Tokio licenses have been issued to 305 machines and in Yokohama 108 licenses have been granted. The combined figure for both cities last year was only 194, so it will be seen that the increase registered is well over 100 per cent. In Tokio a taxicab company has been formed and has in regular service fifty-six cars of American manufacture.

Australia

The latest figures available in regard to the importations of automobiles into the Commonwealth of Australia show the trade to be thriving in every state. During 1911, chassis, bodies and complete vehicles, including motorcycles, to the value of $6,019,947 were imported. The United Kingdom led in countries of origin with shipments valued at $2,265,801, and the United States was next with $1,268,096. The American has obtained a strong hold on this market.

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Trade Opportunities

Automobile Agencies—An American consul in the United Kingdom, in a report on the sale of automobiles in his district, writes that the cars most in demand at present are from 15 to 20 horsepower. Three firms have expressed a desire to enter into correspondence with American manufacturers with the view of acquiring agencies. Correspondence in English. Inquire at the Bureau of Foreign and Domestic Commerce, Washington, D. C. File No. 10,713.

Electric Automobiles—An American consul in a European country reporting on the market for electric automobiles in his district states that two local business men are interested in receiving offers and catalogues from American manufacturers of very cheap and light American electric cars which could be sold to the public at about $1,500. File No. 10,762.

Factory Miscellany

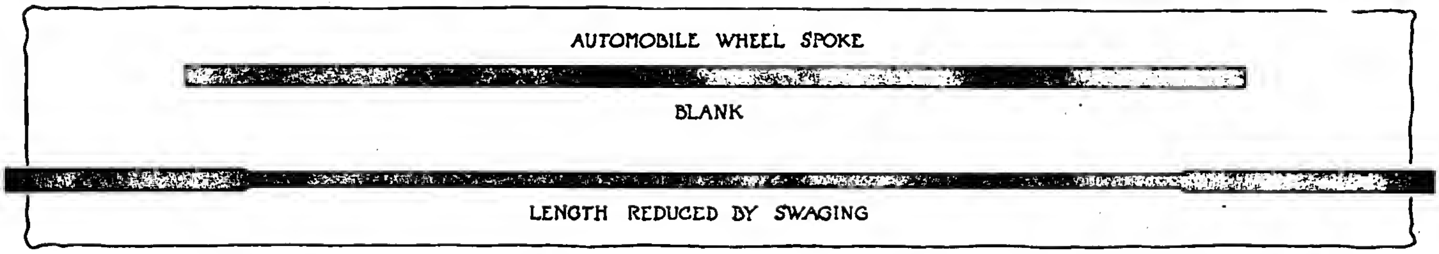
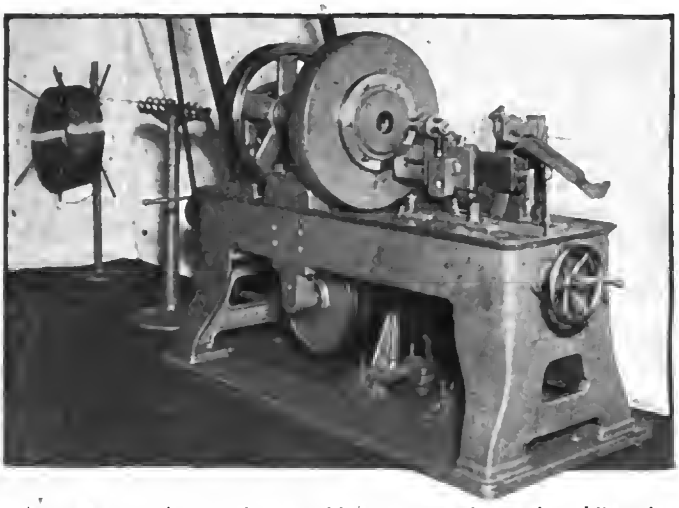


Diagram showing wire spoke for an automobile wheel in two stages of construction. A blank spoke is shown above, while below it is illustrated the effect produced by the swaging machine



Special automatic swaging machine for swaging automobile wire wheel spokes used by the Langelier Mfg. Co., Providence, R. I.

THE accompanying illustration shows an improved type of automatic swaging machine designed and built by the Langelier Mfg. Co., Providence, R. I., for swaging automobile wire wheel spokes such as shown in the above diagram. It takes the wire from the coils, straightens it before entering the machine, swages the spokes between butts and mechanically cuts them off to length after swaging, all operations being entirely automatic and absolutely without waste or manual handling.

This machine has a very high output, on ordinary automobile wire wheel spokes this output reaching as high as three spokes a minute, all straightened, swaged and cut off. This efficiency is obtained by eliminating all time losses between operations. While one spoke is being swaged, a finished spoke is being cut off.

The coil of wire is supported on a wire reel resting on the floor at the extreme left, from which it unwinds as it is drawn through the straightener on its way to the swaging machine. This straightener is of the rotary type. It has offset steel eyelets mounted with ball bearings in suitable holders, so designed that the offset eyelets do not bear in an unyielding manner against the passing wire, but revolves so that no marring of the finish of the wire occurs, as in ordinary wire straighteners.

The wire enters the swaging machine through the rear end of the hollow spindle carrying the dies, and as it is drawn through these swaging dies, these close automatically over the wire, after allowing the portion forming the butt to pass out of them, and impart a high number of sharp, clean blows simultaneously in couples from diametrically opposite directions on the stock, reducing it rapidly and giving it a sort of hammer temper, for the distance between the butts, when the dies again open mechanically, allowing the portion of wire forming the opposite butt to pass out of the machine unswaged.

The outward travel of a saddle with chuck mounted on a horizontal slide, in front of the machine head draws the wire through. This saddle is provided on its rear with a rack seen projecting at end of slide in photograph, in which meshes oscillating segment gear, already set in motion by a face cam and roller underneath the bed of the machine.

The connection between the segment and the cam roll lever is obtained by means of a special form of link having a right and left hand nut, readily reached and locked from the rear, which, upon being adjusted vertically, varies the centers of the link pins, increasing or decreasing the arc of travel of the segment gear, correspondingly varying the travel of the saddle on the horizontal slide above the bed, producing spokes of different overall lengths and with different swaged portions between the butts.

Forced oil lubrication to all running parts and on the dies is maintained by an automatic oil feed pump. Other types of wire feeds besides that described are also put on to suit different makers' spokes and the machine is built for either belt or motor drive. The machine weighs 5,550 pounds and takes up a floorspace about 3 by 6 feet.

REMY Negotiating for Factory—Frank and Perry Remy, of Anderson, Ind., are negotiating for a factory building in that city and expect to re-enter the manufacturing business in a short time. Since their return from Europe some time ago they have maintained a laboratory and have perfected a number of electrical devices. They formerly owned the Remy Electric Co., which they sold 2 years ago.

Installing Steel-Tempering Furnace—The Spokane Auto Parts Co., Spokane, Wash., is preparing to install a large gas steel-tempering furnace.

Dyneto Plant Moved—The Dyneto Electric Co., Syracuse, N. Y., has removed its plant from Elbridge, N. Y., to Syracuse, occupying the plant of the Crouse-Hinds Co.

Buckeye Awards Contract—The Buckeye Rubber Co., Akron, O., has awarded a contract for the construction of a brick, steel and concrete factory addition, to cost $25,000.

Lenox Buys Property—The Lenox Motor Car Co., Boston, Mass., has secured the property owned by Norman Marshall on Factory street, in the Hyde Park section, and will convert it into an automobile plant.

Timken Employs 1,500—In the April 10 issue of THE AUTOMOBILE it was stated that the Timken Detroit Axle Co. employs 150 men. This was a typographical error, as this company has 1,500 men on its payroll.

Want Chandler Building Bids—The W. S. Ferguson Co., engineers, announces that it will be ready for bids in the near future for the general contract of building the new Chandler automobile plant at St. Clair avenue, Cleveland, O.

Velie Increases Capacity—The Velie Motor Vehicle Co., Moline, Ill., has increased its capacity by the construction of a new plant operating under the name of the Velie Engineering Co., which is devoted exclusively to the manufacture of trucks.

Chase Contemplating Additions—The Chase Motor Truck Co., Syracuse, N. Y., is contemplating extensive building improvements. Plans are being contemplated for doubling the capacity of the general offices and greatly extending the manufacturing facilities of the plant.

Hawthorne Planning to Build—The Hawthorne Mfg. Co., manufacturer of automobile horns and metal stampings, is having plans prepared for a new five-story building in which it is proposed to begin construction sometime this spring. This company recently installed some additional drop presses.

Cole's $150,000 Addition—The future production figures for the Cole Motor Car Co., Indianapolis, Ind., will double, a $150,000 addition to the present plant on East Washington street will be built, and the organization generally enlarged. A four-story building has been started and is expected to be completed by October 1.

Weller-Thomas Plans Plant—The Weller-Thomas Co., recently incorporated by Zanesville, O., capitalists, is planning to erect a plant for manufacture of motor-driven fire apparatus. The high waters of the latter part of March may make it necessary to postpone the arrangements. The concern was incorporated at $1,000,000.

Students Inspect Milwaukee Plants—A party of 150 engineering students of the Ohio State University at Columbus, O., spent 2 days inspecting Milwaukee, Wis., industries recently, visiting many of the automobile plants.

Aluminum Goods Awards Contracts—The Aluminum Goods Mfg. Co., Manitowoc, Wis., has awarded contracts for the construction of additions costing $45,000 and which will be completed by September 1. This will increase its output by 35 to 50 per cent.

Klumb to Erect—Paul Klumb, of Sheboygan, Wis., has organized a new company with his two sons, Ewald and Oscar, to engage in the manufacture of gasoline motors. A plant will be erected in the near future. The main building will be 150 by 80 feet.

Establishes Welding Plant—The American Gas Engineering Co., recently organized at Sheboygan, Wis., by E. M. Parmelee, B. Lucas and L. L. Rowlands, has established a welding and general machinery plant as the nucleus of the gas engine business which its founders intend to ultimately establish.

Chase to Increase Facilities—The Chase Motor Truck Co., Syracuse, N. Y., is contemplating extensive building improvements. Plans are now being completed for doubling the capacity of the general offices and greatly extending the manufacturing facilities of the plant. The company increased its working forces two months ago and also started running night as well as day shifts.

To Make Tires—As the result of a strike of thirty employees of the strapping and cementing department of the Chicago Rubber Clothing Co., at Racine, Wis., it is probable that the concern will discontinue the manufacture of rubber clothing and turn the big plant into a motor car tire manufactory. The plant is well equipped and it would require only a small outlay to equip for the production of tires.

New Clintonville Plant—The Four Wheel Drive Automobile Co., Clintonville, Wis., has awarded all contracts for factory No. 3, the newest and largest addition to its plant at that city, which is to be ready for operations July 1. Upon its completion work will be started on factory No. 4, which is to be 100 by 120 feet, similar to the No. 3 building now under way. A power house 40 by 40 feet in size will also be erected without delay. The improvements will cost in excess of $75,000.

Morgan & Marshall's Plant—The Morgan & Marshall Rubber Co., East Liverpool, O., announces new plans and specifications for, a new plant. The company will expend about $1,200,000 for the construction and expects to turn out 500 tires a day at its completion. Ground will be broken in May for three buildings, 60 by 120 feet and 50 by 120 feet. They will be two stories high. There will also be a boiler house, 30 by 100 feet in size. Steel truss construction will be used throughout.

Canadian Goodrich Plant Activities—The B. F. Goodrich Co., Toronto, Ont., is definitely committed to a new Canadian factory, which will be commenced just as soon as the weather permits the builders to get busy. Thirty-two acres of land have been secured at St. Catherines, Ont., conveniently located for the handling of traffic by railroad and the new factory will be modeled on the lines of the parent Akron, O., plant. When fully developed it is planned to employ 1,000 hands, with ample provision for future extensions.

New Wisconsin Aluminum Group—The Wisconsin Foundry Co., Manitowoc, Wis., which recently increased its capital to $110,000 to provide for the construction of an entirely new plant, has received plans for a new group from its architect. The plans call for a large casting shop, 50 by 100 feet in size and 40 feet high; an assembling and finishing room, 50 by 105 feet, and an administration building, 40 by 60 feet in size and two stories high. It will be ready about September 1. The company agreed to expend $360,000 in wages in 6 years' time in order to secure the donation of the new site from the Citizens' Assn. of Manitowoc.

Ambridge Has Automobile Plant—Ambridge, Pa., has joined the ranks of the automobile manufacturing cities. Recently several Ambridge men got together and purchased the parts for twenty automobiles from the Pitt Motor Co., of Pittsburgh, Pa., when that concern went out of business. These parts have been shipped to Ambridge and are now being shipped assembled in an old planing mill building. D. C. Anderson, manager of the Economy Electric Co., has charge of the work, and several men are being employed at the present time. Six more expert mechanics are wanted, as it is a desire of the projectors to have the machines ready for market within the next few weeks. The persons interested in the project are Mr. Anderson, C. G. Carr, Dr. P. J. Sohn, F. C. Schroeder and David Challis.

The Automobile Calendar

Shows, Conventions, Etc.

May 20-21.........Boston, Mass., Convention of Electric Vehicle Makers.
June 2-7..........Racine, Wis., "Made in Racine Exposition," J. I. Case Co.'s foundry.
June 5, 6, 7.......Detroit, Mich., Midsummer Meeting of Society of Automobile Engineers.
October ....Paris, France, Automobile Show, Grand Palais; 10 days.
November ....London, Eng., Annual Automobile Exhibition, Olympia.

Race Meets, Runs, Hill Climbs, Etc.

May 2............New York City, Secret Time Run to New Rochelle, Motor Dealers' Contest Association.
May 5-8..........Washington, D. C., Motor Truck Reliability, *Washington Post.*
May 14...........New York City, Start of 2-Day Hudson and Catskill Scenic Tour.
May 17...........Atlanta, Ga., Automobile and Accessory Association Annual Hill Climb.
May 30...........Indianapolis, Ind., 500-Mile Race, Speedway.
June 7............Philadelphia, Pa., Inter-Club Reliability, Quaker City Motor Club, Automobile Clubs of Delaware County, Philadelphia and Germantown.
June 16, 17, 18.....Columbus, O., Reliability Contest, *Ohio State Journal.*
June 25-28........Chicago, Ill., Non-Motor-Stop Reliability, Chicago to Boston, Chicago Automobile Club.
July 1............Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Association to the Pacific Coast.
July 1-16.........Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.
July 4-5..........Sioux City, S. Dak., Track Meetings, Sioux City Automobile Club and Speedway Association.
July 5-6..........Tacoma, Wash., Road Race, Montemara Festa Automobile Committee.
July 8-16.........Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager.
July 27-28........Tacoma, Wash., Tacoma Road Races.
Nov. 24...........Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 27..........Savannah, Ga., Grand Prize Race, Automobile Club of America.

Foreign.

May ....St. Petersburg, Russia, International Automobile Exposition, Building of Michael Maneze, Imperial Automobile Club of Russia.
May 7-10-11.......Paris, France, Sarthe Automobile Meeting and Speed Hill Climbing.
May 11-12.........Palermo, Sicily, Targo-Floria Race.
June 3-7..........London, Eng., Third International Road Congress, Rees Jeffreys, General Honorary Secretary.
June 23-28........London, England, International Road Congress.
July 12...........Amiens, France, Grand Prix Race.
July 13...........Paris, France, French Grand Prix Cyclecar Race.
July 18-26.........London, Eng., Imperial Motor Transport Conference.
Sept. 21...........Boulogne, France, 3-Litre Race.
Sept. 25...........Isle of Man, International Stock Car Race.
October ....Paris, France, Paris Automobile Show.

Plant of the Rochester Electric Motor Co., Rochester, N. Y., occupying 35,000 square feet. The machinery is driven by individual motors and group drive

The Week in the Industry

Engineer — Dealer — Repairman — Garage

This illustration shows how the State of Connecticut got rid of a dangerous turn in the highway by changing the course so that the road is straight. The old iron bridge at the left of the white fence was formerly used

Crossing at Berlin, Conn., where a number of serious and fatal accidents have occurred. Note the absence of gates

The death trap, one which the motorist should eliminate. This has been the cause of many fatalities in the state of Connecticut

LOCOMOBILE BUILDING NEW HOME—The breaking of the ground for the new salesroom and service station on West 61st street, just off Broadway, marks the most important steps taken by the Locomobile Co. of America, in New York City since their start back in the earliest days of the automobile industry. The new building, which will be eleven stories high, will be completed in October, and will have a frontage of 100 feet on 61st street. The front of the building will be devoted to show rooms with offices on the mezzanine and second floor, while the upper floors will be devoted to storage, repair shop, paint shop and room for rebuilt cars.

FIRE TRUCK FOR SELMA—Delivery has been made in Selma, Ala., of a new automobile fire truck.

GRIBBEN WITH CENTRAL MOTOR—W. C. Gribben has been appointed manager of the Central Motor Car Co., Lexington, Ky.

PULLAR COMPANY FIRESTONE AGENT—James Pullar & Co. have been appointed Hartford, Conn., agents for Firestone tires and rims.

KING FERDINAND BUYS MERCEDES—The Bulgarian ruler, King Ferdinand, has bought a Mercedes car equipped with a Knight engine.

NEW FIRESTONE ADVERTISING MANAGER—E. S. Babcox is now advertising manager of the Firestone Tire & Rubber Co., Akron, O.

LAWTON BI-MOTOR SALES MANAGER—C. T. Lawton has been appointed sales manager of the Bi-Motor Equipment Co., Boston, Mass.

OPEN TIRE REPAIR SHOP—The Hartford Steam Vulcanizing Wks., Hartford, Conn., have opened a tire repair shop on Mulberry street.

TIRE AGENCY BUILDS ADDITION—The Automobile Tire Co., 129 Allyn street, Hartford, Conn., has acquired double floor space by building an addition.

MANHATTAN CLUBROOMS OPENED—The new clubrooms of the Manhattan Automobile Club, 222 West 59th street, New York City, recently opened to members.

BUMP RETIRES—F. R. Bump recently retired from the R-C-H Corp., Detroit, Mich. He was the sales manager of the company, with headquarters at Detroit.

NOW HANDLES SHAWMUT TIRES—The Imperial Motor Tire Co., Washington, D. C., has succeeded the Imperial Motor Co., and will handle Shawmut tires.

SMITH SALES MANAGER—R. Scott Smith has been appointed sales manager of the E. C. Johnson Co., Philadelphia, Pa., distributor of the Reo and Premier cars.

QUIMBY WITH PACKARD—J. C. Quimby has joined the sales force of the Packard Motor Car Co., of Boston, Mass., as assistant manager of the used car department.

WILCOX RESIGNS AS REGAL MANAGER—George Wilcox has resigned from the staff of the Regal Motor Car Co., Detroit, Mich. He was the company's sales manager.

NEW UNIONTOWN GARAGE—The Craig Motor Car Co., Uniontown, Pa., is completing a garage on East Main street and will embark in the automobile business there.

ROWLAND ADVERTISING AGENCY MOVES—The Rowland Advertising Agency, Inc., has moved to the United States Rubber Bldg., Broadway, at 58th street, New York City.

Sibbald Resigns from Salesmanagership—F. C. Sibbald has resigned as sales manager of the Probey Co., Washington, D. C., and has been succeeded by W. D. Arrison.

Kuhns Resigns from Studebaker—E. L. Kuhns has resigned from the Studebaker Corp., Detroit, Mich., where he served in the capacity of sales and branch manager.

Boogher Resigns from Apperson—H. H. Boogher, of Seattle, Wash., recently resigned his position as secretary and manager of the Apperson Motor Car Co., of that city.

Quaker Tires in Binghamton—H. H. Young, Binghamton, N. Y., has secured an agency there for Quaker automobile tires, made by the Quaker City Rubber Co., Philadelphia, Pa.

Ten Fords for Uruguay—Ten Ford cars were exported through New Orleans, La., for Uruguay recently. The cars were assembled and put in extra heavy crates at New Orleans.

New Bosch Appointment—The Bosch Magneto Co., New York City, has appointed the Motor Parts Co., 185-187 Columbus avenue, Boston, Mass., as distributor of its products.

Akron Wants Fire Truck—Bids will be received by D. P. Stein, director of public safety of Akron, O., until May 20 for an automobile fire engine for use of the fire department.

Rose Pacific Lozier Manager—L. H. Rose has been appointed Pacific Coast manager for the Lozier Motor Co., Detroit, Mich. He will make his headquarters in San Francisco, Cal.

Atkin with Sheffield Simplex—Captain J. E. Atkin recently arrived from England to take charge of the sales department of the Canadian Sheffield Simplex Auto Co., Toronto, Ont.

Davis in Detroit—D. D. Davis, recently chief engineer of the Hayes Wheel Co., Jackson, Mich., has been placed in charge of the Detroit, Mich., office of that company at 617 Ford building.

Sleeper with New Concern—I. S. Sleeper, former advertising manager of the Firestone Tire & Rubber Co., Akron, O., is now general sales manager of the Colonial Printing Co., Cleveland, O.

Hoffman Firestone Syracuse Manager—E. A. Hoffman has been appointed manager of the Firestone Tire & Rubber Co., at Syracuse, N. Y. The branch is located at 504 East Genessee street.

Wahpeton Garage Organized—The Wahpeton Garage Co., Wahpeton, N. D., has been organized and will construct a two-story brick building, 50 by 130 feet. Mayor Frank Eberley is president.

Buses Replace Street Cars—The city of Huntington, Ind., has declined to grant a franchise for a street car line and has substituted in its place a motor omnibus service under a 20-year franchise.

Jackson Cole Territory Manager—The Henderson Motor Car Co., Indianapolis, Ind., has appointed W. E. Jackson as territory manager for Southern Illinois with headquarters in Indianapolis.

Apgar Resigns Ford Managership—H. C. Apgar, formerly manager of the Ford Co., in Dallas, Tex., has resigned as manager of the company and will enter the automobile business for himself.

Goes to Factory—Warren Atkinson has just been transferred to the factory of the Lenox car in Boston, Mass., from the Bassett Garage, Bridgewater, and he is to have charge of the stock room.

Woman Garage Manager—J. C. Redmond is claimed to be the only woman garage manager in California. She took over the business from her son, C. A. Redmond, 4317 Central avenue, Los Angeles.

Now with Michigan—John Fischer has become manager of the retail sales department of the New England branch of the Michigan Motor Car Co. of Boston, Mass. He was formerly with the Hupmobile.

Aplco Lighting in Columbus—The Rogers Supply & Tire Co., Columbus, O., has taken the central Ohio agency for the Aplco lighting and self-starting systems, manufactured by the Apple Mfg. Co., Dayton, O.

Indianapolis to Buy Automobile—On the recommendation of fire chief Coots, the board of safety of Indianapolis, Ind., will purchase an automobile for the use of the superintendent of the fire alarm telegraph system.

Vesta Service Station Opened—A branch office and service station has been opened in Providence, R. I., for the installation and care of Vesta electric lighting systems for automobiles, by the Vesta Providence Co.

Cutting Enters Richmond—The Cutting Motor Car Co., Jackson, Mich., is preparing to enter the Richmond, Va., field and has rented a salesroom next to the Chamber of Commerce building on Main street, near Fifth.

Smithson in Charge—B. M. Lindaley, Southwestern manager for the Kissel Kar Co., Dallas, Tex., announced recently that G. W. Smithson would have charge of the commercial vehicle department of that company.

Bolton Changes Detroit Address—L. D. Bolton, representative of the Brown-Lipe products, Spicer universal joints and Kinsey radiators and gaskets in Detroit, Mich., has moved to larger offices at 2215 Dime Savings Bank Bldg.

Dye Resigns—J. E. Dye, manager of the Begg Motor Car Co., Vancouver, B. C., has severed his connections with that firm. He will become managing director of a new company being incorporated and in the same line of business.

Three Years Contract—W. D. Myers, sales manager of the Stutz, has been in Boston, Mass., a few days, where he signed a contract with M. H. Chase, who handles the Stutz in that territory, to take these cars for the next three years.

Warren Resigns from Haynes—C. B. Warren, general manager of the Haynes Automobile Co., Kokomo, Ind., has resigned. His resignation will take effect on the first of June. He was formerly manager of the New York City branch.

Flynn Eastern Sales Manager—J. J. Flynn, formerly manager of the Locomobile branch in Washington, D. C., has been appointed eastern sales manager of the Standard Electric Car Co., that city, and will have headquarters also there.

Back on the Old Job—E. H. Broadwell has gone back to his old position as vice-president of the Fisk Rubber Co., which he resigned to go with the Hudson Company at Detroit, Mich. He will make his headquarters at Chicopee Falls, Mass.

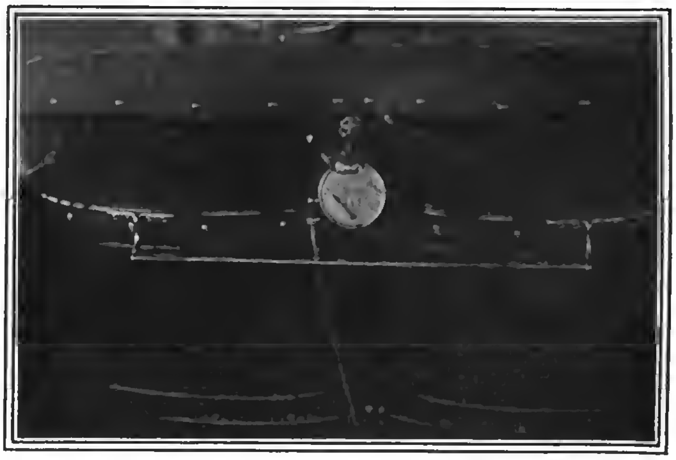
Taxicab Service in St. Paul—The Cook Carriage & Omnibus Co., St. Paul, Minn., will establish a taxicab service with rates based on the zone system. Taxicabs of 1913 model will be installed and the speed restriction will be 15 miles an hour.

Naddy Columbus Visco Representative—The Visco Motor Oil Co., Cleveland, O., has appointed Charles Naddy, of Columbus, O., to act as representative for its products in Columbus, and all counties in the central and southern parts of Ohio.

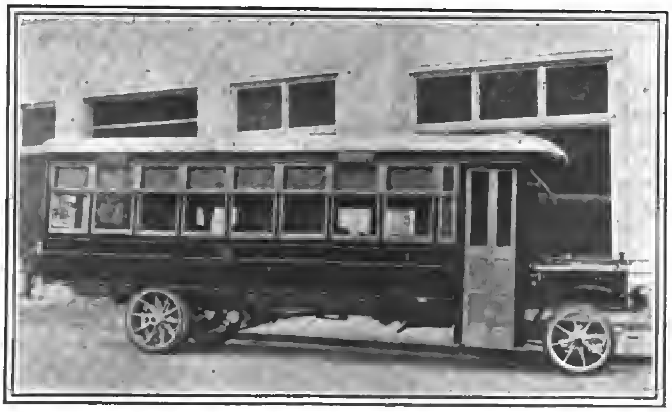
New Vancouver Garage—The Archibald Garage, on 1230 Georgia street, Vancouver, B. C., was recently completed. It was built at a cost of $30,000. It is built of reinforced concrete, has an entrance on two sides and a total floor space of 18,000 square feet.

Carburetor Company's New Department—The Wheeler-Schebler Carburetor Co., Indianapolis, Ind., maker of the Schebler carburetor, has established a publicity department in connection with its advertising department. Joseph Kelly has been placed in charge.

Munger Company Enlarging—The Munger Automobile Co., Dallas, Tex., is adding a two-story building to the big automobile district of that city. It is to cost upwards of $12,000 and will be located at Main and Preston streets. This company handles the Cadillac cars.



A new idea in automobile equipment was evolved by a recent purchaser of a Lozier six, who ordered the speedometer placed on the rear of the front seat, facing the occupants of the tonneau. In placing the speedometer in the tonneau a special tube over 6 feet in length was used, owing to the distance of the dial from the front wheel. Among other novel ideas on the car is the placing of the electric horn midway between the two headlights in front of the radiator. Two push-buttons near the tonneau door are connected with the electric horn and the speedometer light, so that the owner is able to apprise pedestrians of the car's approach in case the driver fails to give warning in time.



One of the pay-as-you-enter white buses used by the Pittsburgh Auto Transit Co., Pittsburgh, Pa. It will seat thirty-four passengers. The wheelbase measures 229 inches

Banquet tendered to President J. J. Cole and Cole owners in southern California by the southern California Cole distributors, at which possible improvements were discussed

ELECTRIC CHARGING IN GARAGE—A. J. Klein & Sons, Lomira, Wis., operating the Lomira garage, are making improvements costing $2,500. The company is equipping for tire repairs, electric vehicle charging and accessory selling.

REPLACES EIGHTY-TWO HORSES—A giant 60-horsepower farm tractor, capable of work which it is estimated would require the labor of eighty-two horses, was recently delivered at Rhinebeck, N. Y., for use on the farm of Vincent Astor.

FITZSIMMONS WITH BUFFALO ELECTRIC—George Fitzsimmons, formerly assistant sales manager of the Velie Motor Vehicle Co., Moline, Ill., has joined the Buffalo Electric Vehicle Co., Buffalo, N. Y. His work will be in connection with the sales and advertising management.

STURDY PLUGS IN CANADA—The International Accessories Co., 117 Belmont Ave., Detroit, Mich., and Windsor, Ont., has taken over the Canadian sales agency for the Sturdy Mfg. Co., Chicago, Ill., manufacturer of the Sturdy and Starite brands of ignition plugs for automobiles.

GRAHAM SANFORD DISTRICT MANAGER—J. A. Graham, formerly sales manager of the Westfield Motor Truck Co., has been appointed district manager for the New England district of the Sanford Motor Truck Co., Syracuse, N. Y. He will make his headquarters in Boston, Mass.

HARDING TAKES LEITCH BUSINESS—The business of the M. Leitch Co., Toronto, Ont., has been taken over by Frederick Harding and is being managed by him. In addition to the F. & S. annular and thrust ball bearings they have taken on a complete line of tires and accessories.

WILMINGTON NEEDS EMERGENCY CAR—It was demonstrated recently that the Wilmington, Del., police department needs an emergency car of some kind, and as soon as the city council can see its way clear to increase the department's appropriation it is likely that one will be purchased.

TAKE PUNCTUREFIX AGENCY—Ireland and Allison, Columbus, O., have taken the central Ohio agency for the Original Puncturefix Co., of Marion, O. The Puncturefix Co. manufactures a fluid which is placed inside the inner tubes for the purpose of closing all punctures automatically.

MONTREAL TO PURCHASE AUTOMOBILES—The corporation of Montreal, Que., will shortly own between twenty or thirty automobiles as the result of the decision of the Board of Control recently to recommend the purchase of five additional machines for greater efficiency in civic administration.

CHANCE FOR AGENCIES—Joseph B. Crandon, A. H. Fuller, C. W. Butterfield and Edwin A. Rowe have formed a company at Bellows Falls, Vt., and they have leased a building on Canal street where a general garage and repair business will be carried on and the territory taken for two or three cars looking for agents.

LOOKING FOR CARS—Chester P. Rowell and Carson P. Bennett have formed a company to handle taxicabs and do a general renting and garage business both at Lawrence, Mass., and Salem, N. H., just over the state line, and they have rented a building at both places. They will also take on some agencies for cars.

CONNELLY WITH DETROIT FIRM—J. F. Connelly, who has had charge of the advertising and publicity department of the Abbott Motor Co., Detroit, Mich., for the past 2 years, has resigned his position to become advertising manager of the W. H. Van Deusen Sales Co., with headquarters in the Ford Bldg., Detroit, Mich.

TWO CHANGES IN PORTLAND—Two changes were made in Portland, Ore., recently. E. A. McCarthy, of the firm of Neate & McCarthy, has withdrawn from the firm, while C. G. Arnold gave up the management of the Pacific Motors Co. Mr. McCarthy has secured the latter company, and for the present will handle the Paige and Oakland cars.

SHANAHAN NORWALK CANADIAN MANAGER—J. M. Shanahan has been appointed sales manager of the Norwalk Motor Car Co. branch in Toronto, Ont., with headquarters at 3-5 Roncesvalles avenue. The former Canadian branch was recently taken over by the parent company at Martinsburg, W. Va., and is now handled exclusively by that company through a selling branch.

HERNANDES KNIGHT TIRE MANAGER—R. M. Hernandes, who has been connected with the United States Tire Co., New York City, since its organization as special representative in the Chicago, Ill., territory, has resigned to become Eastern district manager for the Knight Tire & Rubber Co., Canton, O. Mr. Hernandes will make his headquarters at 1671 Broadway.

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

ASHEVILLE, N. C.—Dixie Motor Co.; capital, $50,000; to deal in automobiles. Incorporators: J. C. Arbogast, R. C. Arbogast, J. E. Craddock.

BELLAIRE, O.—Bellaire Automobile Co.; capital, $6,500; to manufacture and deal in automobiles, trucks and gas engines of all kinds. Incorporators: G. D. Spragg, J. F. Johnson, George Heil, J. R. Greenlee, W. H. Morris.

BUFFALO, N. Y.—Selleck Co.; capital, $40,000; to deal in automobiles. Incorporators: W. V. Selleck, G. K. Selleck, M. L. Selleck.

CINCINNATI, O.—Cincinnati Alco Motor Car Truck Co.; capital, $25,000; to deal in motor trucks. Incorporators: W. H. Peters, J. E. Kelding, G. H. Macduff.

CLEVELAND, O.—Pressed Steel Motor Car Co.; capital, $200,000; to manufacture and vend automobile parts and accessories. Incorporators: W. H. Milliken, F. M. Ossman, A. M. Helmberger, C. L. McConnell, L. O. Helmberger.

HARTFORD, CONN.—New England Car Co.; capital, $5,000; to deal in automobiles. Incorporators: H. T. Sheldon, A. E. Osborne, T. M. Steele.

INDIANAPOLIS, IND.—Indianapolis Auto Sales Co.; capital, $10,000; to conduct a taxicab and motor car sales business. Incorporators: H. S. Wilcox, D. H. Herr, B. W. Rout.

JOPLIN, MO.—Arnold Motor & Supply Co.; capital, $2,000; to deal in automobiles. Incorporators: J. L. Arnold, Ida Tweed Arnold, F. A. Snider.

NEW YORK CITY.—Eagle Sales Corp.; capital, $5,000; to deal in automobiles and supplies. Incorporators: Leo Weinberg, David Goldman, Isidore Goldman.

NEW YORK CITY.—Signal Motor Truck Co.; capital, $350,000; to manufacture motor trucks. Incorporators: J. S. Coates, W. C. Floyd-Jones, F. C. Canfield.

PIERRE, S. D.—F. P. Motor Wagon Co.; capital, $250,000; to manufacture automobiles. Incorporators: L. L. Stephens, T. F. Graham, E. E. Slade, W. G. Price, R. J. Reynolds.

RICHMOND, VA.—H. G. Wagner Auto Co.; capital, $3,000 to $25,000; to deal in automobiles. Incorporators: H. G. Wagner, F. W. Morehead, Frank Phillips.

SOUTH BOSTON, MASS.—Auto Co.; capital, $15,000; to deal in automobiles. Incorporators: J. A. Mebane, F. Mebane.

GARAGES AND ACCESSORIES

ASHEVILLE, N. C.—Phillips Tire Co.; capital, $10,000; to manufacture automobile tires. Incorporators: W. L. Phillips, J. E. Craddock, O. D. Cooper.

BIRMINGHAM, ALA.—Birmingham Motor and Country Club; capital, $150,000; to build a clubhouse and a lake.

BROOKLYN, N. Y.—Noden's Truck Co.; capital, $10,000; general automobile trucking. Incorporators: Abraham Noden, B. H. Noden, L. F. Senke.

BROOKLYN, N. Y.—Whittemore Cab Co.; capital, $1,000; to engage in automobile cab business. Incorporators: W. I. Wiedeman, Albert Wald, C. F. Fuerst.

BUFFALO, N. Y.—Fedders Mfg. Co., Inc.; capital, $400,000; to manufacture automobile radiators and specialties. Incorporators: L. F. Fedders, J. M. Fedders, T. C. Fedders.

CLAYTON, N. Y.—Clayton Motor Repair and Supply Corp.; capital, $15,000; to repair automobiles and deal in accessories. Incorporators: W. M. McCawley, L. A. Phillips, A. O. Bakewell, Jr.

CLEVELAND, O.—Elastic Tread Tire & Wheel Co.; capital, $25,000; to manufacture an automobile tire. Incorporators: J. C. Murry, R. M. Morlenkopf, F. J. Axel, Peter Schneider.

CLEVELAND, O.—Hercules Lock Co.; capital, $1,000; to manufacture automobile specialties. Incorporators: H. A. Hanxhurst, George Bissell, R. T. Mitchell, R. Hall, M. T. Flannagan

DENISON, TEX.—Davis Livery & Motor Car Co.; capital, $10,000; to carry on an automobile livery business. Incorporators: E. E. Davis, Earl Wood, R. L. Apsley.

NEW YORK CITY.—Hampton Kerosene Carburetor Co.; capital, $150,000; to manufacture carburetors. Incorporators: W. Hampton, C. A. Eurr, O. H. Cacciola.

NEW YORK CITY.—Gaulois Tire Corp.; capital, $20,000; to deal in automobile tires. Incorporators: Jean Grenier, V. W. Cutting, Maurice Leon.

NEW YORK CITY.—Merralls' Air and Steam Engine Co.; capital, $150,000; to manufacture engine starters. Incorporators: William Brady, J. C. Heberer, W. A. Merralls.

NEW YORK CITY.—Motor Service Corp.; capital, $500; to engage in an automobile service. Incorporators: W. G. Smith, F. H. Merrill, Mabel Dittenhoefer.

NEW YORK CITY.—Schermerhorn Garage Co.; capital, $20,000; to carry on a general garage business. Incorporators: J. Ginsburgh, Leo Rosett, P. A. Lee.

OKLAHOMA CITY, OKLA.—Liquid Tire Tonic Co.; capital, $10,000; to manufacture a liquid that automatically heals punctures in automobile tires. Incorporators: F. B. Dean, H. N. Schofield, T. H. Williams.

STEVENS POINT, WIS.—Hydraulic Transmission Co.; capital, $45,000; to manufacture a hydraulic transmission. Incorporators: Arthur Beijer, Benjamin Beijer, J. P. Atwell.

TROY, N. Y.—Grand Street Garage Co.; capital, $3,000; to engage in garage business. Incorporators: S. W. Smith, W. G. Swartout, M. J. Cohen.

CHANGES OF NAME AND CAPITAL

AKRON, O.—American Tire & Rubber Co.; capital increased from $200,000 to $500,000.

INDIANAPOLIS, IND.—Wizard Motor Co.; increase of capital from $50,000 to $100,000.

MILWAUKEE, WIS.—Fellhacb Motor Co.; increase of capital from $20,000 to $50,000.

New Agencies Established During the Week

PASSENGER CARS

Place	Car	Agent
Arlington, Wash.	Rambler	Nell Brown.
Blanchard, Ia.	Hupmobile	A. J. Joy.
Buffalo, N. Y.	Midland	Buffalo Midland Sales Co.
Centralia, Wash.	Ford	St. John & Titus.
Centralia, Wash.	Mitchell	St. John & Titus.
Centralia, Wash.	Studebaker	St. John & Titus.
Chicago, Ill.	R-C-H	Lincoln Park Auto Ex.
East Liverpool, O.	Buick	Tri-State Gar.
Groton, S. D.	Hupmobile	Geister & Sheldon.
Harrington, Wash.	Overland	R. R. Hutsell.
Junius, S. D.	Hupmobile	Innes & McGowan.
Kearney, Neb.	Empire	Franks & Kouer.
Kearney, Neb.	Great Western	Franks & Kouer.
Keene, N. H.	Metz	A. W. Dickerman.
Kellogg, Id.	Ford	Coeur d'Alene Auto Co.
Lewiston, Me.	Inter-State	Androscoggin Motor Co.
Lincoln, Neb.	Chalmers	L. E. Tait Auto Co.
Madison County, Neb.	Abbott-Detroit	W. H. Blakeman.
Montesano, Wash.	Rambler	W. H. Bush.
New York City	Panhard	Healy & Co.
Oakesdale, Wash.	Case	Linville Bros.
Oakesdale, Wash.	Ford	Linville Bros.
Oklahoma City, Okla.	Chalmers	Westcott & Magee.
Oakland, Cal.	Krit	C. F. Orra.
Olympia, Wash.	Reo	Blaine Mabom.
Olympia, Wash.	Stoddard	Blaine Mabom.
Olympia, Wash.	Stutz	Mottinger & Sauve.
Portland, Ore.	Empire	W. H. Peacock & J. Freeman.
San Francisco, Cal.	Mercedes	Rene J. Marx.
Seattle, Wash.	Imperial	Stratton & Waller.
Seattle, Wash.	Oldsmobile	C. R. Williams.
Spokane, Wash.	Metz	Baker Bros.
Spokane, Wash.	R-C-H	Inland Motor Car Co.
Sprague, Wash.	Metz	W. R. Lee.
Tacoma, Wash.	Apperson	F. G. Swanton.
Tacoma, Wash.	Michigan	Michigan Auto & Buggy Co.
Toronto, Ont.	Norwalk	Norwalk Motor Car Co.
Utica, Neb.	Hupmobile	Utica Auto. Co.
Washtucnay, Wash.	Reo	G. W. Vols.

COMMERCIAL VEHICLES

Place	Car	Agent
Cincinnati, O.	Alco	Cin. Alco M. C. & Truck Co.
Hartford, Conn.	Koehler	L. M. Camp.
Portland, Ore.	Dart	W. H. Peacock & J. Freeman.
San Diego, Cal.	Mack	H. A. Seller.
San Francisco, Cal.	Wagenhals	Woodman Motor Truck Co.
Tacoma, Wash.	Dart	H. W. Doherty.

Accessories for the Automobilist

THE FAWKES traffic signal, made by the Fawkes Auto Co., Minneapolis, Minn., is a small searchlight mechanism attached to the front of the car by a cross bracket, Fig. 4. The signal itself consists of a vertical post mounted in a socket and turnable in the same, in response to an operating mechanism from the steering wheel, and a horizontal rod carried by the vertical one and having at its end an electric bulb capable of emanating a bright light. By means of a switch the bulb is turned on or off and a small lever on the steering wheel, connected to the vertical rod by steel rodding and universal connections, are used to turn the horizontal bulb-carrier toward the right or left, depending on whither the driver means to steer the car.

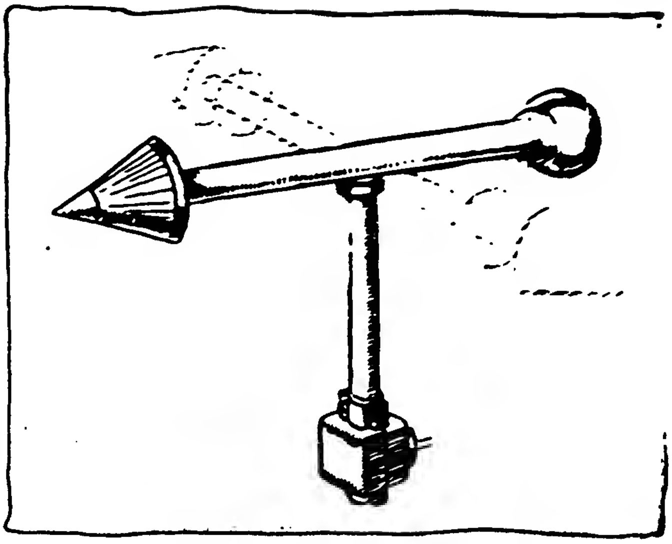


Fig. 4—Fawkes electric turning signal

Thick-Tread Inner Tube

The Kokomo Rubber Co., Kokomo, Ind., manufactures the Kokomo thick-tread inner tube, Fig. 1. This tube differs from others by having the half-ring contacting with the inside of the tread portion of the casing made considerably thicker than the inner half-ring, so that not only is the interior space of the tube lessened and consequently the amount of air needed for proper inflation reduced, but the probability of blowouts, punctures and short life are lessened by the increased strength of the tube. The cross section of the tube, as Fig. 1 shows, is oval shaped to fit well into the casing.

Vellumoid Packing Material

A novel material for gaskets, packings, leather imitations and other applications has been invented by Charles D. Brown & Co., Inc., 49 Federal street, Boston, Mass. Vellumoid is made of a fiber related to paper, and is impregnated with an oily material to make it waterproof. While not recommended for contact with hot steam under pressure, it is applicable to such uses as intake manifold gaskets, etc.

Hemmeter Visible Spark-Gap

A small device for continuous inspection of the motor ignition system has been designed by the Hemmeter Spark Gap Mfg. Co., Pontiac, Mich. This gap is seen in Fig. 2, and consists of a small glass cylinder held by two hard-rubber plates which are connected by brass screws, and two screws extending through the centers of both plates so as to form a narrow gap, which measures about .02 inch, or even somewhat less. The high-tension wire from the magneto or coil is connected to the upper inclosed screw, and the lower is screwed on to the plug terminal by means of a small connector. If the ignition system is functioning, a spark is formed between the two inclosed screws at each ignition stroke of the motor.

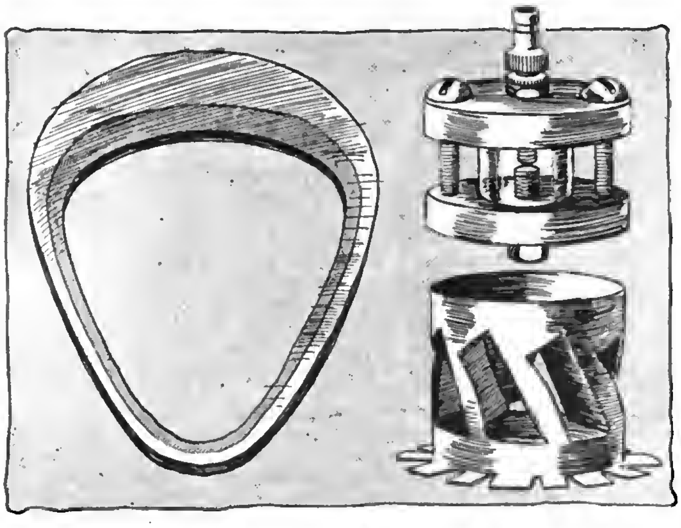


Fig. 1—Kokomo tube. Fig. 2—Hemmeter spark gap. Fig. 3—Egyptian mixer

Egyptian Mixer for Intake Pipe

The R. D. Loose Mixing Chamber Co., 110 North Fifth street, Springfield, Ill., manufactures the Egyptian mixer, a small device which is fitted into the mixture intake pipe of the motor, between carbureter and manifold, in order to break up the liquid globules carried along by the mixture formed in the carbureter. The mixer is made of a single, cylindrical piece of sheet brass of the carbureter outlet diameter. This cylinder, in the making of the mixer, is cut on a slant as in Fig. 3, and then along one circular edge of the cylinder in twelve places. Furthermore, six sections of the cylinder wall are cut and bent inside so as to form blades which break up the mixture and tend to impart a rotating motion to it.

Prest-O-Starter Demonstrator

The Prest-O-Lite Co., Indianapolis, Ind., is providing its agents with demonstrating models of the Prest-O-Starter, which consists of a wooden frame provided with fixtures necessary if a starter of this type is used on the car. The upper half of the wooden frame represents the dash of the car holding the starter pump, etc., and a lower part supports the tank as well as the reducing valve. In making the demonstration the stand is placed beside the front mudguard of the car and connected to the cylinders through flexible brass tubing having injectors which are inserted in the priming cup openings. If there are no priming cups in the cylinders, combination sparkplugs which are formed in themselves with priming cups are used in place of the ordinary plugs.

Miller Telescoping Grease Cup

A telescoping type of grease cup, designed by the inventor of the Miller grease gun, is being placed on the market by Asch & Co., 1777 Broadway, New York City. This accessory consists of four principal parts: First, the main body of the cup

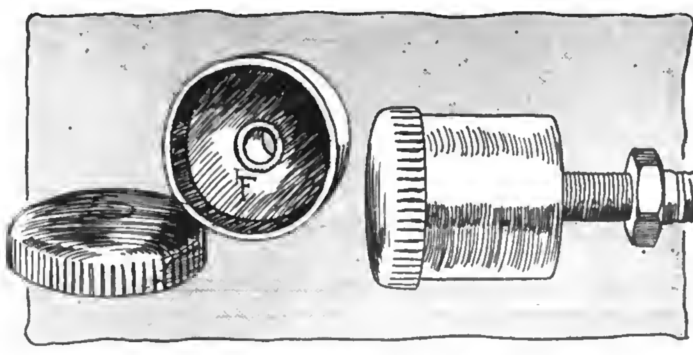


Fig. 5—Miller telescoping grease cup

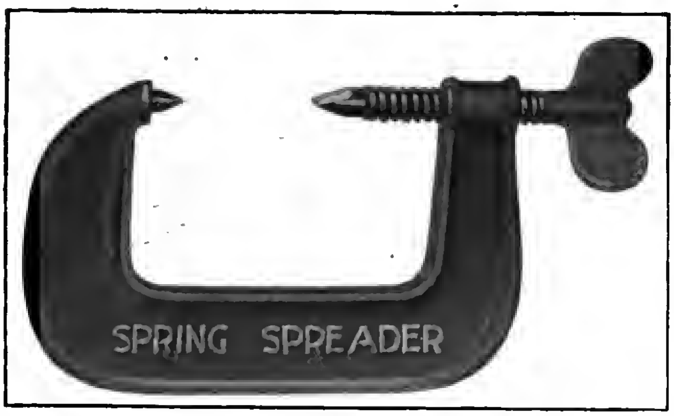


Fig. 6—Dayton automobile spring spreader for springs 2.875 inches in width, as well as the narrowest types

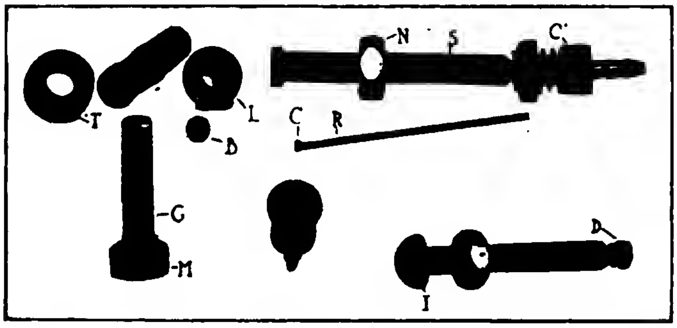


Fig. 7—Standard tire valve and slip-off casing, useful when a driver is accustomed to frequently test the pressure

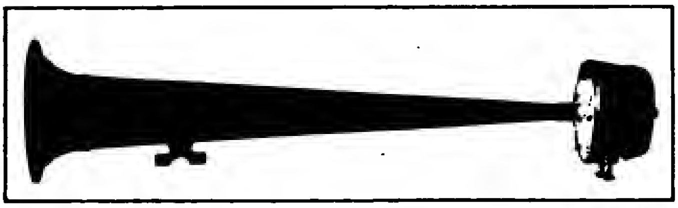


Fig. 8—Maxeff electric horn, specially designed for mounting under the hood

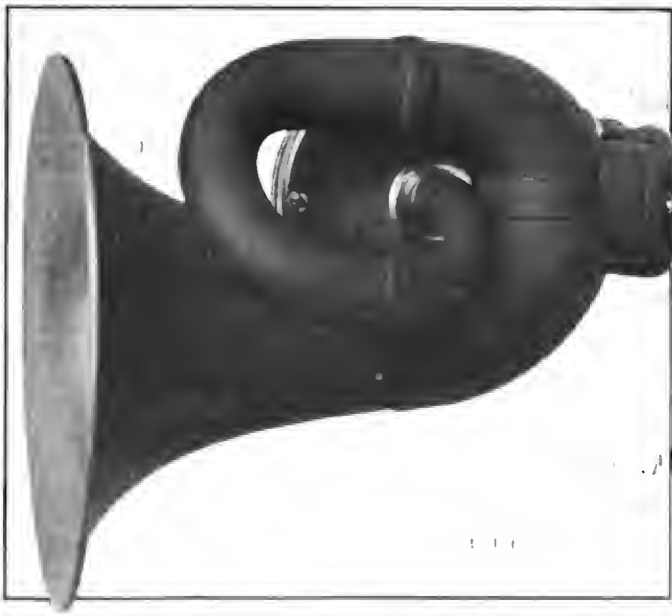


Fig. 9—Maxeff electric horn of conventional design for usual type of mounting

comprising a cylinder with a bottom F which is secured to the outlet pipe of the cup; second, an outer cylinder screw-threaded so as to work along the outside of the inner cylinder; third, a cap for the cup, and, fourth, a nut for pressing a cup-leather washer against the bottom of the cup to prevent leakage of the grease. The outer cylinder, if it is turbed, is made to travel up or down along the inner cylinder. To fill the grease cup, the cap is removed and the outer cylinder is screwed up as far as possible, its coming off the inner being prevented by a rivet. Then the space inside the outer cylinder is filled and the cap is replaced. When the outer cylinder is now screwed down, the bottom of the inner one is moved up, relatively, decreasing the volume of the space in which the grease is contained and forcing the latter out of the cup by way of the outlet pipe. Practically the entire volume of grease in the cup is thereby available.

Carr Gasoline Warning Signal

Automobilists who have found themselves 10 miles from the nearest garage, without enough fuel in the tank to go on, will appreciate the advantages of the Carr signal gauge. This device consists of a float tube containing a float, which is inserted in the gasoline tank, a contact in the top portion of the float tube and an annunciator mounted on the dash, under the hood or wherever desired. If the float falls to a certain point due to the decreasing level of the gasoline, the end of a lever to which it is secured by a string is drawn down, whereby its other end is made to touch a metal contact, thereby closing an electric circuit and ringing the annunciator. A switch on the dashboard may be used to turn off the signal after the driver has noticed it and knows that there is only a limited quantity of gasoline left in the tank.

Dayton Malleable Spring Spreader

The Dayton Malleable Iron Co., Dayton, O., is the maker of the spring spreader, Fig. 6, which is composed of a steel clamp, a steel point attached to one end, a screw threaded through the other and a wedge carried by the inner end of the screw. The point is centered between the leaves of the spring and by turning the wing nut, the wedge carried by the screw may be driven between the leaves to such an extent as to separate them and permit of lubricating the ordinarily contracting surfaces. The maximum clearance is 2.875 inches, so that the spreader is applicable to springs of this width, while it can also be used for the smallest car springs on the market.

Maxeff Electric Automobile Horn

Another electric horn has been brought out, thanks to the manufacturing activities of the Maxeff Electric Horn Co., 814 Woodward avenue, Detroit, Mich. This horn is made in two principal types, regular, Fig. 9, and under-hood, Fig. 8. The horns are of the motor type, and the generating device is attached at the end of the under-hood type or at the side, as in the case of the regular design. Control is by a push-button fixed to the steering wheel, from where the wiring is taken through a flexible casing to the horn. Slip-on terminals are used to connect the wires to the motor terminals.

Usoline Metal Cleaning Cloth

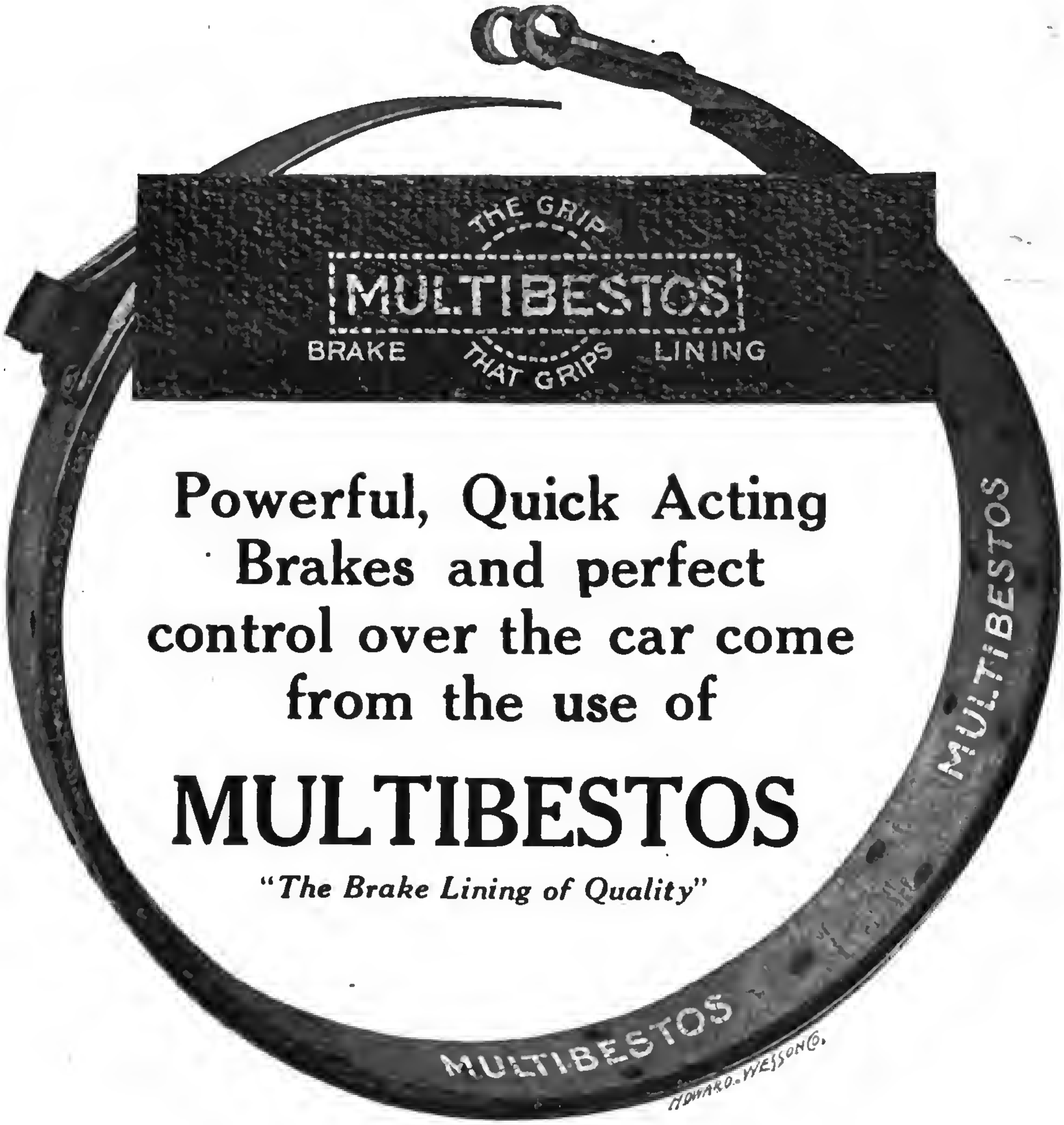
Usoline polishing cloth is the latest product in the Oil Products Co., Inc., New York City. This material consists of a fabric impregnated with a polishing compound, removing dirt from metal surfaces and imparting a fair degree of polish to them, without attacking them in any way.

Standard Tire Sundries

Various new tire fittings have been brought out by the Standard Engineering Co., Woonsocket, R. I., makers of the Potter valve. One of them is the new style of valve, Fig. 7, which is distinguished by the peculiar method of making it airproof. The inner end of the valve is shown at I, consisting of a steel cap with a transverse slot which screws on the end of the valve casing S. The rod or stem R, formed with a conical end C, is inside the casing, and C bears against a rubber ball B. The latter is contained inside I and the pressure in the tube presses B against C, maintaining tightness of C against the valve casing and preventing the leakage of air. Nut N is for drawing the valve casing tight against the inner tube.

Another specialty made by the same company is the connections C1. The construction is obvious from the illustration, Fig. 7. The threaded end of the hose connection screws over the inflating end of the valve casing ordinarily closed by the cap D. The fitting screwing over the end of the casing is pressed in place by a coiled spring.

The gauge cap G has been designed to fit over the casing S



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BOSTON, 903 Boylston Street	SAN FRANCISCO, Fred Ward & Son

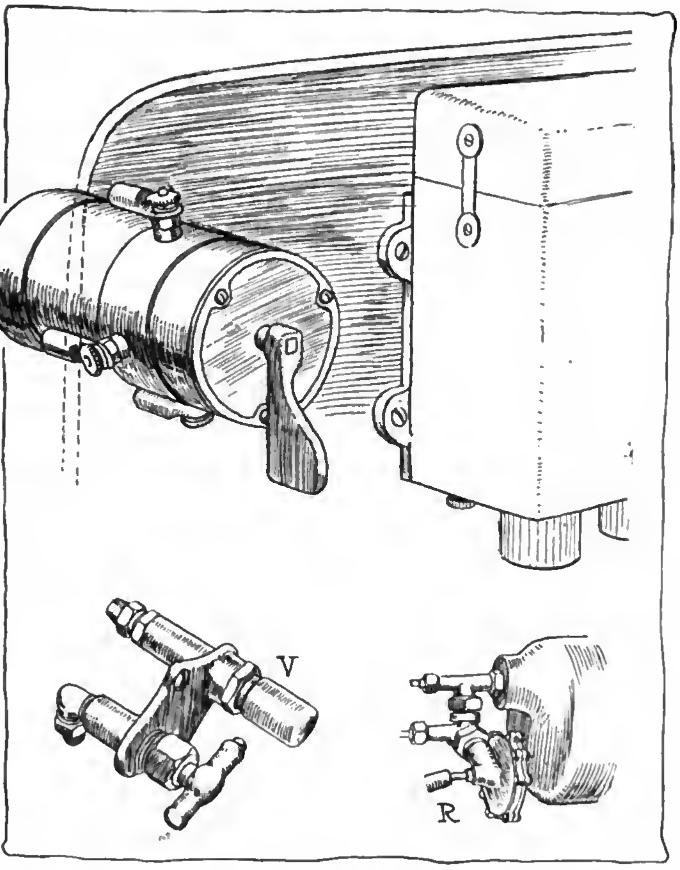

Fig. 10—Connecticut master vibrator and combined dash switch. Fig. 11—Prest-O-Primer reducing valve R for attachment to acetylene tank and foot operated valve V on dash

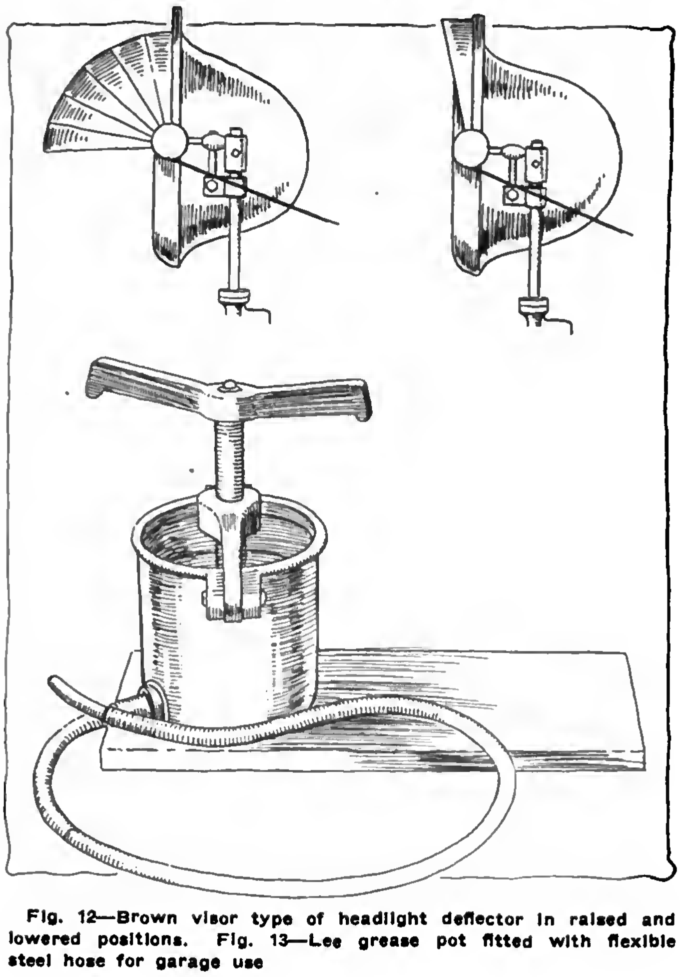

Fig. 12—Brown visor type of headlight deflector in raised and lowered positions. Fig. 13—Lee grease pot fitted with flexible steel hose for garage use

in cases where the drivers are in the habit of frequently testing the pressure in the tires. Nut M screws over the thread of S and inside of it, a short coiled spring R is in place. The latter may be depressed for the purpose of forcing the end of G out of or into the nut M, when desirous of measuring the air pressure, or after having done so. All these specialties are sold in the Metropolitan territory by Asch & Co., 1777 Broadway, New York City.

Connecticut Master Vibrator

To overcome the trouble of frequent adjustment that is associated with the use of an ignition system in which all four cylinders are provided with separate spark coil vibrators the Connecticut Telephone and Electric Co. have brought out a master vibrator. This device, in which is incorporated a throw-over switch, is primarily designed for use on Ford cars fitted with the flywheel type of magneto. This master vibrator is shown in Fig. 10. It is intended for mounting on the dash in such a position that the casing projects inside the hood, with the switch handle on the driver's side of the dash.

The wiring is simple, it being only necessary to connect the three terminals directly to the dash coil, magneto and battery respectively. The vibrators on the four-cylinder coil should be short-circuited by screwing down tightly and connecting the vibrator and bridge on each of the four units with a short length of copper wire. The switch lever is removable, having a locking ball for holding it in place. When removed the ignition is locked.

Prest-O-Primer

In order to facilitate the starting, in cold weather, of engines fitted with electric or compressed air cranking devices the Prest-O-Lite Co., Indianapolis, Ind., are marketing an acetylene primer for attachment to the Prest-O-Lite tank. This device, shown in Fig. 11, is called the Prest-O-Primer and consists essentially of a reducing valve R inserted in a pipe connection between the tank and the inlet manifold, permitting the introduction of small quantities of acetylene at a very low pressure—2 ounces—to cause the initial explosions. It is operated by means of a second valve V in the circuit, located on the dash and actuated by foot. Besides this push valve, which is of the spring-return type, there is a screw valve mounted alongside as a double insurance against gas leakage. The makers claim that this priming device does away with the necessity of gasoline priming when the engine is refractory and state that if the engine is allowed to run about 20 seconds on acetylene it will be found to be warmed sufficiently to obtain the desired response from the carbureter, however cold the weather. A special two-way union is furnished for attachment to the tank, where the latter also supplies the gas for lighting. By the use of a reducing valve the pressure of gas is such that under no circumstances can an explosion of greater force occur than is obtainable with gasoline in the ordinary way, so that no undue strains are imposed on the engine.

Brown Headlight Deflector

To moderate the luminant effect of the headlights without the use of a dimming agent the Brown Co., Syracuse, N. Y., has designed the headlight deflector, Fig. 12. It consists of a multiple unit visor pivoted at the ends of the horizontal diameter of the headlight lense rim. The sections are so fixed that by turning the pivoting member they are one by one lowered or raised, so that the upper half of the lamp is blinded and the rays are deflected downward, while the lower still affords sufficient light to illuminate the road. A cable from the dash operates the visor.

Lee Grease Pot

A substantial greaser for garage use is being manufactured by Henry B. Lee, New London, Conn. This design differs from the conventional grease gun in two respects. First, it is much larger, and, second, the lubricant is ejected through a flexible steel hose, thereby facilitating the lubrication of the more inaccessible points of the chassis. The pot is 7 inches diameter by 7 inches high and is capable of dealing with five pounds of grease. Pressure is applied by means of a 1-inch screw with a large lever handle. There are no loose parts, the top merely hinging for the operation of refilling. Some idea of its substantial construction may be gathered from the illustration, Fig. 13. The walls of the pot are .5 inch thick, and the total weight of the device is 25 pounds. It is stated that the contents of this grease pot can be discharged in 2 minutes. Two types are marketed, No. 1 being designed for use with light grease and heavy oil, and No. 2—not shown—being arranged with a geared top so as to be capable of dealing with the heavier greases. As supplied these grease pots are mounted on a floorboard 8 inches by 20.

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MAY 8, 1913

The AUTOMOBILE

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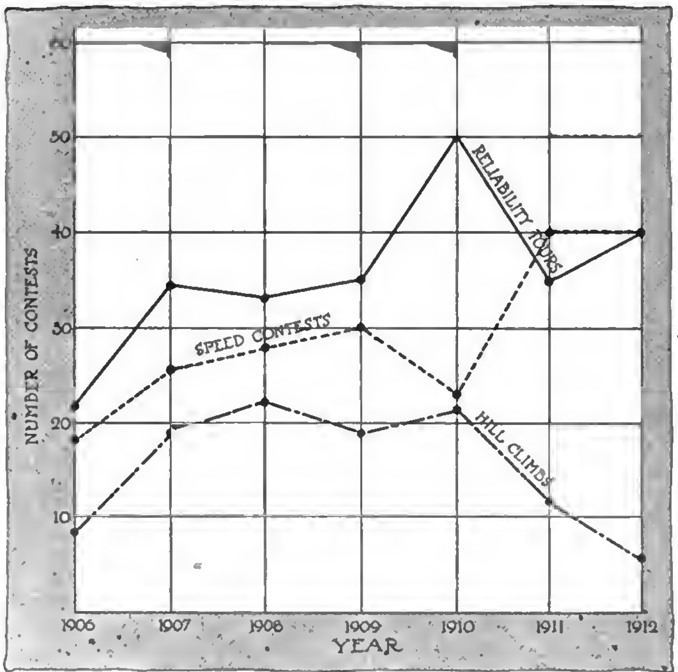
The Automobile

Makers Want Stock Car Contests

Find That the Performances of Specially-Constructed Machines, While Most Interesting from the Spectacular Viewpoint, Are of Little Practical Value to Either the Manufacturer or Buyer

SPEED has had a strange fascination on mankind ever since the history of the world began. Two thousand years ago chariot races attracted the Roman crowds to the circuses. Nowadays it is the automobile. The charioteer who held the reins in those early days and goaded his horses to victory now holds a driving wheel and coaxes a carbureter. Now conditions are different.

Today business has to be reckoned with; the advertising man of today has stepped in at such a splendid opportunity for a full-page display in animation and all the colors of nature before a huge and intensely interested audience. The cars were labelled and the money spent in entering the contests found to be a sound advertising investment. That is, it was until the entered cars bore so little resemblance to the product which the name represented that public interest in that side of the game waned. The prospective automobilist who wished to gain some idea of the relative capabilities of the various makes by following speed trials soon found that there were so many special features incorporated and stock features omitted in the cars raced that the name meant little or nothing. This is not to say that the contests themselves were any the less attractive from the spectacular point of view; rather the reverse, for the speeds attained were, of course, much higher. But there was a very evident decline in the commercial value of automobile racing.



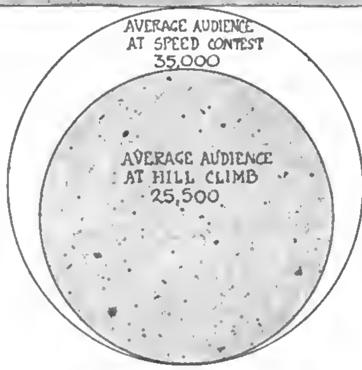


Fig. 1—Total number of speed contests, reliability tours and hill climbs since 1905, showing the trend in popularity. Fig. 2—Average audience at speed contests and hill climbs, respectively

This state of affairs brought about the framing of the stock-car rules a few years ago, so that automobile contests may be divided into two broad classes, the free-for-all and the so-called stock race. The first of these divisions, by its nature is easy and definite. It is the second classification with its elasticity and lack of definition, around which there has been so much contention and dissatisfaction.

Stock cars which were only such before they underwent extensive alteration calculated to bring them into a good position at the finishing line were entered in stock-car events. And the manufacturer who saw that another competitor's machine had undergone more alteration than seemed to him justifiable for such a race naturally felt that the conditions were unfair and the results not only valueless, but such as to detract seriously from the standing of his own product in the open field.

The difficulty of forming rules to govern stock car events is clearly indicated in the present A. A. A. contest rules, in which it is stated that:

It shall be the duty of the Technical Committee of the Contest Board to pass upon, establish and certify to the Contest Board the stock status of all manufacturers' models offered for registration with the Contest Board as stock cars and stock chassis.

In any case where it may be necessary to establish the status of any car alleged to be a stock car under the definition contained in these rules, the committee shall have the right

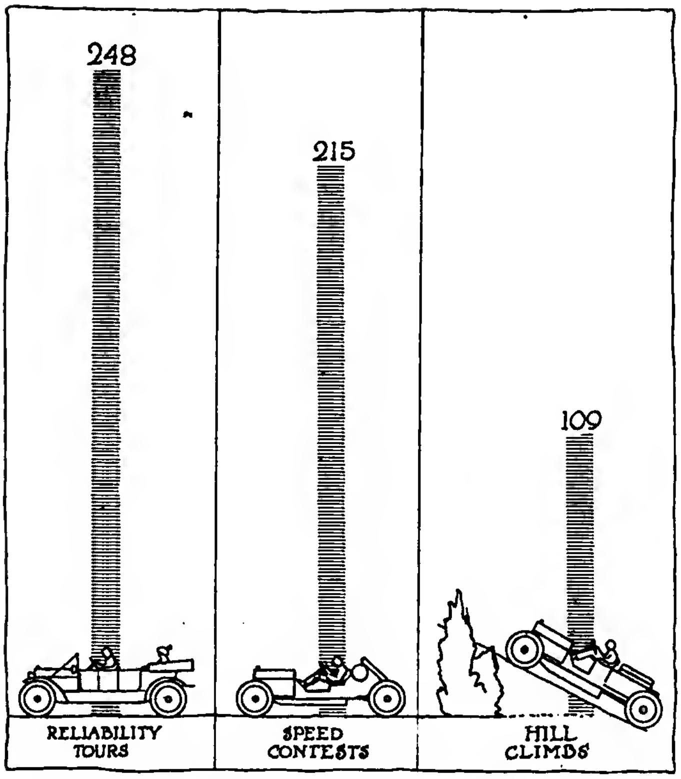


Fig. 3—Graphic representation of the total number of reliability runs, speed contests and hill climbs from 1906 to 1912, inclusive

to visit the factory of the manufacturer of such car, who shall be required to submit to the committee such evidence as it may require to verify the allegation on which the "stock" status of the car is based.

For some reason or other the manufacturers seem to have fought shy of registering with the Contest Board. Possibly the rules appear more stringent than is necessary.

The question of speed contests, reliability tours and hill-climbs is receiving a great deal of attention at the present moment, and in view of this fact the following opinions bearing on the comparative values, both from the commercial and spectacular points of view of stock-car and free-for-all contests is of great interest, coming, as they do, from makers who have been prominent supporters of contests in the past.

H. Butt, of the Mercer Automobile Co., believes that "if a commission could be formed to control stock car contests with powers to rigidly inspect all entrants and to reject all that were not abiding strictly by the rules, such inspection to go to an extent of an analysis of metals employed, providing the commission, in its judgment thought such drastic action necessary, it would be possible to hold stock car races on which the buying public could safely base its estimate of the cars engaged. Free-for-all contests are instructive to the manufacturer and indirectly benefit the public by developing weakness of construction, but are of little value to the prospective owner of an automobile when endeavoring to decide upon the type of car he wishes to buy. We are strongly in favor of stock car contests, and believe they are far more important to the industry than are the more spectacular races."

In the opinion of E. W. Bennett, of the Willys-Overland Co., which does not make racing cars, "automobile contests have outlived their usefulness and there has been so much elasticity in the rules of both special and stock contests and in reliability and other runs that they have ceased to interest the public."

That considerable help to the engineer can be derived from contests of any kind is the opinion of E. LeRoy Pelletier, of the Maxwell Motor Co., who says: "In the development of gas-engine chassis design, doubtless there is considerable value to engineers in these contests—even between extremely light stripped special racing machines. The engineer is able to make valuable deductions from these, but they are of value only to the engineer. As far as the public is really concerned with them, they are meaningless. This has been proven over and over again, from the fact that cars which have won the biggest free-for-all events have sometimes proven the greatest failures commercially and in the hands of users.

Webb Jay, of the Haynes company, "feels that unless the rules for stock cars were more clearly defined, the free-for-all race carries more value than what is termed stock car events and is certainly a great deal more attractive, and the number whose attention is attracted to these contests, as a rule, determines the advertising value."

Homer McKee, of the Cole Motor Car Co., divides automobile contests into two classes, namely, utility contests and sport contests, and says: "From a utilitarian standpoint, there is no question that the contest most worth while is the strictly stock car event. From a sport standpoint, it is equally evident that the free-for-all event offers vastly more opportunity. Personally, it appears to me that the public's general support of stock car events, while in some way increasing the efficiency of the average motor car product, would, on the other hand, work a decided disadvantage in races by inducing manufacturers to attempt to build cars with speed in mind rather than general endurance. There would be an inducement to use higher gear ratios than would be practicable for every-day usage on the country roads, and in the case of hill-climbs the tendency would also be to install gear ratios that would not be best for general road conditions. In other words, the type of motor car naturally evolved by general support of stock car contests would be over-developed in order to arrive at efficiency in the particular direction which the respective events would be intended to bring out. General endurance contests tending to prove the average efficiency of the average car are undoubtedly good. It should, however, be borne in mind that in all stock car events the main attempt should be to develop a better average car for the ordinary user. If hill-climbs and races in which only stock cars participate tend to this conclusion, such events are undoubtedly good."

Speed Contests Aid Designers

That the strictly speed contest is of great value to the designer by developing details that can be introduced advantageously in the stock product is the opinion of V. A. Longaker, of the American Motors Co., who states: "If stock cars only were to be used in speed contests, no manufacturer could place upon a track any new creation and get any benefit whatever from its performance. Instead of stock car principles being reconstructed for speed contests, cars should be designed strictly for speed and then modified and incorporated in the program of the manufacturer. If real stock cars were raced, it would be a help and might prove something to the buying public, who are the only ones interested in the matter of stock car competition. But it is well known that no stock car, strictly speaking, has ever been entered in a speed contest of note. Special material, special fits, special carbureters, special magnetos and various other things are incorporated into these cars and the word stock is therefore a misnomer."

Alvan Macauly, of the Packard Motor Car Co., does not favor contests generally, but believes that "the ideal contest should be limited to stock cars and run under the usual conditions of automobile usage, so as to wear out all except those cars best adapted to meet the conditions."

Although the National Motor Vehicle Co. retired from participation in contests at the close of the Indianapolis Speedway race of last year, it is still strongly in favor of stock car contests. G. M. Dickson, of that concern, writes: "We believe the present stock car rules are sufficiently concise to insure fair and honorable contests, if it were possible to maintain a salaried technical committee to enforce these rules to the letter, and if there

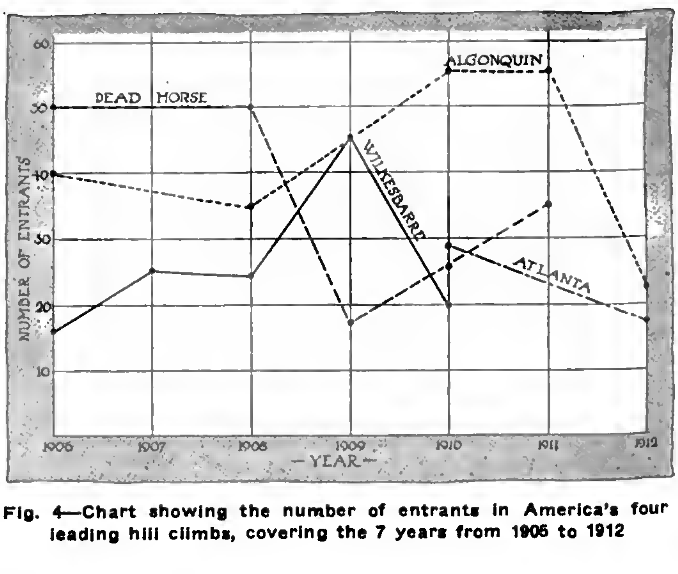


Fig. 4—Chart showing the number of entrants in America's four leading hill climbs, covering the 7 years from 1905 to 1912

is a feeling on the part of American manufacturers that stock car contests should be revived, we would be in favor of heartily supporting such a movement."

It is the opinion of the Henderson Motor Car Co. that all reliability or economy road contests should be limited to stock cars. C. P. Henderson, of that company states: "At one time we thought this should be the rule governing all racing contests, but we have since come to think that the public is more interested in speed than stock requirements, when it comes to a regular speedway event. It would therefore seem that free-for-all events should be encouraged on the speedway.

Chas. F. Barret, of the Knox Automobile Co. points out that the two chief purposes of entering competition of the kind in question are: "first, to make a thorough road test under official auspices of new models so as to correct any weakness which might develop, and second, to impress upon the automobile buying public the reliability and other desirable qualities which standard models could give." On the question of the relative value of racing stock and special cars Mr. Barret continues: "It has never seemed fair to us, or, in fact any help to the industry as a whole, to put specially built cars into contests of this sort, when the automobile public itself knows very well that no matter how well a car may perform under the requirements, they would never secure a car like it from the manufacturer for their personal use. In certain types of racing contests which are run largely for amusement it seems entirely consistent to use specially built models but in contests that are calculated to prove the actual ability of existing types of cars to negotiate certain road conditions, it is nothing short of a humbug to use any other than stock models."

Indications for the Future

The present month is the beginning of another racing season, and the time when those interested in the sport ask whether the prospects are as bright as in previous years or whether a decline in automobile speed contests is imminent. If the list of entries in the famous 500-mile struggle to be held at Indianapolis at the end of this month is any criterion, the followers of automobile sport are in for a good time. But this does not answer the question as to which direction motor racing is moving. The fact is that those who look pessimistically at this matter are inclined to base their views on the decline in popularity of particular events without considering the whole trend throughout the contest field.

With the idea of showing more definitely how the sport really stands the charts accompanying this article have been prepared. They represent graphically the varying popularity of the three principal kinds of automobile contests covering a period of the last 7 years. The diversions referred to are: speed contests, whether on road or track; reliability trials, including economy and endurance runs, and hill-climbs.

Fig. 1 shows by the number of important American contests held each year since 1906 the trend of public favor in reliability tours, speed contests and hill-climbs. It will be seen that with the single exception of 1911, when the speed events exceeded in number the reliability trials, the latter form of contest takes the lead, and, moreover, that the tendency of the curve as a whole

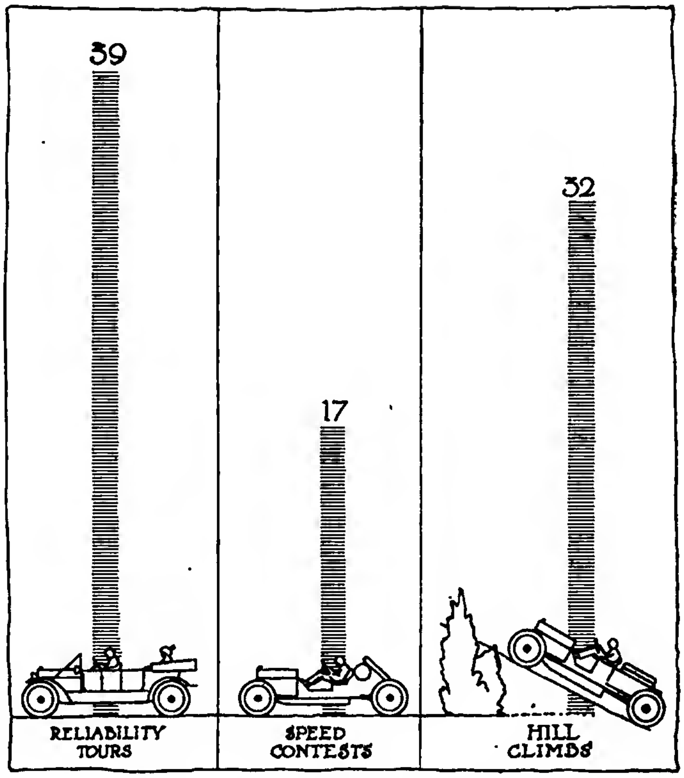


Fig. 5—Comparison of the average number of entries in the three great divisions of automobile contests since 1905

is favorable to increased interest in the future. The same can be said of the line which denotes the popularity of the purely speed contest. Although record speed achievements are now being made only on small margins there have been a sufficient number of these during the last year, or even the last few months, to warrant a keen public interest in any new car which is at all likely to go one better than the previous best in the way of making records.

The total number of events in the three divisions during the past 7 years shows the reliabilities lead with 248, as against 215 speed races and 109 hill-climbs, as charted in Fig. 3.

The hill-climb seems to make the least satisfactory showing, the general tendency being a falling away in favor, although the number of competitors who engaged in the Algonquin climb of 1910 and 1911 was as high as fifty-five. The chart, Fig. 4, dealing with the four most important hill-climbs shows that the average list of contestants varies between a range of twenty to fifty. The actual number of average entries in these contests is thirty-two, as shown in Fig. 5, which also gives the comparative length of the average entry list, obtained from figures extending over several years, of speed contests and hill-climbing events. It will be observed that in general the speed races favor the smallest field of competitors, with an average of seventeen cars.

It is true that the size of the entry list is not of itself a conclusive measure of value or popularity; the size of the audience is a factor that would furnish a truer perspective. Unfortunately these figures are not easily available and in the case of reliability trials on the open road are quite out of the question. However, it may be stated with a fair degree of accuracy that the average number of spectators who witnessed the important speed contests for the past few years is in the neighborhood of 35,000, while the audiences at hill-climbs averaged 25,500, as shown in Fig. 2.

One of the most interesting sets of figures, charted in Fig. 6, indicates the fluctuation in the cars entered from year to year in the four classic races. The rather sudden drop for 1912 in the Indianapolis curve of entrants is not continued, but takes a satisfactory upward turn for 1913, the list of entries just out numbering thirty-one.

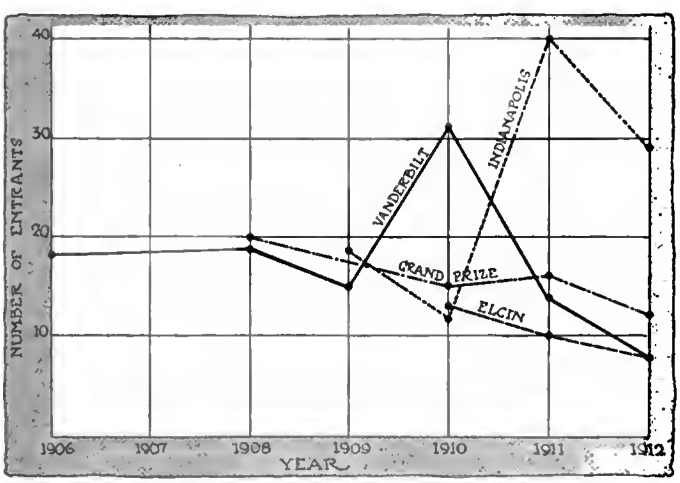


Fig. 6—Diagram of the number of entries in the four great speed classics of the United States during the past 7 years

A. C. of C. Holds Its First Business Meeting

A. B. of T. and N. A. A. M. Passed Out of Existence—Chamber's First General Meeting in Detroit May 19

NEW YORK CITY, May 7—The members of the N. A. A. M., Inc., and of the A. B. of T. have agreed unanimously to the plans adopted by their respective executive committees for the dissolution of the two associations and the consolidation of their interests in the newly-organized Automobile Chamber of Commerce. Meetings of the executive committees of the two bodies were held today. They were the last gatherings at which anything more than routine will be transacted. Tomorrow the members of the N. A. A. M., Inc., which is a Connecticut corporation, will meet at Hartford and vote to take the necessary legal steps to disband. It is intended that on the following day the Automobile Chamber of Commerce will commence active work.

The meeting of the A. C. of C. will be held at Detroit on Monday, May 19. At the meeting held today the following members of the executive committee of the A. C. of C. were present:

Charles Clifton, Charles C. Hanch, Samuel T. Davis, W. T. Leland, Windsor T. White, William E. Metzger, H. O. Smith, Albert L. Pope, L. H. Kittredge, H. H. Rice. Col. George Pope, the treasurer of the body, was also present.

Following is a short history of both the A. B. of T. and the N. A. A. M., which now have been merged into the A. C. of C.:

The Automobile Board of Trade was founded during May, 1911, and was originally composed of some fifty members of the dissolved Association of Licensed Automobile Manufacturers who had built motor cars under the Selden basic patent. This body had included a large number of automobile makers. The A. L. A. M. sought to enforce the Selden patent until early in 1911 when the principal suit of the A. L. A. M. against Henry Ford was lost by the decision of Judge Hough. Then the A. L. A. M. members began to plan a reorganization for the purpose of taking up other patents of general importance to the industry. The result of these considerations was the Automobile Board of Trade, with H. A. Bonnell as acting general manager.

The N. A. A. M. was organized November 10, 1900 at the first show held at New York. The first executive committee meeting was held on December 3, 1900. The association was incorporated on May 4, 1904.

As a partner of the Automobile Club of America, it governed the shows at Madison Square Garden. It remained until 1903 the *only* association of automobile manufacturers in this country. While so remaining it took upon itself the control of shows, the regulation of contests, the prosecution of good roads work, attention to legislative matters, the adoption of a warranty, the standardization of certain features of car construction and other interesting things. The control of shows was one of its first and most important undertakings.

The Selden patent and the formation of the Association of Licensed Automobile Manufacturers, popularly known as the Licensed Association, brought great changes. Following its formation the opposition organized the American Motor Car Manufacturers' Association, popularly known as the Unlicensed Association. The National Association, no longer the only one, became a house divided against itself, though it did not fall.

The licensed association took Madison Square Garden, where the National had formerly held sway, and conducted a show for the benefit of its members. The opposition took the Grand Central Palace for the unlicensed makers. The revenue of the National Association, as far as the New York show was concerned, was cut off. Meanwhile the association continued its control of the Chicago show, which gave it the necessary revenue to carry on its work.

The freight department of the association, backed by the numbers and influence of a united industry, became a real power and its value increased ten fold. The commercial vehicle committee became so active that its work is among the most important the association has done. The show committee jumped into the breach and headed off threatened opposition in New York. The membership committee became so active that it has added sixteen members to the roll, so that the association has now 105 upon the list, by far the greatest number in its history.

Early Metropolitan S. A. E. Meeting

NEW YORK CITY, May 7—The S. A. E. Metropolitan Section will hold its monthly meeting on May 27 instead of May 29, due to the visit of the British engineers, who will arrive on May 26 and will leave on the morning of May 28 for Pittsburgh. On the evening of May 26, an informal beefsteak dinner will be held in the Jungle room of Healy's restaurant, and on the following evening the monthly meeting in the ballroom of the McAlpin hotel. The problem of engine starting will be taken up, many starter manufacturers will have representatives at the meeting and a discussion will follow the reading of the papers.

Meteor Motor Car Co. Replaces Clark

SHELBYVILLE, IND., May 6—*Special Telegram*—The name of the Clark Motor Car Co., whose plant and other assets were purchased last week at a receiver's sale by interests headed by Maurice Wolf, of Chicago, has been changed to the Meteor Motor Car Co. The new company organized under this name will continue the manufacture of cars in Shelbyville, building two models, one of 30 horsepower and the other of 40 horsepower. Production of cars under the new regime is in progress, the first shipment leaving the factory today.

Regal Trebles Its Capital Stock

DETROIT, MICH., May 3—The capital stock of the Regal Motor Car Co. has been increased this week from $1,000,000, to $3,000,000. Of the latter amount, $2,600,000 has been subscribed for and paid in, while the remaining $400,000 of preferred has been set aside as a reserve for any future needs of the business.

The personnel of the Regal company has been altered somewhat, in that C. R. Lambert, John Lambert and Bert Lambert, who formerly held the positions of president, secretary and treasurer, respectively, have retired from active participation in the management. Fred W. Haines, former vice-president, has been made president, he at the same time retaining the general managership. H. H. Emmons has assumed the duties of secretary and treasurer. There is no vice-president under the new régime.

Although retiring from active capacities, the Lamberts will still remain on the Regal company's directorate, which includes Mr. Haines and Mr. Emmons in addition.

The concern's schedule calls for a production of about 7,500 cars this year, and with the present activity this figure will undoubtedly be reached. The Regal company has always enjoyed a healthy foreign trade.

Bostonians Settle 1914 Show Plans

BOSTON, MASS., May 5—A meeting of the Boston Commercial Motor Vehicle Association was held here on May 1, and the matter of holding a truck show for 1914 was fully discussed. It is planned to open the passenger car show on March 7 and close it on Saturday, March 14, and to open the truck show on the following Tuesday, March 17, and close it Saturday, March 21.

INDIANAPOLIS, IND., May 7—*Special Telegram*—C. B. Warren, who is leaving this state, resigned as president of the Indiana Automobile Manufacturers' Association last night. H. O. Smith, president of the Premier Motor Mfg. Co., was elected to succeed him. Carl G. Fisher was elected a director.

U. S. Rubber Earnings $91,000,000

NEW YORK CITY, May 7—The annual report of the U. S. Rubber Co., for the fiscal year ending March 31, 1913, which has been published here today, gives the total gross earnings during that period as $91,782,861.87, the net profit being $10,475,706.97 and the total income $10,559,830.46. The net profit, after deducting interest for funded indebtedness, etc., was $7,544,217.67.

The latter figure amounts to about 8 per cent. of the net sales, and from it $5,799,955 of dividends have been paid. The surplus after these payments is $1,744,262.67; together with moneys from the Rubber Goods Mfg. Co. common stock, etc., the surplus is $11,299,129.65, which together with previous surpluses, leaves the company a total surplus of $28,735,736.80, out of which a common stock dividend of $8,000,000 was paid. Net profits exceeded dividend payments by $1,730,755.36. Regular dividends of 8 per cent. on the first preferred and 6 per cent. on the second preferred stock were paid, as well as 4 per cent. payments on the common during the first quarter and 6 per cent. during the last, in addition to a 20 per cent. stock dividend declared in July.

During the year the first preferred issue has been increased from $40,000,000 to $70,000,000 and the common stock from $25,000,000 to $40,000,000, the second preferred having become convertible into first preferred. In addition to an enlargement of the company's plants, those of the Rubber Regenerating Co. have been acquired.

The report gives the company's assets as $185,770,827.52 of which $105,687,667.88 is credited to property and $7,456,804.28 to cash on hand.

Klaxon Company Increases Stock

NEW YORK CITY, May 5—The Lovell-McConnell Mfg. Co., of Newark, N. J., has just increased its capital to $2,000,000, half of which is common stock and half 7 per cent. preferred stock. The officers of the company remain the same. No stock will be offered in the open market, but the entire issue will go to people active in the company's factory.

Batavia-Seamless Suit to Court

NEW YORK CITY, May 6—The Seamless Rubber Co., of New Haven, Conn., has filed its answer to the complaint of the Batavia Rubber Co. which demands that the Seamless concern cease to manufacture tire treads resembling that of the Batavia company. The defendant has denied all the allegations made in the complaint, and the matter will come to trial. It is hardly probable that the suit will come up in court before the opening of the fall term.

Paige Company Plans Expansion

DETROIT, MICH., May 3—At the annual meeting of the board of directors of the Paige Motor Car Co., held recently, Alexander McPherson retired from the directorate and his place was taken by J. F. Bourquin, general manager of the company. No other changes were made in either the directors or the officials. The latter are H. M. Jewett, president; E. H. Jewett, vice-president; Gilbert Lee, treasurer; William B. Cady, secretary, and J. F. Bourquin, general manager. The directorate is composed of the following: H. M. Jewett, E. H. Jewett, E. D. Stair, S. L. Depew, W. E. Buhl, Gilbert Lee, J. F. Bourquin, C. H. Hodges and C. B. Warren.

The Paige company plans increased activity, and to this end H. M. Jewett has given up active participation in his other interests in order to devote more time to the affairs of the Paige concern. A new plant is contemplated to take care of the increasing business.

Maritime-Singer Six for Canada

LONG ISLAND CITY, N. Y., May 6.—The Palmer & Singer Mfg. Co. of this city has completed arrangements with the Maritime Motor Co. of St. John, N. B., Can., whereby the latter will assemble in its factory six-cylinder cars made from parts made by the Long Island company and known as Maritime-Singer Six, the cars to be practically identical with the sixes built in Long Island, having 45-horsepower, 128-inch wheelbase, and being fitted with two, four or five-passenger bodies. The price is to be about $3,000 Canadian money. The St. Johns factory operates now at the rate of seven cars a week.

Matheson Plant Sale on May 20

WILKES-BARRE, PA., May 5—The property of the Matheson Automobile Co., now in bankruptcy, will be sold here at auction on May 20. The sale will be under the control of receiver in bankruptcy W. C. Shepherd, formerly president of the company. The property will be offered for sale in separate parcels, although it is hoped by some parties that the sale will be preliminary to a resumption of manufacturing operations and not a dissolution sale.

DETROIT, MICH., May 3—Nothing definite as to the future plans of the Warren Motor Car Co., which went into the hands of a receiver recently, has yet been decided. A statement of the condition of the company and an inventory of its stock and equipment are now being prepared. The Detroit Trust Co. has been appointed receiver for the concern.

Automobile Securities Quotations

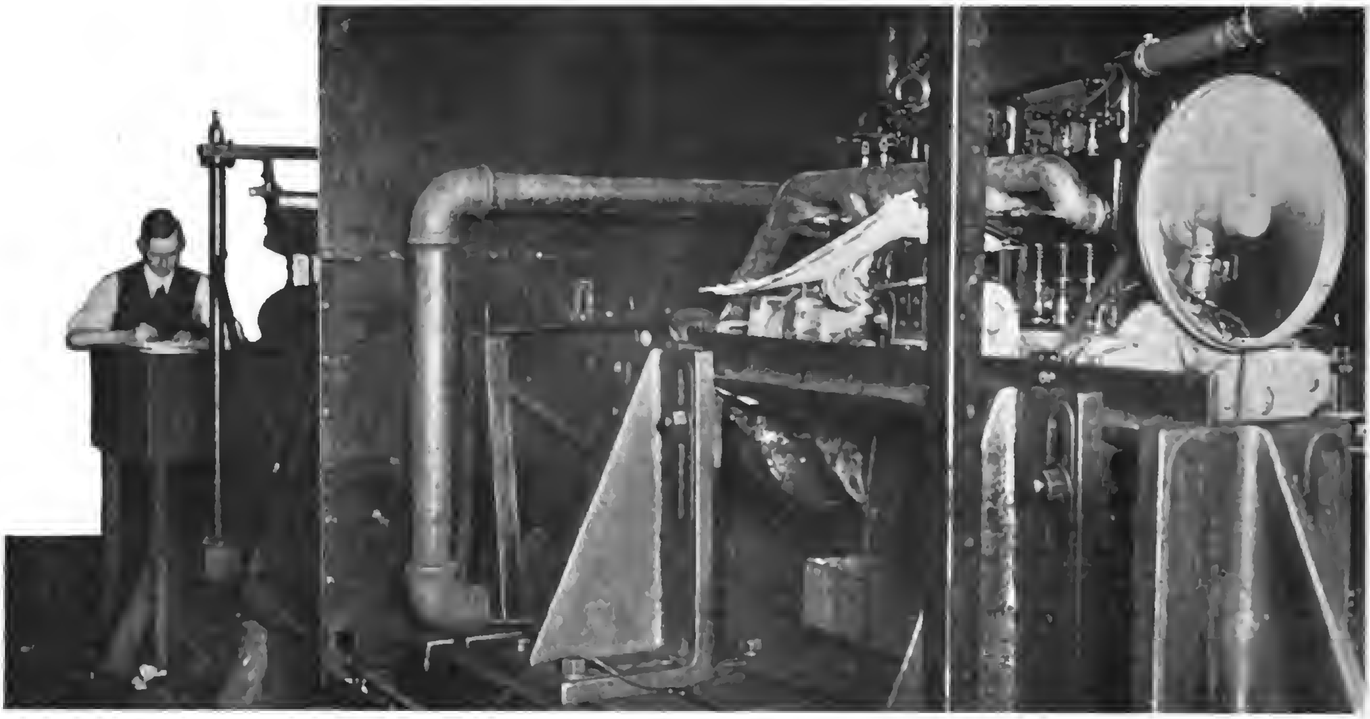
The amount of trading during the week was limited, although the market as a general proposition showed a fair amount of strength. Ajax-Grieb, Firestone, and Goodrich all scored advances, the last named rising 15 points over last week's closing figure. Miller Rubber, on the other hand, fell off as many points. General Motors, Lozier and Overland declined.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	130	155	..
Ajax-Grieb Rubber Co., pfd	95	100	95	100
Aluminum Castings, pfd	100	..	98	101
American Locomotive Co., com	42	43	34½	36
American Locomotive Co., pfd	109	109½	100	103½
Chalmers Motor Company, com	..	..	128	138
Chalmers Motor Company, pfd	..	..	99	102
Consolidated Rubber Tire Co., com	9	11	15	18
Consolidated Rubber Tire Co., pfd	40	..	60	75
Firestone Tire & Rubber Co., com	262	264	265	290
Firestone Tire & Rubber Co., pfd	107	109	105	106½
Fisk Rubber Company, com	..	..	..	..
Fisk Rubber Company, pfd	..	..	..	100
Garford Company, preferred	99	101	99	100½
General Motors Company, com	33½	34	23	26
General Motors Company, pfd	72	74	70	75
B. F. Goodrich Company, com	84	85	32	34
B. F. Goodrich Company, pfd	107	108½	91	93
Goodyear Tire & Rubber Co., com	236	240	325	331
Goodyear Tire & Rubber Co., pfd	105	106	99½	100⅝
Hayes Manufacturing Company	..	104	..	90
International Motor Co., com	33	35	5	5½
International Motor Co., pfd	93	96	12	16
Lozier Motor Company	..	55	..	20
Maxwell Motor Co., com	..	..	3	5¼
Maxwell Motor Co., 1st pfd	..	..	40	50
Maxwell Motor Co., 2nd pfd	..	..	12	16
Miller Rubber Company	160	165	140	150
Packard Motor Company	105	106½	98	102
Peerless Motor Company, com	..	..	35	45
Peerless Motor Company, pfd	..	..	95	100
Pope Manufacturing Company, com	30	34	16	19
Pope Manufacturing Company, pfd	74½	75½	50	53
Portage Rubber Co., com	..	..	35	41
Portage Rubber Co., pfd	..	..	85	90
Reo Motor Truck Company	9	10½	11⅝	12⅛
Reo Motor Car Company	24	25	20	22
Rubber Goods Mfg. Co., pfd	104	109	100	105
Studebaker Company, com	38½	40	27½	28
Studebaker Company, pfd	96	98	89	93
Swinehart Tire Company	112	114	85	90
U. S. Rubber Co., com	57	57½	63¾	64¼
U. S. Rubber Co., 1st pfd	113½	114½	104¾	105¼
White Company	107½	108½	107	109
Willys-Overland Co., com	..	..	58	61
Willys-Overland Co., pfd	..	..	85	92

Market Changes of the Week

Tin had its usual change, this week rising $.50 per hundred pounds. An improved consuming demand was also noted, with a fair amount of speculative buying. The London market was steady. Lead experienced a drop of $.15, the market remaining quiet, following the reduction in prices by the leading interests. Dealers report a rather light demand for domestic scrap, and according to reports from some other cities the demand has latterly fallen off, notably at Boston, where little business has been transacted of late, and the tendency of prices there is reported to be downward. Automobile tire scrap is calling at $.10 per pound. After a fairly steady opening cottonseed oil dropped to $6.87 per barrel, at a loss of $.04. This was caused by the weaker tone to the provision markets and the indifference of the consuming demand. Both petroleums experienced no changes, the prices remaining constant. Reports given say that the wells in the West are working good. Gasoline remains at $.22 1-4 per gallon sold in 200-gallon lots. Electrolytic copper showed a slight gain of $.00 1-8 per pound due to more active trading conditions.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.	.07⅝	.07⅝	.07⅝	.07⅝	.07⅝	.07⅝	....
Beams & Channels, per 100 lbs.	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Copper, Elec., lb.	.15½	.15½	.15½	.15½	.15⅝	.15⅝	+.00⅛
Copper, Lake, lb.	.15⅝	.15⅝	.15⅝	.15⅝	.15⅝	.15⅝	....
Cottonseed Oil, bbl.	6.91	6.89	6.87	6.85	6.86	6.87	—.04
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil, Menhaden, Brown	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 gals.	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard, Oil, prime	.95	.95	.95	.95	.95	.95	....
Lead, 100 lbs.	4.50	4.50	4.50	4.50	4.35	4.35	—.15
Linseed Oil	.49	.49	.49	.49	.49	.49	....
Open-Hearth Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Petroleum, bbl., Kansas crude	.88	.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa., crude	2.50	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	....
Silk, raw Italy	....	4.35	....	....	4.35	4.35	....
Silk, raw Japan	....	3.72½	....	....	3.72½	3.75	+.02½
Sulphuric Acid, 60 Baumé	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb.	49.63	50.00	49.60	49.60	49.88	50.13	+.50
Tire Scrap	.10	.10	.10	.10	.10	.10	....



Packard motor in the A.C.A. testing laboratory undergoing its long endurance test which equals a trip across the continent

Packard Motor Steady

First Half of 200-Hour Heavy Duty Test Goes Off Smoothly

NEW YORK CITY, May 7—For more than 84 hours the Packard six-cylinder 4 by 5.5-inch motor now on test at the laboratory of the Automobile Club of America, has been steadily pounding away at the rate of 1,200 revolutions per minute. This is a model 38 motor taken from stock and driven in a touring car from Cleveland to New York. It arrived here Friday noon and at 10:43 Saturday night it was started on its long test.

For 200 hours the motor will be run at its maximum power at the rate of 1,200 revolutions per minute. The throttle is wired wide open, the magneto is wired so that the spark is fully advanced while the laboratory staff works night and day in 8-hour shifts, keeping a constant record of the performance of the motor. To all appearances the motor is running just as it did when it started.

A test of this kind uses 60 gallons of gasoline every 200 hours. In 1 hour the motor will have turned over 72,000 times or 1,730,000 revolutions per day. At the end of 200 hours the motor will have revolved 14,400,000 times. At 1200 revolutions per minute with the standard gear ratio of a touring car, the car will be traveling at the rate of 37 miles an hour. This is 888 miles per day or for the 200 hours amounts to 7,400 miles. Should the test be continued for 300 hours it will correspond to a traveled distance of 11,100 miles. At the end of 300 hours the crankshaft will have revolved 21,600,000 times.

Observations are made constantly according to the conditions printed in THE AUTOMOBILE for May 1 and no sign of weakness has as yet developed. A blast of air to parallel road conditions is used to cool the crankcase and the water is pumped to a cooling tank instead of through the radiator.

Ford Makes 1,000 Cars a Day

DETROIT, MICH., May 3—The making of 1,000 automobiles a day is no longer a press agent's dream, for on several days during the month of April just passed the production of Ford model T automobiles has equalled or exceeded that figure. Averaging the entire month of April, the daily output of the Ford plant has been 869 cars per each 24 hours. Of course, there were some days when the number turned out fell somewhat short of the 1,000 mark, while on others it was considerably overshadowed.

During May the Ford production department expects to average in the neighborhood of 900 completed machines each working day. This means that on some days the number leaving the works will have to be greatly in excess of 1,000 to make up for the days when it falls below.

Such figures are hard to realize when it is considered that many a prosperous factory does not make many over 1,000 automobiles a year, to say nothing of a quantity equal to a single month's Ford output. During April there were about 21,000 Fords offered to the world. For March there were exactly 17,364 produced, with a total value of $10,000,000, in round numbers. Thus, April showed an increase of manufacture of about 21 per cent. over March. At this rate it looks as if there will be no trouble in meeting the schedule of 200,000 machines as planned.

The company's records for the first half of the fiscal year ending with March and extending over the months of October, November, December, January, February and March, show that for this period a business of $47,000,000 was done, which establishes a new mark in the annals of automobiledom. The sale and delivery of 78,462 cars for the past 6 months is in excess of the entire number turned out by the company for the previous fiscal year by about 5,000 cars. The past half year's quota swells the total number of Fords produced from the beginning of manufacture up to April 1, 1913, to 234,753.

Licenses for New York Operators

ALBANY, N. Y., May 3—The McGrath bill was passed in the Legislature yesterday, after having been amended seven times. All automobile operators must be licensed. In its present form the law gives to the secretary of state the power to suspend or revoke any license after a hearing and 10 days' notice to the owner thereof, if he has been shown to be guilty of reckless driving.

The amendment reads in part as follows:

"Application for a license to operate motor vehicles as an operator or chauffeur may be made, by mail or otherwise, to the Secretary of State or his duly authorized agent upon blanks prepared under his authority.

"Special licenses shall be issued to chauffeurs, but before such license is granted the applicant shall pass such examination as to his qualifications as the Secretary of State shall require. The Secretary of State shall appoint examiners and cause examination to be held at convenient points throughout the state as often as may be necessary. Every application for a chauffeur's license shall be accompanied by two photographs of the applicant in such form as the Secretary of State shall prescribe, such photographs to be taken within 30 days prior to the filing of such application and to be accompanied by the fee provided therein.

"As regards to licensing chauffeurs, the bill provides for a more liberal license fee and a reduction of the renewal. The first license shall be $1.00 and no charge for a renewal; this is a change from $5.00 for new license and $2.00 for renewal.

"The Secretary of State is empowered to suspend or revoke any certificate of registration or any license for the following causes: Three violations of the speed provisions in one year, conviction of felony, physical or mental disability, intoxication or the use of drugs, negligence or reckless driving."

Makers Object to Tariff

Proposed Chassis Reduction Is a Joker, Says Manufacturers' Protest

TWENTY-SEVEN manufacturers of American-made passenger cars have protested to Congress against the new tariff on motor cars and motor car parts. The chief ground of protest is on the reduction of the duty on chassis from 45 to 30 per cent. and further on the reduction of duty on finished parts of cars, not including tires, from 45 to 20 per cent. These manufacturers take the view that the present Underwood tariff takes care of the foreign manufacturer and the foreign workman by opening the American market to them on the lowest possible terms. The protests further goes on to state that importers and representatives for foreign manufacturers were consulted and their advice taken, whereas the American manufacturer seeking to defend his business and his employees from foreign cheap labor products has been utterly ignored.

The protest goes on to show that not only a slight modification of the existing duty of 45 per cent. was necessary to be entirely satisfactory to European factory representatives in this country and that if the duty were reduced from 45 to 33 or 30 it would give the European makers entry to the American market at satisfactory rates of profit to them.

The protest further says: "It certainly is a joker to have finished automobiles in the tariff schedules at 45 per cent. and to have automobile chassis listed at 30 per cent. . . . Practically all of the imports of motor cars are in the form of chassis. The chassis is the thing the European manufacturer wants to bring in at the minimum rate of duty. European manufacturers do not manufacture bodies except to a very small extent, as bodies are too bulky and subject to damage in shipping and too expensive to ship by reason of their bulk in proportion to their value. Does it seem like a joker to have a Ways and Means Committee put its stamp of approval on the 45 per cent. rate of duty for finished automobiles exactly as it was done by the Payne-Aldrich bill and then place a rate of duty of 30 per cent. on the chassis?"

Further: "The chassis itself is really a completed automobile and it is the thing the European manufacturer wants to bring in at the minimum rate of duty. It is the part requiring the ingenuity, the invention, the expensive material, the elaborate work of skilled manufacture chiefly represented in expense by American labor at American wages and American material. There is practically no material now imported. It is all made in this country. Magneto factories, parts makers, etc., have been transplanted to America and motor car factories also under the present Payne-Aldrich tariff."

The second joker consists in admitting finished parts at 20 per cent. duty.

The protest goes on to show how it is the parts that make the car and that the chief cost of its chassis consist in the material in these parts and the labor bestowed on them, whereas the labor necessary to properly bring them together into a chassis is a minor one, and the negligible per cent. of the chassis cost.

The protest continues: "Is a European manufacturer going to import these products into America as chassis at 30 per cent. duty, when he can ship it at less cost of freight and enter it at 20 per cent. and have simply to assemble the various parts into a chassis at a cost of approximately 1 per cent.? It is clear that the foreign manufacturer will provide for uniting or assembling the imported parts in America. Chassis as such will only be imported by the foreign manufacturer who is without sufficient means to establish an assembling branch in America."

In conclusion: "The man in the grocery business who buys an American automobile sees his money distributed in payroll to the American workmen making that automobile, who, buying groceries or clothing, spend it in his store. With free trade or a tariff reduced to the point of ready admission of foreign automobiles or parts this same grocer or clothier sees his money going to Europe to pay foreign workmen and to be spent for foreign groceries and clothes. With the purchase of the American automobile, the buyer benefits the American manufacturer, the American workman and himself. With the tariff reduced to admit foreign automobiles, the purchasers of them take away the means of existence of the American motor car manufacturer, the American workman and himself to just that extent.

"The motor car industry is deserving of credit for the large export trade which has been built up as the result of great national prosperity at home, which has enabled it to adopt manufacturing methods, to reduce the cost of production, and enter into the war for the world's commerce with European concerns who are better located as to freight, fully equipped with American machinery and with cheap labor available at approximately half to two-thirds that paid American labor.

"The total American export trade of all kinds has grown to exceed the enormous sum of $2,000,000,000 annually. This could not have been done without a condition precedent to it of prosperity, first in America, which properly has given the ways and means and ability to engage in the fight for world-wide commerce. Prosperity at home is the first necessary factor for increase of export trade.

The protest is signed by the following, constituting a committee of five representing the 27 manufacturers mentioned below.

John N. Willys, vice-president, Willys-Overland Co.; W. S. Leland, general manager, Cadillac Motor Car Co.; Charles Clifton, treasurer, Pierce-Arrow Motor Car Co.; Hugh Chalmers, president, Chalmera Motor Car Co., and Henry B. Joy, president, Packard Motor Car Co.

The following are the manufacturers represented by the above committee:

John S. Clark, vice-president, Autocar Co.; Ardmore, Pa.
A. F. Benjamin, general sales manager, American Locomotive, New York, N. Y.
V. A. Longaker, general manager, American Motors Co., Indianapolis, Ind.
H. W. Ford, secretary, Chalmers Motor Co., Detroit, Mich.
W. C. Leland, vice-president, Cadillac Motor Car Co., Detroit, Mich.
J. J. Cole, president, Cole Motor Car Co., Indianapolis, Ind.
G. W. Bennett, vice-president, The Garford Co., Elyria, Ohio.
Elwood Haynes, president, Haynes Automobile Co., Kokomo, Ind.
Chas. D. Hastings, secretary, Hupp Motor Car Co., Detroit, Mich.
S. T. Davis, Jr., president, Locomobile Co. of America, Bridgeport, Conn.
G. A. Kissel, president, Kissel Motor Car Co., Hartford, Wis.
Joseph M. Gilbert, president, Lozier Motor Co., Detroit, Mich.
Leo A. Feif, general sales manager, Mitchell-Lewis Co., Racine, Wis.
Geo. M. Dickson, secretary, National Motor Vehicle Co., Indianapolis, Ind.
Geo. O. Daniels, vice-president, Oakland Motor Car Co., Pontiac, Mich.
O. C. Hutchinson, vice-president, Olds Motor Works, Lansing, Mich.
Henry B. Joy, president, Packard Motor Car Co., Detroit, Mich.
L. H. Kittredge, president, Peerless Motor Car Co., Cleveland, Ohio.
Charles Clifton, treasurer, Pierce-Arrow Motor Car Co., Buffalo, N. Y.
George Pope, treasurer, Pope Mfg. Co., Hartford, Conn.
H. M. Snyder, secretary, Reo Motor Car Co., Lansing, Mich.
H. B. Staver, Staver Carriage Co., Chicago, Ill.
W. H. Whiteside, president, Stevens-Duryea Co., Chicopee Falls, Mass.
Frederick F. Fish, president, Studebaker Corporation, South Bend, Ind.
Robert W. Allen, general manager, Warren Motor Car Co., Detroit, Mich.
Windsor T. White, president, White Co., Cleveland, Ohio.
John N. Willys, president, Willys-Overland Co., Toledo, Ohio.

Yosemite Park Open to Motorists

WASHINGTON, D. C., May 3—Secretary Lane today rescinded an order which bars automobilists from Yosemite Park, on the grounds that thereby a large proportion of the people will be enabled to enjoy the beauties of the National Park.

AUGUSTA, ME., May 5—The legislature has passed a law creating a state highway commission of three members and authorizing the issue of $2,000,000 bonds to be spent solely on highway construction.

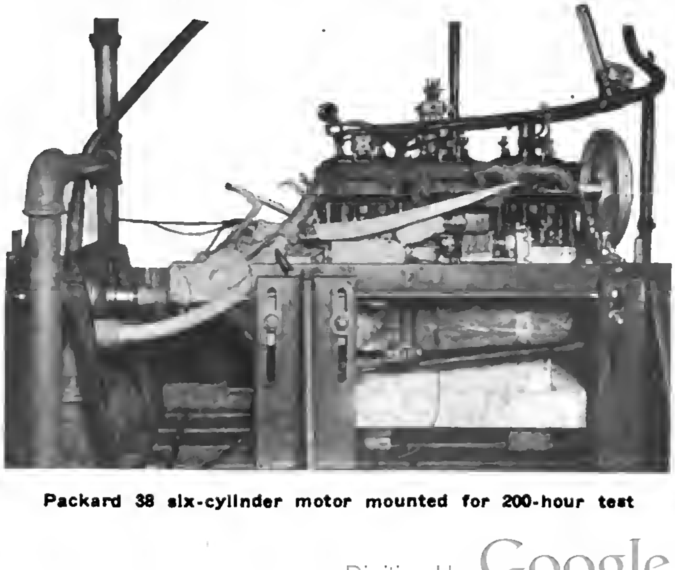
$3,000,000,000 Road Plan Proposed

WASHINGTON, D. C., May 1—National and state co-operation in a $3,000,000,000 expenditure for good roads—$1,000,000,000 being for construction and $2,000,000,000 for maintenance, and both extending over a period of 50 years—are proposed by a plan submitted this week by Jonathan Bourne, Jr., former Senator from Oregon, to the joint committee on federal aid in the construction of post roads.

His plan contemplates that the billion-dollar construction fund shall be apportioned among the states upon the basis of area, population, assessed valuation and road mileage, and that the several states shall deposit in the U. S. Treasury their 50-year 4 per cent. bonds for the amount due them, and the Government loan the states the par value thereof for road construction, the Government raising its fund by the sale of its 50-year non-taxable 3 per cent. bonds. By crediting each state every year with the excess 1 per cent. interest paid by the state to the Government over what the Government pays on its bonds and allowing 3 per cent. interest compounded annually on said excess 1 per cent., a sinking fund is established from which the Government pays off the bonds at the end of 50 years and the state is relieved of the payment of principal on its bonds.

The Government will also, under this plan, pay to each state annually for road maintenance an amount equal to 2 per cent. of the amount of bonds on deposit, provided the state expends a like amount.

NEW YORK CITY, May 7.—Under the provisions of the Pollock bill, which has just passed the legislature of New York state, it will be possible for bus companies operating in New York City to compete with the Fifth Avenue line, which has long held a monopoly. A new company, the Electric Coach Co., with a weighty financial backing is seeking a franchise and expects to have 1,000 electric four-wheel-drive buses operating on New York streets by the end of the season. The fare is to be 5 cents.



Packard 38 six-cylinder motor mounted for 200-hour test

Start of eighteen trucks which participated in the Washington Post commercial car run

Atterbury truck crossing the Hyarthtown bridge, Maryland

Trucks Do Well in Run

HARRISBURG, PA., May 6—With approximately one-half of its distance covered the Washington Post motor truck demonstration reached here early this afternoon, having all of its original eighteen contestants and three non-contestants in line, as well as all of the various passenger cars used by officials.

Eight of the eighteen contestants still have perfect road scores these being Mais, Wilcox. Hupmobile, McIntyre, Lauth-Juergens, two Whites and an International. The three non-contestants are ambulances entered by Major P. L. Halloran, of the United States army and two of these, a White, has still a clean sheet, the other carry slight penalties.

The total run, which will take in 4 days and cover 288.7 miles of country, will come to an end in Washington, D. C., Thursday evening after which the trucks will be given brake, clutch and transmission tests as well as a technical inspection. The daily itinerary has averaged 72 miles with night stops at Hagerstown, Md.; Harrisburg, Pa.; Hanover, Pa.; and Washington, D. C. The trucks carry their full load as catalogued. this in many cases being bags of gravel carefully weighed before the start of the run and in other cases merchandise. Each one carries in addition to its driver an official observer. During noon contols, which are from 1 to 2 hours in length to give citizens at the noon stops an opportunity of examining them, the trucks are parked under police protection so that no meddling can be done with them. At night they are similarly parked, so that any work done on them from start to finish will result in penalization.

The speeds on the roads vary from 9 to 12 miles per hour according to the truck loads, but on the first 2 days these have been entirely too slow, for the dry roads passed over, although if rain were encountered it is certain that all of the time afforded would be required.

The following are the loads carried: Under 1,500 pounds load 12 miles; 1,500 to 2,000 pounds 11 miles; 2,000 to 5,000 pounds, 10 miles; 5,000 to 8,000 pounds 9 miles per hour. The following are the entries, their official speeds, loads and penalties to date:

No.	Name	Entrant	Capacity	Sp'ds	Penalties
1	Vulcan	Commercial Garage	8000 lbs.	9	189
2	Mais	Mais Motor Truck Co	3000 lbs.	10	0
3	Little Giant	Motor Truck Corp	2000 lbs.	11	12
4	Witt-Will	Witt-Will Co	2240 lbs.	10	43
8	Rowe	Rowe Motor Mfg. Co	4000 lbs.	10	47
9	Hupmobile	Wash. Auto Service Co	800 lbs.	11	0
10	McIntyre	W. H. McIntyre Co	3000 lbs.	10	0
11	Autocar	Autocar Sales & Service Co.	3000 lbs.	10	23
12	Lauth-Juergens	Lauth-Juergens Motor Car Co	4000 lbs.	10	0
13	Atterbury	Atterbury Motor Car Co	1500 lbs.	12	3
14	Atterbury	Atterbury Motor Car Co	2000 lbs.	11	6
15	Atterbury	Atterbury Motor Car Co	3000 lbs.	10	101
16	Atterbury	Atterbury Motor Car Co	4000 lbs.	10	29
17	White	The White Co	1500 lbs.	12	0
18	White	The White Co	3000 lbs.	10	0
19	International	H. B. Leary, Jr	1000 lbs.	12	0
20	Atterbury	Atterbury Motor Car Co	1500 lbs.	12	128
100	Brown	Major P. L. Halloran	Ambul'ce	12	3
101	Four-Wheel-Drive	Major P. L. Halloran	"	12	15
102	White	Major P. L. Halloran	"	12	0

No 1912 Los Angeles-Phoenix Race

PHOENIX, ARIZ., May 1—It has been practically decided that there will be no Los Angeles-Phoenix race this year. Conditions are so unsettled on the coast that the members of the Maricopa Auto Club. who have promoted the race for 5 years, do not believe it will be possible to hold it with any satisfaction next fall. They hope to promote a race from El Paso, sanctioned by the A. A. A. instead.

Texans to Build Speedway

SAN ANTONIO, TEX., May 1—The San Antonio Automobile Club and the Texas State Highway Assn. have under consideration the construction of a 2-mile speedway here to take the place of the present short racing course. The proposition is being urged by Dr. W. A. Hering, president of the club, and John W. Warren, president of the association. It is meeting with enthusiastic endorsement.

PHILADELPHIA, PA., May 3—Preliminary plans and regulations that are to govern the interclub reliability run to Gettysburg, to be held on June 7, under the joint auspices of the Quaker City Motor Club, the Automobile Club of Philadelphia, the Automobile Club of Germantown and the Delaware County Automobile Club, have been completed.

The run is to be open to members of the four organizations mentioned, who are private owners and not connected with the automobile industry. Members of the trade are invited to accompany the run as non-contestants. The Interclub Road Run trophy will be awarded the club having the most teams finishing with a perfect score, the entrants being divided into teams of five for each club.

PHILADELPHIA, PA., May 4—Favored by ideal weather and road conditions, the local automobile contest season was opened yesterday when the Quaker City Motor Club conducted its sixth annual sociability run to Atlantic City, N. J. Forty-one cars were officially entered, of which thirty-one checked in at the Hotel Strand

Thirty-One Cars for Indianapolis Race

INDIANAPOLIS, IND., May 5—When the list of entries was closed for the 500-mile race to be held at the Indianapolis Motor Speedway, May 30, it was found thirty-one cars had been entered for the long grind. This is seven more entries than there were in the race last year. Two of the entries are unknown, and may not be announced until the elimination trials.

It is said that the race will present one of the most thorough representative international motor car races ever held. Most of the entries this year have been made by factories, both of the United States and abroad. This year will see several foreign drivers, whereas heretofore the foreign entries have been by American owners with American drivers.

The qualifications for the race are that cars must not exceed 450 cubic inches piston displacement, must have a minimum weight of 1,600 pounds and must be able to do 75 miles an hour.

The seat sale is proceeding in a most satisfactory manner. Preparations for the race are also making excellent progress. There will be better hotel accommodations than in the past, because two large hotels, one of seventeen stories and the other of twelve stories, have been built since the race last year. The complete list of entries follows, together with some of the mechanical details of the cars:

No.	Car	Cyls. In.	Bore In.	Stroke In.	Disp. Cu. In.	Driver
1	Nyberg	6	6	4	389	H. Endicott
2	Stutz	4	..	..	...	Merz
3	Stutz	4	..	..	...	Anderson
4	Keeton	4	5 3/32	5.5	387	Burman
5	Mason	4	4 5/16	6	350.5	Evans
6	Mason	4	4 5/16	6	350.5	Tower
7	Unknown	..	..	..	...	......
8	Stutz	4	..	..	...	Herr
9	Sunbeam	6	3.54	6.29	380.8	Guyot
10	Henderson	..	4 5/16	6	350.5	Knipper
12	Fox Special	4	4.75	5.5	389	Wilcox
14	Smada	4	3.5	5	192.4	Adams
15	Peugeot	4	..	..	...	Goux
16	Peugeot	4	..	..	...	Zucarelli
17	Amel	4	4.5	5	318.1	Liesaw
18	Schacht	4	4 7/8	5.5	410.6	Jenkins
19	Mercer	4	4.8	6 3/16	447.9	De Palma
20	Mercer	4	4.8	6 3/16	447.9	Bragg
21	Mercer	4	4.37	5	299.7	Wishart
22	Mercedes-Knight	4	3 5/16	5 1/8	250	Pilette
23	Pennebaker-Stearns-Knight	4	5 1/8	5 1/8	443.5	Pennebaker
24	Tulsa	4	4 3/4	5.5	389.9	Clark
25	Mercedes	4	4.4	7 1/8	440.8	Mulford
26	Isotta	4	120 mm	160 mm	443.86	Grant
27	Isotta	4	120 mm	120 mm	443.86	Tetzlaff
28	Isotta	4	120 mm	160 mm	443.86	Not named
29	Case	..	..	..	450	Disbrow
30	Case	..	..	..	450	W. Endicott
31	Case	..	..	..	450	Nikrent
32	Unknown		..	..	...	......
33	Mason Special	..	..	..	...	Haupt

CHICAGO, May 5—Additional improvements planned for the Kane County circuit by the Elgin Automobile Road Race Association promise to make the course one of the fastest in the country, and one that even will threaten the Santa Monica course's supremacy. If a speed of close to 80 miles an hour cannot be maintained in the Elgin National race next fall, it will be surprising. These contemplated improvements mean that the Kane County course will be in reality an 8.5-mile circular speedway, with no sharp right-angled turns.

At a meeting of the Elgin Automobile Road Race Association yesterday it was decided to build a new turn at the east end of the course.

The Elginites will again close with the Chicago Automobile Club to handle the meet. They also have contracted for a covered grandstand and several concessions have been let.

Motor Dealers Secret-Time Run

NEW YORK CITY, May 2—The recently organized Motor Dealers' Contest Association held its first contest of the season this evening, which took the form of a secret-time sociability run from Columbus Circle to Hotel Cedarcliff, New Rochelle, 17.5 miles. Fifty-four cars started in the gasoline and electric division. The secret time for the gasoline cars was 56 minutes and 21 seconds, and the winning car was J. T. Kelly's Overland, which took 56 minutes and 10 seconds; second prize, W. Cullem, DeDion, 56 minutes 50 seconds; and third prize, Miss Stella Mayhew, Regal, 55 minutes 21 seconds. Gold, silver and bronze medals were awarded.

Nearly a score of electrics contested for the W. C. Poertner Cup. Their running time was 80 minutes 17 seconds, a speed of 13 miles per hour. Mrs. A. E. Waxham, in a Waverley, was first, 84 minutes 49 seconds. P. S. Rogers, in a Waverley, was second, 72 minutes 36 seconds, and a Baker entered by the New York Edison Co. was third, 68 minutes 57 seconds.

White truck near South Mountain in Washington run

At the left is part of the gasoline division of the run to New Rochelle. Electric division at the right

The AUTOMOBILE

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Testing Out the Motor Trucks

IT is generally conceded that the early reliability contests did much to quicken the devlopment of the passenger car. The 200-mile mountain climbs showed up weaknesses in brake construction, in cooling facilities, in running gear details and in not a few other lines. These same makers who learned their valuable passenger car lessons are today averse, in many cases, to entering in truck competitions. They claim that they are not needed. They claim that the passenger car trials taught them all that it was necessary to know.

The motor truck is more and more becoming a vehicle of inter-city work and the requirements for such service are often quite different from those in city service. This is chiefly so in hilly districts where severe strains are placed on the motors and brakes. The present truck demonstration through the states of Maryland and Pennsylvania is proving that in several cases brakes are not adequate for the long mountain descents, the same as was discovered in the touring car field 8 years ago. The long mountain climbs are showing the necessity for adequate radiator capacity.

Apart from the valuable lessons that truck demonstrations teach the maker direct, they play a big part by the enthusiasm they create along the route, which is particularly so when efforts are made to give the business people at noon and night stops an opportunity not only to look over the trucks but also to talk with the factory managers who accompany the demonstration.

Reducing the Automobile Tariff

THE announced reductions in the tariff on automobile chassis and parts from 45 to 30 and 20 per cent. respectively has, as tersely pointed out in a brief recently issued by twenty-seven leading American automobile makers, placed in the hands of the foreign maker a weapon that he can wield with danger to some of the American factories, in that the flat reduction of 15 per cent. on chassis coupled with his cheaper labor and modern machines will enable the foreign maker to readily compete in certain car fields with the home-made product on a much more favorable ground than formerly.

In manufacturing cars, the foreigner secures labor that often does not cost one-third the price of American labor, but today he has a still further advantage that he did not possess a few years ago, namely, he has fitted his factory up with the most approved machinery purchased in America.

Heretofore, the American maker has excelled the makers of all other countries in production. Automatic and multiple machines have so far outdistanced the old-fashioned foreign methods that the cheap labor question of Europe was offset. Today matters are changing. The foreigner is cutting his costs of manufacture and consequently will be a stiffer competitor in America than he has been. In the past conditions have been sufficiently favorable that where foreigners have been well represented on this side of the Atlantic they have been able to build up a very large market. True, only one or two have so taken advantage of the conditions, but they have existed, nevertheless, and if under the 45 per cent. rule they have made such progress what can be expected under a 30 per cent. regime?

The American manufacturers point out that in the reduction of duty on spare parts from 45 to 20 per cent. an opportunity will be offered to ship the separate parts in and assemble them and so place them on the market at an enormous price reduction as compared with today. There is little danger at present of this because it would call for a greater speculative investment than most of the foreign concerns would be willing to make. To build an assembly factory in this country would mean to produce 2,000 cars or over and few of the concerns would venture on such a risk. Practically all of the importation of parts will, as in the past, continue to be for replacement of cars now running.

It is, however, up to the American maker to look to his fences. He must cast the microscope around his engineering department, around his manufacturing methods, around his selling force and around his maintenance organization.

Letting down the bars, as the tariff proposes, pushes our makers out into world-wide competition burdened with a labor handicap, also handicapped in that the European maker is a more experienced exporter and has been developing his market in all parts of the world for the last 10 years, whereas the American builder has been engaged in that time filling home demands. Every economy in manufacture will have to be looked to. Motion study will have to be made a greater study in all production departments; and the designers will practically be compelled to design with a view to economy of manufacture.

Detroit S.A.E. on Kerosene and Aluminum Alloys

DETROIT, MICH., May 2—That kerosene carburetion and aluminum alloys are especially live subjects in the automobile industry just at present, was demonstrated by the large attendance at the meeting of the Detroit Section of the Society of Automobile Engineers on May 1. Vice-chairman Cornelius T. Myers called upon P. S. Tice for the first paper, under the title of "Some of the Difficulties of Kerosene Carburetion." Mr. Tice first gave a résumé of the characteristics of kerosene and their relation to gasoline under the following heads: (a) greater specific gravity, (b) higher viscosity, (c) less volatile, kerosene being practically non-volatile at the ordinary temperatures in this latitude, (d) about the same specific heat, (e) two and one-half times the latent heat of vaporization, or about 680 British thermal units per pound for kerosene, (f) more diverse composition with more and more widely assorted foreign matttr in suspension in the commercial product.

Difficulties with Kerosene

Of the difficulties encountered in kerosene carburetion, he said that the change of viscosity with change of temperature was especially hard to deal with, since the ratio between kerosene and gasoline of the rate of flow through a small orifice is 1.74 from 40 to 140 degrees Fahrenheit. This means that the motor has to be nursed until the whole system warms up, and to give flexibility and economy, it is necessary to supply the conventional type of carbureting device with additional heat. With the high boiling point and a latent heat of vaporization of about 680 British thermal units per pound it requires approximately 900 British thermal units to vaporize kerosene from an initial temperature of 40 degrees Fahrenheit. Prohibitive difficulties may easily arise from the very high temperatures necessary to furnish the fuel with the required heat units in the very short time available. The relative non-volatility of any of the constituents of kerosene, below 135 to 140 degrees Fahrenheit has proven the greatest trouble in producing a commercially successful kerosene carbureter, for it is practically impossible to start witht a cold motor and carbureter on this fuel.

The second part of Mr. Tice's paper dealt with the results of a preliminary investigation of kerosene fuel carried on by him in the laboratory of the Holley Brothers' Co. Tre results of this research were given graphically by curves shown by means of lantern slides. The runs were made on a Ford motor with the regular carbureter and manifold replaced by a T-manifold with short branch to which was attached a vertical copper tube. At the lower end of the tube a series of venturi-like throat pieces could be fitted. The flow of fuel was controlled by the relative position of the jet to the venturi neck. There was no throttle of the ordinary type. The copper tube was wound with resistance wire through which an electric current was passed, the amount of current being controlled by a rheostat. The kerosene used had a specific gravity of .817. One set of curves was plotted between pounds of kerosene per brake horsepower-hour and mixture temperature. These were for two conditions, that of minimum temperature for starting with a cold motor and that of minimum temperature for steady running. These curves showed that to start with a cold motor it was necessary to have a mixture temperature of from 170 to 250 degrees Fahrenheit, depending upon the richness of the mixture. The leaner the mixture, the higher the temperature necessary. The steady running temperatures varied with the richness of the gas from 76 to 120 degrees Fahrenheit. Normal conditions required temperatures of 220 and 100 degrees Fahrenheit, respectively.

Another set of curves showed the effect of mixture temperatures upon economy. The difference in economy for different temperatures was very marked and with conditions varying from very light to almost full load and at several speeds it was found that the greatest economy lay between mixture temperatures of 150 to 170 degrees Fahrenheit.

The last slide brought out the fact that with a kerosene mixture at 160 degrees Fahrenheit, the fuel consumption per brake-horsepower-hour at different speeds was much lower than that considered very good with a standard carbureter on the same motor under the same conditions of speed and load but without heating. These results were under close throttling of the motor.

In the discussion following the Tice paper, W. S. Hovey spoke of the progress of the Sheffield Car Co. in injecting kerosene and even lower grade oils in two-cycle railroad and marine motors.

Geo. A. Kliesrath then described a test trip with an Overland car equipped with the new Ray Harroun carbureter. This device uses kerosene which furnishes the required heat at the jet by passing all of the exhaust through it. Starting on a cold motor was accomplished by feeding gasoline to the inlet manifold during the time that the self-starter was cranking. The performance of the car was very satisfactory, tests being made for acceleration, sustained speed, idling, etc. The fuel economy was excellent considering the very bad roads encountered in the flood district of Indiana and Ohio.

It had been the experience of both Mr. Tice and Mr. Kliesrath that it is necessary to heat the fuel or the mixture when using kerosene and not to pre-heat the air as is now common practice in gasoline carburetion. Neither had intentionally used water with the mixture for the purpose of decreasing carbon deposits or preventing pre-ignition. The motors in both cases were of the same compression as used with gasoline. It was also brought out by several members that the pounding or bumping of the motor which has been noticed with kerosene and sometimes with gasoline, when starting, is probably due to a poor distribution of fuel between the different cylinders.

The second paper dealt with a comparison of aluminum alloys. Claude E. Cox showed several charts giving the possible alloys with aluminum and the results of a large series of tests of different alloys and under varying conditions. It is possible to alloy aluminum with many other elements, such as gold and silver, but those with which we are most familiar are the alloys with copper, zinc, and more recently, magnesium, as in duralumin and magnalium. The data presented pointed to quite a variation in the physical properties for the different kinds and proportions of the alloys, and also that the pouring temperatures made a great difference in the strength of the castings. Probably the most interesting chart indicated that the strength of an aluminum casting decreased markedly with an increase of the temperature of the piece.

Aluminum Casting Practice

Following the talk by Mr. Cox, J. P. Carritte read a paper dealing with the shop practice in casting aluminum with especial reference to what is known as McAdamite metal. This metal was perfected by William McAdams, and is an aluminum-zinc compound, handled by a special method in shop practice production. Mr. Carritte gave some foundry rules for obtaining especially good castings, among them being the use of graphite crucibles, the rubbing of pots and receptacles with graphite and the avoidance of iron skimmers. These precautions are advisable because of the great and detrimental affinity of aluminum for iron and silicon. For the same reason he recommended that no turnings be used in the scrap, because of the iron which comes from the tools. In the McAdamite castings, for which extra strength is claimed, the virtue seems to lie not only in the alloy, but more especially in the method of handling the casting and molding. A molding compound of carborundum, carbon, French clay, charcoal, etc., is used in the same manner as in ordinary sand practice, and by this means quick chilling is accomplished the same as if the metal were poured into iron molds. The latter practice, however, would be commercially impracticable. Tests by Prof. Henry Souther and other authorities showed some very interesting results as to its strength. Although in regular practice this metal does not run to extreme strength, it is possible to make special McAdamite castings which will average 33 1-3 per cent stronger in all directions than the No. 12 and other ordinary aluminum alloys. Mr. Carritte favors the zinc alloys, and also looks forward to the time when we shall produce aluminum from many other sources besides that of bauxite.

In the discussion which followed these papers questions were asked concerning a new fluxing material, of which about 6 ounces are used to 100 pounds of aluminum. It seems that some very favorable results have been obtained with it in a few Detroit foundries, but that just what it is still is more or less of a secret. It is said that a party of engineers has just left for the locality where deposits of this flux are found, and that it is soon to be brought forward commercially.

There will be no June meeting of the Detroit section, as the National body of the S. A. E. will leave this city with their English guests on the fourth of the month. The semi-annual meeting will be held upon the steamer City of Detroit III during the voyage to the Soo.

Upper—Two cloudbursts had changed this alkali road 4 miles east of Laramie into a swamp hole for a distance of 8,100 feet. Three distinct sets of wheel tracks may be seen where automobiles have tried to avoid the pitfalls of those who had gone before. This one bad spot in a distance of many miles conld be eliminated by using the earth on the sides to build np the center, with a cross-culvert to take care of the water that runs back and forth on the low ground at each side. It took a cor 1 hour with outside assistance to make this 100 feet. Vertical arrows indicate a board over a cross-nnder drain which was badly choked.

Lower—An overage example of the culvert type of bridge out in Wyoming in the plateau conntry. Owing to a bend in the channel of the occasional small stream, the far bank has been gradually washed away nntil it no longer protects the posts on which the end plates rest. These plates have now started to tip out of place. The length of the eorth rest when first built can be judged from the position of the bridge and at the right of the pictnre. There are three bridges in a distance of 200 yards. Circle shows end supports falling away from lack of protecting wings.

A Transcontinental Hodge-Podge

By Ernest L. Ferguson

Part III

From Denver to Salt Lake City

FROM Denver to Salt Lake City by the way the motorist travels is 600 miles. You traverse portions of three states: one-sixth of the trip is northward through Colorado, where you have an opportunity of enjoying all the scenic beauties and far-famed mountain scenery that is to be found west and north of Denver. Leaving Colorado you practically cross the lower end of Wyoming, in fact two-thirds of the Denver-Salt Lake leg is through this state. These 400 miles are monotonous being over plains with sage brush, and while you cross the Rockies in this distance, you are scarcely aware of them because you work your way through them instead of over them. If it were not for your route book you might miss knowing them.

From north of Denver to the Rockies, near Wamsutter the soil is alkali with only occasional outcroppings of rock. This alkali makes a most excellent road, excepting in very wet weather. It is not difficult for the tourist to average 18 miles per hour with equipment. This pace will be slowed down at a dozen places by dry washes which cross the road. They are gulches 3 to 5 feet deep. There used to be a section of road 30 miles long between Table Rock and Point of Rocks, through what is familiarly known as the Bitter Creek section that is filled with these gulches, but a new road is now built 10 to 15 miles further north. It is free from gulches, also 6 miles shorter between these points.

From the Rocky Mountains to the Wyoming-Utah state line, the same general character of roads continues; and from the state line to Salt Lake City there is that positive change of road mentioned. It is a natural highway, well cared for, and being rapidly improved with concrete culverts and grading. The last 10 miles into the Mormon Mecca, through what is known as Parley's Canyon, is a gorgeous trip. The road is narrow and winds through the heavily wooded canyon accompanied on one side by a running stream along the banks of which the local people spend much time in camping and fishing.

Although the Denver-Salt Lake City stage of the trip takes you through the mountains, there is really not a bad grade in the whole 600 miles.

From the eastern slope of the Rocky Mountains to the Great Salt Lake the most traveled trans-continental automobile route continues to follow the old-time trail of early Western history. This leads one across the

Upper—This shows a section of a 70-mile stretch that does not vary 2 per cent. in grode or character in its distance across the eastern Wyoming plains between Laromie and Medicine Bow, and over what is known as the Laramie plains. Because it is some miles away from the railroad, for more of which distance it is to be abandoned, and a new road is now being finished between the same points, near the railroad for antomobile travel. It is on alkali soil and noturally well drained.

Lower—This long, winding climb west of Hanna, Wyo., had a fairly good surface np to 1912 when a series of unprecedented heavy rains, locally known as cloudbnrsts, washed away so much that there is now a high center. Only one side ditch, on the right, had been provided. With the large area, sharp slope and freqnency of rainfall this ditch conld not take care of the surface drainage. The result is shown by the deep gulley on the left. A new roodway is now planned 2 miles to the right that will have a more gradnal rise ond that will not have to drain so great an area. In crossing Wyoming there are four such stretches, each 1 mile in length. Arrows indicate deep side ditches—road washed out by heavy rains.

Upper—One of Wyoming's broad expanses of alkali with but scant growth of any kind at Preston and Continental waterehed. It is 8 miles long. The dotted line in this particular expanse is the Continental watershed. The trail that shows is maintained in its distinct marking almost entirely by transcontinental and other automobile touring. Upper arrow is good bench for road bed. Lower arrow shows an alkali bottom.

Lower—One of the conditions that must be watched in touring acrose the plateau country is the dry wash west of middle of the State. These are in groupe of two or three and three such groups in a distance of 100 miles. These have very steep banks, are frequently 3 to 5 feet deep and rarely more than 2 feet wide at the bottom. The rise out of them is so sharp that more often than not the front wheels are at the top before the rear wheele come to the bottom. A car will run in and out of them on its own power. Circles show banks of earth thrown out to ease the approach.

entire State of Wyoming near its southern border for over 400 miles. Some there are who have accused that state of having the poorest roads in the United States. If this were true, then many a state east of the Mississippi River could boast of its roads whereas facts compel them to silence by any comparison.

There are many miles of bad stretches and there has been one other that was notoriously vicious, but as an example of what is being done in Wyoming to improve touring conditions particular attention is here called to that one, of over 30 miles. It followed the curve of the railroad through the Bitter Creek and Black Butte country, forming a large Indian bow, and was a succession of viciously deep gullies. It holds a record of many broken frames.

With the influence of a trans-continental route association, having its headquarters at Cheyenne, a new road line across a plateau has been established that may be likened to the string of the bow. This not merely shortens the distance by about 7 miles but more important that that it gives a roadway without gullies and with no climbs of moment. At the present time it is hardly more than a trail through the sage brush though clearly defined by a very considerable amount of automobile travel. In its making the sage brush was dug out to give a roadway of single track width.

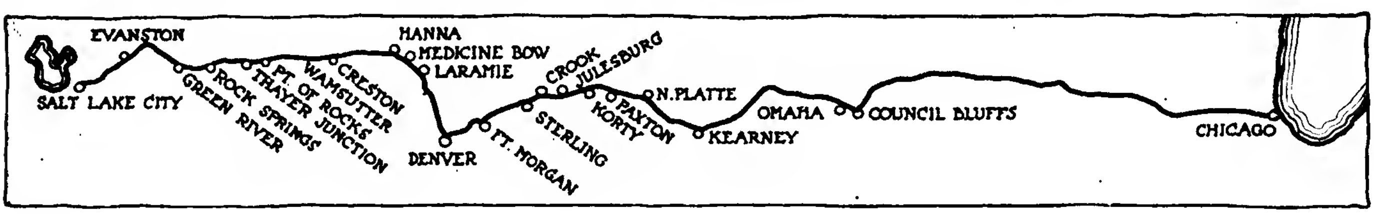
The state can also boast of as fine a piece of highway as is to be found in any traveling. This connects Rock Springs and Green River, a distance of 15 miles. The highway has been carefully engineered and keeps to only portions of the old roadway lines. It swings around hills instead of over them as did the old lines of travel; also it avoids the deeper hollows and greasewood bottoms either by a new line or by filling. The culverts are substantially made and protected by heavy rock work against the rush of waters from the nearby hills. The roadbed is of rock with a sort of shale surface and has all the delights of boulevard riding. The country between is wild in the extreme and taken all in all the contrasts between the highway and its surroundings never fail to mightily impress those who travel over its $40,000 surface.

In viewing the Wyoming roads the tourist in passing over them often pronounces judgment without being consciously aware of the effects of surroundings. The long distances between habitations and settlements, together with the monotony of sage brush growth ever present, and the weather-scarred cliffs and mountains without a vistage of tree growth, have an influence not always realized.

Another point not to be overlooked is that the lack of roads is not so much a lack of appreciation as it has been a lack of needs. The state has been one distinctly devoted to grazing, and roads were of no material importance in that industry. Now that farming is being taken up, particularly along the line of the transcontinental route, the needs for

Upper—The trail-like road that frequently for miles in Wyoming winds along one side or the other of the railroad between the latter and the mountain ranges in the central southern part of the State. These ranges are so broken in their lines that no real mountain climbing is encountered at any point. Grades are rarely over 8 per cent. One passes through rather than over the Rockies. It will be noted that in some places the road is along the lowest ground and again on the benches along the mountain side. White arrow shows a good road bench. Circle is a greasewood bottom.

Lower—It is not all alkali and sage brush. There are now and then bold croppings of rocks long distances from the mountain sides. Sometime these will become valuable as nearby road-making material. One-holf way across State and at approach to the Rocky Mountain section. Vertical arrow indicates red gronite rocks. Horizontal arrow is alkali soil.



Top—This bridge is amply strong and well designed to take care of any travel. However, it will be noticed that the support at the ends is such only as comes from resting on the natural soil. This is over a particularly deep gulley that drains a large area of mountain side. The rush of waters is washing away the soft earth bank as shown in the circle.

Upper Middle—Miles from any town, but paralleling the nearby railroad, the county authorities have filled in a roadway across an alkali flat the cracked surface of which can be partly seen on each side of a built-up section. The illustration shows the spot shortly after a series of rains that would have made impassable a road across the flat at Salt Wells in western Wyoming. Circles show alkali flats.

Lower Middle—An alkali flat after a few cloudbursts. This flat is only 2 miles from the one just described, having a built-up roadway. These flats have measurements varying from yards to miles in area. They are lower ground than their surroundings and are without a vestige of growth. While wet the soil varies from greasy slipperiness to a glue-like consistency thot clings to anything. Circles show alkali baking out into flakes. Vertical arrows show ruts made by cars.

Bottom—Nearing the Wyoming-Utah line west of Evanston, Wyo., the earth is not so clearly alkali. Thereby it more readily lends itself to keeping in some reasonable condition where only traffic does the work. By keeping this road to the higher ground on the left more natural road soil would be found and better drainage. There are 10 miles of such road in this particular stretch. Circle indicates higher rocky soil.

at least what might be called roadways is being felt and given attention.

Progressive thought in that line of progress is being devoted to the subject as evidenced in the recently passed law that places the convicts at the disposal of communities for road construction. A number of instances are already evident of work done in the past year and more is being planned. That a greater amount is not evident seems to come from the lack of a more general knowledge and understanding of the application of the law.

Fortunately for the tourist the average rainfall is from one-third to one-quarter that of Eastern states, because this immense elevated plateau, crossed by broken ranges of the Rocky Mountain system, is an alkali plain with occasional greasewood bottoms. And water-soaked alkali at all times surpasses the most energetic gumbo that ever was. There seems to be no limit to the depth that a car can sink in saturated alkali. Yet, when dried out by wind and sun it bakes to a surface that is as hard and smooth as the best asphalt road.

Materials Are at Hand

Whenever the time comes that stone-road construction takes place in that state nature has placed the material close at hand all along the route. More frequently than not this is in a natural disintegrated condition of varying sizes that will require only screening to produce all the accepted road building aggregate. While some of this is of the sand-stone variety there are mountains—millions of tons—of very proper quality.

A condition of circumstances that materially benefits the tourist is the many miles of old railroad grading that is utilized as a roadway. Some years back the railroad, from various causes, in many places changed its roadbed for greater or lesser distances. In the days of that old railroad bed the grading was not carried to the tops of the ties, so that with their removal the intermediate cross ridges were of little height and soon disappeared under weather and travel, leaving a smooth surface.

The result is a roadway that is cut through all hills it encounters as well as being filled in across low spots and ravines. One component of the old right of way that was not left when the grading was abandoned by the railroad company was the bridging across the dry washes that drain the country in its few rain periods. This means the travel is required to occasionally leave the grading and take to the side ground and obviously at the least desirable spots.

Care Greatly Needed

Now and then where the grading reaches across deep fills the rain has gradually washed off some of the sides so that the traveled surface is barely wider than the tread of the vehicle. In the growing use, from trans-continental touring and local traffic, these places well need to be taken care of. From the same cause will undoubtedly come the replacing of bridges or culverts at the now existing gaps. All told, this will give something like 100 miles of excellent highway at a minimum cost of construction.

Throughout much of the country just east and west of the Rocky Mountains there is an elemental weakness in the method of constructing the bridges and culverts, even where the superstructure is well taken care of. That weakness is in the lack of abutment wings.

Such rains as they have are generally heavy and as the country is one of steep slopes, at varying angles to the line of travel, the waters do not flow but rush along such courses as they form. The alkali soil is without

Top—A $40,000 shale and rock boulevard 15 miles long connecting Rock Springs and Green River, Wyo., winding its well-engineered way through one of the mountain ranges, west of the Rockies, in Wyoming. At each end is a town; between is not a habitation. The surrounding country is wild. Dotted line shows part of the old trail across the alkali bottom.

Upper Middle—West of Green River, at the west end of the boulevard, shown in (M), the road is bad only by comparison. The soil is of the same type, largely gravel, shale and rock. Arrow shows road across alkali bottom. Line shows good bench for a road.

Lower Middle—The importance of Salt Lake City and Ogden, ond the value of the land between has brought about definite road construction, connecting the two, on modern lines. In the meantime the roadway yet to be completed by the engineers is in a generally excellent condition, although in places liable to have standing water because of high sides at certain points. White arrow is wide irrigation ditch. Black arrows show ruts indicating true character of soil.

Bottom—The canyons that lead into Utah from the east are narrow winding valleys. The soil is oll thot could be desired for the construction of roads. Even now the little attention that hos been given has yielded a roadway that affords excellent touring, there being considerable rock and a lot of surface gravel that rapidly shape themselves under the minimum of attention. Circles indicate mountain sides of rock and gravel.

body, and rapidly wears away along the banks of the narrow, suddenly formed streams. In constructing a bridge or culvert a frequent method is to carry the ends well beyond each bank onto what is at the time solid ground.

By this method or even where post or plank abutments are built it is only a question of time when the banks wash away to points beyond the abutments or the natural soil on which rests the floor timber ends.

With the construction of wings the banks at the ends of the structure would be materially protected. Owing to the powder-like consistency of alkali soil this protection could not have the permanence that would obtain in more homogeneous soil. There would be sometimes come the need for filling at the wings to prevent back water getting at the bridge ends, but this work can be reduced to a negligible quantity compared with what is now necessary if serious attention was given to prevent the present condition of washed-away bank ends.

Choice of Two Branches

Going west from the Wyoming-Utah state line the trans-continentalist for the second time is given the choice of taking either branch of a huge Y. The right one goes direct to Ogden, but, as in the case at the Nebraska-Colorado line, going by way of the left well repays the choice. This leads to Salt Lake City with its many attractions for the tourist, where a turn north is made to Ogden. This routing adds but 34 miles to the journey.

The branching takes place at Echo, Utah, and each has picturesque canyons with roadways constantly being bettered. Each branch is about the same in mileage, the added difference being the distance from Salt Lake City to Ogden and this is over a newly improved modern road.

Of the two branches the left one to Salt Lake City is the more improved and passes through well-settled farming districts, principally dairying, that are rapidly rebuilding their roads to take care of the necessary hauling of products to the railroad shipping points. Two-thirds of the way along this branch is a valley with as picturesque scenery as can be found anywhere, with one view equaling anything to be found in Switzerland. Coming down from the low divide into the city by the inland salt sea the canyon is one vast camping-out ground for fishing and hunting. The right-hand branch from Echo has one of the country's natural scenic wonders, the Devil's Slide, which is well worth the 10-mile trip from Echo, even though one decides to go via Salt Lake City.

Fuel Situation in Australia

SYDNEY, AUSTRALIA, April 10.—The price of fuel in this commonwealth is having its effect on the type of car being purchased. Fully 80 per cent of the cars registered are of the type represented by Ford, Overland, Buick, Hupmobile and a few similar makes. Such cars as these practically control the whole Australian market. Fuel in any of the cities costs 42 cents per gallon for heavy benzine, and this is now becoming the generally-used fuel. Gasoline cost 60 cents per gallon today. Now as most of our automobiles go into the back country, anywhere outside a 50-mile radius of any of the cities, the cheapest you can get benzine is 50 cents, and any man living off the railway line will pay 5 to 10 cents more. Another item to bear in mind is the cost of tires. Thirty-six to 4-inch tires cost from $50 to $60 retail, according to make.

Detecting Resistance-Saving Fuel

PART IV

Accelerometer Readings Furnish Data for Plotting Close Approximation To Torque Curve of Motor—Maximum Grades for Each Speed Deduced

By Professor W. C. Marshall

¶ This is the last and concluding part of Professor Marshall's article on the accelerometer. In this issue some more uses to which the instrument may be put and the results obtained from actual tests are given. It is shown that the torque curve of the motor at all speeds may be plotted from the information derived from the accelerometer. The amount of grade the car should be able to mount on each speed may be determined and plotted in the form of curves which will stand a lasting record of what the car should be able to do and which will give immediate information to the owner of the car when the torque of the motor drops off owing to some decrease in compression through poor valve seating or from any one of the many other possible causes.

LET us examine the accelerating properties of the car, the resistance curve of which is shown in Fig. 1 by curve (A).

On this curve are plotted the torques exerted at the various gear reductions and the resistance exerted by hills of varying degrees of steepness, besides the resistance curve A.

From the motor torque curve obtained in the laboratory and published by the makers, we can construct the torque curve on direct drive when the wheels are 37 inches diameter and the gear ratio is 3 3-7 to 1.

The accelerating power at 20 miles per hour on direct drive is shown by the length of ordinate between curves A and 1 at 20 miles, which measures 157 pounds per ton.

This force acting on a mass weighing 1 ton will produce an acceleration of $F = \frac{121 \times 32}{2{,}000} = 2.5$ feet per second per second. At 40 miles per hour the force available for acceleration will be 121 pounds, which will produce an acceleration of $F = \frac{121 \times 32}{2{,}000} = 1.94$ feet per second.

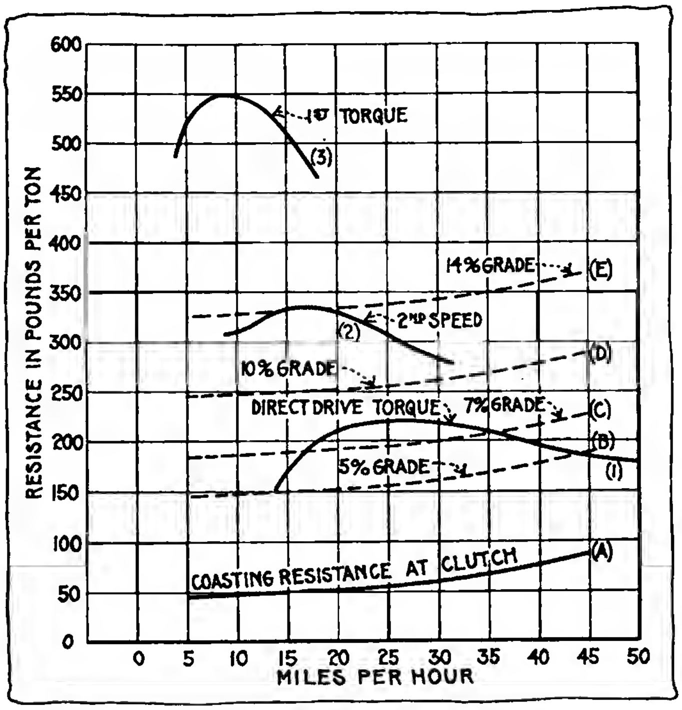


Fig. 1—Showing the torque curves plotted for each speed. The readings along the torque curves give the amount of effort produced by the motor at the speeds shown along the abscissæ. The amount of resistance interposed to climbing the grade at any speed is shown along the grade curves given by the dotted lines. It is obvious that the point at which the engine effort or torque curve falls below the effort required to ascend the hill at that particular speed, the car will no longer be able to climb the hill. Therefore where the curves intersect shows the maximum hill that can be climbed on any gear at any speed. For instance, on direct drive the car could not ascend a 5 per cent. grade faster than 44 miles an hour. It will be noticed that the curves intersect at this point and this value could be used as one point on a curve of maximums

The resistance curve of a 5 per cent. grade, with the coasting resistance, is shown by curve (B). The intersection of curves (B) and (1) shows the maximum speed obtainable on this grade, viz., 44 miles per hour.

A 7 per cent. grade could be mounted at 35 miles per hour. Above 7.5 per cent. it would be necessary to drop to second speed to mount the grade.

The acceleration produced on a 5 per cent. grade on direct drive at 20 miles per hour would be $F = \frac{55 \times 32}{2{,}000} = .88$ feet per second. At 15 miles per hour it would only be $F = \frac{18 \times 32}{2{,}000} = 0.288$ feet per second, which might prevent the car from mounting this grade at this speed.

If the speed was 20 miles when the car struck the grade it would probably go up without difficulty on the direct drive.

This of course is the usual policy employed by those driving through the country wherever they have a chance to rush a short steep hill and this often saves gear changing.

This shows the disadvantage some cars have when they can not increase their speed just before reaching a hill and in consequence must shift gears.

By inspection of the diagram in Fig. 1, one can see that this car could ascend a 13 per cent. grade, provided it started at a rate of 15 miles per hour on second speed. If the rate was 10 miles it would probably be necessary to shift gears and drop to first speed.

The maximum force which the motor of this car can exert is 550 pounds per ton to push the car at a speed of 9 miles per hour, whereas the motor of the car in Fig. 5, Part III, can exert 710 pounds per ton to push the car 5 miles per hour.

The 550-pound per ton force would enable the first car to ascend a 24 per cent. grade, but the second car could ascend a 31 per cent. grade.

As the latter car has a 4.5 by 5.5-inch motor and the other car a 4.25 by 5.5-inch, it seems quite probable that this is correct.

It the cases just treated it was assumed that the horsepower torque curve of the motor was known.

By means of the accelerometer we can determine the torque curve of the motor, approximately, in the following manner: Determine, first, the resistance curve at the clutch by declutching and reading the retardation at various speeds on the accelerometer. This test should include a run at the maximum speed of the car.

Plot this curve resistance.

Next make an acceleration test at 5 miles per hour intervals from 5 miles up to the maximum.

This consists in running at a constant speed in top gear at each interval, and reading the maximum acceleration in feet per second per second which it is possible to give the car by opening the throttle wide.

From these readings the torque curve of the motor can be plotted as curve (1) of Fig. 5 in Part III.

For example, suppose an average car running at a constant speed of approximately 20 miles per hour. The throttle is opened wide and the acceleration instantly given to the car is read on the dial of the accelerometer as 2.5 feet per second per second. This amount of acceleration by comparison with the opposite half of the graduated scale, is equivalent to a force of 158 pounds per ton. This is measured on the 20-mile ordinate above the resistance curve of the car and gives a point on the torque curve of top or highest gear.

After plotting the torque curve on the diagram of pounds resistance and miles per hour we can proceed to plot the motor torque curve on the basis of horsepower and revolutions per minute. The top speed gear ratio must be known as well as the driving wheel diameters to enable the revolutions per minute of motor to be determined from a given car speed in miles per hour.

Suppose the top speed gear ratio is 2.4 to 1. Taking a speed of 20 miles per hour with 36-inch wheels we find the motor is making 448 revolutions per minute.

The resistance overcome at the clutch is 158 pounds per ton plus 60 pounds for coasting resistance, a total of 218 pounds $\frac{218 \times 2 \times 20}{375} = 23.2$ horsepower which is laid off on a vertical ordinate erected at the 218 revolution per minute point of the horizontal base line.

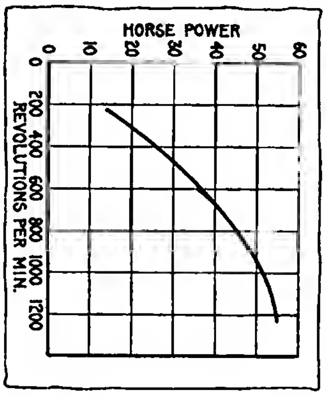


Fig. 2—Result of a test made by the author Nov. 6, 1912, on a 1908 chain-driven car weighing 2 tons. The car was not equipped with a windshield. The results shown in this curve were obtained solely by accelerometer readings and were plotted by taking the intersections of the torque and resistance curves on various degrees of gradient. This gave the maximum horsepower at these speeds

The motor torque curve once plotted can be used to calculate the torque curves on the resistance-miles diagram for third, second and low gear ratios, as previously shown in Fig. 5, Part III.

By drawing in the grade resistance curves we can determine the accelerating power and grade-climbing ability of the car in question.

The author made a test of this character on a 1908 chain-drive car, November 6, 1912. The car weighed 2 tons and did not have a windshield. The tires were 36-inch diameter; gear ratios: first, 9.25; second, 4.65; third, 3.08; fourth, 2.4. Motor, four-cylinder, 5.75 inches by 5.75 inches.

The resistance curve is shown in Fig. 2 (A). As maximum speed was 55 miles per hour, this point was taken on a point on the resistance curve where the torque curve, on fourth speed, crossed it. Another point was taken on the 10 per cent. grade resistance curve at its intersection with the 20-mile ordinate. As given in the curves, Fig. 3. This was determined from the performance of the car, which ascended a 10 per cent. grade at 20 miles per hour, on fourth speed, without being able to accelerate.

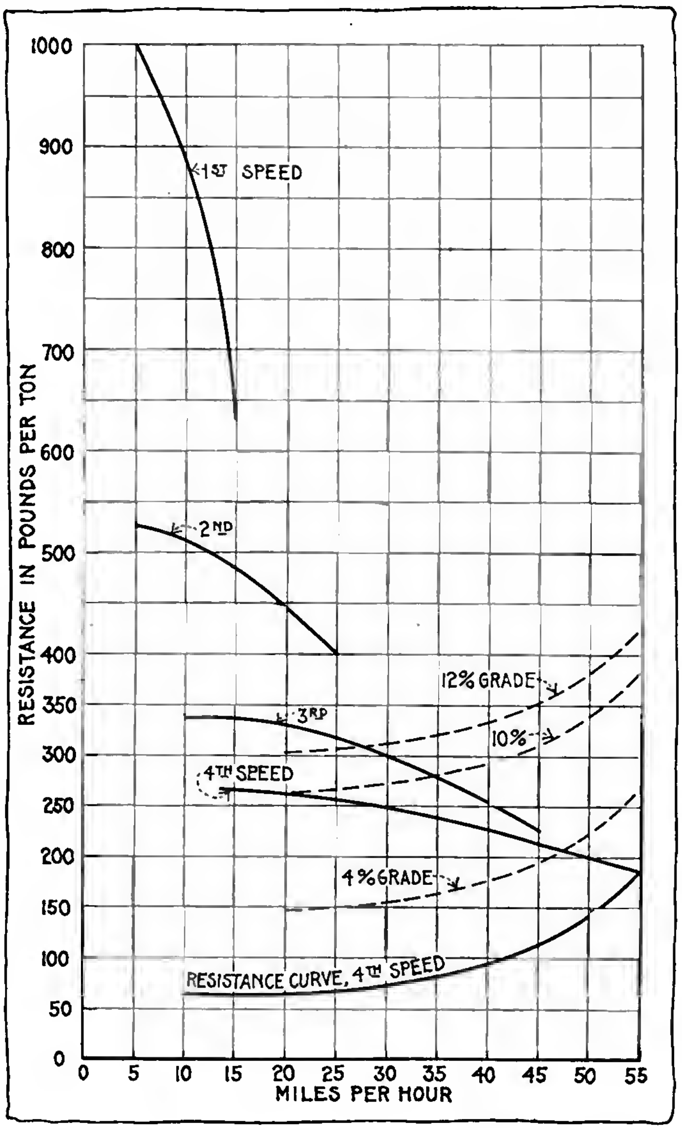


Fig. 3—This set of curves furnishes the data necessary in plotting the maximum horsepower curves for each speed. Such a curve has been plotted from the data given here and is shown in the curve above (Fig. 2)

Other points on the torque curve were found from the acceleration which could be given to the car at various velocities in miles per hour.

From this torque curve a motor torque curve was plotted, as shown in Fig. 3.

This curve was then used as a basis for obtaining the torque curves of third, second and first speeds, which are shown in Fig. 1.

These curves show the great power which this car has to accelerate when in low gears. The maximum power is 1,000 pounds per ton at 5 miles per hour on first speed.

In all these cases just cited, if the wind should be blowing against the car or if the road becomes rough the resistance, of course, would be increased and the speed shown by the diagram could not be realized.

The engine torque curve can be raised a small amount by opening the muffler, provided the speed is greater than 30 miles per hour.

Some of the possibilities of the accelerometer have been shown in the preceding lines. Now it remains for the car owner to make the above-mentioned experiments and by comparison judge whether his

(*Continued on page* 993)

The Engineering Digest

A Digest of Technical Information from the Engineering Journals

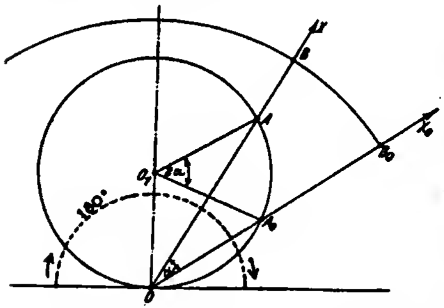


Fig. 1, Illustrating the geometrical principle of the Magg system for a graphic presentation of cam and valve action of any given requirements in four-cycle motors—the system enabling the designer to ascertain in advance the effect of any chosen valve-timing or cam shape on other factors of interest

ASSISTANCE for the Designing and Mounting of Camshafts.—A graphic method has been devised by Dr.-Engineer J. Magg of the Technical Highschool at Graz, Austria, for co-ordinating the position of the camshaft and the cams with the corresponding position of the crankshaft and piston in a four-cycle motor, the resulting diagrams enabling the designer to visualize requirements and effects with regard to any particular valve-timing or control mechanism which it may be his purpose to incorporate in the motor. Diagrams serving the same purpose have been in use for 50 years for steam engines and have been applicable to two-cycle internal-combustion motors as well, but the corresponding data for four-cycle motors have been in the form of tabulations, difficult to consult and giving no mental advance-image of the relations and shapes to be accomplished.

As the camshaft makes one revolution while the motor shaft makes two, the basis for a diagram system must be sought in a geometrical relation of the same nature. This is found in the fact that a peripheric angle is one-half of the center angle on the same arc. In Fig. 1 the center angle AO_1A_0 measures twice as many degrees as the peripheric angle AOA_0. Consequently, when the line OX turns to the position OX_0 describing the arc BB_0, it turns exactly one-half as many degrees as the line O_1A which at the same time turns to the position O_1A_0, describing the arc AA_0. [Those who have forgotten this geometrical theorem may easily realize the relation by turning a tangent at O around O, so as to intersect the circle successively at all points of its periphery until it points in the opposite direction, having turned 180 degrees, while a radius to the successive points of intersection, by following the movement, describes a full circle or 360 degrees].

A full revolution of OX thus corresponds to two full revolutions of O_1A, and there are therefore the same relations between OX and O_1A, as between the camshaft and the motor shaft in a four-cycle motor. But if only one circle is used to represent the motor shaft, no distinction will appear in the diagram between induction and power strokes or between compression and exhaust strokes. In the complete cam-action diagram, Fig. 2, the motor shaft and piston movement is therefore represented by two circles placed side by side. O_1 and O_2 are here the separated centers of the two revolutions of the motor shaft, the line O_1 O_2 is the piston displacement, and O is the center of the cam-action circle. It is practical to draw the crankshaft circles with a radius of 100 millimeters, as this facilitates all graphic dealing with factors in the valve-timing which are expressed as a percentage of the piston displacement. The radius of the circle representing the cam-action is best shown in a simple numerical relation to the actual eccentricity e of the cam [which in most cases is identical with the number of millimeters of valve-lift]. For the sake of uniformity, the movements expressed in the diagram should always be represented as taking place clockwise, and the exterior intersection Z between the crankshaft circle to the left and the line representing the piston displacement should be taken as the moment of ignition [on center; the retarding or advancement of the spark being a matter not entering for consideration]. The halves of the crankshaft circles will then represent successive strokes in the cycle of the motor in the order marked on Fig. 2. In this illustration there is constructed an opening Aa of the exhaust valve taking place when the expansion or power stroke lacks 15 per cent. of being finished and a closing Az of the same valve 5 per cent. after the end of the exhaust stroke. The arc between Aa and Az represents the angular travel of the exhaust cam while the exhaust valve is open, and the hatched area gives a relative value, as a gas channel, of the valve-lift effected (apart from the effects of a possible lever device with unequal arms for actuating the tappet rods or valve stem). The perpendicular

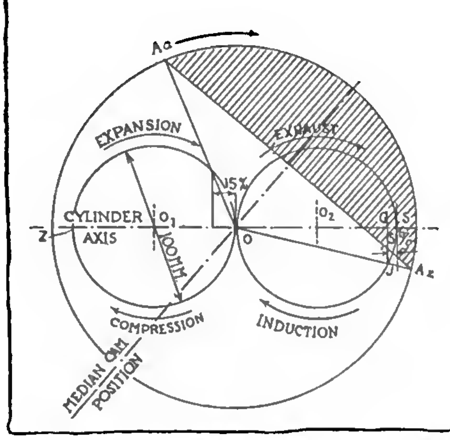


Fig. 2—The plan of cam action diagram

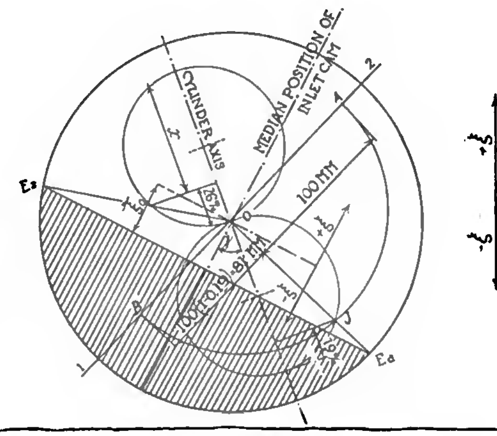


Fig. 3—An example of diagram construction

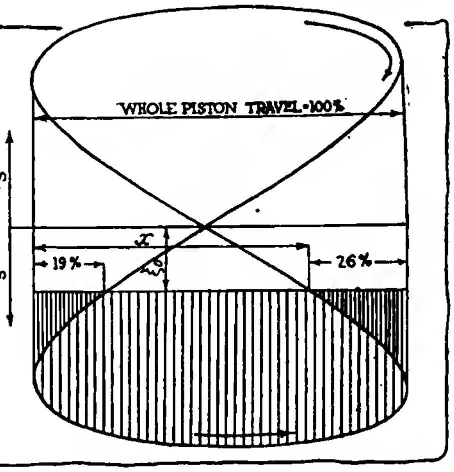


Fig. 4—Determining the valve lift

erected upon the middle of the line Aa-Az determines the median position of the cam during the exhaust.

Three examples of the numerous ways in which this diagram may be used are illustrated in Figs. 3, 4, 5 and 6.

Example 1, Fig. 3. Assumed to be known: The point Ea in the camshaft circle corresponding to the moment of opening the inlet valve; also the point in the piston stroke to which Ea corresponds, this being chosen as 19 per cent. before center, and the piston displacement before the closing, the moment of closing to come 26 per cent. after center. This moment is to be marked Ez on the camshaft circle. To be determined: The median position of the cam during the admission of gas and the relations to the piston travel.

The diagram can be completed from the given values of Ea and Ez by drawing crankshaft circles first and turning them by superposition within the camshaft circle till Ea is in the correct relation, but Fig. 3 shows a direct construction as follows: Draw the line 1-2 perpendicular on Ea-O and mark on it OA equal to the diameter of the crankshaft circle (100 millimeters) and OB equal to the piston travel from the center at O to Ea (in this case 100 millimeters minus 19 per cent., or 81 millimeters). The semi-circle over AB as diameter intersects the straight-line O-Ea at a point J which is now the second point known in the crankshaft circle which is sought. Having O and J, the center of the crankshaft circle can now be determined (being the intersection of a perpendicular on middle of OJ and an arc drawn with radius 50 millimeters from O) and therewith the line of piston travel. Thereafter the point Ez is determined as before, and the perpendicular on the middle of chord Ea-Ez gives the median cam position, while the arc Ea-Ez gives the duration of the admission.

The relation between the cam-lift ξ (xi), measured at the median position, and the corresponding piston displacement x, measured from the dead center, gives a value for ξ (xi) in which the length of the connecting-rod does not enter as a factor but in the form of an equation of the fourth degree:

$$\xi = \pm e \left[\sqrt{\frac{x}{2r}} \sin \gamma \pm \sqrt{1 - \frac{x}{2r}} \cos \gamma \right]$$

in which e is the eccentricity, r the crankarm length, γ (gamma) the angle between the line of piston displacement (cylinder axis) and the median cam position. To work this equation out is a tedious task, but the diagram shows directly the relations between x and ξ (xi), as indicated in the diagram for the point Ez. When the same relations are drawn in for a large number of points, there is obtained a picture of the open-period of the inlet valve, as in Fig. 4, in which the piston travel is drawn on twice as big a scale as in Fig. 3. If the dimensions of possible rocker-arms or tappet-lift levers are known, a curve designating the valve lift can be drawn directly from such a diagram.

Example 2, Fig. 5: The object being to operate inlet and exhaust valves by means of a single cam, the angle of rotation intervening between the actuating of the two valves is to be determined. Under the circumstances the two valves must remain open equally long, so that three points in the valve action determine the fourth. Thus, if it is given that the opening of the inlet valve is 7 per cent. early (Ea = 7 per cent.), its closing 11 per cent. late (Ez = 11 per cent.) and the opening of the exhaust valve 16 per cent. early (Aa = 16 per cent.), then the position Az for the closing of the exhaust, which is usually most variable, is fixed. In the diagram, Fig. 5, it is found practical to introduce the "inert circle" of the cam in the place of the cam circle. The angle between Ea and Ez, with the opening moments as assumed, measures 125 degrees and must be the same between Aa and Az, whereby Az is determined. From the points Ea and Ez and a chosen valve lift the shape of the cam portion can be constructed. The angle ϕ (phi) between the tappet-rod rollers is determined by radial perpendiculars on the chords Aa-Az and Ea-Ez.

Example 3, Fig. 6: [This relates to means for equalizing the action of two symmetrical cam systems in a double-acting four-

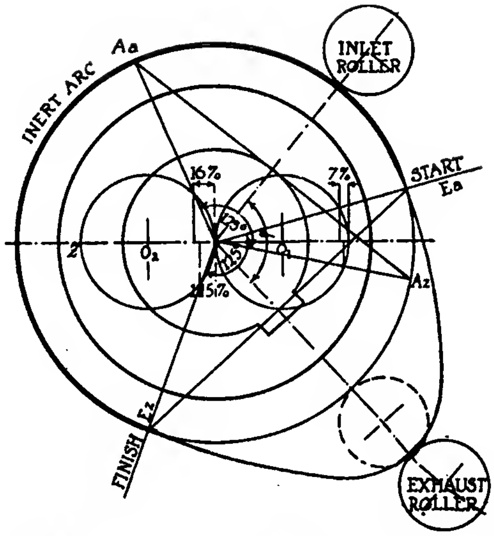


Fig. 5—Diagram for using one cam for inlet and exhaust

cycle motor, and as this case is even farther removed from automobile practice than example 2, the details are here omitted and only the diagram is presented. The author has under way a larger work on the valve control of internal-combustion motors, in which the style of diagram here exemplified is employed exclusively for elucidating the subject.]—From *Zeitschrift V. D. I.*, Feb. 15.

CONTINUOUS Gear Change.—The Bardet system for effecting infinitely graduated changes in the ratio of a power transmission depends upon the use of special beehive-shaped slidable gear teeth such as are shown marked *d* in Fig. 7. The system is at present interesting mainly as an example of pretty mechanics. The teeth *d* of the driving-wheel *a* are mounted on sliding-blocks *e* movable transversely of the wheel in grooves *ei*. The driven wheel *b*, on the other hand, has fixed teeth formed on planes radiating from its axis. The shaft *f* of this wheel is stationary, and the shaft *h* of wheel *a* can turn around a third shaft *i* which is perpendicular upon both shaft *f* and shaft *h*.

If wheel *a* is turned parallel with the shaft wheel *b*, as in both the sectional views of Fig. 7, its teeth *d* can all pass successively between two teeth *g* of wheel *b* without causing any rotation of the latter. But if the plane of wheel *a* is turned around shaft *i* into an oblique position, each tooth *d* of *a*, once engaged between two teeth *g* of *b*, will push one of these teeth laterally and will make the wheel *b* turn a certain angle, the size of which depends upon the angle of inclination of wheel *a*.

[It may be considered an objection that the highest gear is thus obtained in the most oblique position of *a*.]

In order to make the engagement possible, the teeth of the driving-wheel are mounted on sliding-blocks which remain movable so long as the tooth on each of them is not in mesh with *b*, and the teeth during that period follow a path determined by a toothed cone *w* which turns in unison with wheel *b* and by a curved guide-piece *c*. This hollow piece is flared at its entrance where it receives the tooth coming out of mesh

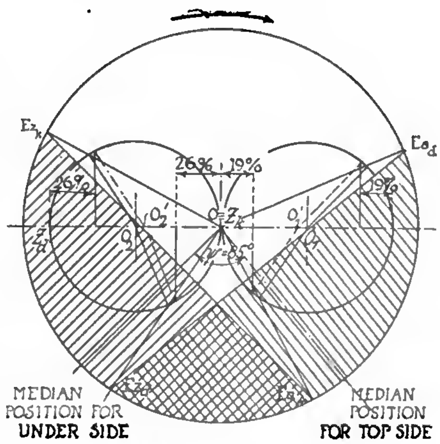


Fig. 6—Diagram for double-acting motor

and narrows down at its other end which is opposite to the apex of the toothed cone *w* whose base is tangent to one of the edges of wheel *b*. The bevel-gear pinions *k* and *y*, secured respectively to cone *w* and wheel *b*, assure the unity of movements by which the teeth of wheel *a* are sure to be guided into the space between two teeth of cone *w*—the sliding-blocks assisting—and thence into the space between two teeth of wheel *b*. The guide *c* is secured to the support *j* in which the spindles *h* of wheel *a* are journaled, so that the guide piece always remains in the median plane vertical upon wheel *a*.

Now, if the wheel *a* is turned a certain angle around the shaft *i*—by means of the worm *u*, the sector *v* and the two bevel pinions *l* and *m*—the guide piece *c* is turned with it, and the cone *w* oscillates around shaft *f*, while its apex remains at the exit of guide *c*; this by virtue of a special manner of mounting shaft *ji* of cone *w* permitting this oscillation.

Steel balls *x* are placed in nests *n* formed in driving-wheel *a* in line with each sliding-block. The bottoms of these nests are slightly inclined toward the middle. The balls, being pushed outwardly by springs *o*, are pinched between the bottoms of the nests and the sliding-blocks, blocking any movement of the latter in either direction. It is necessary to release the blocks in order to bring them back into the central plane of wheel *a* as soon as teeth *d* enter the guide piece *c*. For this purpose, the mechanism includes two plates *p* journaled upon shaft *h* with the intermediation of ball joints *q*. Upon the edges of these plates there are shoulders *r* extending laterally and engaging the entrances to nests *n*. By reason of the position of the plate, which is held inclined at an angle with shaft *h* by the action of the fixed fork *t* upon the lug *s*, in all position except that directly facing wheel *b*, the balls *x* are pushed by the shoulders *r* to the center of the nests, excepting at the moment when a tooth passes before wheel *b*.—From *Technique Automobile* and *Génie Civil*, January 18.

STEEL Better and Cheaper.—According to detailed reports in the metallurgical journals it costs about $1.50 less to produce 100 tons of steel by the Hadfield method than without making use of this improvement. By the Hadfield method the freshly poured ingot is forced to cool and solidify from below up, the top being kept hot longer by means of a layer of charcoal, separated from the molten steel only by a thin layer of non-conductive material, such as slag, and an airblast fomenting the combustion of the charcoal. The saving is materialized solely through the fact that from 15 to 30 per cent. must be cut from the top of the ingot cooled in the ordinary manner by reason of being faulty in structure and composition and must be melted over again, while the discard from the top-heated ingot amounts only to from 8 to 10 per cent. The flaws which are made to concentrate in this small percentage of the steel are checks ramifying from the "pipe," or empty space forming in that part of the ingot which cools last, and segregation. The latter is due to the flow of impurities toward the portion of the ingot which keeps fluid longest. By keeping the top hot, the "pipe" is partly filled from above—or, rather, prevented from forming—while the impurities, such as oxides, nitrides, sulphur and phosphorus, continue to rise.

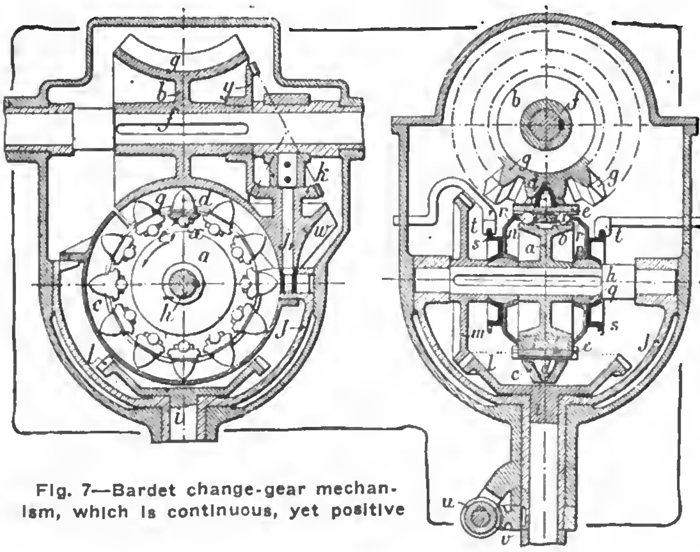


Fig. 7—Bardet change-gear mechanism, which is continuous, yet positive

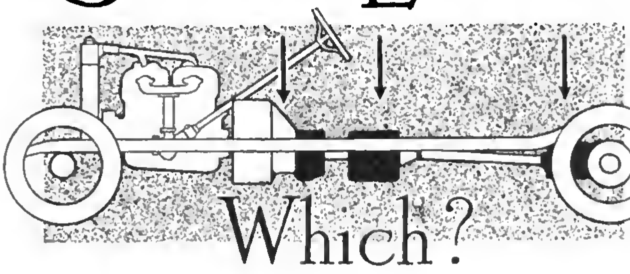
Of greater importance to the automobile industry than the saving in the cost of production of plain carbon steel is the much greater saving effected in the case of alloy steels, their value being higher and their discard being relatively of lower value for remelting purposes. But far beyond even this consideration comes another which has not yet become widely appreciated, although it is strongly emphasized by Hadfield. It is this, that the strong flow of impurities toward the top-heated portion, which is discarded in the end, leaves the usable portion of the ingot—the 90 to 92 per cent.—perfectly sound and uniform in structure, while the 70 to 80 per cent. which is used of ingots cooled in the ordinary manner still frequently contains faulty streaks of steel that pass undetected until taken into use. These minor flaws, which are after all far from negligible, especially for automobile purposes, are caused by irregularities in the process of the cooling and solidification, the steel in which they are found having remained hot while imprisoned in cooler and impervious surrounding portions of the whole mass, so that the flow of impurities toward the eventual discard-portion was barred and the steel in the hot pocket was compelled to contract separately in the final cooling under strains likely to cause a local "pipe" or a fissure.

From another source there comes a guarantee of better and cheaper steel than that which has been available in the past. The electric steel furnaces and melting-ovens are multiplying and offer industrial facilities for producing at a relatively low cost steels in which a desired chemical composition is maintained with an accuracy scarcely to be equalled by the much more expensive crucible-method of production. It is perhaps especially notable that the carbon content of electric-smelted steel can be warranted to come within 5 points (1 point being 1 per cent. of 1 per cent.) of that specified in advance, while a tolerance of 10 points, or even 15, has been considered unavoidable in the case of open-hearth steel. A still more far-reaching importance is attributed to the fact that steel can be maintained at a very high temperature and degree of fluidity in an electric oven or tip-furnace and, when poured from it directly into moulds, can be made to assume shapes so thin and intricate that similar ones never could have been contemplated heretofore for steel castings. And as the chemical composition of the electric steel is also under excellent control, as mentioned, the strength and toughness of such castings can be made highly creditable. In conjunction with recent progress in the art of producing and handling the moulds and cores by special machinery, the electric furnace renders a rapid expansion in the casting of automobile parts distinctly probable, the development in this direction being already well under way and limited in its immediate possibilities only by the necessary slowness in the installation of furnaces and in the acquirement of the new technical knowledge which must be brought to bear upon the work.—From *Revue de Métallurgie*, *Giesserei Zeitung*, *Järnkontorets Annaler* and other journals.

DIFFERENCE in Motoring Temperaments of Nations.—According to statistics presented by Prince Henry of Prussia, there are 88,279 motor vehicles in circulation in France with a population of about 38 millions, making 441 persons to each vehicle, while in Great Britain there are 175,245 vehicles for a population of 43,740,000, or one vehicle for 249 persons. Germany, on the other hand, with 75 million inhabitants, has only 70,000 motor vehicles, or one for 927 persons. The figures include motorcycles. Whether the explanation of the disproportion for Germany is to be sought in the lesser popular wealth, in prejudices not yet overcome or in the too-high taxation of the German automobiles, seems difficult to decide.—From *Z. V. D. I.*

The Engineers' Forum

Gearbox Location



Part II

Amidship Location Is Favorite with Three Engineers—Two Prefer Unit with Motor Construction

Keeton Prefers Location Amidship
Maraini Also Likes Amidship Type
Crane Finds Conditions Determine
Porter Approves a Unit with Motor
Gilliard Leans Toward Amidship Idea
Lee Likes the Unit with the Motor

HEREWITH appears the second installment of the views expressed by leading automobile engineers on the subject of gearbox location, the discussion of which was caused by the article by S. D. Waldon, "The Rear Axle Gearbox," in THE AUTOMOBILE for April 17. The ideas of several men prominent in the automobile field follow:

¶ *Weight Distribution Is Most Important—Keeton*

DETROIT, MICH.—Editor THE AUTOMOBILE:—With reference to location of gearbox, in the first place, the question of distribution of weight is a most important factor. After considerable experimenting and observation, we found that locating the gearbox amidship in a car of the weight of 3,400 pounds, completely equipped and all tanks full, makes for easier riding than when located as a unit with the motor or with the rear axle. And, by this practice, we distribute the weight as evenly as is possible in an automobile so that an undue proportion is not put on the front axle or on the rear axle. **Further, the distribution of weight, as in our car, to some extent lessens the liability of skidding,** which, as you will agree, is a most important point to carefully consider. Then there is the question of accessibility. It takes but a fraction of a minute to remove the footboards in the car, and the gearbox complete is exposed, ready for oiling, adjustment, or, in fact, whatever work is necessary to be done. If the gearbox was located as an integral unit with the rear axle. it would mean removing the body entirely in order to make simple adjustments, or else assuming a very uncomfortable position beneath the car in order to put oil into the transmission. And if located as an integral unit with the motor, it would be necessary to remove at least the front footboards for oiling, and if adjustments were necessary, the body and radiator as well. **The location of the gearbox as an integral unit with the motor, in our type of car especially, would make the clutch practically inaccessible even for the ordinary oiling.**

The demand of the critical motor-buying public of today is for simplicity with the greatest possible efficiency, and in locating the gearbox as we do, with left-hand steering and center control, changes from first to fourth speed and to reverse being made by one lever extending directly upwards from the gearbox, we completely eliminate pull-rods with their adjustments, etc., which gives us a clean chassis and at the same time makes for easier gear changing. Just one more vital fact—locating the gearbox as we do makes it serve as a cross-member, strengthening the frame and eliminating the two cross-members ordinarily used when other methods of locating the transmission are followed.—F. M. KEETON, Vice-president and Manager, Keeton Motor Co.

¶ *Best Type Depends on Size of the Car—Maraini*

POUGHKEEPSIE, N. Y.—Editor THE AUTOMOBILE:—Gearset as a unit with the rear axle: Differential and main driving bevel or worm gears, and occasionally brake control, are enough for a rear axle to carry. Any other mechanism added to these, besides spoiling its simplicity and neat appearance, increases its weight; and the rear axle better than any other part of the car should be as light as possible. For this simple reason I believe there is no advantage in making the gearbox a unit with the rear axle.

Gearset as a unit with the motor: For a car not high-powered a neat unit with a short three-speed gearset is preferable under every point of view, say, lightness, rigidity and simplicity, and this especially if combined with a well-designed three-point suspension, so as to relieve the system from any stress or distortion. I am very favorable to this style of construction limited to a certain limit of power.

Gearset mounted amidship: For a big motor with a large clutch, four-speed gearset, the unit system, though not absolutely objectionable, is apt to lose the main qualities of lightness and neatness above mentioned, so that in a high-powered heavy car I prefer to have the gearbox mounted amidship. This allowing also the discharge directly on the frame. through the cross-bar, the heavy stress and distortion transmitted by the rear system.—B. MARAINI, Engineer, Fiat Automobile Co.

¶ *Roads Too Rough for Axle Type—Crane*

BAYONNE, N. J.—Editor THE AUTOMOBILE:—The proper position of the gearbox whether it should be combined with the rear axle or with the engine, or mounted separately in the center of the car is a complicated one involving many opposing considerations. **So long as the roads in this country are no better than they are, I do not think that the extra weight below the springs on the rear axle caused by placing the gearbox there can be justified.** This is a serious matter with a three-speed gearbox and naturally much more serious with a four-speed gearbox. I believe that it is admitted by all engineers that the axles both front and rear of a car, as well as the wheels should be as light as they can possibly be made if the easiest riding car over all kinds of roads is to be obtained and if the tire wear is to be reduced to a minimum.

The chief advantage of the gearbox on the rear axle is its power first cost and the possibly slightly lower cost of upkeep of the propeller shaft and joints. In view of the fact that most cars are driven 99 per cent. of the time on the high gears the latter advantage cannot be expected to be noticeable, and would never compare except in a case of cars driven at very low speeds with the excess tire wear and consequent expense due to the extra weight below the springs. **This form of mounting also prevents the use of a propeller shaft brake, which, when properly designed, is far more powerful, equally smooth in operation, easier to adjust and less liable to need adjustment due to its being completely protected against dirt, as well as much more efficient on slippery roads, presenting as it does an equal retarding effect on both wheels than the brakes mounted directly on the rear wheels.**

As to whether the gearbox should be combined with the engine or mounted separately in the center of the car depends somewhat on the size of the power plant. The combination system is simpler from a manufacturing point of view and affords better protection against dirt, although it frequently makes certain parts somewhat inaccessible.

As the design and construction of clutches especially and of other parts becomes more reliable, the relative importance of accessibility becomes less, and the advantages of the unit power plant more marked.

In our own cars combining a six-cylinder engine of rather large size and a four-speed gearbox with gearbox brake the size and weight of the parts and the element of accessibility decided in favor of the separate gearbox.—H. M. Crane, President, Crane Motor Car Co.

¶ *Unit with Motor for Small Cars—Porter*

Trenton, N. J.—Editor The Automobile:—The discussion opened in the April 17 issue of your paper in reference to the mounting of gearchange set is one that will present many varied and opposite opinions. The position taken in this issue by S. D. Waldon, of the Packard company, to my mind, evades the paramount issues concerned in the relative values of the different methods used. He seems to have neglected the fact that **the suspended part of a car's weight is to the car as a whole under speed conditions, the same as the flywheel is to the motor. This coupled with the fact that unnecessary weight is undesirable is the one never-failing fact that faces every designer who attempts the rear-axle gearbox.**

These are things that are not the question of different men's opinions or judgment, or the interpretation of the laws governing these things, but are facts that have been illustrated from time to time by tests and conceded, I believe, by nearly every one. Mr. Waldon had ignored this entirely and seems to lay great stress on the easy-riding qualities of inclosed cars with this type of construction. The easy-riding qualities mentioned cannot be disputed, but the realization of this condition is not the rear axle unit. I merely take sides with Mr. Waldon on these points to illustrate why I believe the rear axle unit to be out of the question in so far as a fast-moving vehicle is concerned.

The unit construction I believe to be without question the only thing for cars developing less than 30 horsepower, owing to the length of the unit usually involved with motors developing greater horsepower in order to take care of the increased torque makes necessary such a cumbersome and rigid construction that the practice resolves itself into a very roundabout way of reaching the desired object. Since three-point construction is almost necessary with this type of unit, this then leads to the sub-frame construction for the medium and heavy-weight cars. The theoretical ideal, of course, points to unit construction with three-point suspension, but in practice the obstacles are many. The success of subframe construction depends largely on the placing of the gusset and the section of the subframe member. The subframe must necessarily be as narrow as possible and so placed that the result of the main frame warping is not conveyed to the subframe members in an exaggerated proportion. The misalignment under these conditions occasioned at the point between the gearset and the motor, due to the twisting of the main frame, becomes so very slight that it is easily taken care of in a permanent manner by the compensating joint at this point.

It Is Up to the Designer

Since this is about the only argument against subframe construction it behooves the designer using this type to so locate the compensating joint in relation to the feet of the motor and gearset that any possible misalignment of the subframe is transmitted to the two separate units in a very nearly like ratio, which will reduce the misalignment between the two units to a minimum. Subframe construction also lends itself to economical production and the compensating joint proves of considerable value in taking care of the variation in frame dimensions as well as relieves the necessity of being too accurate on the feet of the different units.

The question of excess weight with this construction can be neglected inasmuch as cases often cited in arguments are not the result of subframe construction, but more often lack of thorough understanding exhibited by the designer of different units. This construction also lends itself readily to the perfect alignment of driveshaft, universals, torque rods and radius rods. Without resorting to unduly heavy construction, it practically eliminates all end movement of the universal joint excepting in the case of one wheel being raised and the other stationary. This point alone proves of wonderful value in the maintenance of these parts and relieves to a great extent the usual shock transmitted by a hard jolt often experienced in the other types of construction.

Summing up briefly the subframe construction in the hands of one thoroughly conversant with the desirable points to be attained develops many of the ideal values sought after and more nearly approaches them as a whole than any other class of construction.

Mr. Waldon's reference to class of material and workmanship used in the rear construction permitting of lightness, together with his remarks in reference to accessibility of the clutch, are also points that have no bearing on the type of construction. The same argument holds good for all types and becomes merely a matter of the designer's ability and the standard set for attainment.—Finley R. Porter, Engineer, Mercer Automobile Co.

¶ *Amidship Is Very Advantageous—Gilliard*

York, Pa.—Editor The Automobile:—In looking over the different ways of mounting the motor, gearset and rear axle in motor cars, it will be found that the size of the car itself is of predominating importance, and one system, although successful with a small car, could not be very well applied with the same results to a larger car.

Readers of The Automobile will find outlined below our criticisms of the three principal modes of construction, with their qualities and defects, which 15 years of experience in the automobile field in America and abroad have allowed us to learn.

The writer will incidentally state that he was connected from 1895 to 1902 with the Motobloc Co. of France, which was the first abroad to introduce a unit power plant system, motor and gearset combined, with the clutch running in oil. This was in 1895.

Gearset as unit with motor: Good points: neat in appearance, cheap as a manufacturing proposition.

Bad points: weight of gearbox carried on front axle too much, this system necessarily being of the inclosed type, the disadvantage of inaccessibility presents ieself. Unit systems of this design are heavy, meaning unnecessary weight to be carried by tires and less hill-climbing ability; driveshaft of gearset and crankshaft of engine being constructed in a rigid line, and the bearings of the crankshaft being generally split babbitt, while the gearset bearings are ball bearings, the wear of the crankshaft bearings being mostly in a direction perpendicular to the axis of the shaft, and the radial wear of ball bearings is practically nil, it will be clearly seen that undue stresses resulting from disalignment will be created even under the most normal conditions of wear.

Unless power plants below 25 horsepower and three speeds forward are produced, the problem of attaching the unit to the frame becomes difficult on account of its length and weight.

Gearset as unit with rear axle: Good points: Minimum strains on rear universal joints; saving in manufacturing; gearset not rigidly fastened to frame, minimizing gear noise.

Bad points: Too much unsprung weight on rear wheels, giving bad riding conditions and excessive wear on tires; abnormal length of change-speed control rods; position of gears in gear case affected by the accidental change of position of rear axle in relation to rear springs.

Gearset amidship: Bad points: More expensive as a manufacturing proposition and one more set of universal joints.

Good points: Access of parts maximum; repair and replacements facilitated and cars not in repair shops long; no side strains on engine or transmission; small units to handle in shop; direct-acting gear-shifting rods, as gearbox comes under floor, naturally in the right position, and weight uniformly distributed on frame.—E. T. Gilliard, General Manager, Pullman Motor Car Co.

¶ *Unit with Motor Is Most Simple—Lee*

Detroit, Mich.—Editor The Automobile:—Since the inception of the motor car, opinions as to the locations of its different components have been various. In the past the motor and gearbox were located anywhere between the front and rear axle, and it is safe to say that the present predominating locations have been more the result of public opinion than from engineers carrying out what they frankly believed to be the more practical. However, as engineers are more or less adaptable they accomplish a great deal even though they are not privileged to carry out their own pet ideas.

Not long ago there was a car made with the motor and gearbox located very close to the rear axle. This left the front end of the car lighter and gave it the advantages of being able to climb obstructions in the road and contributed to easier steering, not to mention the added traction to the rear wheels. On account of this construction it is safe to say, and there are those who can bear witness, that for ability to get around over any kind of roads there was nothing, that could compare with it, having the same amount of power.

However, in the meantime there were many other cars designed with the motor under a hood in front which, while it occupied much valuable space, proved to be more accessible and pleasing to the general public. It also has its advantages which are well known, such as being more accessible for carbureter adjustments and minor troubles. The gearbox was still a matter of opinion as to its location and is to this time. However, at present it has three principal locations; that of the rear axle, mounted separately between the motor and rear axle, and the unit construction now employed by many makers of well-known ability.

The writer, being an advocate of the unit construction, will, therefore, pass up the others, and while the arguments will be drawn from our own car it is for the purpose of illustration only. As before mentioned, the advantage in placing the motor in front under a hood was to make it more accessible for correcting troubles, and in order that they may be more readily detected. This being the case, it is evident that the gearbox and clutch could be incorporated with the motor as a unit for the same purpose. No doubt this was the intention of the designer of the first unit constructed power plant, but which, however, does not cover all of the advantages. By this construction it is possible to design the motor, gearbox and clutch so that they cannot be distorted by road conditions. Once they are right there is nothing aside from completely demolishing a car that can disturb them and even then they have been found to be as good as ever. They are there to stay. Especially is this the case when the three units are suspended at three points. It also lends itself very readily to the new and popular center control as the mechanisms can be incorporated in the gearbox cover and directly connected without the necessary linkage and reach rods that are usually found on the cars of other designs. There are few possibilities for oil leaks and dirt may be more readily excluded, as the only moving parts which project outside of the case are protected by the sod pan beneath the motor.

Engineers Working Toward Simplicity

Up-to-date engineers are continually working to make cars simpler of construction and operation. In some cases it is necessary for an owner to keep a couple of barrels of oil and from 50 to 100 or more pounds of different kinds of grease, and a chauffeur who must be an expert mechanic. This may suit the man who can afford this extra expense, but for the average owner who drives and looks after his own car, the simpler and fewer the duties he has to perform before the car may be operated the better he likes it. This is where the unit construction again has its advantages.

In the case of our car it is only necessary to pour the oil through the breather pipe, which is made especially large for this purpose, until it shows the proper level on the gauge and the motor, clutch and gearbox are oiled. After the motor has run long enough to collect cuttings all that is necessary to remove them is to drain the oil out at the point lowest in the oil receptacle, pour in a gallon of kerosene, and run the motor 5 seconds, after which the kerosene may be drained off, and the oil receptacle refilled with clean oil. As far as accessibility goes it is possible to take the motor out of the frame, gearbox and all, and replace in an hour's time. Again the gearbox and clutch can be detached from the motor and disassembled, put back and reattached in 30 minutes, all without removing anything but the hood and the floor boards in front. In our construction there is absolutely no end thrust taken by the motor or gearset. The driving of the car is not transmitted from the rear axle to the gearbox as in some cases, but is accomplished by means of specially designed cross-member to which the axle torque arm is attached by means of a ball-and-socket joint, which leaves the gearbox and motor free from any duties save imparting the rotary motion to the rear axle. This construction also permits of supporting the gearbox high enough to clear all obstructions in the road and it cannot be affected by vibrations due to the rear wheels, or subjected to any driving strain or torque from the rear axle. In motor cars as well as in all other progressive lines of business, evolution is a factor always to be considered, and in using the unit constructed motor and gearbox we are only taking advantage of what long well-founded experiences have proved to be most desirable.—W. S. Lee, Engineer Briggs Detroiter Co.

—

Boston, Mass.—Editor The Automobile:—The point that seems uppermost in my mind is in regard to the power developed at the various speeds allowed by law, which, as you state, is, of course, a great deal below the maximum horsepower of the motor. It seems as though if the automobiles were allowed only 25 miles per hour as a maximum speed, the horsepower developed at that speed being approximately 12-15 horsepower, that it would most certainly be unfair to tax the owner for something that he had but was not allowed to use. If the owner is allowed to drive his car at its full rated power, then, of course, it would be no more than right that he should be obliged to pay in proportion.

At the present writing this is the only point that the writer could see that would have any effect on stalling this new legislation.—C. T. Bates, Lenox Motor Car Co., Inc.

Inspection Report Blanks

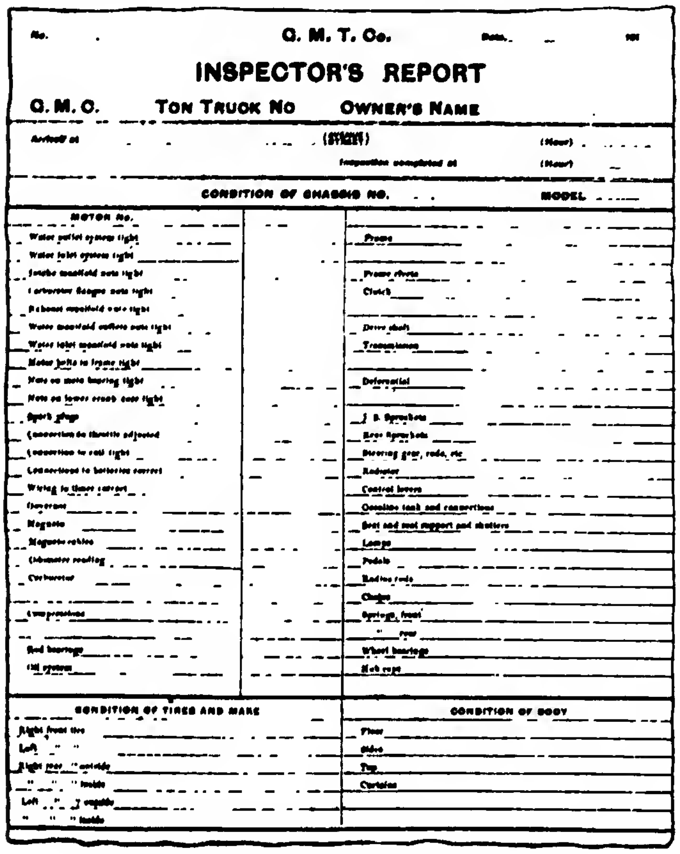
Truck Form, Passenger Car Test Card and File Index Key Card Used in New York Service Plants

New Type of Requisition Designed for Work Shops on the Card and Punch-Tag Scheme

IN ADDITION to the several series of automobile inspection blanks which have been illustrated and the use of which has been described in previous issues of THE AUTOMOBILE, a few additional blanks in use with several companies of New York are shown below.

The first of these forms, Fig. 1, is a report which is made out by the truck inspectors of the General Motors Truck Co., of New York. This company arranges with GMC trucks operating in the Metropolitan territory for monthly calls at the service department garage, during which inspectors look over the exterior parts of the trucks which are apt to get out of adjustment. Once every 3 months, the inspectors open the crankcase and gearbox of every truck to see if the internal parts are in good condition, whether or not the bearings need taking up, if the gears are properly lubricated, etc. In this way, a thorough inspection is made of the whole truck and by applying the principle of a stitch in time saving nine, the life of the truck is lengthened and the cost of maintenance per year and mile reduced. In such cases where it is impossible for a truck to call at the department, the latter sends inspectors to meet the truck at a pre-arranged time and place, to make as thorough an inspection as possible.

After the inspection has been completed, the inspector fills out a report, Fig. 1. The paper on which this report blank is printed, is 8.5 inches wide, 22 inches high and folded across to form two pages of half that height. On the first, spaces are provided for the name of the truck owner, the place and time of the inspection as well as three sets of smaller spaces for reporting on the condition of the chassis, the tires and the body. The parts named on the sheet are inspected one by one, and in each case a note is made, if there is anything wrong with it. On the second page is a space for owner's or driver's remarks or complaints.


G. M. T. Co.

INSPECTOR'S REPORT

G. M. C. TON TRUCK NO OWNER'S NAME

Arrived at (Hour)

Inspection completed at (Hour)

CONDITION OF CHASSIS NO. MODEL

MOTOR No.

Water outlet system tight
Water inlet system tight
Intake manifold nuts tight
Carburetor flange nuts tight
Exhaust manifold nuts tight
Water manifold outlets nuts tight
Water inlet manifold nuts tight
Motor bolts to frame tight
Nuts on main bearing tight
Nuts on lower crank case tight
Spark plugs
Connection to throttle adjusted
Connection to coil tight
Connections to batteries correct
Wiring to timer correct
Governor
Magneto
Magneto cables
Odometer reading
Carburetor
Compression
Rod bearings
Oil system

Frame
Frame rivets
Clutch
Drive shaft
Transmission
Differential
J. S. Sprockets
Rear Sprockets
Steering gear, rods, etc.
Radiator
Control levers
Gasoline tank and connections
Seat and seat support and shutters
Lamps
Pedals
Radius rods
Chains
Springs, front
" rear
Wheel bearings
Hub caps

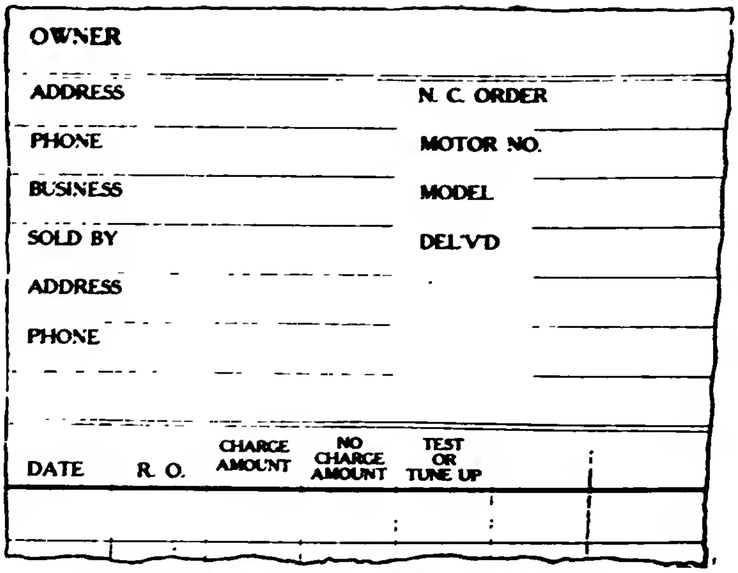
CONDITION OF TIRES AND MAKE

Right front tire
Left " "
Right rear " outside
" " " inside
Left " " outside
" " " inside

CONDITION OF BODY

Floor
Sides
Top
Curtains

Fig. 1—General Motors truck inspection blank


OWNER

ADDRESS N. C. ORDER

PHONE MOTOR NO.

BUSINESS MODEL

SOLD BY DEL'V'D

ADDRESS

PHONE

DATE	R. O.	CHARGE AMOUNT	NO CHARGE AMOUNT	TEST OR TUNE UP

Fig. 2—Cadillac service department history card

The Cadillac Motor Car Co.'s New York branch does not send inspectors periodically after the cars operating in the territory, but instead any Cadillac car driving up before the service department is readily looked over by the three testers whom the company employs for this purpose. If an inspection is made, the tester goes over the motor, its parts and conjointly operating systems such as lubrication, ignition and carburetion, and then looks over the running gear, etc. As his inspection progresses, he either checks the names of the parts on the blank, Fig. 4, if they are in good order, or states whatever troubles there are. This form is 4.75 by 10.75 inches and is made out with an original on white and a duplicate on yellow paper. After this form has been filled out, it is marked with the name of the car owner, the date of the test, the model name or number of the car and the number of the motor. The report is shown to the owner or driver, and if repairs are ordered by him, the order of the shop or job number is also noted on the form. The original remains in the office of the service department superintendent, while the duplicate is sent to the shop with the job order. All test reports are filed under the engine numbers, the salesroom being in possession of a cross index giving these and the owners' names.

The service department also keeps an exact history of the life of each Cadillac car sold and serving in the New York territory. This work is done by means of file cards, Fig. 2, which are 5 by 8 inches and printed black on thin white cardboard. When the car is sold, the upper half of the card is filled out, giving all possible information about the purchaser and the car itself. Then, whenever the car is brought in for a test or repair job, the date, the eventual repair number and the amounts of paid-for and guarantee work are noted on the card. These cards are filed under the names of the car owners and serve as a key to the inspection and repair record system which latter is too elaborate to be described here at this time.

Handy Stockroom Requisition

A requisition form used for drawing material from the stockroom which is used by a New York service department is shown in Fig. 3. This form is quite original in the following respect. Ordinarily, requisitions are printed on thin paper in form of

Date ________

No. 519
Job....

Rq. 519
Job....

REQUISITION

Part No.	Quantity	Name of Part	List Unit	List Cost, Total	C	F

Quantity	Part No.	List Total	C	F

Received **O.K.**

Received **Clerk**

Fig. 3—Novel type of requisition which consists of a main section for the stockroom and a tag attached to the steering wheel

pads and are made out with duplicates and sometimes triplicates, one copy going to the stockroom, a duplicate to the main office and the eventual triplicate to the accountant of the company. A handier system is obtained by the use of the requisition, Fig. 3. This form is of the size here shown and printed on medium-heavy tan or green cardboard. The right-hand fourth of the card forms a section being divided from the rest of the card by a perforation so that it can be torn off easily; it is punched with a hole so that it can be tied to the steering wheel. The main section which fills three-fourths of the card, is divided into spaces for making a note of the number and quantity of the parts to be drawn from stock, the list price per unit, the total list price which is to be charged to the customer as well as the total cost appearing on the company's books. Sometimes, when material has to be bought outside, the price paid for it is noted under cost. By checking each item under either C or F, the bookkeeper is informed whether the job is to be charged or is done free of charge under the guarantee. Each form is of course numbered on both sections.

In filling out, the workman requiring the card takes one of the cards which are kept on the desk of the foreman and fills out on it the job number, the date, the number and name of the part and the quantity required. The foreman then O.K.'s the requisition by signing it, not until after he has marked each item for charge or free work. Then the workman takes the card to the stockroom, or sends it in by a boy. The latter receives from the stockroom clerk the required material and signs for it on the main section; then the clerk fills out the small section at the right of the card and signs it, as does the recipient of the material. The clerk also marks the items free or charge and if any of the materials are not in stock, he corrects the amount on the requisition. The materials delivered, the clerk retains the main section of the card, while the person who takes the materials to the shop attaches the small section of the card to the steering wheel of the car. When the repair job is completed, the requisitions found on the steering wheel, together with the time-distribution cards of the workers, give full information regarding the cost of a repair job and what should be charged for it.

Practical Value of Service Systems

Many a dealer, especially if his business is small, is of the opinion that service systems, which include car inspection and repairs done at the lowest possible price and without profit, are work that does not pay and consequently cannot be done to any purpose. The fallacy of this idea, however, is shown by the fact that large firms with whom economy of practice has become a byword are more and more introducing such apparently unprofitable systems; and that the moral effect on an automobile buyer is greater than one might think. Heretofore, salesmen have sold cars and made not unfrequently statements and claims for their wares and the guarantee these bore, which could not be borne out by practical work. The public has begun to understand, now, however, that expectations of service by automobile makers and dealers must be reasonable and that a guarantee must necessarily be a flexible matter. This brings up the great desirability of keeping the car out of the repair shop as much as possible; but not by running along until it breaks down for good, but to have it inspected frequently and by making small repairs when trouble is still embryonic anticipate bigger ones thereby save in maintenance cost and depreciation of the car.

DETROIT-CADILLAC MOTOR CAR CO.

TESTERS REPORT

FIRST TEST BY

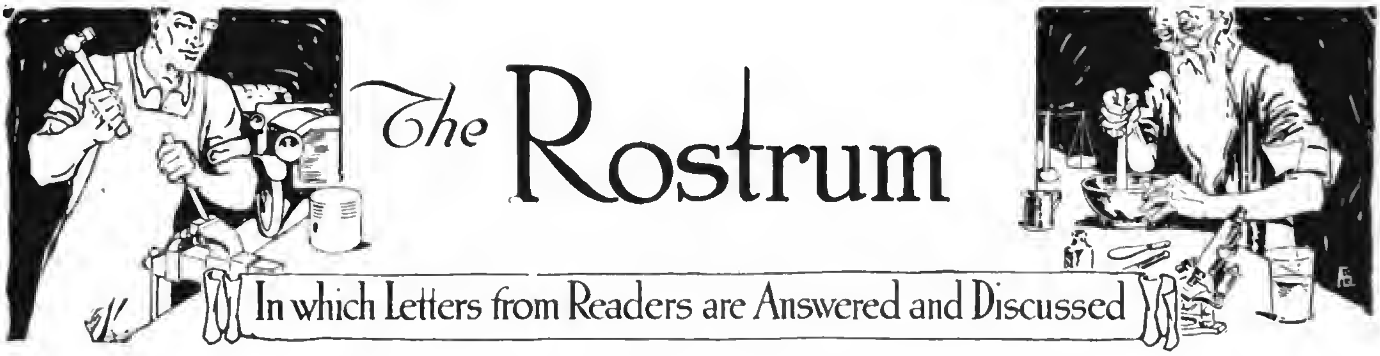
OWNERS NAME	DATE

MODEL	ENGINE NUMBER	JOB NO

MOTOR........
CONNECTING RODS........
WRIST PINS........
VALVES........
CYLINDERS........
MAGNETO........
PAN AND BEARINGS........
BONNET AND FASTENINGS........
ENGINE PAN........
GASOLINE TANK AND CONNECTIONS........
MUFFLER AND CUT OUT........
MUD GUARDS........

PASSED BY........

Fig. 4—Test report used by Cadillac Inspectors



Knock Develops After Overhauling—Lubrication of the Jackson 59—How To Wire Up a Splitdorf Coil—Repairing a Leaky Radiator—Air Pressure on Account of Car Weight—Derivation of S.A.E. Horsepower

Knocks After Overhauling Job

EDITOR THE AUTOMOBILE:—I am driving a car having a four-cylinder motor, 4.5 by 5 inches, rated at 40 horsepower. The motor has lately been overhauled, all slack taken out, carbon cleaned out, and is apparently in good order, yet the motor knocks badly when accelerated, will not stand a quick opening of the throttle without knocking at any speed it may be running, but will attain maximum speed exceeding 50 miles an hour. The compression is good. In fact, it is difficult or rather impossible to spin the motor when cranking and yet it turns easy with petcocks open. I have tried all degrees of spark advance. Has Zenith carbureter, which, as you know, is not adjustable.

New York City. W. M. WEBB.

—There are two possible causes for this trouble. One is that the compression has been increased an undue amount owing to the reboring of the cylinders and the other, and most probable, is that a piston slap has developed. Twice in every revolution the thrust of the piston against the cylinder wall is transferred to the opposite side. When looseness exists between the piston and the cylinder the skirt of the piston has a tendency to strike the cylinder and give rise to a knock which has come to be known as the piston slap. The only cure for this is the re-boring of the cylinder or the fitting of an oversized piston. The piston has a tendency to swing about the wristpin as a pivot. This produces the condition of affairs which is shown in an exaggerated form in Fig. 1. Before taking steps to prevent the piston slap, which will be a costly operation, be sure that the connecting-rod bearing caps have been tightly fitted, that there is no play in the crankshaft bearings or at the wristpin, that the ignition is properly timed and not advanced too far, that the motor is free of all carbon, and that the valves seat correctly.

Shoe Has Been Made Too Large

Editor THE AUTOMOBILE:—I have a Ford touring car, and am having trouble with the rear shoe, which is a 30 by 3.5. It keeps slipping off the rim. It has run about 500 miles, and I have been unable to find a remedy up to the present time. Do you know a remedy for such a difficulty?

Lawrence, Mass. GEORGE W. LEDUKE.

—The fault is in the shoe, which has been made too large. The 30 by 3.5-inch size is the correct tire to put on the rear wheels. The best course to pursue would be to take the tire back where you bought it and complain of its oversize. There is a possibility that they have given you a 30 by 4-inch tire by mistake.

You may remember when the tire was last put on whether it slipped on more readily than is usual with tires of the correct size. If this was the case it is proof of the fact that the tire is too large and should be exchanged for one of the correct size.

Resurfacing a Scored Crankshaft

Editor THE AUTOMOBILE:—Where can I secure a tool for truing up scored crankshafts? I have been doing this on a lathe, but find that it is hard, sometimes, on marine engine shafts when the flywheel has become firmly rusted to the shaft and it is not desired that the time be taken to remove it.

I understand that a tool is made to do this work and that it is adjustable and works on the same principle as a common pipe-cutter, only with the blade running the other way and acting as a scraper or cutter. Can you enlighten me on the subject?

Edgartown, Mass. WILLIAM S. NEVIN.

—THE AUTOMOBILE has no record of any instrument for turning down a scored crankshaft other than a lathe. In practice it would seldom happen that the time required in removing a stubborn flywheel would ever be so great that it would counterbalance that required for turning down the shaft in some other manner. An expert mechanic could, if necessary, take off the extra material by means of a light file and get the work accurate by means of the frequent use of a micrometer. This would be very delicate work and would naturally require a long time on account of the necessity of proceeding carefully and of avoiding the possibility of getting the shaft out of round. After doing this work independently for each bearing it would be necessary to fit each bearing liner very carefully. The bearings would vary in size to a much greater extent than they do when a lathe is used. Even in the latter case there is a variation which sometimes amounts to as much as .005 inch. This amount is made up by scraping in the bearing, or in other instances by shimming. Should the shaft be somewhat out of round or dented it is put in a lathe and a tool which contains an aperture for the shaft lined with very fine emery is put on and the shaft brought back to round. The shaft is never touched by a file where good work is done.

Lubrication of the Jackson Car

Editor THE AUTOMOBILE:—Will you kindly give me an outline of the oiling system used in the 1912 Jackson 50? Is it a force or splash system?

Bridgeport, Conn. G. C. B.

—The oiling system on the Jackson car is a circulating splash system. The circulation of the oil is maintained by means of the flywheel and by gravity. The oil reservoir is contained in the clutch or flywheel housing, the main oil supply resting in the bottom of this housing. The oil is picked up by the flywheel and carried up to a device known as a skimmer which catches up the oil carried up by the flywheel. This skimmer forms a small vessel which constantly holds a supply of oil.

The oil from the skimmer flows by gravity to a splash trough located beneath each of the connecting-rods and also flows by the same means through another pipe to the gearset. Thus, there are two oil leads from the skimmer vessel, one a large pipe which takes the oil to the crankcase and the other a smaller one which takes the oil to the gearset. The pipe which leads to the crankcase is pierced by four smaller pipes which grade in size from the rear cylinder to the foremost. The reason for this is the fact that there will be less oil left in the large pipe after each cylinder is passed and therefore, to make the supply of oil even to each one of the cylinders, the oil is divided correctly by the various sizes of pipe. The areas of these pipes have been obtained by calculations and subsequent experiment.

The splash troughs are divided off from one another by walls which are pierced by overflow holes. The holes are of such a height that the oil level is maintained at the right point. Before it can become high enough to cause an over-supply of oil to be thrown up to the cylinders, it will flow down through the overflow holes. The walls between the splash compartments are put there to prevent the oil from leaving the compartments when the car is ascending or descending a steep hill. This would starve either the rear or front cylinders of their oil supply.

As there is constantly much more than the necessary quantity of oil being fed to the skimmer there is always an overflow at this point as well as at the splash troughs and in the gearset housing. All the overflow oil goes back to the well beneath the flywheel, from which it is again picked up and distributed through the system. All the bearings are lubricated by this system without the aid of an oil pump.

Some Electric Ignition Queries

Editor THE AUTOMOBILE:—Kindly answer the following questions:

1—How to wire master vibrator using a five-unit of an ordinary Splitdorf coil for the purpose on a four-cylinder car?

2—How to tell polarity of current in old-style Apple igniter dynamo, so as to charge storage battery?

3—What voltage should dynamo read?

4—Will it be a success to charge in this manner and ignite and light the car with storage battery?

5—Can I successfully construct an automatic switch on the dynamo from an ordinary bell magnet so that same will throw dynamo in and out to prevent bother of throwing dynamo on and off storage circuit?

6—Instruct me how to fit cylinder rings.

Atlantic City, N. J. J. W. TAYLOR.

—1—Splitdorf never made a five-unit induction coil. There is, however, a coil known as the four-cylinder synchronized coil made by the Splitdorf Co. in which a vibrator unit acts for the entire coil besides the regulation for induction units. The synchronized coil has been made by the Splitdorf Co. to do away with the individual vibrator adjustment. When this one vibrator is adjusted all the cylinders will fire in synchronism as far as the vibrator is concerned. This is no doubt the coil to which you refer in speaking of the five-unit type. The method of wiring up this coil is given in Fig. 2. The instrument consists of a vibrator which forms the fifth unit. The only duty of this unit is to operate for each coil in the series as the primary circuit is grounded by the commutator. The speed of this vibrator is very high, which is one of the recommending features of this system. The unit consists of a double-pole magnet applied under the base which actuates the vibrator spring and hammer. The magnet is excited by the current from the battery through the grounding of the commutator on the engine. The vibrator is fitted with a regular condenser for the suppression of the spark at the vibrator points, thereby avoiding burning these out rapidly. All the units of the coil are equipped with auxiliary condensers having a ground connection of their own to form a protective system to the commutator points on the motor.

2—In the old-style Apple igniter dynamo the top of the pulley turns towards the plus pole. As the amperage of the dynamo only amounts to 2 it will charge the battery very slowly.

3—The voltage of the dynamo is about 7 or 8.

4—The system would operate with this dynamo, but it would be rather slow on account of the low output. It would be better to get one of the new dynamos for $27.50 and get an allowance for your old one. The allowance would probably amount to $5 or $6 and would thereby cut down the cost of the new one to a large extent. The new machine includes within it a governor and automatic switch.

5—Such a switch as you suggest would hardly work well enough to be depended upon. A new automatic switch which is positive in its action can be bought from the Apple Co. for $10. It would be better all around to install the modern system as stated under answer No. 4.

6—Piston rings are bought to size and are slipped down over the piston head into the grooves by placing thin strips of metal around the piston. About four of these strips of sheet metal a half inch wide will be sufficient to prevent the ring from slipping into any but the correct groove. After the rings have been placed in the piston the pistons can be pushed into the cylinder by compressing the ring by means of a cord wound around the lower part of the ring, leaving just sufficient space to be able to slip the upper edge of the ring into the cylinder.

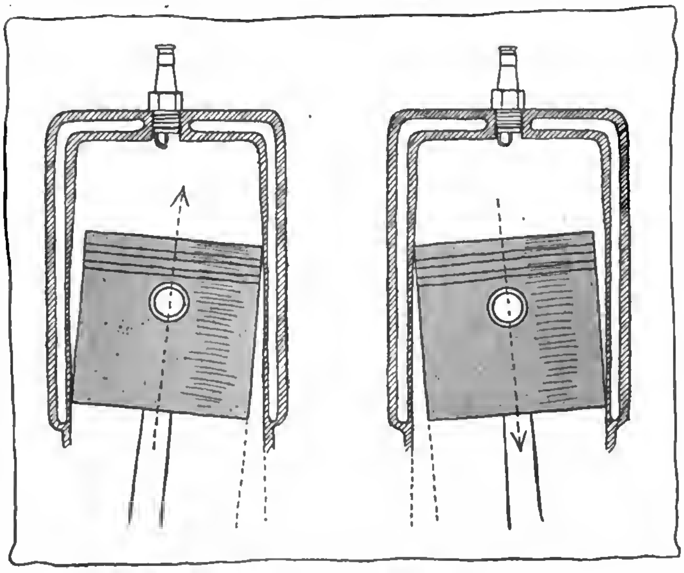


Fig. 1—Exaggerated sketch to show cause of piston slap. Piston rocks about wristpin

Repairing Radiator Tube Leak

Editor THE AUTOMOBILE:—I have an Elmore automobile, model 25, which has a McCord Mfg. Co. radiator on it, and one of the small radiator tubes about the center of the radiator has a split about an inch long in it. I see different kinds of radiator compounds advertised to repair such leaks, but hardly think such would make a permanent repair. So, if you can tell me of anything that would repair it without going to the expense of having new tubes put in, I would appreciate it very much.

Metz, W. Va. L. C. SHIELDS.

—To solder a leak in the tube of a radiator necessitates some delicate work unless you are somewhat familiar with the work. In fact, were you to take the radiator to your local plumber you would probably have to buy a new one after he got through with it. The amount of skill that is required depends largely upon the position of the leak. Assuming that it is in such a place that you can reach with a little care the method of procedure is as follows: Set the radiator in some position where you can work at it readily in a good light. Put a small piece of emery cloth on the end of a thin stick or rod and work down into the space between the tubes rubbing the metal along the leak until it becomes bright and clean. This must be done thoroughly if you wish the ultimate work to be a success. This will take some time if done right, and can be handled best if the radiator is tilted up in some such position as shown in Fig. 3. Immediately after the metal has been cleaned and be-

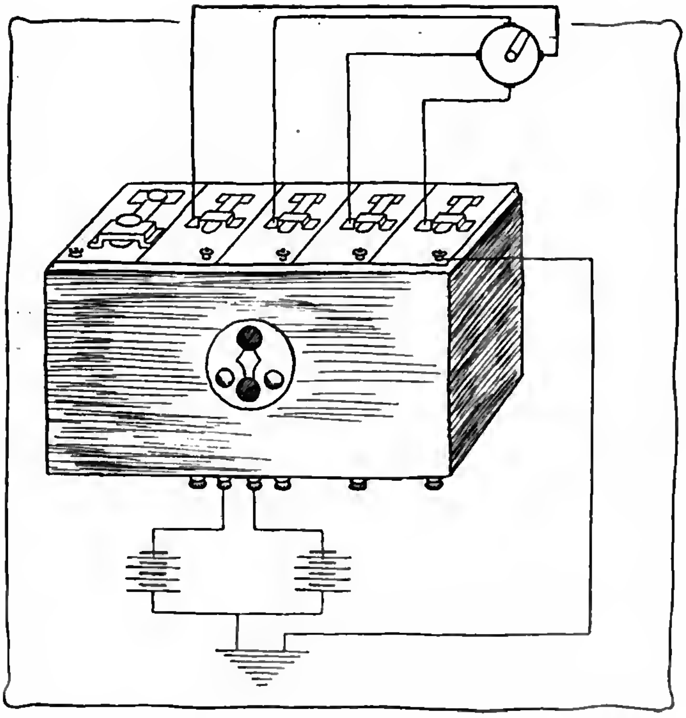


Fig. 2—Wiring diagram of Splitdorf coil with single vibrator

fore it has a chance to oxidize and become dull apply the flux, which should be zinc chloride. With a thin soldering bit heated to a cherry-red color, heat the metal to be soldered and which has been coated with the zinc chloride. While using the heated rod have another rod heating in the flame so that before the metal will have a chance to become cool the solder can be applied. The solder should be in the form of a narrow strip or else you will not be able to get it into the small aperture within which you have to work. To make the strip solder it is only necessary to heat a bar of solder and pour it into a vessel containing a small hole, as the solder is poured in it will leak through the hole in a fine stream and by running this stream along a metal surface a thin strip of solder will be produced. This should, of course, be ready before the work is commenced.

The solder is applied by means of the red-hot bit and is carefully moved along the surface of the metal which has been prepared by the flux. After the solder is applied the work should be cleaned up by the aid of a fine file.

The probabilities are that for the first two or three attempts you make at this you will have the pleasure of seeing the solder

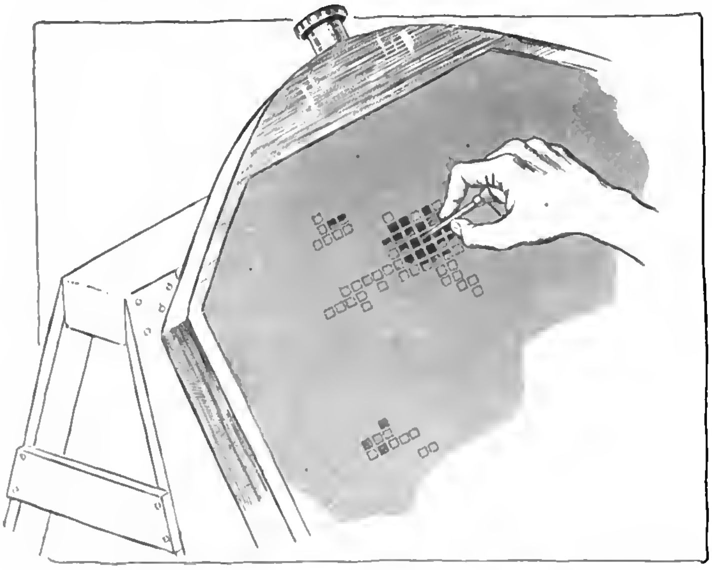


Fig. 3—Emery on the end of a fine rod will clean tube rupture

that you apply drop gently from the surface of the metal and leave the leak in very much the same state as it was at first, but with the use of considerable amount of patience you should be able to make a permanent job of it. The main part of the work is the preparation of the surface by means of the emery and flux. Some flux should remain on the surface when the solder is applied. The flux may be applied by the use of a fine paint brush. If you find that the leak is in such a place that it is absolutely inaccessible for this work, the best thing would be to send it at once to the factory and have the work done there, because this would be cheaper in the long run owing to the fact that it is very easy to spoil a large section of the radiator by means of a little clumsy workmanship. The solder to be used is the ordinary medium sōlder to be obtained in any plumber's shop. You can make it yourself by melting together one part of lead to two parts of tin.

Car Weight Increases Air Pressure

Editor The Automobile:—A claims that a tire pumps up harder if the weight of the car is on the tire, B claims that there is no difference, as the air pressure is inside the tubes. Who is correct?

Bernardsville, N. J. C. B.

—This question has been argued for hours by chauffeurs and others and there appears to be no reason why it should not be clear. Perhaps you have stepped, at some time, on a partially-inflated rubber ball. The ball was round before you stepped upon it, but when you did this it flattened out. When you stood upon the ball the pressure within the ball became greater than before because the internal volume of the ball was decreased. In other words, the same amount of air occupied a smaller volume. The air was compressed and therefore its pressure increased.

Air is a perfect gas. Perfect gases follow Mariotte's law, which states that the volume of a gas diminishes at the same ratio that the pressure upon the gas is increased, or conversely. When the ball was stepped upon its internal volume was decreased. If there had been no air in the ball it would have been actually flattened out. As it was, however, the ball reached a point at which the pressure within was enough to hold it against further compression.

The same thing happens with a partially inflated tire. When the car is jacked up the tires are round and the internal volume of the tire is at a maximum. The inner tube is round. When the jacks are removed the inner tubes become elliptical in section and the internal volume is smaller. According to Mariotte's law the pressure in these tubes has increased in the same ratio that the volume has been decreased. It is harder to pump against a tire that has a pressure of 1 ounce more than another. Although the difference is minute, it is nevertheless there. A is right.

Wants Automobile Engineering Course

Editor The Automobile:—I should like to know if a boy of 18 years of age with 2 1-2 years in a high school of good standing can enter any automobile course or mechanical engineering course in any of our state universities.

Frankfort, Ind. L. C.

—The mechanical engineering course in a state university requires a standing equivalent to that of high school graduation. You may take college entrance examinations and if you pass with the required percentage you may enter. The probabilities are, however, that if you have just managed to pass the entrance examination and your foundation work is weak, you will be bothered during your entire university course by this insufficient groundwork. It would be wiser all around to complete your high school course before entering the university.

Automobile courses are just being considered by universities, and those which have adopted them use them as a sort of post-graduate course to their mechanical engineering studies or have a course which is very much like the ordinary automobile schools.

To make a proper study of automobile engineering you need the same training that you do before taking up mechanical engineering because the same principles are involved in each study and, in fact, automobile engineering requires a more extended course in thermodynamics. In order to study thermodynamics a knowledge of the calculus is necessary. To lead up to the calculus requires all the mathematics that you will get in your high school course.

Derivation of S. A. E. Horsepower

Editor THE AUTOMOBILE:—Under the section Letters Answered and Discussed of your issue of April 10, 1913, the explanation of the derivation of the S. A. E. horsepower formula should be taken up differently.

First, the mean effective pressure assumed was 75 pounds per square inch. This should have been 90. No doubt, this was a typographical error as the final result $\frac{D^2N}{2.5}$ is correct.

The number of working strokes of a four-cycle and presumably a single-cylinder motor is $\frac{N}{2}$ in which N = revolutions per minute. (We must bear in mind that there are two strokes per revolution.)

The speed of the piston in feet per minute is given as L N, in which L = stroke in feet; N = revolutions per minute. This should be: Piston speed in feet per minute is 2 L N. This, of course, is due to the fact that there are two strokes to a revolution.

I would like to submit a derivation of the S. A. E. formula which, I believe, will be much easier comprehended. Let us take the formula for indicated horsepower:

$$\text{I horsepower} = \frac{PLAn}{33{,}000}$$

P = mean effective explosion press in pounds per square inch
L = length of stroke in feet
A = area of piston in square inches
n = number of explosions per minute.

It is clear that this formula is good for motors of any number of cycles and cylinders. Let us now apply it to a four-cycle single motor.

Let R = number of revolutions per minute. Now we know that there will be one explosion for every two revolutions, therefore

$$n = \frac{R}{2}$$

Putting this value for n in the formula for I horsepower it will look like this:

$$\text{I horsepower} = \frac{PLAR}{2 \times 33{,}000}$$

Now let us convert this into the A. L. A. M. formula. Only a certain part of this power can be utilized.

Tests which the A. L. A. M. made showed this to be .75.

The formula then becomes

$$\text{A. L. A. M. horsepower} = \frac{.75\ PLAR}{2 \times 33{,}000}$$

A. L. A. M. tests showed that motors gave their maximum power at a piston speed of 1,000 feet per minute.

Piston speed in feet per minute = 2 L R.

Then, piston speed in feet per minute divided by 2 = L R.

If the piston speed is 1,000 feet per minute we get

$$\frac{1{,}000}{2} = 500 - L\ R.$$

For every revolution the piston travels the length of its stroke twice, therefore the 2 in the above.

Now we can write the formula

$$\text{A. L. A. M. horsepower} = \frac{.75\ P\ A\ 500}{2 \times 33{,}000}$$

Further tests of the A. L. A. M. showed that the average mean effective pressure of the motor was 90 pounds per square inch. This was adopted as the average mean effective pressure.

Then the formula becomes

$$\text{A. L. A. M. horsepower} = \frac{.75 \times 90 \times 500\ A}{2 \times 33{,}000}$$

If D = bore of cylinder in inches
A = $D^2 \times .7854$

This gives us

$$\text{A. L. A. M. horsepower} = \frac{.75 \times 90 \times 500 \times .7854 \times D^2}{2 \times 33{,}000}$$

Working this out gives us

$$\text{A. L. A. M. horsepower} = \frac{D^2}{2.49}$$

or in round numbers

$$\text{A. L. A. M. horsepower} = \frac{D^2N}{2.5}$$

This is the A. L. A. M. rating for a single cylinder. To get the A. L. A. M. horsepower for a motor of any number of cylinders you have simply to multiply by the number. Let N be the number of cylinders, then for any number of cylinders the

$$\text{A. L. A. M. horsepower} = \frac{D^2N}{2.5}$$

This explanation, I believe, is much easier followed out than one at which the conclusions are jumped at, even though the reasoning were right.

Detroit, Mich. FERDINAND JEHLE.

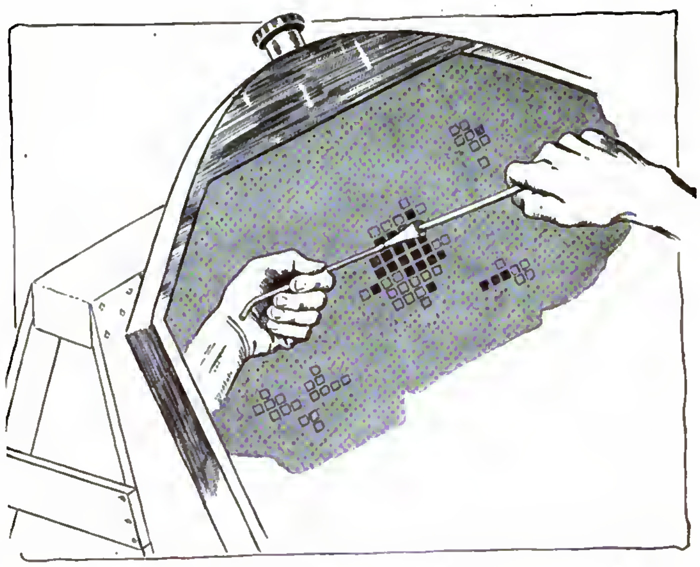


Fig. 4—String solder is used for repairing the radiator leak

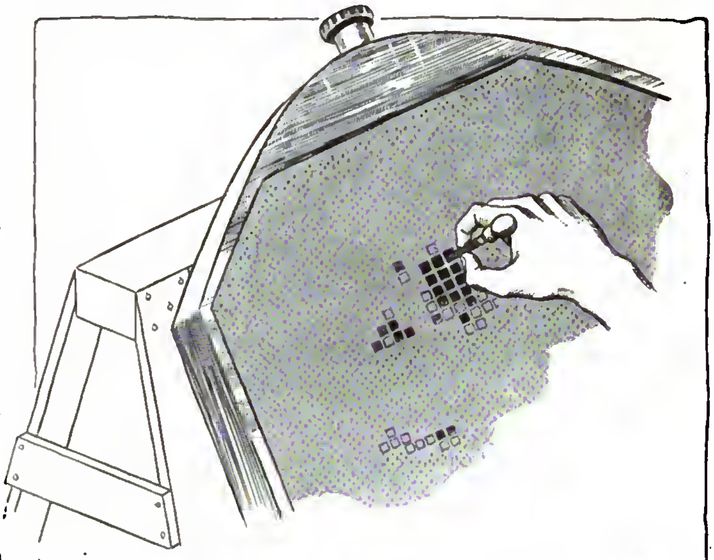


Fig. 5—After soldering the excess is removed with a file

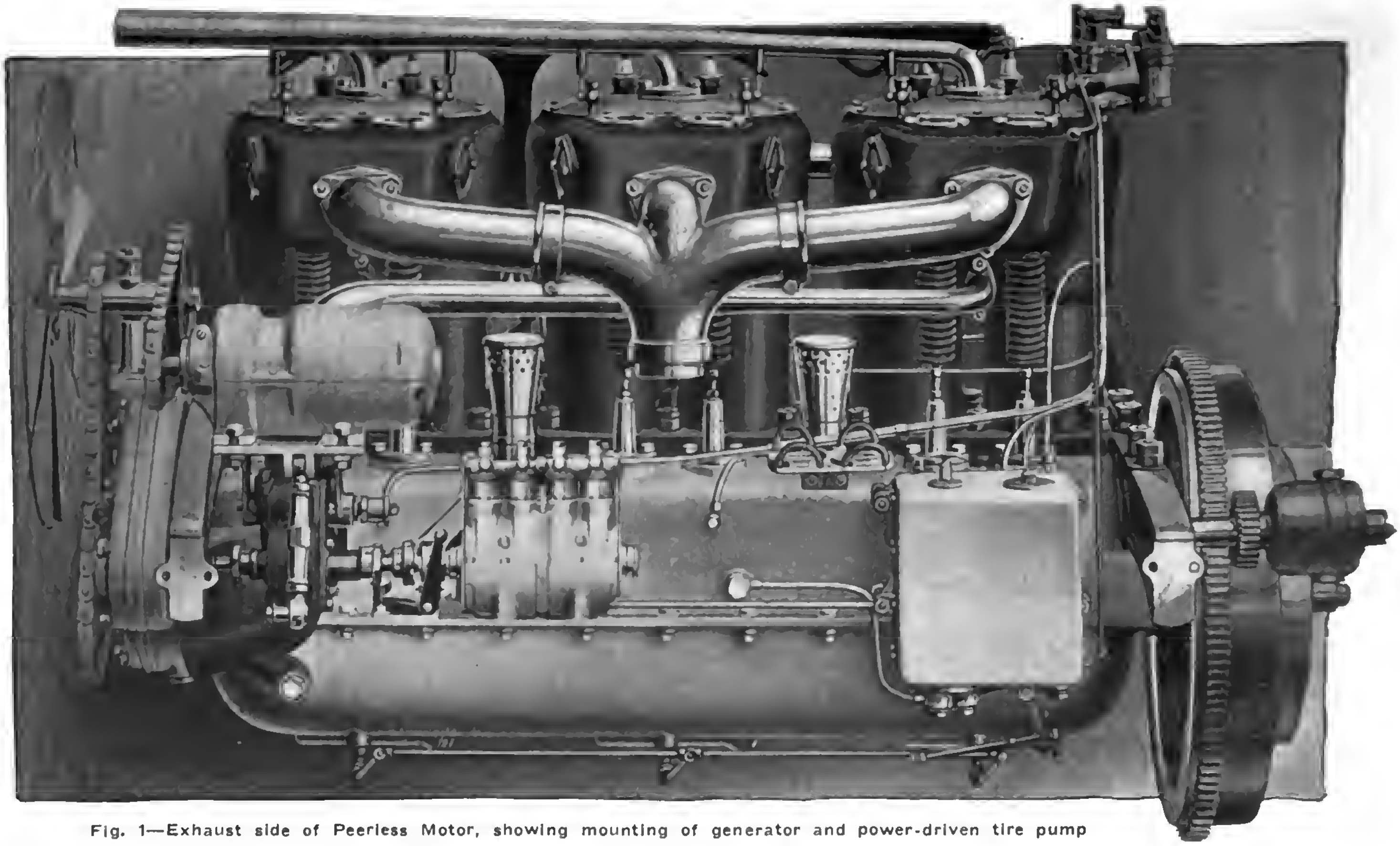


Fig. 1—Exhaust side of Peerless Motor, showing mounting of generator and power-driven tire pump

Peerless Continues the Three Sixes

THREE models of Peerless cars will comprise the line of this company for the coming season. These are all sixes and are known as the 38-Six, 48-Six, and 60-Six. They are all identical in principle and construction, merely varying in the weights and sizes of the parts. The most important changes have been made in the direction of improving the riding qualities of the car and the changes made in this direction have resulted in a lower center of gravity. The gasoline tank has been placed under the rear of the body and is slung between the two side members of the frame while the tirs are now carried on a rack at the rear of the car instead of at the side on the running board. The springs have been made thinner by decreasing the thickness of the leaves and the front and rear axles are now fitted with shock absorber. The upholstery of the rear seat has been increased in thickness to 10 inches which insures increased comfort for the passengers.

The equipment of the car has been made more complete. It includes a speedometer in combination with a clock, a combination bulb and electric horn, an electric starting and lighting system, and the same type of power driven tire pump as used last year.

The motor sizes of the three new car models are as follows:

38-Six,	bore 4	inches,	stroke 5.5	inches.
48-Six,	bore 4.5	inches,	stroke 6	inches.
60-Six,	bore 5	inches,	stroke 7	inches.

The new pistons are different than the pistons used in the past. There are now three piston rings used instead of four. All three of these rings are located at the top of the piston. A cross section of the piston is given in Fig. 2 and also a plan view. It will be noticed that a very strong system of cross bracing is employed to stiffen the walls of the piston which have been made somewhat lighter. The cylinders are T-head cast in pairs.

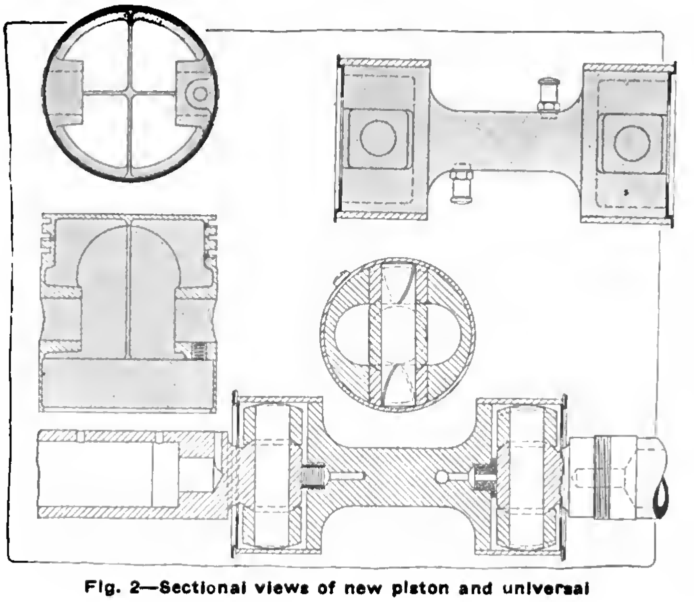


Fig. 2—Sectional views of new piston and universal

Crankshafts are drop forgings tested for both static and running balance. The material is of chrome metal steel. Seven main bearings are used and they are all carried in the upper half of the crankcase. No shimming is used in the main bearings these being all scraped in by hand. All the bearing surfaces are ground and all the bushings have bronze backs lined with babbit.

The valves are of nickel steel and are operated by an eight-bearing camshaft. The camshaft, magneto and water pump shaft are all driven through spiral gears of semi-steel running in oil. The crankcase is contained in two horizontal sections and is made of a special aluminum alloy.

The gasoline feed is by pressure from a copper tank suspended at the rear of the frame. This tank is a new departure for the Peerless company and is illustrated in detail in Fig. 4. As will be seen it is substantially braced by angle-iron cross members. A two-way gasoline valve connects either main supply 5-gallon reserve or shut off. The tank has a 22-gallon capacity and is supplied with an automatic gauge. The pressure is automatically supplied by a reciprocating pump on the engine and the air line contains a relief valve to limit the pressure in the tank. About 2 pounds is generally carried. There is a dirt trap in the gasoline line. The Peerless carbureter remains unchanged.

Ignition is by the Bosch Dual system as in the former models. When the magneto is not in use the current is suplied by the storage battery of the starting and lighting system which is kept charged by the dynamo.

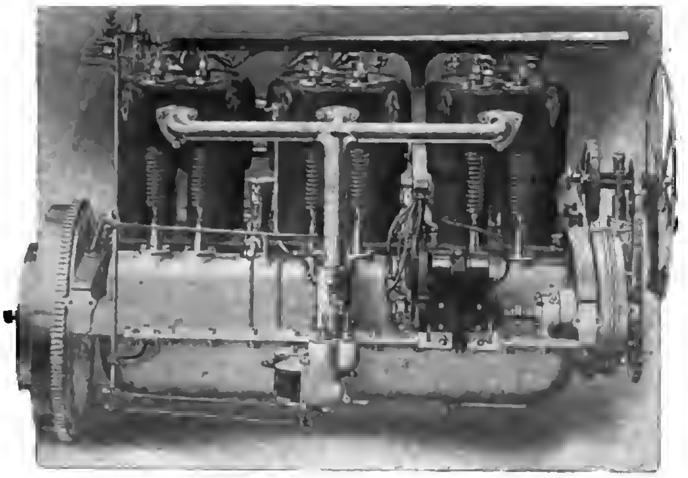


Fig. 3—Intake side of motor with magneto mounting

The Peerless type of expanding band clutch operating through a worm and screw is maintained. The frictional surface is composed of chrome leather with round cork inserts forming about 33 per cent. of the frictional surface. In the new model the action of the clutch has been somewhat improved by the introduction of a double swivel joint in the shifter fork support. The power is transmitted through a four-speed gearset which has been improved by the addition of a universal in place of the flexible coupling formerly used between the gearset and clutch. This new universal is illustrated in Fig. 2. Another improved part of the car is the muffler. This has perforated baffle plates and an interior that may be removed for cleaning. It is placed lengthwise on the left side of the chassis instead of transversely at the rear as on all previous Peerless models. The spring suspension has been improved on all three models by using thinner leaves of high quality.

Detecting Resistance—Saving Fuel

(*Continued from page 979*)

car is up to the standard of easy running or not, if, indeed, his gasoline bills have not already given him this information.

The question of grade can be solved by it instantly to the satisfaction of any doubtful ones.

Fitted to a neat bracket, so placed on the dash as to be easily read by the driver, one has always ready a sure detector of hard running.

An enterprising owner interested in engineering research can plot the torque curve of his motor by taking acceleration readings at different speeds and with varying gear combinations.

Perhaps the future car owner may require the torque curve of the motor to be produced by the makers, and before purchasing ask to make the accelerometer tests to verify it.

The instrument is not expensive ($52.50) and it is not difficult to use. Why then should it not be more widely used?

Partly perhaps because it is made in England and is not especially well known in this country.

(*Concluded*)

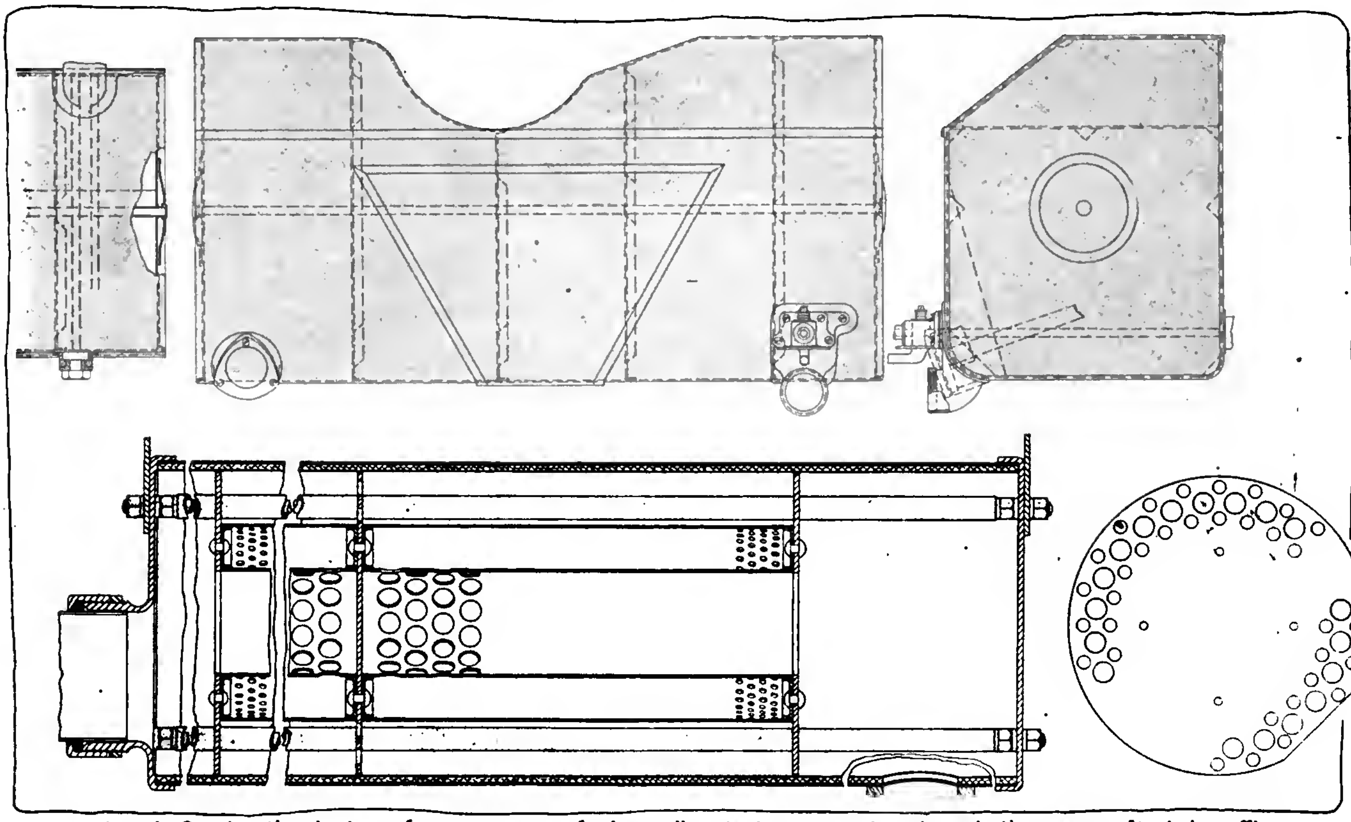
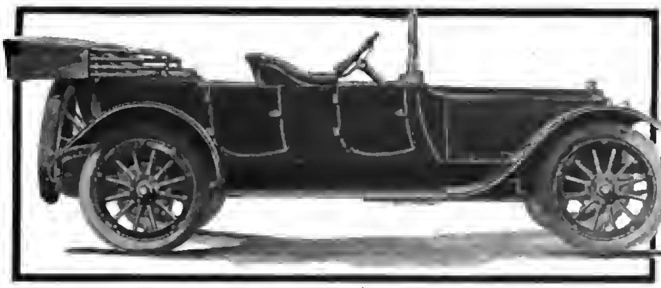


Fig. 4—Constructional view of new pressure feed gasoline tank and section through the new perforated muffler

Chandler Six of Light Construction

THE new Chandler is strictly in line with the policy of the time in constructing light six-cylinder cars. Weighing less than 3,000 pounds and having a motor which develops 35 horsepower, the car is distinctive even in that field.



New Chandler light six, which weighs under 3,000 pounds

The motor has its cylinders cast in three blocks of two. The bore is 3.375 inches and the stroke is 5 inches. This gives an A. L. A. M. rating of 27.3 horsepower and a stroke-bore ratio of 1.33. Ignition is by Bosch high-tension magneto and starting is by the 6-volt Westinghouse system.

Coventry silent chains are used for driving the magneto, pump shaft and camshaft. The arrangement of the magneto, generator, cranking motor and pump may be noted from the illustrations of the motor at the foot of this page. The water pump and magneto are operated from the same shaft on the left side of the motor, while the generator and cranking motor form independent units and are located on the right side. The cranking motor in this installation carries a gear wheel on the end of the armature shaft. This gear meshes with the gears in the flywheel. The generator is driven from the timing gear set and is located at the front of the motor on the right side.

The lubrication system is a combination of the force feed and splash. Oil is forced from the crankcase oil reservoir to each of the main crankshaft bearings. From this point the oil overflows into a series of splash troughs located beneath the crank throws. The splash takes place in the customary manner. All the oil leads are contained within the crankcase. There are no exterior oil pipes.

The clutch is of the multiple-disk type with the alternate plates lined with Raybestos. The clutch and gearset form a unit with the motor and an aluminum housing, which is a continuation of the crankcase, encloses both the clutch and the three-speed selective sliding gearset. The gearshift lever and the brake lever are both connected to the gearset housing, giving center control.

The driveshaft has two universal joints and terminates in a ball-bearing rear axle of the floating type. The differential is of the bevel type and is also mounted on ball bearings. No torque strains are taken by the springs, these being absorbed by a triangular member of pressed steel.

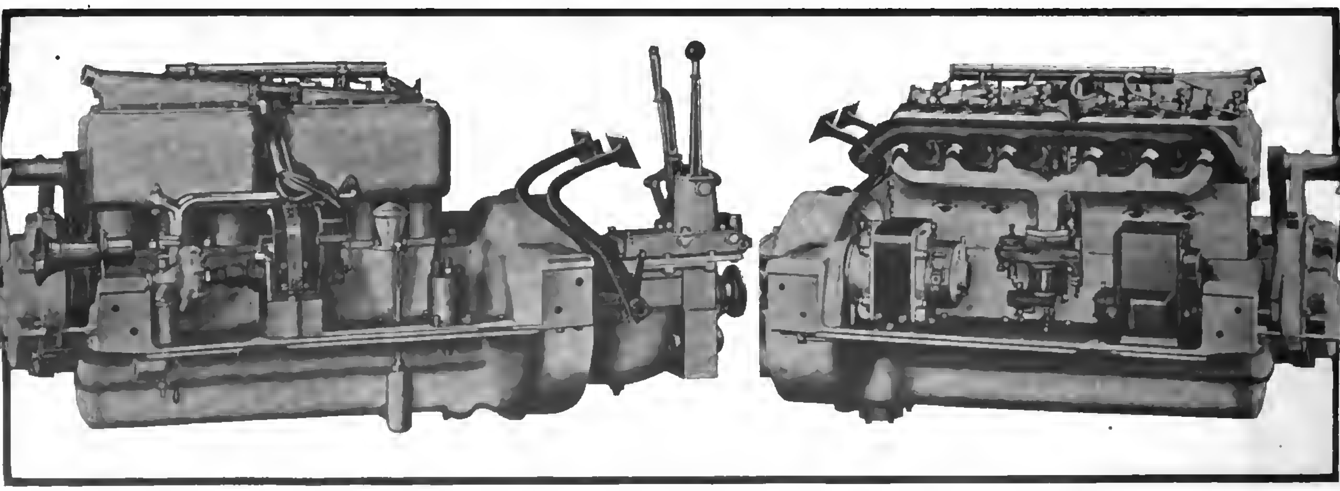
The channel side members of the frame are toed-in in front to decrease the turning radius of the car. This works out to 37 feet which is low for a car of 120 inches wheelbase.

The gasoline system consists of a 20-gallon tank swung between the members of the frame at the rear of the car. The gasoline is fed to the carbureter by pressure secured from a small reciprocating pump. The pressure maintained is in the neighborhood of 2 pounds. An air gauge is located on the dash to tell the pressure in the gasoline tank at any time. The makers claim a mileage of 13 to the gallon for this car.

The steering gear is a worm and sector. The column extends straight through the sloping footboard and terminates at the worm and gear housing. The column is raked back at a racy angle to coincide with the low driving seat given by the straight-line construction. The body side line is raised just slightly above the line of the hood, giving a pleasing appearance.

Throughout the entire construction of the car modern practice has been followed. An example of this is in the windshield, which is built directly into the cowl and does not require the long brace rods which are necessary in many types. This gives an air of simplicity to the body and does away with some of the lines that would cross the straight-line construction and destroy the simple and clean appearance that straight-line body work is supposed to give. The dash equipment is carried on a cowl board and the body line is kept smooth by mounting the lamps within the dash instead of allowing them to project.

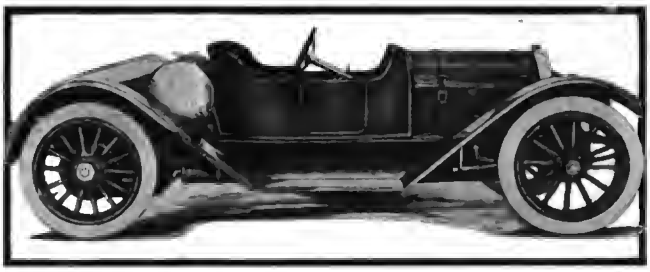
Complete equipment is furnished with the car. The accessories are stowed in a neat manner, leaving the streamline touring body lines unbroken at the sides. The extra tire is carried on the spare demountable rim at the rear of the car and the electric horn is mounted firmly on the motor itself, beneath the hood. The sound is projected through the radiator. The fenders are long and flat with a quick arch over the 34 by 4-inch wheels. Jiffy curtains, robe rail, speedometer, illuminated cowl dash, 12-inch Turkish upholstery and a full tool equipment fit the car for immediate use on the road in any weather.



The Chandler motor has its cylinders cast in two blocks of three and develops 35 horsepower on the block

Multiplex—A New Car with Racy Lines

A NEW concern which was made known to the automobile world by the recent sealed bonnet endurance run of the Automobile Club of Philadelphia has brought out a car known as the Multiplex. It is made by the Multiplex Manufacturing Co., of Berwick, Pa. The car is made in touring and roadster bodies on the same chassis.



Multiplex roadster manufactured by new Pennsylvania concern

The motor is a four-cylinder Waukesha having a bore of 5 inches and a stroke of 6 inches. The A. L. A. M. rating of this motor is 40 horsepower. The makers' rating is 50. The cylinders are of the L-head type with inclosed valves.

Modern practice has been followed in the motor arrangement and the latest features for silence have been included. The crankshaft is suspended from the upper half of the crankcase the lower half being a separate casting and used for an oil reservoir. The gears are of the skew type and the valve action is reached by the removal of a cover plate.

Lubrication system employed is a combination force feed and splash. A gear pump driven off the camshaft lifts the oil from the crankcase reservoir and forces it to the three main bearings supplying these with copious lubrication. After leaving the main bearings the oil runs into the splash troughs which are located beneath each crank throw. Scoops are placed on the connecting-rod caps which throw the oil into the cylinders and also take care of the lubrication of the wristpins. A separate lead runs from the gear pump to the timing gearcase, causing the spiral gears to operate in a constant oil bath. The oil drains back to the crankcase after overflowing from the troughs and since the oil supplied is constantly in excess of the demands of the lubricating system, there is a continuous circulation maintained throughout the lubricating system.

Ignition is by Bosch dual system with a single set of sparkplugs. The systems are independent of each other except for the plugs. The carbureter is a Stromberg and draws its air supply from a heater surrounding the exhaust pipe.

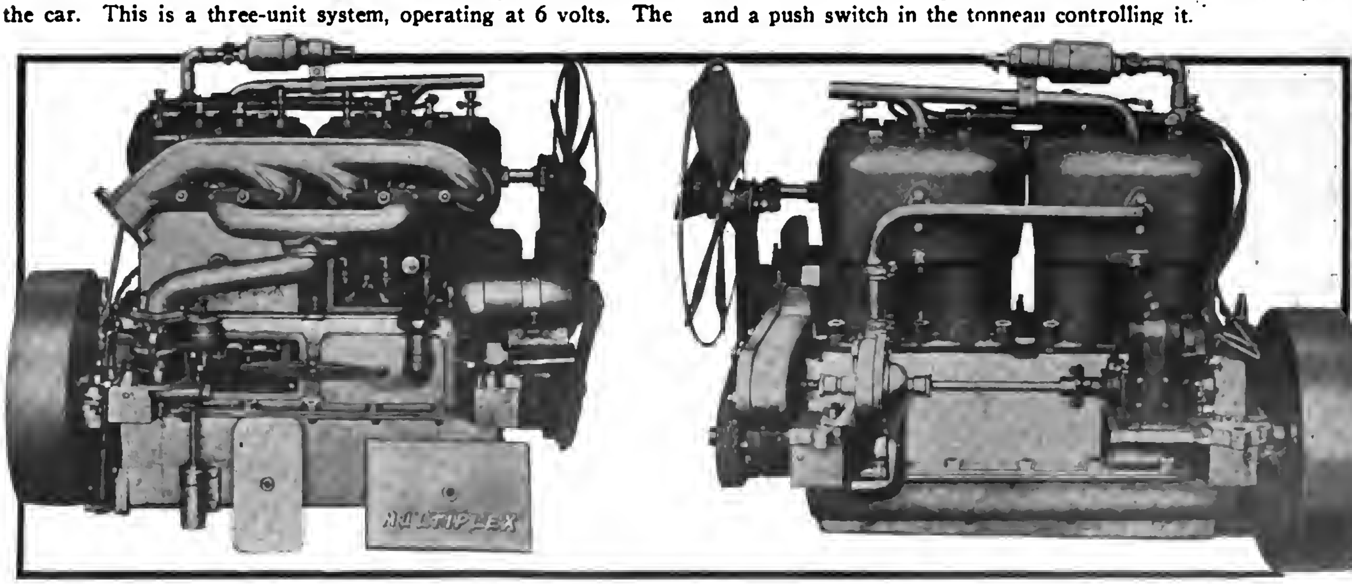
The Rushmore electric lighting and starting system is used on the car. This is a three-unit system, operating at 6 volts. The Rushmore generator has been on the market for some time and is of the iron-clad bi-pole type. The noteworthy feature of the Rushmore system is the regulation of the current by the utilization of a peculiar property of iron wire of greatly increasing its resistance when heated. The resistance of the wire is practically constant up to a certain point allowing the current in amperes to be proportional to the voltage applied. At a certain point, however, the wire reaches a dull red heat and at this point the resistance increases enormously, a very large voltage being required to force another ampere through the line.

The clutch is of the dry-plate multiple-disk type with alternate disks faced with asbestos material. The power is transmitted by a four-speed Warner selective gearset having the levers placed in the center to permit access from the right side of the car. Right steering is used, however, with center control. The fourth gear is higher than direct while the third gear is direct drive.

The steering gear consists of a worm and complete gear, the gear wheel being mounted on a square shaft which renders it possible to remove the wheel and give it a quarter turn when wear begins to appear.

Both the roadster and touring car bodies are swung long and in connection with the long wheelbase, 134 inches, and large wheels, a very racy appearance is given. The rear tires of the touring car are 39 by 5 inches and the front wheels of the touring and all the wheels of the roadster and race-abouts are 38 by 4.5. Firestone demountable rims are used all around. The tread is 56 inches and the floorspace of the tonneau is 45 inches wide.

The body is of steel panels on wood and iron framing, extra tonneau seats being supplied on the touring model which fold up very compactly and fit in floor sockets. They can be lifted out if desired to leave the floor clear. A refinement not always found on touring cars is the use of the step light which lights automatically when the door is opened. Another convenience is a light fastened in the folding top with a flexible cable leading to it and a push switch in the tonneau controlling it.



The four-cylinder Waukesha motor used in the Multiplex car has a bore of 5 inches and a stroke of 6 inches

Making Motor Spirit

Standard Oil Manager Outlines Process—Two Refineries Now Supplying Trade with New Fuel

WHEN, on the advent of motor spirit, came the statement that it would be sold at practically 3 cents per gallon less than gasoline, many were skeptical, feeling that the news was too good to be true, and naturally felt that even if the information were correct as to price there must be something wrong with the quality. To clear up this point it may as well be stated at the outset that the information as to price is correct, and with the exception of a slight odor, and the fact that the color is not quite water white, there need be no misgivings as to the quality either.

Gasoline is made, as everyone knows, by distilling the crude oil and taking off the lighter products. Other products then are made by further distillation, until finally there is a residue left that heretofore has been marketed only for fuel purposes at a price in competition with coal. For a great many years the chemists have known that this residue, or fuel oil, contained a large amount of material similar in composition to gasoline, but of a much higher boiling point. Notwithstanding the vast amount of experimental work that has been done, the problem of converting high boiling-point products into low boiling-point products by a practical method baffled every effort.

It is true that the necessity for a greater production of gasoline has become imperative only within the past year. Prior to that the refineries were able by the ordinary methods to produce enough gasoline to meet all requirements, but with the constant increase in the number of gasoline engines and the growth of the automobile industry, coupled with the decrease in the production of crude oil, an acute condition has been brought about within the last year. Necessity is ever the mother of invention; with the urgent necessity of an increased yield of a fuel for internal-combustion engines came a solution of the vexing problem, and the discovery of the process by which motor spirit is made.

Total Fuel Production Doubled

As stated above, motor spirit is made from what was formerly known as fuel oil. It is extracted by the process of pressure distillation. Under this process it is possible to secure about as many gallons of motor spirit from a given amount of crude run as now are obtained of gasoline. Thus the total production of fuel suitable for gasoline engines can be practically doubled. Of course, this takes time. The process requires an extremely expensive plant installation—several times as expensive as is necessary in the ordinary refining process.

The operation likewise is expensive, but as rapidly as the stills can be built they are being erected at the huge refineries at Whiting, Ind., and Alton, Ill., owned by the Standard Oil Company of Indiana.

It will take several years to reach a point where a maximum amount of production can be secured, but the progress that has been made and is being made in the erection of these stills seems to give assurance that the supply of fuel will keep pace with the demand.

Motor spirit could be refined further, deodorized and a product could be obtained therefrom that would be identical in every way with gasoline, but to do this would bring up the cost of the product to the present price of gasoline. This would accomplish no good purpose. The odor, whilst pungent, is not necessarily disagreeable; it is simply a distinctive odor that is noticeable only when handling the liquid. The exhaust from an engine is not as offensive as is the exhaust from gasoline. You can ride in an automobile using motor spirit and not detect it. The color is of but little moment. We have learned to expect gasoline to be water white. The fact that the new fuel is slightly yellow has no bearing on its efficiency for power purposes, any more than if it were green or blue. There are other disadvantages in further refining this product.

There are certain inherent properties in motor spirit that are desirable for power purposes that would be taken out in refining, principally the low boiling points which make the starting of the car easy, for it is a fact that in cold weather a car can be started easier with this fuel than with gasoline. There is also more power in it than there is in gasoline, and further refining would destroy this advantage, so that there is everything to be lost and nothing gained in seeking a product that would look a little prettier and smell a little sweeter. As is the case with gasoline, it is desirable to use a chamois filter for filling to avoid the presence of moisture.

It is not necessary to use a different carbureter, but it will be found best to make a slight adjustment of the carbureter, either by reducing the amount of fuel or increasing the amount of air admitted to the carbureter.

Provision for storing motor spirit is being made through the entire section in which the Standard Oil Co. of Indiana operates. This in itself is a huge problem, but every effort is being made to supply the trade as rapidly as possible. The trade can now be supplied, even in the most remote sections by making shipments in iron barrels from distributing points. Of course, this will make some little reduction in the saving where local freight has to be paid, but there is still sufficient saving to warrant the consumer in using motor spirit.—P. C. CRENSHAW, general manager sales department, Standard Oil Co. of Indiana.

English Fuel Situation More Acute

LONDON, ENGLAND, April 24—The fuel situation is growing more acute every week in this country. There is a strong feeling here that a combine controls the supply of motor fuels in England. It is a rather significant fact that almost simultaneously with the publication in America of facts concerning the new fuel, Motor Spirit, that the Shell interests here announced that they would in future furnish two grades of fuel. They always have supplied a heavy spirit named Crown which was not used by private car owners to any great extent, but by buses and cabs. Then they announced Shell I and Shell II, taking the opportunity to put Shell I up 4 cents a gallon, making it 43, and Shell II at 39. The Anglo-American people followed exactly 1 week afterwards taking the same course and putting up the price.

Motorists on this side feel very strongly that they are in the grip of a trust and that there will be no relief until there is a strong and determined competition up against them.

Our imports of motor fuel are rising enormously. During the 3 months ending March 31, we imported no fewer than 23,171,471 gallons, as against 14,903,951 gallons for the period last year.

There are campaigns on here for home-produced fuel, and the joint committee representing two of our institutions, the Royal Automobile Club, the Automobile Association, and our Trade Society is now investigating the whole question.

Every effort is being made at present to create a big demand for benzol, which is giving excellent results. It gives more miles to the gallon than gasoline, and has no deleterious effect on the engine. England is producing millions of gallons of benzol annually, but the irony of the situation is that the bulk of it is exported and used in France as a motor fuel. The home demand should be great enough to kep the stuff for use here, but even so, the supply is infinitesimal compared with the growing demand. The coke oven plants at the mines only produce 1½ to 2 gallons of benzol to each ton of coal treated, plus the various by-products, but investigations show that with a Del Monte system, this can be increased from 6 to 7 gallons per ton of ordinary coal, and to as high as 20 gallons per ton from channel coal. It is further claimed by this process that the residue after treatment is a thoroughly efficient smokeless fuel.

Acetylene Tank Makers Protest Against Undue Emphasis Placed on Electric Light Systems for Automobiles

INDIANAPOLIS, IND.—Editor THE AUTOMOBILE:—Inasmuch as the columns of the automobile press seem to be constantly filled with matter which discusses the value of lighting systems for automobiles, and which dwells largely on the use of electricity as an illuminating agent, we should like very much to suggest a thought or two which possibly may have escaped your attention.

We acknowledge the novelty of electricity, its undoubted convenience while in working order and the unquestioned widespread demand.

The other side of electric lights seems to be ignored, probably on the theory that the weakness will be eliminated in time. The fact that only the highest class of electric equipment, carefully installed and expertly cared for, is competent to give satisfaction seems to be having little or no publicity. It is well known that the makers of medium-priced cars cannot afford, at present prices, to install the grade of electrical equipment which will hold up and give service under practical road conditions. The manufacturers themselves admit it, and yet thousands of these outfits are being hastily put on, and incorrectly put on, in order that automobile factories may advertise "electrically lighted and started." Literally thousands of these systems have been torn out by the purchasers of such cars and gas lighting substituted.

Gas lighting yields nothing to electricity in point of convenience, cost of installation, cost of up-keep and service, quality and character of light or dependability. As a plain matter of fact, gas lamps, electrically lit, are as convenient as electricity. With the gas automatically regulated to give the proper height of flame in all the lamps at all times, the user has only to turn on the gas at the dash, press a button and the lamps are lit. True, an automatic electric lighter for gas lamps will occasionally get out of order—probably not as often as electric lights get out of order. But there is this important difference: When you push the button and your gas lamps don't light you can use a match; when you push the button and your electric lights don't light—suppose you tell your readers what to do.

Misinformation on Cost of Service

Perhaps the largest single amount of misinformation on this whole lighting subject is on the point of cost of service. The expression "Electric light costs nothing—the engine generates the light," is a common one in the news columns, in electric light advertisements and in the mouths and minds of automobile dealers and owners. Coupled with this statement one usually finds the sapient remark, "you save the money you used to pay for gas." This is perhaps the largest factor today in the sale and use of electric lights, even greater than the convenience of electric lights, and yet it is an absurd untruth. The average user of gas for lighting pays not to exceed $10 per year. Can you figure out for the benefit of your readers how they can use electric lights at the minimum cost of $10 per year? In computing this take into consideration something more than is usually considered, namely, the cost of electric-light globes. Go also into the cost of repairs on electric lighting systems, cost of gasoline used for current generation, the cost of new batteries to replace those ruined by amateur abuse, and many other phases of electric lighting troubles.

Does an electric light company create its current and maintain its equipment for nothing? Will any well-posted electrician contend that the maintenance of electric equipment, particularly when operated by someone who is not an electrician, costs nothing?

The unreliability of electric lights is proverbial—the whole trade knows it. The stories of people who have suddenly found themselves without light on a country road, without the slightest knowledge of how to effect a repair, are not uncommon. Even officials of automobile factories have been compelled to spend the night at some small town, 50 miles from home, because they were powerless to repair their electric lighting system, and because dealers are likewise unable to render this service. And yet some of these manufacturers who, in private conversation have no hesitancy in admitting the need of an auxiliary lighting system on any electrically lighted car, are even proceeding to omit the oil founts from their lamps, thereby compelling their customers to rely wholly on electric lights.

The reason for this is not hard to find. People know that their houses are electrically lighted with almost no trouble. They therefore rush to the conclusion that electric lighting of automobiles is equally simple and equally dependable. Then, spurred on by misstatements of certain manufacturers that "electric light costs nothing" and encouraged by the dealer who spreads this same erroneous message, either because he does not know better or because he has electrically lighted cars for sale, the prospective automobile buyer has no reason for believing that electric lights are anything but ideal in every way. Hence the demand.

Influence of Unprincipled Dealers

Another angle of the situation is the eagerness of a great many automobile makers to take prompt advantage of the unthinking demand which a few of the automobile makers originally created by spectacular announcements of electrical features. The dealer, instead of frankly telling his customers the disadvantages as well as the advantages of electric lights, and winning their gratitude for letting them see both sides of the question, realizes that he might make sales more easily if he could hand the public what they ask for regardless of its merits and so presses the factory for electric lighting equipment. The factory yields to this pressure, when it becomes sufficient, and thereupon promptly rushes into print with the announcement "electric lights."

Some dealers have already paid an excessive penalty for their part in this peculiar sort of sales logic by being compelled to perform gratis considerable expensive labor on lighting systems which they recommended and sold as "absolutely reliable."

That the reaction has commenced and will increase admits of no doubt, but the remarkable part of the situation is that the trade press itself, which should be the most reliable guide to public opinion, is reticently tagging along in the wake of the procession instead of attempting to lead it.

The gas lighting industry is showing today the largest per cent. of increase in its entire history. The only thing that could possibly change the situation, with any permanence, would be the perfection of an electric lighting system, cheap enough to be accessible to the maker of medium-priced cars and reliable enough to give satisfaction. That such a combination will ever come to pass defies imagination.

All the foregoing has been said with a view to encourage a calm, unprejudiced discussion of the lighting problem and in the hope that you may ultimately present the whole subject, uncolored by the imagination, unbiased even by the hope of future perfection of any system, and undaunted by any consideration of what people will say.—S. M. COOLEY, Prest-O-Lite Co.

Test E.C.B. Carbureter on Many Fuels

New Device Has Interconnected Throttle and Jet—External Adjustment of Fuel Level Provided

A CARBURETER which it is claimed will give correct fuel mixture at all running speeds, thus making for considerable fuel economy, bas been developed by the Detroit Carbureter Co., and carries the trade name E.C.B.

The E.C.B. carbureter, a sectional view of wbich is sbown in Fig. 1, possesses a number of unique features and on account of its peculiar design it really is equivalent to a small carbureter at low speed, and as the demand increases due to the greater engine speed the greater opening of the throttle and its interconnected fuel needle valve and air valve causes it to become virtually equivalent to a larger instrument.

The carbureter is of the concentric float type, the float surrounding the mixing tube and regulating the flow of fuel from the supply tank through a needle valve in the usual way.

Referring to the figure, the float is shown at F. The mounting of this float is one of the patented features of tbe instrument. It is wbat is termed a gimballed arrangement and really amounts to a universal connection to the arm F_1, allowing the float to remain stationary in any position. This is, no matter what the position of the engine on which the carbureter is placed and not actually upset, the float will maintain a constant level of fuel at the spray nozzle N. The primary air intake is at the bottom of the carbureter, allowing the air to pass vertically upwards around the nozzle where it mixes with the fuel. The auxiliary air enters at A and combines with the mixture at B, the whole passing on to the manifold through the diffusing screen at the outlet O.

The carbureter has no automatic features whatever, all variable quantities except primary air intake being controlled by their interconnection with the throttle. The throttle control lever is shown at T. This clamps the cylindrical throttle valve V, which has openings in its opposite sides. When these openings register with the passages O and A, air is admitted through A and fuel allowed to escape through O in proportion to the amount of register. The manifold opening in the throttle valve V bas a certain lead on the air opening so that for slow running and for priming, the auxiliary air inlet is entirely closed.

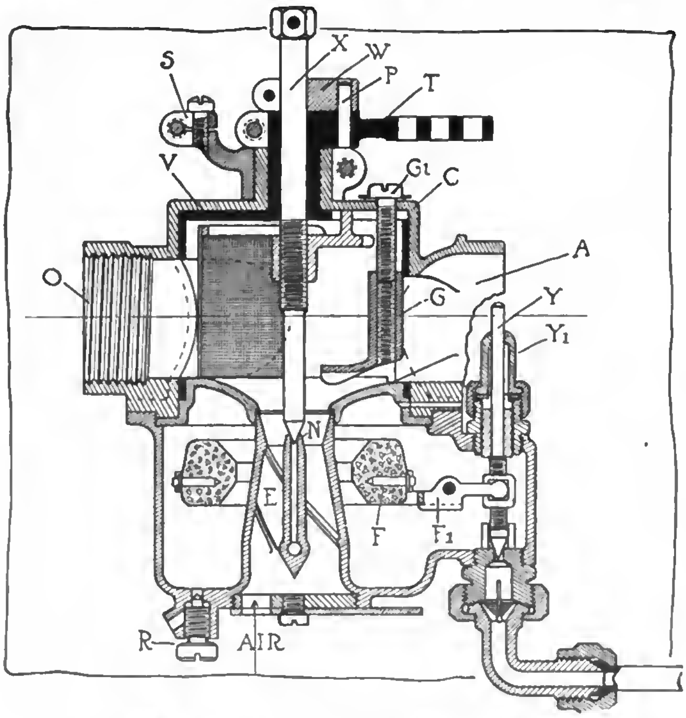


Fig. 1—E. C. B. carbureter with sleeve type of throttle

Referring to the figure, it will be seen that the needle X is screwed into a part of the carbureter casing. Through its clamp W and the pin P it is also fastened to the throttle lever T so that when the latter is turned it also raises or lowers needle from its seat.

The stop S is provided to prevent the opening of the throttle beyond a certain point. Thus when T is turned it opens the throttle, the auxiliary air and the needle valve all at the same time. The relation of these various openings must, of course, be adjusted after the carbureter is installed, so as to furnish the best results with a given engine.

It will perhaps be observed that without any apportioning feature, the amount of air admitted through the auxiliary intake would be in direct relation to the throttle opening through O. To take care of the greater proportionate amount of auxiliary air necessary with the increased engine speeds, an adjustable gate G is provided in the air intake passage. A clearer view of this gate is shown in Fig. 2. The lower edge of this gate G is inclined. Thus the more the valve V is opened the greater the proportion of air, since the valve opens from the left. The gate G may be raised or lowered in its guides through the adjusting screw G_1, allowing for the correct proportioning of the auxiliary air.

Adjustment of Fuel Level

There are several special minor features of the carbureter which are of note. For instance, the adjustment of the level of the fuel in the float chamber may be very simply and correctly made for 1-64-inch increments. The upper end Y of the inlet valve is flattened on two sides, while the lower portion is threaded to fit the float controlling nut to whicb the float lever F_1 is connected. The needle guide Y_1 is broached at its upper end to fit the flattened part of Y, while at its lower end Y_1 is provided with two lugs or keys wbich fit in slots in the carbureter bowl. The thread of the needle is of such a pitch that when the guide Y_1 is turned so that these lugs fit the second set of slots beyond any given position they have either raised or lowered the fuel level by 1-64 inch. The clamping nut around the guide Y_1 prevents Y_1 from turning until the nut has been unscrewed sufficiently to allow the lugs to clear their slots so that accidental alteration cannot take place.

Another feature is the provision made so that the upper and lower halves of the carbureter may be placed in six different positions relative to each other. That is, the holes for the connecting screws in the lower half allow the register of the upper holes in six combinations. This permits the location of the carbureter on either side of the motor and allows for the accommodation of any position of the manifold and of the gasoline connection.

Tbe venturi tube E is provided with spiral inner flanges to assist in the directing of the air rapidly to the nozzle. Another good feature is the placing of a drain plug at R.

The E.C.B. carbureter has been tested rather strenuously of late and is said to have come through with flying colors. In fact, the tests show that with a fixed adjustment it has worked satisfactorily on gasoline, mixtures of gasoline and kerosene, kerosene and lubricating oil, alcohol alone, and alcohol and water. A test of the carbureter was recently made by the Superior Motor Co., Detroit, with one of its stock two-cylinder, two-cycle motors, 3 1-2-inch bore and 4 1-2-inch stroke. A non-stop run lasting for 96 hours was made, the engine driving an 8-kilowatt generator and delivering approximately 9 brake horsepower at the flywheel.

The fuel used in this test was 50 per cent. gasoline .740 specific gravity and 50 per cent. kerosene with specific gravity of .807.

For the 1st 24 hrs. 1,344,770 revolutions were made averaging 934 R.P.M.
For the 2d 24 hrs. 2,292,430 revolutions were made averaging 900 R.P.M.
For the 3d 24 hrs. 1,355,170 revolutions were made averaging 927 R.P.M.
For the 4th 24 hrs. 1,291,580 revolutions were made averaging 900 R.P.M.

The above variations were caused by moving the position of the throttle.

After this run the cylinders and all parts in general were examined. The pistons were free from carbon.

The engine was then re-erected for further tests on different fuels and different grades of the different fuels. Kerosene .807 specific gravity, or 44 degrees Beaumé, was next tried and worked as satisfactorily as the mixture of half kerosene and half gasoline combined. The following mixtures of kerosene and lubricating oil were next used:

	S. G.	Beaumé
7 parts of kerosene to 1 part of lubricating oil........	.815	42.5
13 parts of kerosene to 3 parts of lubricating oil.......	.820	41
3 parts of kerosene to 1 part of lubricating oil........	.825	40.5

The above mixtures held the load as steadily as the mixture of half gasoline and half kerosene did. With the last-mentioned heavy mixtures the exhaust was very smoky and would undoubtedly have fouled the engine in time, but with all of the previous tests as well as the following the exhaust was odorless, showing proper consumption of fuel.

A run with denatured alcohol purchased at a local drug store at 60 cents per gallon followed. The specific gravity of same was .835, or 38.5 Beaumé. This fuel was easily handled by the carbureter and engine and instantly showed an increase of power over the other fuels. It held the electrical load as steadily as any other fuel. The next test made was purely out of curiosity and for experiment:

Alcohol 90 per cent., water 10 per cent., specific gravity..........	.850
Alcohol 85 per cent., water 15 per cent., specific gravity..........	.860
Alcohol 80 per cent., water 20 per cent., specific gravity..........	.975
Alcohol 75 per cent., water 25 per cent., specific gravity..........	.890
Alcohol 70 per cent., water 30 per cent., specific gravity..........	.905
Alcohol 65 per cent., water 35 per cent., specific gravity..........	.920
Alcohol 60 per cent., water 40 per cent., specific gravity..........	.935
Alcohol 50 per cent., water 50 per cent., specific gravity..........	.960

After all of the above tests, a continuous run of 10 hours was made on pure kerosene, after which the cylinders were again removed for examination. The piston heads and all other parts were found to be as clean as when previously examined. The carbureter adjustment was the same throughout the entire tests and experiments. During the above tests no heat whatever was supplied to the carbureter either in the shape of hot water or hot air, the carbureter being made without hot-water jackets. The water used for cooling entered the cylinders cold just as it was pumped from the city supply or under the same working conditions that would occur with a marine engine. The only adjustments made were when the different viscosities of the various fuels demanded, it is said.

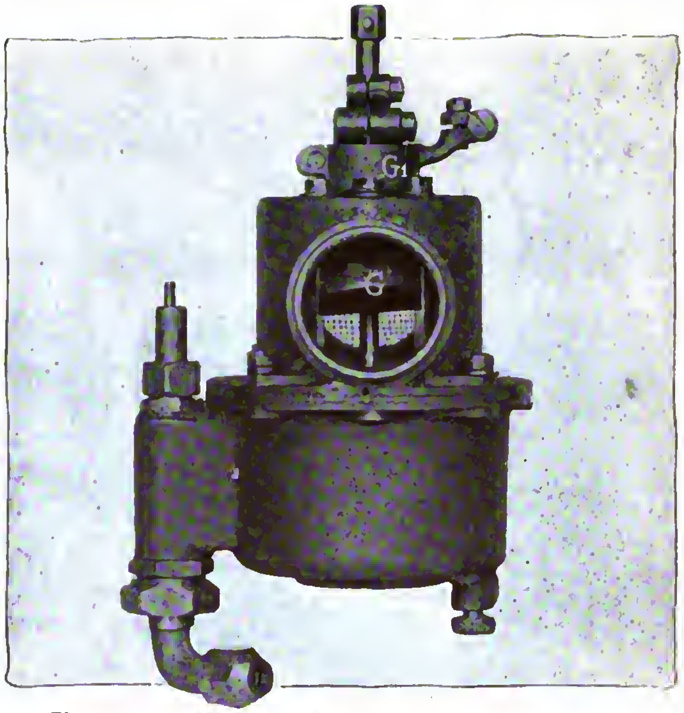


Fig. 2—E. C. B. carbureter, showing auxiliary air intake

Fisher 8-Ampere Generator

With the coming of electric lighting for automobiles, makers of electric apparatus have all striven for utmost efficiency and simplicity of generating units, so that they will be impervious to the shocks and jars to which motor vehicles are subjected.

One of the makers which claims to meet such conditions as those imposed by the automobile is the Fisher Electrical Works, Detroit, Mich., which has brought out the lighting generator shown in Fig. 3. This unit is of the inverted "U" type, which permits the minimum distance between the center of the armature shaft and the base of the generator. In the machine shown, this distance is 1.75 inches, including the non-magnetic baseplate. The generator is designed to be driven at crankshaft speed and comes up to its full rated voltage at about 300 revolutions per minute. It is so designed that the current produced does not exceed 8 amperes at any speed. The machine weighs 24.5 pounds.

The pole pieces and the fields are constructed of drop-forged steel, while the armature shaft, which is carried on ball bearings, is also of steel ground to size. The armature is of the drum wound type, the slots being partially closed by the overhanging tops of the segments. The field coils are wound in the usual way and the commutator is constructed of hard drawn copper segments with mica insulation.

The cut-in switch is mounted directly above the commutator casing, as shown at A, Fig. 3. The function of this device is to close the platinum iridium points at its base, when the generated energy reaches 7 volts, thus sending it to the storage battery. When the generating speed is too low to furnish the minimum voltage, the cut-in automatically disconnects the generator from the battery by opening the contact points. Thus, regulation is obtained automatically and there are no hand-operated switches used with the apparatus, with the exception of that for controlling the current to the various lamps.

The full potential is delivered at about 300 revolutions per minute and at about 400 revolutions per minute it is sending current to the battery at the rate of about 1 ampere. At a speed of 900 revolutions per minute it is delivering 6 amperes, coming up to its maximum of about 8 amperes at about 2,000 revolutions per minute. It is claimed that it is more desirable for a generator not to deliver over 8 amperes at any speed, thus charging the battery continuously at a moderate rate, than it is to race the generator at high speed, flooding the battery with successive charges for short periods; then operating at others without sending any current to the storage battery.

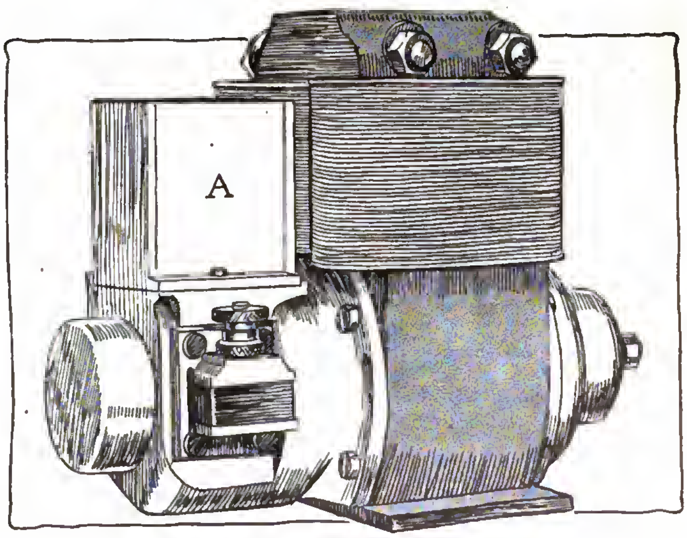


Fig. 3—External view of Fisher generator

Factory Miscellany

Bank of drills and reamers which performs four separate operations on motor castings in one of the plants of the Studebaker Corp.

QUANTITY production means to a large extent keeping things moving. The machine shown in the accompanying illustration helps to do this in the Studebaker plant. The bank of drills and reamers is a special machine which performs four separate and distinct boring and reaming operations on the motor castings. The first operation is the boring of the holes for the bolts which fasten the cylinder block to the crankcase. The second operation is the boring of the push rod guide holes. The third operation is concentric with the second and is the boring for the valve stem guide. The fourth operation is really two in one and consists of reaming both the valve stem guide holes and the push roll guide holes with a two-step reaming tool.

CHANDLER'S New Plant—The Chandler Motor Car Co., Cleveland, O., is making rapid progress in the erection of the new steel and concrete plant near St. Clair avenue. The factory will have more than 50,000 square feet of floor space. The site which has been acquired consists of 6 acres. It is expected to have the factory completed by June 1 at the latest.

Huselton Motor Company Working—The Huselton Motor Co., Butler, Pa., recently organized, will commence work in the near future on the manufacture of motor trucks.

Leases Prest-O-Lite Plant—The Miami Cycle & Mfg. Co., motorcycle manufacturers of Middletown, O., has leased half of the old plant of the Prest-O-Lite Co., in East South street in Indianapolis, Ind.

To Manufacture Electrics—Volney S. Beardsley, president and manager of the California Automobile Co., Los Angeles, Cal., states that plans have been completed to manufacture electric cars on the Coast with a factory located in that city.

Hewitt Rubber's Factory—The Hewitt Rubber Co., Buffalo, N. Y., has filed plans in Buffalo for the construction of a new three-story brick factory at 240 Kensington avenue, to cost $175,000. Work will be started on the new building within the next 3 weeks.

Moves Offices to Factory—The E. B. Van Wagner Mfg. Co., Syracuse, N. Y., has moved its general offices to the factory at Fayettesville, N. Y. Extensive improvements have been made to the factory buildings, increasing office and manufacturing facilities.

New Lord Baltimore Buildings—It is stated that J. H. Powers, Gaither Bldg., Baltimore, Md., has plans in preparation for a group of buildings to be erected for the Lord Baltimore Motor Co., that city. The buildings are to be of steel and concrete. Details are not yet available.

Erects New Deaco Plant—The Detroit Electric Appliance Co., manufacturer of the Deaco electric lighting and starting system, is building a new plant on East Grand boulevard, Detroit. The new structure will be three stories high, of brick and concrete construction, and will cover 25,000 square feet.

New Detroit Factory—The latest recruit in Detroit, Mich., automobile manufacturing army is the Detroit Electric Appliance Co., maker of the Deaco apparatus for lighting, ignition and cranking. The new plant is being erected on East Boulevard and has a floor space of 25,000 square feet. It is to be of brick and concrete and three stories high.

Wallis Tractor Rents Factory—The Wallis Tractor Co., an $800,000 corporation formed in Milwaukee, Wis., will begin the manufacture of traction engines on a large scale in Cleveland, O., and has rented the factory buildings on East Seventy-second street near Clair avenue, formerly occupied by theRoyal automobile company. H. M. Wallis, Sr., and H. M. Wallis, Jr., are the main stockholders in the concern.

Tracy Moves Testing Plant—Joseph Tracy has again moved his testing plant and laboratory, Rutherford, N. J., to larger quarters. At the new plant, six to eight motors may be tested simultaneously, and there are special facilities for making investigations on motor fuels. The equipment includes torsion, reaction, fan, electric, and hydraulic dynamometers, one of the latter having a maximum capacity of 500 horsepower.

Bosch Makes Record—The Bosch Magneto factory at Springfield, Mass., established a record for magneto shipments last month. There were shipped nearly 25,000 magnetos.

Beaver Company's Plant—The Beaver Automobile Co., Portland, Ore., recently incorporated with a capital of $150,000, will erect a plant in Vancouver, B. C., for the manufacture of automobiles.

Ravenna Working on Plant—The Ravenna Auto Truck Co., Ravenna, O., has started work on the erection of its proposed factory. It will be 50 by 150 feet. The company makes automobile trucks.

Erects $100,000 Chicago Plant—The W. J. Hughey & Son Co., Chicago, Ill., will erect a factory at Prairie avenue and Thirty-third street for the manufacture of automobile bodies. The estimated cost is $100,000.

Pope's Production Increasing—Production at the factory of the Pope Mfg. Co., Hartford, Conn., has been at a satisfactory rate and without interruptions such as have occurred in former years. To date the company has built approximately 1,100 automobiles as against 531 in the same period in 1912 season and 820 for all the 12 months to July 31 last.

Davies-Bach to Add—The Davies-Bach Mfg. Co., Cleveland, O., with a plant at Alliance, O., for the manufacture of automobile parts, has increased its capital stock from $300,000 to $600,000, in order to provide additional working capital. The company is about to place a contract for a large addition to its plant to be used for assembly purposes and a pickling department. Still further enlargement will be made in the summer, when the company will set about the construction of a sheet metal and enameling plant.

Peerless Factory Pushed—E. J. Kulas, general manager of sales for the Peerless Motor Car Co., Cleveland, O., has issued a bulletin to the company's dealers and branches throughout the country offering customers whose orders are on the books for delivery before July 1, $100 for delaying the delivery of the car till after that date if the delay amounts to 30 days and $200 if it amounts to 60 days. This unusual situation is due to the fact that the spring rush of orders is pushing the factory in an unprecedented manner in spite of the additional facilities provided at the plant.

New motor-testing plant of Joseph Tracy at Rutherford, N. J.

The Automobile Calendar

Shows, Conventions, Etc.

May 20-21.........Boston, Mass., Convention of Electric Vehicle Makers.
May 20-23.........Baltimore, Md., Spring Meeting, American Society of Mechanical Engineering.
June 2-7...........Racine, Wis., "Made in Racine Exposition," J. I. Case Co.'s foundry.
June 5, 6, 7.......Detroit, Mich., Midsummer Meeting of Society of Automobile Engineers.
October ....Paris, France, Automobile Show, Grand Palais; 10 days.
November ....London, Eng., Annual Automobile Exhibition, Olympia.

Race Meets, Runs, Hill Climbs, Etc.

May 5-8...........Washington, D. C., Motor Truck Reliability, *Washington Post.*
May 14-15.........New York City, Start of 2-Day Hudson and Catskill Scenic Tour.
May 17............Atlanta, Ga., Automobile and Accessory Assn. Annual Hill Climb.
May 29-30.........Chicago, Ill., Inter-Club Reliability to Indianapolis, Ind., Chicago Motor Club vs. Illinois Athletic Club.
May 30............Indianapolis, Ind., 500-Mile Race, Speedway.
June 5............New York City, Orphans' Day Picnic at Glen Island, Orphans' Automobile Day Assn.
June 7.............Philadelphia, Pa., Inter-Club Reliability, Quaker City Motor Club, Automobile Clubs of Delaware County, Philadelphia and Germantown.
June 14..........Cincinnati, O., Hill Climb, Cincinnati Auto Dealers.
June 16, 17, 18....Columbus, O., Reliability Contest, *Ohio State Journal.*
June 19............Chicago, Ill., Algonquin Hill Climb, Chicago Motor Club.
June 25-28.........Chicago, Ill., Non-Motor-Stop Reliability, Chicago to Boston, Chicago Automobile Club.
July 1.............Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Assn. to the Pacific Coast.
July 1-16..........Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.
July 4.............Taylor, Tex., Track Meeting, Taylor Auto Club.
July 4-5...........Sioux City, S. Dak., Track Meetings, Sioux City Automobile Club and Speedway Assn.
July 5-6...........Tacoma, Wash., Road Race, Montemara Festa Automobile Committee.
July 8-16..........Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager.
July 11............Twin City, Minn., National Reliability Tour, A. A. A.
July 27...........Grand Rapids, Mich., Tour, Grand Rapids Auto Club.
July 27-28.........Tacoma, Wash., Tacoma Road Races.
August 5...........Kansas City, Mo., Sociability and Endurance Run from Kansas City to Colorado Springs, Col., Kansas State Automobile Assn.
Aug. 29-30........Elgin, Ill., Elgin Road Races, Elgin Road Race Assn.
Aug. 30-Sept. 6....Chicago, Ill., Reliability Run, Chicago Motor Club.
Sept. 1............Columbus, O., 200-Mile Track Race, Columbus Auto Club.
Sept. 9............Corona, Cal., Track Race, Corona Auto Assn.
Oct. 4-11..........Chicago, Ill., Around Lake Michigan Run, Chicago Motor Co.
Nov. 24...........Savannah, Ga., Vanderbilt Cup Race, Motor Cups, Holding Company.
Nov. 27...........Savannah, Ga., Grand Prize Race, Automobile Club of America.

Laying the foundations for the new steel and concrete plant of the Chandler Motor Car Co., Cleveland, O.

The Week in the Industry

Engineer Dealer Repairman Garage

An Indian driver on one of the White trucks used in building an oil pipe line from the Midway fields in California to San Pedro

How the pipe lines were distributed along the road

WHITES BEAT 500 MULES—The Auto Delivery Co., San Francisco, Cal., recently undertook a hauling contract in building an oil pipe-line from the Midway oil fields in California to tidewater at San Pedre. Eighteen White motor trucks were used, supplanting 500 mules. A journey of 40 miles through desert sand and other hindrances had to be made. Before great progress could be made it became necessary to build bridges and put on full-blooded Indian drivers to stand the heat. The average time made by the trucks was about 8 miles an hour.

WILBUR ASSISTANT GENERAL MANAGER—L. R. Wilbur has been made assistant general manager of the Empire Automobile Co., Indianapolis, Ind.

GERAGHTY GENERAL MANAGER—F. D. Geraghty has been appointed general manager and president of of the Imperial Motor Tire Co., Washington. D. C., recently incorporated for $100,000. The principal offices will be at 1112 Connecticut Avenue.

TO HAVE ITS OWN BUILDING—The Grafton & Knight Mfg. Co., of Worcester, Mass., has decided to house its motor cars in a building of its own on Franklin street that will be 95 feet by 25 feet, one story in height and take care of a dozen cars.

WILL HANDLE ACCESSORIES—H. P. Thompson, formerly with the Houston, Tex., branch of the Goodrich Co., has accepted a position with the Houston Motor Car Co., Cadillac distributors. Mr. Thompson will have charge of the tire and accessory department.

WADE GENERAL PURCHASING AGENT—F. A. Wade, formerly purchasing agent of the Flanders Motor Co., has been made general purchasing agent of the Maxwell Motor Co., Inc., with headquarters at the executive offices, Woodward avenue and Warren, Detroit, Mich.

TIMES SQUARE COMPANY'S ADDITION—Immediate work will be started on the construction of two additional stories to the rear building of the Times Square Automobile Co., New York City, extending from 56th street to 55th street. When completed there will be over 100,000 square feet of floor space.

INTO NEW QUARTERS—The salesrooms formerly occupied by the R-C-H Co. at 911 Boylston street, Boston, Mass., have been secured by the Michigan Motor Car Co., that was further down town in showrooms that were not so attractive because of their being several feet up in the air. The R-C-H Co. retains a part of the floor space.

ACCESSORY CENTER IN INDIANAPOLIS—Agents for manufacturers of automobile accessories in Indianapolis, Ind., are considering the feasibility of establishing an accessory center for the purpose of decreasing overhead expense. In Indianapolis each agent would have supervision over the business of the company he represents.

WITH ABBOTT-DETROIT—A. L. Bennett has become sales manager for the Abbott-Detroit Co. in New York City.

ADDS VULCANIZING SHOP—The E. S. Youse Co., Reading, Pa., is adding a tire vulcanizing shop to its automobile establishment.

SECURES FISK TIRE AGENCY—Rudolf & West, automobile accessory dealers in Washington, D. C., have secured the Fisk tire agency.

PITCHER COLUMBUS BUGGY MANAGER—L. W. Pitcher has been made manager of the Columbus Buggy Co. branch at Minneapolis, Minn.

NEW FIRESTONE FRISCO HOME—The new home of the Firestone Rubber Co., San Francisco, Cal., was recently opened on upper Van Ness avenue.

PORTLAND ADDS TRUCK—Portland, Ore., has recently added another Federal truck to its string, this being the eighth truck in service of that city.

POLLOCK KISSELKAR MANAGER—The KisselKar sales and service building at Wabash and 26th street, Chicago, Ill., has been put in charge of P. J. Pollock.

GIBNEY'S BOSTON BRANCH—Manager Albert L. Greene of the Gibney Tire & Rubber Co. has opened his salesrooms at 245 Columbus avenue, Boston, Mass.

COLLARD NEW GOODYEAR MANAGER—C. E. Collard has been appointed manager of the motor truck department of the Goodyear Tire & Rubber Co., New York City.

LAND PURCHASED FOR AGENCY—Land was purchased recently for the new home of the Michigan Motor Sales Co., Los Angeles, Cal. It will be completed by July 1.

THORNTON MANAGER—J. M. Thornton has again returned to the Seattle, Wash., field, this time as manager of the McKenna-Marmon Co., selling the Interstate cars.

TAKES MCNAULL TIRE AGENCY—The Rogers Supply & Tire Co., Columbus, O., has taken the central Ohio agency for the McNaull electric tires, manufactured in Akron, O.

BASLE WITH SOWERS TRUCK—A. H. Sowers has secured the services of Charlie Basle, the racing driver, who will assume charge of the assembling plant of the Sowers Motor Truck Co., Boston, Mass.

TRADE CONGRESS IN GENEVA—The Syndicate of Swiss Motor and Cycle Manufacturers and Agents has invited the International Union of European Motor Car Builders to hold a congress in Geneva during 1914.

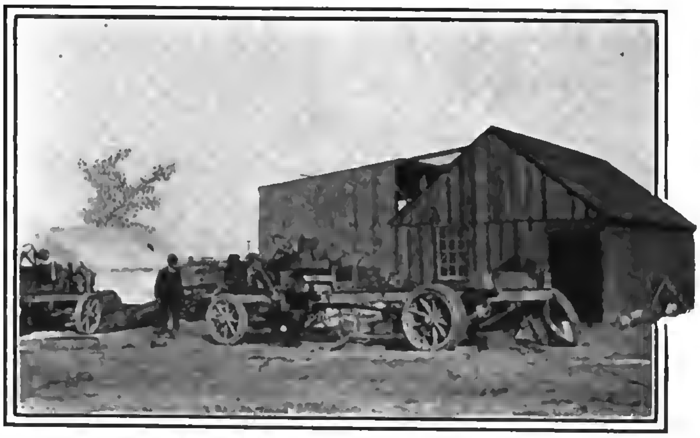
DE DION MOVES—The De Dion Bouton Selling Branch, New York City, announces the removal of its showroom to 1672 Broadway, northeast corner of 52d street. The garage and repair department is on 110 West 54th street

LOCOMOBILE TRUCKS FOR VANCOUVER—Two 5-ton Locomobile trucks have recently been purchased by the city of Vancouver, B. C. The cars will be used as street flushers and each will transport a tank carrying 12,000 gallons of water.

WILSON WITH MARATHON—F. E. Wilson has severed his connections with the Tone Car Corp., Indianapolis, Ind., and joined the sales organization of the Marathon Motor Works, Nashville, Tenn. His headquarters will be in Dallas, Tex.

NEW HARTFORD SALESROOM—Edward S. Clark, Paige-Detroit and Modern representative at Hartford, Conn., has acquired the whole salesroom at 183 Allyn street, one-half of it having been formerly occupied by T. E. Oakes. Richard C. Skinner, state representative of the Shawmut tire and tube department of the Hood Rubber Company, will conduct a tire branch at the same address. Alterations are now in progress.

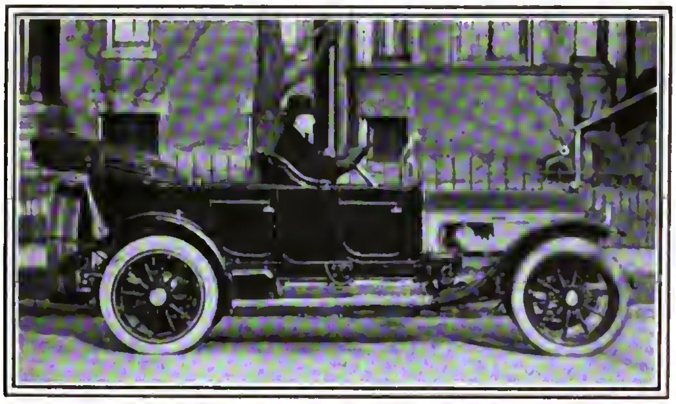
DRAWBACK ON ANNULAR BEARINGS—A ruling has been made by the treasury department at Washington, D. C., that drawback shall be allowed under section 25 of the existing tariff act on motor cars and motor car engines manufactured by the Briggs-Detroiter Co., of Detroit, Mich., with the use of imported annular bearings. The allowance is not to exceed two imported annular bearings to each motor car or engine exported.



Rough-and-ready garage at Lancaster, Cal., for the trucks

How the pipes were carried, ready to drop at the roadside

Hauling sheet metal and supplies through the sand hills. Blankets, food and water were carried with every load



New model Peerless 38-six with touring body

Automobile Incorporations

AUTOMOBILES AND PARTS

BRITTON, OKLA.—Darling Automobile Mfg. Co.; capital, $25,000; to manufacture automobiles. Incorporators: C. P. Stealey, A. W. Hedge, H. O. Crum, G. R. Crawford, S. D. Shintaffer, D. L. Sellers, W. C. Settle, H. S. Emmerson, O. L. Stealey.

BROOKLYN, N. Y.—S. & K. Mfg. Co.; capital, $10,000; to manufacture and deal in motors, engines, etc. Incorporators: Harry Stander, F. J. Hill, Stephen Koetler.

BUFFALO, N. Y.—Selleck & Co.; capital, $40,000; to deal in automobiles. Incorporators: G. K. Selleck, M. L. Selleck, W. M. Selleck.

CHICAGO, ILL.—Falk Sales Co.; capital, $25,000; to deal in automobiles and accessories. Incorporators: L. W. Mack, W. J. Dixon, L. L. Falk.

GALVESTON, TEX.—American Motor Co.; capital, $2,000; to deal in automobiles. Incorporators: John Christensen, Johann Rasmussen, Geston Weigel.

MEMPHIS, TENN.—Michigan Motor Car Co. of Memphis; capital, $5,000; to deal in automobiles. Incorporators: R. Kupferschmidt, C. V. York, Irby Bennett, J. J. Carrigan, H. L. Combs.

MOLINE, ILL.—Borg & Beck Co.; capital, $80,000; to manufacture machinery and motors. Incorporators: O. W. Borg, M. Beck, G. W. Borg.

NEWARK, N. J.—Ingle Motors Co.; capital, $25,000; to manufacture motors, engines, etc. Incorporators: J. E. Ingle, Jr., C. L. Riess, C. M. Maurling.

NEW YORK CITY.—Still's Automobile & Accessories Co.; capital, $10,000; to deal in automobiles and accessories. Incorporators: G. M. Still, G. E. Still, J. H. Still.

NEW YORK CITY.—Tarrytown Motor Car Co.; capital, $250,000; to deal in automobiles. Incorporators: B. J. Knerr, A. M. Levy.

SACRED HEART, MINN.—Sacred Heart Automobile Co.; capital, $10,000; to deal in automobiles. Incorporators: J. H. Sagnes, P. Melaness, Torlief Arestad, W. A. Day, E. O. Dosseth.

SLAYTON, MINN.—Murray County Automobile Co.; capital, $10,000; to deal in automobiles. Incorporators: A. Pelck, F. F. Young, O. L. Young, O. H. Harrington, LeRoy Triplet, W. E. Richardson, Oliver Duchene, Cornelius Casey, Charles Carlson.

SOUTH BOSTON, VA.—Auto Co.; capital, $15,000; to deal in automobiles. Incorporators: J. A. Mebane, Frank Mebane, W. W. Ballou.

UTICA, N. Y.—H. D. Grim Auto Co.; capital, $20,000; to deal in automobiles. Incorporators: C. W. Grim, Fred Crain.

GARAGES AND ACCESSORIES

AKRON, O.—Diamond Rubber Co.; capital, $10,000; to deal in rubber and rubber goods of all kinds including automobile tires. Incorporators: A. H. Marks, O. C. Barber, Guy E. Norwood, A. B. Jones, N. S. Noble.

BROOKLYN, N. Y.—Self-Generating Motor Co.; capital, $250,000; to manufacture machines for generating steam, etc. Incorporators: O. G. Holahausen, R. T. Maul, H. B. Wood.

BUFFALO, N. Y.—Fedders Mfg. Co.; capital, $400,000; to manufacture automobile accessories and supplies. Incorporators: T. Fedders, C. W. Fedders, J. M. Fedders.

CANTON, O.—Canton Tire Saver Co.; capital, $25,000; to manufacture a liquid preparation to be used in automobile tires to prevent and stop punctures and deal in other automobile and motorcycle accessories. Incorporators: J. A. Calhoun, H. H. Calhoun, A. H. Wilson, A. E. Gordon, W. E. Romy.

CHICAGO, ILL.—Costello Seat Co.; capital, $10,000; to manufacture automobile accessories. Incorporators: G. W. Costello, Deward J. Hennessy, W. R. Swissler.

CLEVELAND, O.—Puncturemend Co.; capital, $1,000; to manufacture and deal in articles to be used in connection with automobiles and any part thereof. Incorporators: H. C. Wharfield, M. A. Wharfield, T. L. Felber, Florence Cook, W. B. Wood.

CINCINNATI, O.—Heeb Auto Service Co.; capital, $10,000; to deal in automobile accessories. Incorporators: Charles Estep, J. E. Reese, J. E. Marget, W. W. Weaver, R. E. Anderson.

CINCINNATI, O.—Neeb Auto Service Co.; capital, $10,000; to carry on an automobile service. Incorporators: P. B. Davidson, H. C. Armstrong, J. Trumbull, Victor Heintz, C. M. Neeb.

CLEVELAND, O.—Auto Garage Co.; capital, $5,000; dealing and renting automobiles. Incorporators: J. M. Bucheider, W. M. Dilkes, B. Klikes, G. W. Gumney, Horace Neff.

CLEVELAND, O.—Harris Carbureter Co.; capital, $15,000; to deal in carbureters and other automobile accessories, machinery and appliances. Incorporators: H. C. Cummins, F. B. Fishman, J. W. Camp, L. A. Black, Harry Pott.

HEMPSTEAD, N. Y.—James Street Garage; capital, $5,000; to carry on a garage business. Incorporators: T. A. McWhinney, F. W. Russell.

HARTFORD, CONN.—Automobile Insurance Co. of Hartford; capital, $300,000; to engage in automobile insurance. Incorporators: M. G. Bulkeley, M. B. Brainard, J. S. Rowe, C. H. Remington, H. R. Clough.

MONTREAL, QUE.—Montreal Autobus Co.; capital, $10,000,000; to carry on an automobile bus business. Incorporators: H. S. Holt, U. H. Dandurand, F. L. Wanklyn, D. McDonald, J. S. Norris, Tancrede Bienvenue, D. Lorne McGibbon, Paul Galibert, J. E. Wilder.

NEW YORK CITY.—Gerlelt Auto Spring Wheel Co.; capital, $200,000; to manufacture an automobile spring wheel. Incorporators: August Gerlelt, Martin Vath, Henry Hell.

NEW YORK CITY.—National Spark Plug Co.; capital, $10,000; to deal in automobile supplies, etc. Incorporators: R. L. Cherburg, C. B. Bennett, Agnes Boselman.

NEW YORK CITY.—Universal Liquid Register Co.; capital, $25,000; to manufacture and deal in gasoline gauges, etc. Incorporators: A. D. Dickerson, C. F. Brown, H. M. Moorhead.

PAINESVILLE, O.—Vulcan Mfg. Co.; capital, $200,000; to manufacture automobile accessories.

PITTSFIELD, N. Y.—City Garage and Sales Co.; capital, $50,000; garage business. Incorporators: W. G. Venn, M. H. Ward, H. N. Stackpole.

RICHMOND HILL, MASS.—Richmond Hill Garage & Machine Co.; capital, $8,000; to manufacture machinery, etc. Incorporators: O. H. Ryan, A. F. Ryan, M. E. Tunon.

SYRACUSE, N. Y.—Bendring Mfg. Co.; capital, $50,000; to manufacture piston rings and other engine parts. Incorporators: H. C. Cowles, W. R. Walker, A. L. Jones.

SEDALIA, MO.—Shaffer Motor Co.; capital, $35,000; to manufacture and repair the Shaffer revolving valve internal combustion gas engine and motor machinery. Incorporators: F. K. Shaffer, J. H. Remington, O. S. Gray.

SPRINGFIELD, O.—National Jack & Mfg. Co.; capital, $6,000; to manufacture automobile accessories. Incorporators: G. Wallace, J. L. Glaze, C. Kraft.

SHERIDAN, IND.—Sheridan Motor Bus Co.; capital, $5,000; to operate a bus line from Sheridan to Noblesville. Incorporators: J. W. Ridge, Emma Ridge, Haley Hutchens.

WASHINGTON, D. C.—Imperial Motor Tire Co.; capital, $100,000; to deal in automobile tires.

CHANGES OF NAME AND CAPITAL

CLEVELAND, O.—Davies-Bach Mfg. Co.; capital increase from $300,000 to $600,000.

CLEVELAND, O.—R. H. Allen Motor Sales Co.; change of name to the Velie-Paige Motor Car Co.

ELMWOOD PLACE, O.—Highland Body Co.; capital reduced from $50,000 to $5,000.

SANDUSKY, O.—Suspension Roller Bearings Co.; capital increase from $250,000 to $350,000.

RICHMOND, IND.—George W. Davis Carriage Co.; change of name to the Geo. W. Davis Motor Car Co.

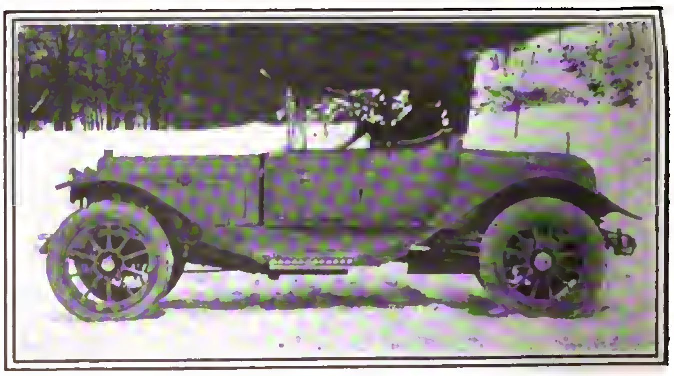
New Agencies Established

PLEASURE VEHICLES

Place	Car	Agent
Alexandria, La.	Kissel Kar	Sloan Motor Co.
Barre, Vt.	Kissel Kar	Barre Kissel Kar Co.
Beresford, S. D.	Kissel Kar	Motor Inn.
Bridgeport, Conn.	Kissel Kar	Boulevard Garage.
Cadiz, O.	Mitchell	J. W. Robertson.
Cadiz, O.	Oldsmobile	J. W. Robertson.
Cadiz, O.	Overland	E. M. Long & Sons.
Cadiz, O.	Reo	George Sampson.
Cadiz, O.	Studebaker	J. W. Robertson.
Chadron, Neb.	Little	O. U. Linington.
Chadron, Neb.	Reo	O. U. Linington.
Chicago, Ill.	R-C-H	Centaur Motor Co
Claremont, N. H.	Kissel Kar	Earl F. Howe.
Cresco, Ia.	Franklin	McHugh & Lusson.
Dyersburg, Tenn.	Kissel Kar	J. S. Scott.
East Orange, N. J.	Kissel Kar	C. A. Dorer.
Eau Claire, Wis.	Kissel Kar	A. C. Jordan.
Edmonton, Alta.	Franklin	C. M. Jamieson.
Erie, N. Y.	R-C-H	Wood & Gammon.
Fort Worth, Tex.	Kissel Kar	Chandler & Hightower.
Grand Island, Neb.	Empire	Jarvis Bander Auto Co.
Hemingford, Neb.	Little	H. O. Wildy.
Hemingford, Neb.	Reo	H. O. Wildy.
Jamaica, L. I.	Kissel Kar	Consolidated Gar.
Lake Charles, La.	Kissel Kar	Calcasieu Motor Co.
Lebanon, N. H.	Kissel Kar	Smith Auto Sales Co.
Lima, O.	Henderson	Auto Sales & Supply Co.
Los Angeles, Cal	Kissel Kar	Pacific Kissel Kar Branch.
Lynn, Mass.	Kissel Kar	Essex Automobile Co.
Marietta, O.	Hudson	W. W. Wood.
Merna, Neb.	Little	B. S. Wells.
Newark, N. J.	Kissel Kar	I. H. C. Motor Express Co.
Norfolk, Va.	Kissel Kar	Allen Motor Co.
Paterson, N. J.	Kissel Kar	Taximeter Auto Co.
Phoenix, Ariz.	Apperson	Southwestern Auto Co.
Phoenix, Ariz.	Buick	Southwestern Motor Co.
Phoenix, Ariz.	Hudson	Carr Auto Co.
Pittsfield, Mass.	Kissel Kar	S. W. Goodrich.
Phoenix, Ariz.	Pope-Hartford	W. D. Tremaine
Red Bank, N. J.	Kissel Kar	F. H. Van Dorn.
Rising Sun, O.	Franklin	E. F. Day.
San Francisco, Cal.	Kissel Kar	Pacific Kissel Kar Branch.
Sioux City, Ia.	Kissel Kar	H. E. Blum.
Syracuse, N. Y.	Hudson	H. E. Stowell.
Syracuse, N. Y.	Packard	H. E. Stowell.
Tempe, Ariz.	Ford	E. H. Spain.
Tucson, Ariz.	Hupmobile	Underhill & Campbell.
Uniontown, Pa.	Michigan	Craig Motor Car Co.
Uniontown, Pa.	Page	Craig Motor Car Co.
Warrensburg, Mo.	Kissel Kar	H. R. Ogleby.
Washington, D. C.	Norwalk	Edward Bready & Co.
Washington, D. C.	Regal	Probey Co.
Washington, D. C.	Selden	C. D. B. Motor Co.
Watertown, N. Y.	Chalmers	R. H. Treadwell.
White Salmon, Wash.	Kissel Kar	G. A. Thomas

COMMERCIAL VEHICLES

Place	Car	Agent
Los Angeles, Cal	Lauth-Juergens	Langford, Bacon & Myers.
New York City	Brown	Torney & Fargo.
Uniontown, Pa.	Reo	Craig Motor Car Co.



Peerless new model 38-six roadster type

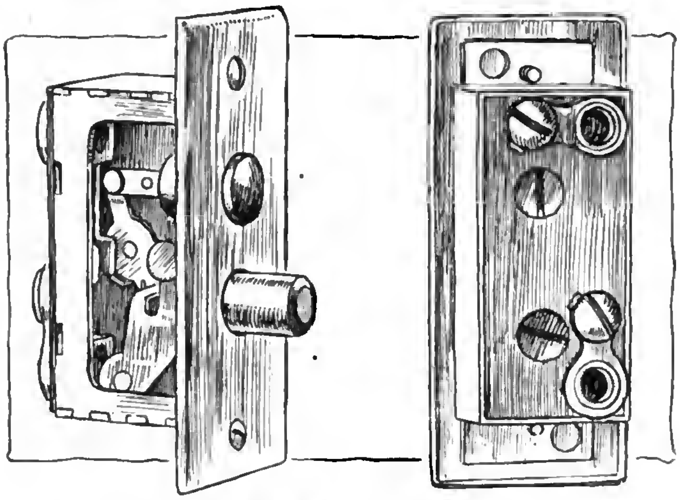


Fig. 1—Hart & Hegeman push switch

A PUSH SWITCH specially constructed for automobile lighting systems, is made by the Hart & Hegeman Mfg. Co., Hartford, Conn. This switch, Fig. 1, is constructed along the same lines as the ordinary house switch, and consists of two push-buttons which bear upon a pivoted lever, so that by depressing one the other button is raised above the plane of the metal face of the switch. The face of one button is finished in white and that of the other in black, and linked to the white button is a short lever which is raised or depressed by raising or depressing the button. If the latter is pressed in, the end of the short lever contacts with a plate inside the back of the switch. This plate is connected to one of the terminals on the back of the switch—which are seen in the illustration to the right—the other terminal is connected to the short lever.

Benson Self-Adjusting Worm Drive

The worm drive, Fg. 2. which is made by the Benson Car Co., Chicago, Ill., is so constructed as to do away with the necessity of adjusting the relation between worm and gear so as to prevent localized wear of the operating members. This end is obtained by the relative arrangement of worm gear as here shown. The point X of the worm is the fulcrum on which the gear works, and being central the wear is equally distributed toward both sides A and B. In order to permit the upper worm, however, to move sideways relatively to the lower gear, the trunnion T on the flange F is used.

Simple Ventilator for Coupe Bodies

A simple and neat ventilator for closed cars which would seem to be very practical is being made by Morrissey's Shop, Chicago, Ill. As shown in Fig. 3, it consists of a vertical pipe or neck B to which a horizontal top plate carrying a flange F is fastened. A cover C fits over the plate, which former is shaped with two holes, one cut into each end. On one of its longer sides, however, the cover does not reach down fully to the plate, but leaves a slot through which air enters if it is turned forward in the direction of the moving car. The device is installed at the roof of the body, the neck projecting into the coupé. As the car moves, the air entering through the slot is led down through B and forced into the interior of the body, supplying the passengers with fresh air.

Fabric Tester for Interlock Liners

The Double-Fabric Tire Co.. Auburn, Ind., tests the fabric used for its inner liners in a hydraulic machine, Fig. 4. The special laminated fabric used for the liners is made from high-grade Egyptian cotton, the threads of which are composed of three times the number ordinarily used, according to the manufacturer, and woven so that all of them are under even tension. The testing machine consists of a hydraulic press, which moves a hammer against the fabric, the blow amounting to 1,500 pounds per square inch. This is approximately the breaking strength of the fabric used for the inner liners.

Liquid Tire Tonic

The Liquid Tire Tonic Co., Kansas City, Mo., is manufacturing a tire tonic to stop punctures. This company claims that it will not only cure punctures instantly, automatically and permanently, but will increase the life of the tire at least 30 per cent. It is a free-flowing liquid or semi-liquid sealing agent of cement, so that upon puncture in a tire the escaping air will force said agent or cement into the aperture or wound, thereby closing or healing the same, preventing the further escape of air confined therein. The liquid is employed as a self-healing agent designed to automatically close or heal a leak. This liquid is injected in the inner tube and by centrifugal force it is evenly distributed around the inner surface of the air-containing tube. It has the consistency of molasses and has the property of remaining fluid when exposed to the air contained in the tube, but will harden upon exposure in small quantities to the outer air. The basis of the tonic is a fiber and when a puncture occurs the suction of air through the hole instantly pulls the fibre into it, automatically plugging the puncture, and as the compound hardens in the hole a permanent cork is formed. This tonic is so made chemically that it has a preservative effect upon the rubber in the tire and prolongs its life. Automobile owners who treat their tires with this solution do not sacrifice any of the advantages of riding on air. Only about a quart of the tonic is needed for each tire. It is poured through the valve and requires only 6 per cent. of the space inside of an inflated tire, the remaining 94 per cent. being air. As soon as the wheel is in motion this fluid forms a thin coating over the walls of the inner tube.

New Scott Side-Curtain Fixtures

The Star Storm Front Co., Troy, O., manufactures the ingenious side curtains which are illustrated in Fig. 5. These consist of celluloid panes secured to pressed sheet metal frames, the

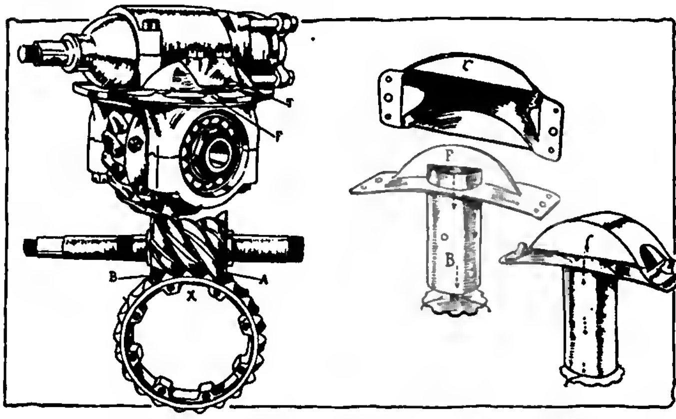


Fig. 2—Benson drive. Fig. 3—Morrissey ventilator

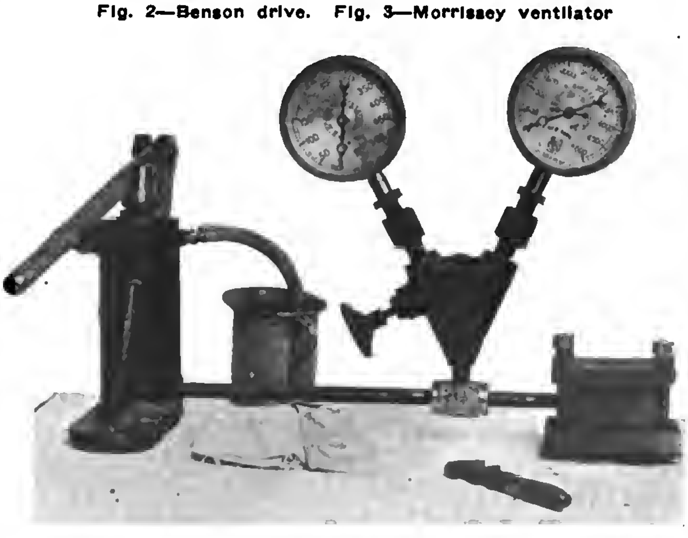


Fig. 4—Innerlock fabric tire strength tester

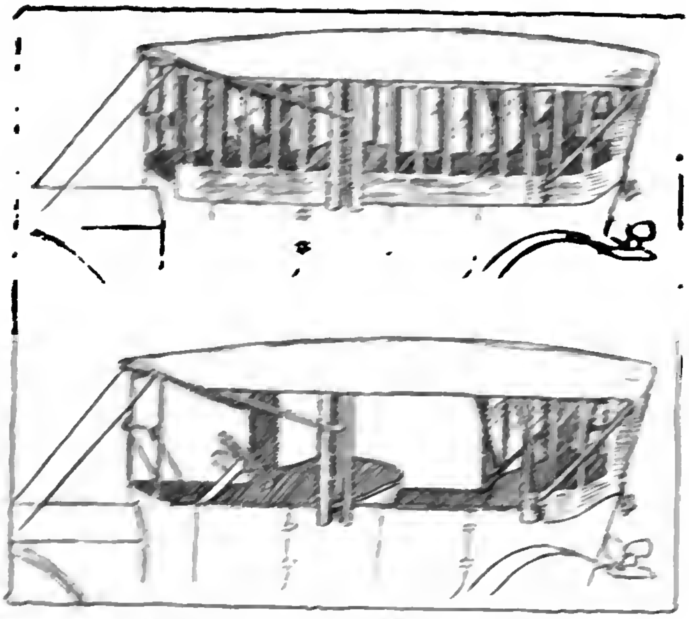


Fig. 5—New Scott automatic side curtains

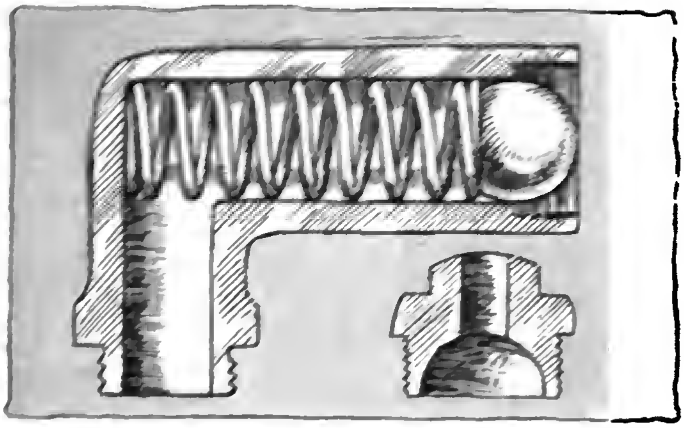


Fig. 6—Automatic gasoline saving device

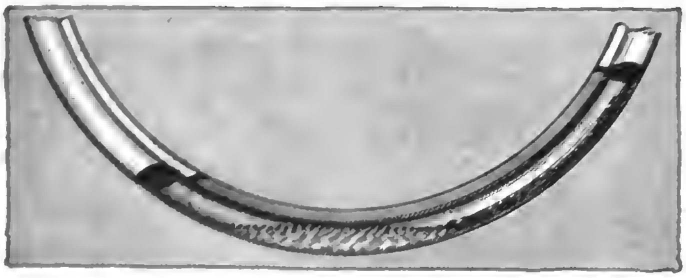


Fig. 7—Duryea self-healing inner tube

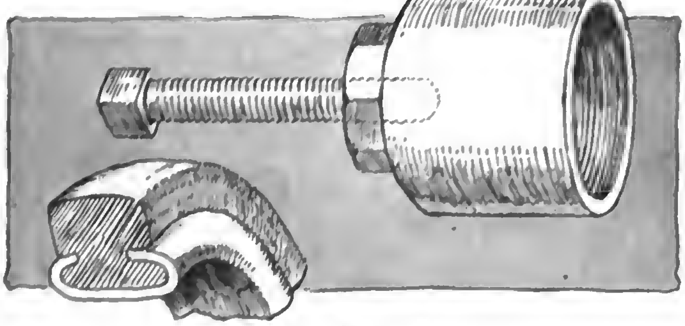


Fig. 8—Divine tire. Fig. 9—Grossman wheel puller

whole curtain being capable of rolling around a rod. How this property of the material is utilized in the construction is seen by referring to the illustration. The curtain on each side consists really of three sections, front, middle and rear. The latter is permanently open, that is, visible, being mounted on the side edge of the rear of the top and to the rear upright of the top frame. The front and middle sections are secured at their relative rear and fore edges to revolving rods or bars encased in a metal housing. These bars are held under spring tension somewhat similar to that applied to window-shade mechanisms. The free edges of front and middle sections are temporarily secured to the windshield frame and the front edge of the rear section. By this construction it is easy to open or close all or any of the six curtain sections promptly and with hardly an effort. The use of the materials above named warrant the longevity and strength of the device.

Automatic Gasoline Saving Device

An auxiliary air intake device is being made by the Automatic Gasoline Saver Co., [illegible] Broadway, New York City. This accessory is shown in Fig. 6. It consists of a brass angle pipe with polished surface, which screws into the intake pipe of the motor with the end shown as the lower in Fig. 6. The horizontal, in the illustration, shank of the pipe contains a coiled spring which presses against a ball fitted into the screw-threaded end of the pipe. Into this end fits also a plug threaded externally, the interior of which is shaped as a hollow sphere with a diametral outlet pipe through the surrounding plug metal. The plug is also made of brass. As it is screwed into the end of the pipe, it presses the ball against the spring, the tension of the latter holding the former tight against the plug and closing the outlet opening tapped into the latter. The operation of the device is automatic, as follows: If the motor is started and run at low speed, the saver is not influenced at all and all its parts remain in the same condition and relation as when the motor is at rest, being those described before. When, however, the motor is speeded up by wide opening of the throttle, the motor developing more suction than can be satisfied by the air passing through the carbureter intake—which is of limited capacity—draws the air out of the pipe and the atmospheric pressure outside of the latter works upon the ball pressing it against the spring, compressing the latter and opening an inlet for auxiliary air. The capacity of this inlet varies with the throttle opening, being maximum with the largest opening of the same. By screwing the plug in more or less, it takes a higher or lower speed to bring the instrument into action and to compress the spring.

Grossman Wheel Puller for Fords

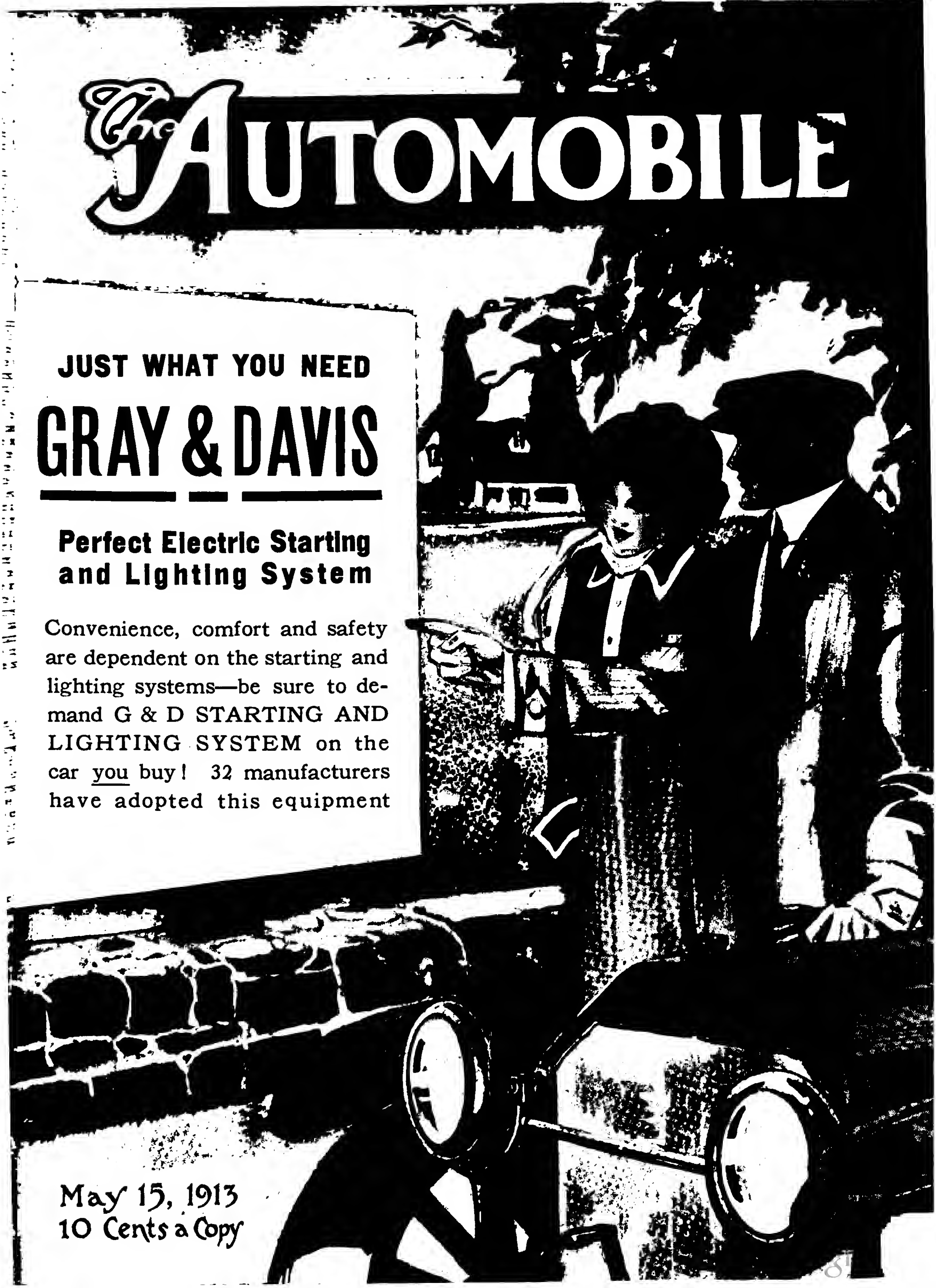
The Emil Grossman Co., 250 West Fifty-fourth Street, New York City, manufactures a wheel puller for Ford cars, Fig. 9. The device consists of a bobtail hubcap through which screws a bolt. To apply the device, the original hubcap is taken off the wheel, and the bobtail cap is screwed on in its place. After it is tightened on the end of the axle, the screw which is threaded through the center of the end plate of the cap is screwed in, thereby pressing upon the end of the axle and forcing the wheel off the axle of the car. The only tool required in the use of this device is an ordinary spanner or wrench for engaging the square head of the screw bolt.

Divine All-Fabric Tire

The Divine Tire Co., Utica, N. Y., makes the tire shown in Fig. 8, which is composed entirely of cotton fabric, containing no rubber or binding material of any nature. The tire consists, in other words, of a number of canvas blocks, held together under the great rim pressure. The threads of the fabric are placed diagonally so that the wear comes on the thread ends. The coefficient of traction of this tire is claimed to be very high and it is said to be non-skidding. While it has not as much resiliency as rubber, it is stated by the manufacturer that the tire is very well capable of absorbing road shocks. One of the principal advantages of this tire is its long life. This is easily explained as due to the high pressure of the fabric in the rim, which evens up all inequalities of the tread after any objects picked up while traveling have been removed.

J. H. Tonneau Shield

The J. H. Tonneau Shield Co., 229 West Forty-sixth Street, New York City, is manufacturing a small windshield which is designed to protect the passenger in a tonneau from the wind. The shield consists of a mahogany frame made in three sections and fitted with glass panes. The sections are joined with the main frame by means of brass joints. The two side sections may be folded over the central section and the latter may be turned from a vertical into a horizontal plane, in which position it may be used as a table. A waterproof curtain depends from the lower edge of the central section.


The AUTOMOBILE
JUST WHAT YOU NEED
GRAY & DAVIS
Perfect Electric Starting and Lighting System
Convenience, comfort and safety are dependent on the starting and lighting systems—be sure to demand G & D STARTING AND LIGHTING SYSTEM on the car you buy! 32 manufacturers have adopted this equipment
May 15, 1913
10 Cents a Copy

The AUTOMOBILE

Vulcan Wins Washington Contest

Carries 1 Ton 1 Mile at a Cost of 1.22 Cents—Great Reliability of Commercial Car Shown by Fact That Every Car Starting Finished Run — Six Out of Eighteen Have Perfect Road Scores

All Six Trucks Finishing with Perfect Score Were Put Through Rigid Technical Test and Came Out With Clean Slate—Result Depended on Fuel Economy

WASHINGTON, D. C., May 9—The announcement of the final results of the 4-day motor truck demonstration conducted by the *Washington Post* was made tonight and the 4-ton Vulcan, which was No. 1 in the contest, was declared the sweepstake winner on the ton-mile basis used in determining the results. This truck carried 1 ton 1 mile at a rate of 1.22 cents. In dollars its figure is, ton-mile cost $.0122. This truck was the only one in its division. Each of the other divisions had its winner, as set forth in the tabulation herewith. Thus, Division 5 K, No. 16, Atterbury, ton-mile cost, 1.72 cents; Division 4 K, No. 18 White, ton-mile cost, 1.40 cents; Division 3 K, No. 5 Wilcox, ton-mile cost, 2.6 cents; Division 2 K, No. 17 White, ton-mile cost, 2.38 cents; Division 1 K, No. 19 International, ton-mile cost, 3.47 cents, and Non-Contesting Division, No. 102 White, ton-mile cost, 2.76 cents. In Division 6 K there was only one contestant, namely, No. 8 Rowe, which had a ton-mile cost of 2.62 cents.

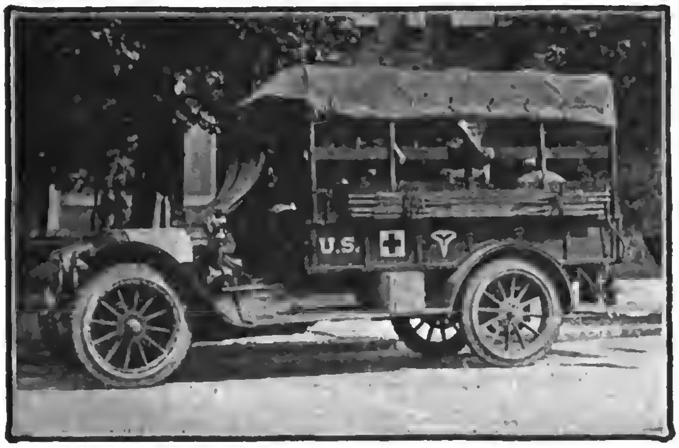
Final Results

			Ton-Mile Cost
SWEEPSTAKES WINNER			
No. 1, Vulcan	4 tons	8 M.P.H.	$.0122
DIVISION 6 K, 4001 TO 5000 POUNDS			
No. 8 Rowe	2.5-tons	10 M.P.H	$.0262
DIVISION 5 K, 3001 TO 4000 POUNDS			
No. 16 Atterbury	2-tons	10 M.P.H	$.0172
No. 12 Lauth-Juergens	2-ton	10 M.P.H	$.0214
DIVISION 4 K, 2001 TO 3000 POUNDS			
No. 18 White	1.5-ton	10 M.P.H	$.0140
No. 10 McIntyre	1.5-ton	10 M.P.H	$.0181
No. 11 Autocar	1.5-ton	10 M.P.H	$.0183
No. 15 Atterbury	1.5-ton	10 M.P.H.	$.0185
No. 2 Mais	1.5-ton	10 M.P.H.	$.0220
No. 4 Witt-Will	1.25-ton	10 M.P.H	$.0289
DIVISION 3 K, 1501 TO 2000 POUNDS			
No. 5 Wilcox	1-ton	11 M.P.H	$.0260
No. 14 Atterbury	1-ton	11 M.H.P	$.0270
No. 3 Little Giant	1-ton	11 M.P.H	$.0277
DIVISION 2 K, 1001 TO 1500 POUNDS			
No. 17 White	.75-ton	12 M.P.H	$.0238
No. 13 Atterbury	.75-ton	12 M.P.H	$.0279
No. 20 Atterbury	.75-ton	12 M.P.H	$.0411
DIVISION 1 K, 1000 POUNDS AND UNDER			
No. 19 International	.5-ton	12 M.P.H.	$.0347
No. 9 Hupmobile	.4-ton	12 M.P.H	$.0474
NON-CONTESTANTS, U. S. AMBULANCES			
No. 102 White	8 Persons	12 M.P.H	$.0276
No. 101 Brown	8 Persons	12 M.P.H.	$.0442
No. 101 Four-Wheel-Drive	8 Persons	12 M.P.H.	$.0525

Eighteen contesting trucks of various capacities started on the run and all eighteen finished under their own power. Three non-contesting United States Government ambulances carrying eight passengers each made the complete trip.

The run proved a strenuous test for all of the trucks, which carried their rated load capacities throughout the trip. The run each day was short, but bad roads were encountered in many places and a great many penalties were assessed. Six trucks, however, were able to complete the road circuit with perfect road scores, these being Mais, Wilcox, McIntyre and three Whites. After the road work was over the cars were given outdoor tests of brakes, clutches, gearboxes and a final examination and all of these six took these tests and passed the examination with a clean score. This done, the final result depended upon the amount of gasoline and the number of gallons of oil used. Gasoline was charged for at

Vulcan contestant and two of the Whites, one 3000 and the other a 1500-pound capacity as they appeared on the road



U. S. Army Ambulance which participated in the Washington run

White touring car with officials which followed the run and noted the work of the contestants

No.	Name	EMPTY			LOADED		
		Total	Front	Rear	Total	Front	Rear
1	Vulcan	7270	3300	4430	15370	4260	10960
2	Mais	6100	2960	3020	9150	2800	6220
3	Little Giant	3120	1580	1520	5200	1900	3240
4	Witt-Will	4400	2200	2140	6685	4180	2450
5	Wilcox	4240	1900	2250	6260	1925	4250
8	Rowe	6400	2480	3860	11435	2330	9000
9	Hupmobile	2300	1100	1200	3120	1150	1940
10	McIntyre	4540	2200	2260	7575	2640	4850
11	Autocar	4060	1960	2050	7125	3030	3950
12	Lauth-Juergens	5650	2750	2820	9715	3300	6350
13	Atterbury	3120	1350	1720	4720	1500	3160
14	Atterbury	4100	1675	2425	6150	1800	4325
15	Atterbury	4400	1800	2580	7475	2100	5240
16	Atterbury	5550	2275	3225	9650	2475	7150
17	White	3600	1650	1900	5175	1850	3300
18	White	4920	1950	2900	7950	2200	5675
19	International	2600	1200	1320	3675	1220	2360
20	Atterbury	3160	1400	1750	4680	1400	3250

a rate of 20 cents a gallon and the oil at 45 cents per gallon. These costs, together with the loads carried, were used as a basis of computing the ton-mile cost. Where points penalty were assessed the costs were also charged.

One of the interesting features of the run was the government representation, the army having three ambulances and a carload of officials, who followed every detail of the trip, noted the performances of the competing vehicles and made measurements on the majority of the contestants.

The trucks showed up remarkably well throughout the contest, and, although thirteen of the eighteen contesting vehicles received road penalties against them, the majority of these penalties were for minor troubles. Many of them were for adjusting carbureters and cleaning out gasoline feed lines. A number of the trucks had to take on water outside of controls and were penalized therefor. Others had to replenish oil between the starting and finishing points of each forenoon or afternoon run. Others received penalties for broken driving chains, leaky radiators, etc.

No. 1 Vulcan, the sweepstake winner, had 217 points against it for road work and 20 points in the technical examination, but it won out on its gasoline and fuel cost. It used but 5 quarts of oil on the run, which was remarkable for so large a truck. This truck had particularly great difficulty on the first day out due to getting stuck on the Middlebrook hill and making it necessary to unload part of its 4 tons, ascend the hill with one-half a load, unload it at the top and return for the second half. This caused heavy time penalties against the truck. During the remainder of the trip it did not have any similar difficulties. On the Middlebrook hill a dozen of the other contestants had to be assisted.

Four-Wheel Drive Ambulance Does Well

The performance of the three White trucks stands out conspicuously. Two of them had clean scores throughout, but the third lost on both road work and in technical examination.

The Four-Wheel-Drive government ambulance was one of the interesting vehicles of the trip. On the first day it demonstrated the superiority of driving through all four wheels when ascending Middlebrook hill. It pulled to the side of the road and moved up past the stalled vehicles without any difficulty. A difficulty befell this truck on the last day's run when the differential between the gearbox and the front axle broke so that the truck had to complete its trip driving through the rear wheels only.

The lowest consumption of gasoline on the trip was made by No. 17 White with 1,500-pound load. It required but 22.125 gallons. The next lowest was No. 19 International, 1,000-pound load, 24.19 gallons, and third was No. 9 Hupmobile, 800 pounds, with 25.125 gallons. Fourth place was taken by No. 102 White ambulance, which consumed 26.5 gallons.

The consumption of oil was estimated by quarts. The lowest consumption was 1.5 quarts by No. 19 International, 1,000 pounds load, the cost being 17 cents. Next came No. 16 Atterbury, 4,000 pounds, 2 quarts, cost 23 cents. No. 14 Atterbury was third, with an oil cost of 34 cents. The highest oil cost of the trip was No. 20 Atterbury, 1,500 pounds, using 18 quarts at a cost of $2.03. The winning Vulcan used 5 quarts, its cost for oil being 56 cents. The amount of gasoline and oil used and the cost of each are given in the general tabulation.

During the test or demonstration every precaution was taken to prevent tampering with the vehicles. An observer rode on each truck and he did not leave it from the time it was checked out in the morning until it reached the noon control, where it was kept under watch by the officials. The same program was followed during the afternoon runs. Each night the cars were parked in a roped-off space and police watched them. The gasoline and oil were carefully checked at each filling, an official watching the measuring. At the end of the run the gasoline and oil measurements were made to correspond with those at the start of the run so that the utmost accuracy was obtained.

Upper: One thousand pound International motor truck
Lower: One ton Wilcox car entered by the Columbia Coal and Brick Co., which made a good showing

Interest Aroused Along the Route

Throughout the run much interest was shown in every town and city passed through and also along the country roads. The parking space at noon and night was crowded outside the ropes with business men who wanted to see the trucks and who talked business with the representatives in not a few cases. The only way in which the run might have been improved so far as making it a greater merchandising proposition is concerned would have been to have spent 1 day in Harrisburg, Pa., where the contestants could have been witnessed in their all-day work by the citizens and business men.

The trucks carried throughout the run their full rated capacity. The majority of the loads were bags of gravel, but a few carried merchandise consisting of barrels or boxes. The speeds

Lauth-Juergens, Autocar, Atterbury and Hupmobile entrants as seen along the line of the route

No.	Car Name	ROAD PENALTIES 1-Day	2-Day	3-Day	4-Day	Total	Test Br.	Test Cl.	Test Tr.	Test Tech.	Total	Gallons Gasoline	Gasoline Cost	Quarts Oil	Oil Cost	Grand Total Cost	Ton-Mile Cost
1	Vulcan	158	31	13	15	217	0	0	0	20	237	70.75	$14.15	5	$ .56	$14.95	$.0112
2	Mais	0	0	0	0	0	0	0	0	0	0	43.19	8.64	8.125	.91	9.55	.0220
3	Little Giant	12	0	0	0	12	0	0	0	31	43	34.625	6.92	9.25	1.04	8.00	.0277
4	Witt-Will	39	4	0	22	65	0	0	0	1	66	42.25	8.45	7.50	.84	9.36	.0289
5	Wilcox	0	0	0	0	0	0	0	0	0	0	30	6.00	14	1.52	7.52	.0260
8	Rowe	46	1	70	8	125	0	0	0	33	158	84	16.80	17.75	2.00	18.96	.0262
9	Hupmobile	0	0	8	0	8	0	0	0	0	8	25.125	5.03	4	.45	5.48	.0474
10	McIntyre	0	0	0	0	0	0	0	0	0	0	32.5	6.50	12	1.35	7.85	.0181
11	Autocar	20	3	9	3	35	0	0	0	1	36	35.375	7.08	7.5	.84	7.96	.0183
12	Lauth-Juergens	0	0	3	129	132	0	0	0	1	133	51	10.20	18	2.03	12.36	.0214
13	Atterbury	3	0	13	0	16	0	0	0	15	31	27	5.40	5.5	.62	6.05	.0279
14	Atterbury	6	0	0	63	69	0	0	0	1	70	37	7.40	3	.34	7.81	.0270
15	Atterbury	92	9	22	0	123	0	0	0	1	124	35	7.00	8	.90	8.02	.0185
16	Atterbury	29	0	0	3	32	0	0	0	1	32	48.5	9.70	2	.23	9.96	.0172
17	White	0	0	30	0	30	0	0	0	15	45	22.125	4.43	6	.68	5.16	.0238
18	White	0	0	0	0	0	0	0	0	0	0	27.625	5.52	5.125	.58	6.10	.0140
19	International	0	0	0	0	0	0	0	0	0	0	24.19	4.84	1.5	.17	5.01	.0347
20	Atterbury	0	128	27	0	155	0	5	0	0	160	34.25	6.85	18	2.03	9.04	.0417
100	Brown	3	0	19	1	23	0	0	0	2	23	35	7.00	14	1.57	9.59	.0442
101	F-W-D	0	15	10	272	297	24	0	0	151	472	51	10.20	6.75	.76	11.43	.0525
102	White	0	0	0	0	0	0	0	0	0	0	26.5	5.30	6	.68	5.98	.0276

NOTE.—Under columns for each of the first four days are the penalty assessed for day with a total road penalties in the following column. Br.—Penalties for brake test. Cl.—Penalties for clutch test. Tr.—Penalties for transmission test. Tech.—Penalties imposed in technical examination.

The Mais truck was one of the heavier contestants and went through the run without penalization

The Little Giant truck was penalized 12 points on the road the first day, but went through with that total

The Witt-Will truck was entered by the only builder of motor trucks in Washington, D. C.

The trucks followed each other closely into the checking-in stations, at which points there was always a crowd of spectators

averaged were varied according to the loads carried and were as follows: 1,500 pounds and under, 12 miles per hour; 1,501 to 2,000 pounds, 11 miles per hour; 2,001 to 5,000 pounds, 10 miles per hour; 5,001 to 8,000 pounds, 9 miles per hour. These speeds were too slow for average country touring as the trucks were invariably well ahead of schedule.

The route was divided into eight divisions, one for each forenoon and one for each afternoon. These were as follows:

Monday, May 5: forenoon, Washington to Frederick, Md., 43 miles; afternoon, Frederick to Hagerstown, 25.9 miles.

Tuesday, May 6: forenoon, Hagerstown, Md., to Shippensburg, Pa., 32 miles; afternoon, Shippensburg to Harrisburg, 38.7 miles.

Wednesday, May 7: forenoon, Harrisburg to Columbia, 31.5 miles; afternoon, Columbia to Hanover, 33.8 miles.

Thursday, May 8: forenoon, Hanover to Baltimore, Md., 43 miles; afternoon, Baltimore to Washington, 40.8 miles.

In determining the winner the following factors were considered: Number of gallons of gasoline at 20 cents per gallon; number of gallons of oil at 45 cents per gallon; penalties on road for doing work on car or being late at controls, 10 points, penalty being equivalent to 1 cent; an outdoor test at the end of the run of brakes, clutch and gearset; and a technical inspection at the end of the run for broken parts, all penalties in this being on a basis of 1 cent for every 10 points. In arriving at the final result the grand total of cost from these various sources was obtained. The ton-miles work done by each truck during the run was computed by multiplying the total mileage 288.7 by the rated load of the truck in tons. This product was divided into the total cost. The results show that the winner carried 1 ton 1 mile at 1.22 cents cost. In the tabulation the cost is given in dollars.

Gasoline Measured at 20 Cents a Gallon

Considerable criticism was heard relative to the method of calculating total cost in that the gasoline and oil consumed were in too great proportion to the cost assessed for work done on latest in arrival in control. To explain: A gallon of gasoline amounted to 20 cents in the final calculation. Two hundred points penalty at the rate of 1 cent per point equaled the same cost as a gallon of fuel. Thus a car could be 200 minutes late and this penalty would amount to but 20 cents or the same as a gallon of fuel. A truck being 3 hours late on schedule should have a greater cost debited against it than this. In other words the real winner was determined on a fuel economy basis rather than on a reliability basis. The final result showed six cars to make perfect scores on the road; perfect scores in the brake, clutch and transmission test and perfect scores in the technical examination. Yet none of these six was adjudged the sweepstake winner and, in fact, several of them were not winners in their own divisions because of the amount of fuel they consumed.

The work of the Vulcan, the sweepstake winner, was conspicuous from start to finish, because it was the largest capacity truck in the contest, carrying a useful load of 4 tons, the next largest truck to it being one with a capacity of 2.5 tons. The results would tend to show that there was a satisfactory ratio between the motor size and the load carried in this truck.

The history of the Vulcan throughout the run shows that it suffered penalties each day on the road. On the first day, due to an accident of some rope getting entangled with the driving chain on one side the chain was broken and a 100-point penalty assessed. The truck was also 29 minutes late because of its trouble on Middlebrook hill. On the second day the fan belt bracket loosened and the fan blades cut into the radiator, penalty being 31 points. On the third day there was more fan bracket and radiator trouble, resulting in an assessment of 13 points. On the fourth day there were more similar troubles and 15 points penalty annexed. In the final examination 20 points more were added for the leaky radiator.

The greatest competition of the demonstration occurred in Division 4K with trucks of loading capacity from 2,001 to 3,000 pounds. There were six contestants, namely, White, McIntyre, Autocar, Atterbury, Mais and Witt-Will. All had 1.5-ton capacity except the Witt-Will, which is 1.25 ton. The White proved the winner and its ton-mileage cost in the entire classification of the run was next to the Vulcan. Its figure was 1.4 cents per ton-mile. It had a perfect road and technical test. There were other close contests in this trial as McIntyre, Autocar and Atterbury were very close. The final ton-mile figures showed how close was the fight. Here are the figures; McIntyre cost 1.81 cents; Autocar ton-mile cost, 1.83 cents; and Atterbury ton-mile cost 1.85 cents.

The contest for the Divisional prize in Division 3K, 1,501 to 2,000 pounds was equally close, but the Wilcox proved winner. The ton-mile figures are: Wilcox, 2.6 cents; Atterbury, 2.70 cents; and Little Giant, 2.77 cents. The ton-mile cost of this class is considerably higher than that for the 4K Division or 2,001 to 3,000-pound trucks. No. 5 Wilcox, winner of this division, had a clean road and technical score. It used $6 worth of gasoline and $1.52 worth of oil at a total cost of $7.52. The cost of the Atterbury was $7.81 and the Little Giant $8.

In the 1,001 to 1,500-pound trucks, of which there were three contesting, the ton-mile cost was less than in the 1,501-2,000 division, the figure being 2.38 cents for the winning White. Atterbury, finishing second, had a cost of 2.79 cents per ton-mile and the Atterbury finishing third was much higher.

The winning International in the class of 1,000 pounds and under had a clean road and technical score and the total cost of gasoline and oil for the 288.7 miles was $5.01. The Hupmobile, the other contestant in this division, would have had a clean road and technical score had it not been for a gasoline leak when 11 miles out of control on the third day which caused the penalty of 8 points being imposed.

Atterbury Wins 3,000-Pound Class Contest

There were only two contestants in the class 3,001 to 4,000 pounds, both being 2-ton trucks. The winning Atterbury had a ton-mile cost of 1.72 cents per mile. This car received road and technical penalties. The first day out it took on water; the second day its score was clean and the third day clean, fourth day water and in the technical examination it received 1 point for a water leak. The Lauth-Juergens was second in this division. It had a clean score on the first 2 days; had to take oil on the third and had engine bearing trouble on the fourth day. In the technical examination it received 1 point penalty for the end, being off the shutter-valve operating rod.

Of trucks of 4,001-5,000 pound capacity the Rowe was the only contestant. Its ton-mileage figure was 2.62 cents. On the road it had to repair the fan belt the first day; had trouble with the gasoline line the second; had trouble with the gasoline line the third day and received penalties the fourth day. In the technical examination it was assessed 8 points.

The following tire report was issued by the Technical Committee at the completion of the run of 288.7 miles. Some of the tires were abnormally cut for so short a run. There was one case of a tire blowing out during the first half day of the trip. There was one example of block tires which were practically used up from the distance. The following are the reports as issued:

No. 1 Vulcan, gross load, 15,370 pounds, Goodrich demountables, front 36 by 5, rears 36 by 5 dual. "Inside left rear cut badly in one place, slight cuts in others. Tires stood up well owing to the overload and speed."

No. 2 Mais, gross load, 9,050 pounds, Polack, fronts 36 by 3.5, rears 37 by 5.5. "Right rear slightly cut on the inside on account of sharp obstacle. All others in fine shape."

No. 3 Little Giant, gross load, 5,200 pounds, Goodrich wireless pressed on, fronts 36 by 3.5, rears 40 by 4. "A few slight cuts on the right rear inside. Others slightly cut."

No. 4 Witt-Will, gross load, 6,685 pounds, Firestone side wire, fronts 36 by 2, rears 36 by 2.5. "Right rear a few slight cuts. Right front slightly worn on outside edge."

(*Continued on page* 1038)

The U. S. Army vehicles made good showing in the run under the close inspection of government officers

McIntyre 3,000-pound truck escaped penalization on the road for the entire 4 days and also in the technical test

Atterbury No. 16 and Atterbury No. 13 made the best records of the Atterbury team of four

Some of the roads through which the contestants had to work their way were not of hard surface

The new Automobile Chamber of Commerce. From left to right the members are: Standing—L. H. Kittredge, H. H. Rice, W. C. White, H. O. Smith, A. L. Pope, W. C. Leland, Alvan Macauley, S. A. Miles, J. S. Marvin, H. A. Bonnell. Sitting—A. L. Prindle, W. E. Metzger, Charles Clifton, George Pope, C. C. Hanch

N. A. A. M. Now Formally Dissolved

Indianapolis Company Announces Cyclecar—Will Be Ready in May—Fletcher Sells to Roebling

NEW YORK CITY, May 13—The Automobile Chamber of Commerce was incorporated on March 18 by the fourteen who had comprised the executive committee of the N. A. A. M. and C. C. Hanch, the only director of the Board of Trade who was not also a member of the executive committee of the N. A. A. M.

The N. A. A. M. was formally dissolved at a meeting held in Hartford, Conn., last week, as the law of that state, under which the N. A. A. M was incorporated, demands a two-third vote of the membership in case of dissolution The meeting was held at the offices of the Pope Mfg. Co. and the vote was unanimous.

All of the departments of the old associations will be continued under the same management. S. A. Miles, for 10 years general manager of the N. A. A. M., retains that position with the new organization with H. A. Bonnell as assistant general manager. The traffic department remains in charge of J. S. Marvin and the commercial vehicle work in charge of H. W. Perry, to whose department will probably be added a bureau of publicity, with particular reference to the interests of good roads.

The officers of the Chamber of Commerce are:

Charles Clifton, president; Wilfred C. Leland, vice-president; Hugh Chalmers, vice-president, in charge of the gasoline vehicle department; W. T. White, vice-president, in charge of the commercial vehhicle committee; H. H. Rice, vice-president, in charge of the electric vehicle department; George Pope, treasurer; R. D. Chapin, secretary.

The committees so far appointed are as follows:

Patents Committee—C. C. Hanch, W. H. Van Dervoort, L. H. Kittredge, Alvin Macaulay and L. E. Latta.

Show Committee—George Pope, H. C. Smith and W. C. Leland.

Traffic Committee—A. L. Pope, W. E. Metzger and H. H. Rice.

Legislative Committee—J. N. Gunn, G. H. Stilwell and J. I. Farley.

The next meeting of the Board of Directors will be held at the association's offices on Wednesday, June 4.

Indianapolis Cyclecar Out Soon

INDIANAPOLIS, IND., May 12—Local capitalists and motor car men are behind the Economy-car Co. which is being organized to manufacture cyclecars. Details of the company and the names of the men behind it will not be made public for several days. A sample car is being built and will be exhibited the week of the 500-mile race to be held at the Indianapolis Motor Speedway, May 30. It is probable the company will enter a car in the Indiana to the Pacific tour which starts from Indianapolis, July 1.

The car to be built will have a two-cylinder, 8-10 horsepower, air-cooled motor, a wheelbase of 106 inches and a tread of 36 inches. Wire wheels will be employed and two models will be built, one a tandem.

Flechter Sells Out to Roebling

NEW YORK CITY, May 12—The manufacturers of the Flechter carbureter, L. V. Flechter & Co., have assigned their business and the entire manufacturing and selling rights of the above-named carbureter to the Trenton Brass & Machine Co., of Trenton, N. J. The latter concern is under the control of C. G.

Automobile Securities Quotations

Trading this week was limited and stock prices fluctuated, the quotations at the closing of the week being given below. Rubber Goods was almost the only issue which gained.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	130	155	..
Ajax-Grieb Rubber Co., pfd	95	100	95	..
Alumnium Castings, pfd	100	..	98	101
American Locomotive Co., com	43¼	43⅜	32	33
American Locomotive Co., pfd	108	109½	100	103
Chalmers Motor Company, com	..	..	128	135
Chalmers Motor Company, pfd	..	..	99	102
Consolidated Rubber Tire Co., com	10½	11	14	18
Consolidated Rubber Tire Co., pfd	40	..	60	75
Firestone Tire & Rubber Co., com	262	264	258	261
Firestone Tire & Rubber Co., pfd	107	109	105	106½
Fisk Rubber Company, com	..	..	..	..
Fisk Rubber Company, pfd	..	..	..	100
Garford Company, preferred	99	101	99	100½
General Motors Company, com	33½	34	25	29
General Motors Company, pfd	72	74	70	75
B. F. Goodrich Company, com	84	85	31	32
B. F. Goodrich Company, pfd	107	108½	91	94
Goodyear Tire & Rubber Co., com	236	240	320	326
Goodyear Tire & Rubber Co., pfd	105	106	98½	99¾
Hayes Manufacturing Company	..	104	..	90
International Motor Co., com	33	35	5	6
International Motor Co., pfd	93	96	10	15
Lozier Motor Company	..	55	..	20
Maxwell Motor Co., com	..	..	3	6
Maxwell Motor Co., 1st pfd	..	..	40	50
Maxwell Motor Co., 2nd pfd	..	..	12	16
Miller Rubber Company	160	165	138	149
Packard Motor Car Company, pfd	105	106½	98	102
Peerless Motor Car Company, com	..	..	35	45
Peerless Motor Car Company, pfd	..	..	95	100
Pope Manufacturing Co., com	30	34	14	16
Pope Manufacturing Co., pfd	74½	75½	49	51
Portage Rubber Co., com	..	..	..	45
Portage Rubber Co., pfd	..	..	85	90
Reo Motor Truck Company, par 10	9	10½	10½	11½
Reo Motor Car Company, par 10	24	25	20	21¾
Rubber Goods Mfg. Co., pfd	104	109	107	112
Studebaker Company, com	38½	40	27	28
Studebaker Company, pfd	96	98	89	91½
Swinehart Tire Company	112	114	85	90
U. S. Rubber Co., com	6	7	61½	62
U. S. Rubber Co., 1st pfd	25	28	103¾	104¾
White Company	107½	108½	107	109
Willys-Overland Co., com	..	..	64	69
Willys-Overland Co., pfd	..	..	85	92

Packard Motor Will Run for 300 Hours

Roebling and F. W. Roebling and employs 200 men; the manufacturing equipment of the Flechter concern will immediately be shipped to Trenton, where manufacturing will be continued. There will be a New York sales and distributing branch, with L. V. Flechter as general sales manager. At present the Trenton company manufactures plumber and hardware articles, but the intention is to gradually apply all the manufacturing force to the making of carbureters.

Paige-Detroit Builds Huge Addition

DETROIT, May 10—The Paige Motor Car Company has completed the plans for the erection of new buildings which will have an aggregate area of 225,000 square feet and will be large enough to house the entire organization, both manufacturing department and executive offices. The new plant will be situated on McKinstry street, between Fort street and the tracks of the Wabash and Pere Marquette railroads, on a plot of ground 900 feet in length by 170 feet in width.

Location in proximity to the railroads will afford ideal shipping facilities. The architect is the John Scott Co., who has planned a most modern factory in every particular. Ground is to be broken at once for this latest of Detroit's factories. The buildings will be in the shape of an H and they will be of fireproof reinforced concrete construction, having a complete sprinkling system. The wall surface of the plant will be practically entirely of glass, the front, facing the west, being of ribbed glass to lessen the sun's glare, while the east side will be of plain glass.

The main building will be 406 feet long by 60 feet wide and three stories in height, giving a total working space of 107,000 square feet, or nearly 2.5 acres.

It is stated by H. M. Jewett, head of the Paige concern, that the imperative need for a new plant is evidenced by the fact that the company is now 22 weeks behind with its orders although working to utmost capacity with existing facilities. It is planned to make the first year's output at the new factory 15,000 machines, while during the year following 25,000 cars are to be made, it is said.

The new plant will provide facilities for the manufacture of more of the parts of the Paige-Detroit cars than has heretofore been possible. Motors and transmissions will continue to be made under the plant's supervision.

Market Changes of the Week

Few changes occurred this week in the markets and those which did take place were immaterial with the exception of tin which was affected by a slump of $.73, due to the lower London cables which put somewhat of a damper on speculative operations. The lack of disposition to trade on the part of operators, together with the dull consuming demand, presented a rather inactive market. Prices receded from $50.63 on Wednesday to $49.90 on Tuesday. The lead market is dull. Buying is very light, with prices somewhat easier. Lead on call at the Metal Exchange $4.35 was bid and $4.40 was asked for all deliveries. Both coppers experienced slight raises in prices, electrolytic copper, $00 3-4, and Lake, $.00 1-8. Antimony rose $.00 1-8 on Monday. Cottonseed oil was very dull, prices fluctuating, but to no great degree, remaining around $6.90 and $6.91 a barrel. A lack of demand seems to be the cause.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Change
Antimony, lb....	.07⅜	.07⅜	.07⅜	.07⅜	.07½	.07½	—.00⅛
Beams & Channels, 100 lbs...	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	....
Copper, Elec., lb.	.15⅝	.15⅝	.15⅝	.15⅝	.15¾	.15 7/10	+.00 3/40
Copper, Lake, lb.	.15⅝	.15⅝	.15⅝	.15⅝	.15¾	.15¾	+.00⅛
Cottonseed Oil, bbl.......	6.90	6.92	6.92	6.93	6.93	6.91	+.01
Cyanide Potash, lb.....	.19	.19	.19	.19	.19	.19	....
Fish Oil, Menhaden, Brown.	.33	.33	.33	.33	.34	.34	+.01
Gasoline, Auto, 200 gals......	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime.	.95	.95	.95	.95	.95	.95	....
Lead, 100 lbs....	4.35	4.35	4.35	4.35	4.35	4.35	....
Linseed Oil.....	.48	.48	.48	.48	.48	.48	....
Open-Hearth Steel, ton.....	29.00	29.00	29.00	29.00	29.00	29.00	....
Petroleum, bbl., Kansas crude..	.88	.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa., crude.....	2.50	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	....
Silk, raw Italy..	....	4.35	....	....	4.35	4.35	....
Silk, raw Japan..	....	3.70	....	....	3.70	3.70	....
Sulphuric Acid, 60 Baumé	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb......	50.63	50.38	50.10	50.10	50.10	49.90	—.73
Tire Scrap......	.10	.10	.10	.10	.10	.10	....

Change of Spark Plugs and Two Adjustments on One Tappet Only Attention Given to the Motor Adjustment

NEW YORK, May 14—At 10:43 a. m. today the Packard Motor on test had finished 10.5 days of continuous running. In this time the car would have covered about 1350 miles at a rate of 37 miles an hour against a resistance equivalent to a grade of 6.5 per cent.

NEW YORK, May 13, 7 P. M.—The Packard motor on test at the A. C. A. laboratory in this city had run 236 hours at 6:43 this evening. It passed the 200-hour mark on its continuous run at 6:43 a. m. Monday. Running at 1,200 revolutions per minute steadily the motor would have pulled the Packard 38 car 7,492 miles in 200 hours. The fuel consumption averages just above 100 gallons per day, and at this figure would carry the car at a rate of 9 miles to the gallon. The only adjustments made have been the substitution of two new spark-plugs and two adjustments of the exhaust valve tappet on the No. 1 cylinder. A valve cover was also tightened during the run.

The test will be continued for 300 hours, ending at 10:43 a. m. Friday. During this time the horsepower is not allowed to drop below 70 per cent. of the maximum of 45. No important mishaps have occurred, a slight breakage of the gasoline line which did not damage being the nearest approached. The motor has been averaging in the neighborhood of 35 horsepower since shortly after the beginning of the run.

NEW YORK, May 14, 9 A. M.—The adjustment of the exhaust valve tappet on No. 1 cylinder at the 147th and again at the 152d hour of the test has aroused criticism in that it is construed as a violation of rule 5 under which the tests are being made. The part of this rule in question is "No adjustments of the motor or its accessories, which directly affect the quantities being measured, will be permitted after the first official test run has been started, except as provided in rule ...." The view expressed by the critics is that adjusting the tappets is an adjustment which would affect the power, which is one of the quantities being measured in the test. Professor Hutton who has charge of the A. C. A. laboratory and Herbert Chase, laboratory engineer, held a conference on the subject yesterday and decided that under rule No. 5, as quoted, the adjustment of the tappet was permissible.

S. A. E. Getting Ready for Detroit

NEW YORK CITY, May 13—The entertainment committee of the Metropolitan Section of the S. A. E. held a meeting yesterday to confer on the welcome and the details of the entertainments to be extended to the British engineers who will arrive in town on May 26, to leave for Detroit two days later.

Ideal Changes Name to Stutz

INDIANAPOLIS, IND., May 12—Announcement is made that the name of the Ideal Motor Car Co., maker of the Stutz car, has been changed to the Stutz Motor Car Co.

Batavia Annual Meeting Held

BATAVIA, N. Y., May 14.—The stockholders of the Batavia Rubber Co. held their annual meeting here yesterday, at which Vice-President A. W. Caney was elected president for the ensuing year, and Geo. E. Perrin vice-president. The stockholders voted that the company proceed legally against any competitors infringing on any of the rights of the Batavia concern and that the plant of the company be extended during next year. The present capacity of the factory is from 125 to 150 tires a day.

CHICAGO, May 13.—Three garage fires, all taking place within 30 hours on the south side of the city and destroying 132 cars at an estimated loss of $420,000 has resulted in an investigation by the fire attorney's office.

Texas Discourages Clubs

Motor Spirits Patent Right Disputed—Standard Oil Defends It

AUSTIN, TEX., May 10—The State Supreme Court has been called upon to decide the question of whether automobile clubs and kindred organizations may legally be incorporated in Texas. Acting on an opinion given from the attorney general's department that such organizations could not be chartered under the statute granting charters to bicycle clubs and such other innocent sports, Secretary of State John L. Wortham has refused to grant a charter to the Dallas Automobile Club Building Association of Dallas. This latter organization has filed a mandamus petition in the supreme court to compel Mr. Wortham to grant it a charter.

Motor Spirits Patent Questioned

CHICAGO, ILL., May 12—An article appearing in the April issue of one of the oil trade journals under the heading "Is Standard Using Old-Time Process?" questions the priority of the Burton patents for the manufacture of the Standard Oil Co.'s new motor fuel called Stanolind Motor Spirits. It seems that as early as 1890 Sir Boverton Redwood and James Dewar, both of England, patented in the United States a process for the production of light oils by pressure distillation. The Dewar-Redwood patent was obtained at a time when burning oil was the chief product wanted and gasoline practically was thrown away. The article referred to expresses the opinion that the United States patent granted to W. M. Burton for manufacturing gasoline and asphalt from fuel oil presents nothing of patentable novelty over the work of Sir Boverton Redwood and the Dewar-Redwood patent.

It is claimed by the Standard Oil Co. of Indiana that its patent attorneys, who prepared and prosecuted the applications for the Burton patents, fully acquainted themselves before filing them, with the prior art including the Dewar-Redwood patent. It is a significant fact that the examiners in the Patent Office, as shown by the records of the Burton applications, cited and fully considered that patent with reference to them, but found nothing in it anticipatory of the claims made by Burton.

One of the chief differences between the processes as outlined in the Dewar-Redwood patent and that of the Burton patent is, as pointed out by Burton, that in the former, carbonic acid gas. etc., was introduced to produce the pressure for the pressure distillation, whereas in the Burton process such means of pressure production is not made use of. Another point made is that the earlier patent did not consider the production of gasoline as it was not of value, whereas the gasoline substitute is the chief object of Burton's process.

The Standard Oil Co. of Indiana, owns and attaches great value to the Burton patents, and says it will undertake to maintain its rights under them against any infringements.

Municipal Repair Trucks Immune

MILWAUKEE, WIS., May 13—That repair trucks belonging to the fire and police departments have the same privileges on the streets as fire-fighting apparatus or police patrols, was the decision of Judge Halsey in the Circuit Court at Milwaukee in dismissing the damage suit of Rudolph Engel against the city of Milwaukee. Engel was struck by a fire and police alarm system truck as he was boarding a street car and sued for $5,000. The city demurred and Judge Halsey sustained it, saying that the city cannot be held liable for an accident occasioned by a police and fire alarm truck any more than by an accident caused by the fire department.

Fletcher Carbureter No Infringer

CHICAGO, ILL., May 10—The Flechter carbureter, made by L. V. Flechter & Co., of New York City, is no infringement of the Perkins patent No. 731,218, owned by the Stromberg Motor Devices Co. This is the decision rendered by Judge Sanborn in the United States District Court, Northern District of Illinois; the opinion is founded on the statement that the claims are vaguely formulated, that the Perkins carbureter never influenced automobile carbureter design.

No Decision on Victor vs. Mechanics

BUFFALO, N. Y., May 14—*Special Telegram*—Justice Marcus of this city has reserved decision on the motion for change of venue in the case of the Victor Motor Truck Co. vs. the Mechanics Bank of New York City and W. F. McGill. These parties were sued by the truck company to recover the face value of notes totalling $250. It is desired to shift the place of trial from Erie to New York county.

Motor Wagon Co. a Bankrupt

DETROIT, MICH., May 13.—The Motor Wagon Co. filed a voluntary petition in bankruptcy in the United States District Court here on May 12. The Union Trust Co. of this city was made the trustee by Lee E. Joslyn, referee in bankruptcy.

It is probable that this company will be made receiver for the Motor Wagon concern by the court. Nothing definite has yet been decided as to whether the business will be continued under the receivership or sold out immediately.

The concern's filed statement shows its liabilities to be $131,196.83, while the assets are set at $85,339.75. This includes stock on hand, machinery, buildings and other equipment.

Railroads Demand 5 Per Cent Increase

WASHINGTON, D. C., May 12—While members of the Interstate Commerce Commission do not know anything, officially, about the proposed railroads freight rate increase, it is being consistently rumored that the railroads of the East will demand an increase of 5 per cent. of the present freight rates. At present first-class freight between New York and Chicago is 75 cents per 100 pounds, and if a 5 per cent. increase were granted by the Commission, this rate would be increased to 75¼ cents.

A. A. A. to Test Double Taxation

NEW YORK CITY, May 13—The Supreme Court of the United States will be asked to pass upon the constitutionality of the double taxation of automobiles as enforced by many states. It was as a result of the growing inclination on the part of many states to increase the registration tax, while at the same time taxing automobiles as personal property, and thus compelling motorists to pay an unjust proportion of roads construction and maintenance money, that this action was taken at the Baltimore meeting of the executive board of the A. A. A.

From time to time there have accumulated protests from automobilists in various parts of the country against holding them mainly responsible because a greater use of the highways has made necessary improved construction and systematic maintenance.

The double taxation question is the main issue at stake. By double taxation is meant where the motorist pays an annual registration on his car and also a personal property tax. There are at present forty-eight states in the Union and of this number there are but five in which the personal property tax has been set aside and only the annual car registration tax imposed. These states are: New York, Pennsylvania, Iowa, Alabama and Idaho. This means that in practically all of the other forty-three states, and nearly all of them have state laws governing registration, the motorist is discriminated against and pays double taxation on his car, the registration fee and also the personal property tax.

The case which will be carried to the highest court in the land has been adversely passed upon by the New Jersey courts, and it involves both the question of double taxation and discrimination against one class of road users. The subject occupied the thorough attention of the Baltimore meeting, held last week, which had representatives from 10 states, with President Laurens Enos presiding and Ex-Presidents Robert P. Hooper, of Pennsylvania, and L. R. Speare, of Massachusetts, included in the board members present.

The New Brunswick Automobile Association of St. John, N. B., asked the executive board if it would be eligible for membership. A favorable reply has been sent to the Canadian body, and it will undoubtedly result in the growing interchange of visitors across the border.

Aldermen Graft Held Up Taxi Ordinance

NEW YORK CITY, May 12—The Mason-Seaman, as well as the Yellow Taxicab Company, have forwarded to Assistant District Attorney Du Vivier evidence to the extent that many members of the New York Board of Aldermen have been using taxicabs for a long time without paying for them. The Grand Jury is now investigating the situation.

Maxwell Indiana Receiver Paid

INDIANAPOLIS, IND., May 12—After hearing several witnesses and taking the matter under advisement for several days, Judge Joseph Collier of the Superior Court has allowed a fee of $7,500 to Frank E. Smith. The allowance is for Smith's services as ancillary receiver in Indiana for the United States Motor Co.

Western Crops in Promising Condition

MINNEAPOLIS, MINN., May 10—Spring wheat seeding is fully completed in the lower half of the wheat belt and 80 per cent. in the upper. Reports coming in from the Soo line are also very favorable.

The secretary of the Oklahoma Grain Dealers' Association has estimated the state's wheat crop at 30,000,000 bushels. Ohio crops are being placed at 35,000,000 bushels.

Illinois State Aid Sought

Governor Urges Convict Labor—To Number All French Roads

SPRINGFIELD, ILL., May 13—*Special Telegram*—At the meeting of the Illinois State Highway Improvement Association held at Hotel Leland in this city today, Governor Dunne announced that he is strongly in favor of employing convict labor on honor system in building state roads. Up to the present convict labor in Illinois has to an extent, been used indirectly in road construction in that the convicts at Joliet have been used in preparing stone for road purposes which has been sold at the lowest possible rate for construction purposes. The governor tonight held a reception which marked the closing of the annual meeting of this association, which, although little more than a year old, has secured more for good roads in the State of Illinois than any other movement.

The main object of the meeting here today was to urge upon the Legislature the necessity of passing the Tice Good Roads bill, which provides for state aid in road building, the state to furnish one-half and the county the remainder. The state, under the law, will supervise construction and maintenance of the roads. The bill also provides for the use of motor car registration fees for road building.

This bill has been endorsed by over 100 motoring and business men's organizations in the convention here today, all of these organizations being represented by delegates.

The Tice bill is at present before the joint committee of the House and Senate. It is expected it will be reported from committee at once, or before the end of the week at the latest.

President W. G. Edens, and all the other major officers of the association were re-elected.

French Roads to Be Numbered

PARIS, May 3—France has adopted a reform which has the double advantage of costing the nation nothing and of being invaluable to the tourist. Every highway throughout the land is to be given a name and number, and these denominations are to be immediately painted on all kilometre stones and government road-direction posts. It appears but a slight reform, but in reality it is one of immense importance to automobilists. All the roads in France are divided into classes: national highways, departmental highways, *chemins de grand communication*, etc., and each road bears a number. This classification is made use of by the authorities, who never speak of a highway as the road between Dieppe and Rouen, but as "National Highway No. —." To indicate the position more accurately, they have only got to add "Kilometre stone No. —" or "Hundred metre stone No. —" to make it possible for any person to find a desired spot as easily as he would pick out a numbered house in a numbered street.

Good Roads Committee of Congress

WASHINGTON, D. C., May 12—*Special Telegram*—Chairman Henry of the Rules Committee of the House of Representatives reintroduced to-day his resolution to create a House committee on roads to handle all legislation relating to the good roads movement. The amended resolution provides that the new committee shall not have appropriative powers.

Transcontinental Movement Progressing

INDIANAPOLIS, IND., May 12—The present scope of the transcontinental rock highway movement and the Indiana to Pacific automobile tour, which will leave Indianapolis on July 1, both of which ideas were born in this state, are becoming wider each day. Letters from state officials, commercial bodies, Governors of states and private individuals are pouring in each day. Cities on various routes which the tour might travel are making all kinds of preparations for the visitors and are begging that they be allowed to act as hosts.

Throughout the entire West the tour plans have been received with open arms. Every city of any importance has written concerning it, and within the week messages were received from the Governor of California and the chief executives of all the states through which the tour will pass and the San Francisco and many other Chambers of Commerce telling of the preparations of welcome which are being made.

The State of Wyoming, through its Legislature, has sent an invitation to so arrange this midsummer tour to the Pacific Coast that advantage may be taken of the excellent roads of Wyoming. The resolutions were signed by the Speaker of the House, the President of the Senate and approved by Governor Carey. A copy was sent to John Guy Monihan, also of the Premier company of Indianapolis, who conceived and put over the Premier Ocean-to-Ocean tour and to whom is largely responsible the development of across country automobile literature and the tremendously increasing number of private motor car owners who see the great vacation possibilities of the now famous trail to the sunset.

The Governor of Nevada has advised that he with his official staff, will meet the tour and accompany it to the California state line, where the Governor of the latter state and his staff will welcome the party, and all will accompany the tourists to the Golden Gate.

Various communities are ready to repair the roads which the tourists will travel, and it is known definitely that the $218,000 which will be spent on the transcontinental highways can be attributed directly to the Indiana tour and assures the American public another means of reaching the coming great Panama Exposition in San Francisco in 1915.

Colorado Roads Get $200,000

DENVER, COLO., May 9—The new state highway commissioner and advisory board held their second meeting this week and planned an apportionment of $200,000 more among the several counties for road building this year. This makes a total of $518,000 furnished from the state road fund thus far to aid the counties in this year's work of improving the principal highways in Colorado. In nearly all cases the counties will be required to put up as much as the state offers, in order to get the help from the state fund.

The highway commission has also ruled that every county must secure and present a clear title to the roads to be improved, and also have the work planned and supervised by a civil engineer.

This new apportionment makes special provision for improving roads over five or six mountain passes, as well as for putting into good condition several long stretches of important lines of travel.

The first improvement work is planned largely for the benefit of motorists wishing to cross the state, and will take in many pieces of road through Colorado's most attractive scenery.

H. O. Smith Heads Hoosier Makes

INDIANAPOLIS, IND., May 12—The resignation of C. B. Warren, president of the Indiana Automobile Manufacturers' Association, has been accepted by the board of directors, and H. O. Smith, of Indianapolis, president of the Premier Motor Mfg. Co. Carl G. Fisher, of the Prest-O-Lite Co., was chosen as a member of the board of directors, and R. P. Henderson, builder of Henderson cars, was selected as tour treasurer.

Wisconsin Makers Dislike Compensation

MILWAUKEE, WIS., May 13—Wisconsin manufacturers, among whom there are many identified with the motor car industry, are protesting vigorously against the passage of amendments to the Wisconsin Workmen's Compensation law, or industrial insurance act.

Bad Eggs Among Milwaukee Roads

MILWAUKEE, WIS., May 13—Nearly 1 of the 9 miles of concrete highway built in Milwaukee County during 1912 must be replaced because of incompetent inspection during construction. The mile of poor paving is distributed over 3 of the 5 stretches of county highway improved last year. County Highway Commissioner H. J. Kuelling takes the blame for the mistake and says that the poor paving was due to unwise selection of gravel, which may cost the county $75,000 to $90,000.

Hudson-Catskill Starts with Seventeen

NEW YORK CITY, May 14.—The West Hudson & Catskill reliability hill-climbing and fuel test started here at noon today with seventeen participants. The cars were entered by members of the New York trade. The night stop will be made at Newburgh, N. Y., where a smoker will be held and the tourists will be addressed by various speakers. They are to return to this city tomorrow night.

L. I. A. C. Will Have Century Run

BROOKLYN, N. Y., May 13—The L. I. A. C. has announced that it will hold a 100-mile run on May 18. This run will be a non-stop, fixed-time event, held under the A. A. A. rules. The average pace will be 20 miles an hour, and cars will be checked at five points, being penalized 1 point for a deviation of 15 seconds from the speed scheduled.

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Proportioning Motor to Load

OFFICIAL tests of the *Washington Post* motortruck demonstration published in this issue bring out forcibly the marked differences of cost per ton-mile with different makes of trucks. The reports show where the ton-mile cost is quite often double that of other makes of trucks and there are a few cases where one truck has nearly three times as great a ton-mile cost as another make. The lowest ton-mile cost was with the truck carrying the heaviest load and generally speaking the ton-mile cost increased in proportion as the amount of useful load was reduced; thus a 3000-pound truck showed a lower ton-mile cost than a 2000-pound vehicle, and a 2000-pound truck lower cost than one with a load capacity of 1000 or 1500 pounds.

The only conclusion to be arrived at is that there yet remains much to be done in proportioning the motor size to the load to be carried. This is particularly true in small-capacity delivery wagons where the motor capacity is often twice or perhaps three times too great for the actual work to be done. Such ill-proportion of work to power is poor engineering, but it is generally to be found in vehicles where a motor from a passenger car has been fitted in the chassis for delivery work. Generally with such a vehicle there is a speed nearly as great as in a touring car. On the other hand builders of high-capacity trucks have generally set out to develop a motor for those particular conditions.

Simplifying the Gearshift

THE electrical gearchanging attachment and also the mechanical device for the same purpose give promise of being factors of more or less consideration in the 1914 models. One car-building concern announced some weeks ago that it had tried out and conclusively convinced itself that the changing of speeds by electric means instead of the side lever or the pedal was a big improvement and particularly so with city travel. This concern uses a relatively small motor, one in which it is necessary to change gears much oftener than with a high-powered car. One or two other concerns are now contemplating attaching mechanical gearchanging arrangements which will entirely eliminate work so far as the driver is concerned other than pressing of a button on the steering wheel.

It is doubtful exactly where the electrical and mechanical gearchanging apparatus originated; perhaps the self starter, the self-lighter for acetylene headlights and the press button for electric lights impressed the inventor with the one thought of eliminating labor to the greatest possible extent and make car driving as great a luxury as possible so far as the driver's work is concerned. It is quite true that the electrical or mechanical gearshift will be welcomed by women drivers, many of whom have discovered how tiring the constant shifting of gears is, particularly when some of the garments interfere with the free movement of the body as needed for gearchanging on some cars. To such the new devices will be a friend in need and leverless gearshifting combined with selfstarting, demountable rims or wheels and simplified lighting should bring the automobile nearly as close as possible to simplified control.

There is yet one other respect in which the electrical and mechanical gearchanging devices can prove their worth, namely, in that their installation will tend towards more frequent gearchanging. For 7 or 8 years there has been developed a strong sentiment against gearshifting, a sentiment that considered gearshifting a weakness in the car or lack of expertness with the driver. The very fact that the body movement connected with lever gearchanging has been eliminated will be an incentive to the driver to change more frequently.

Horsepower is gradually being reduced. Last year saw a general reduction as compared with 1911, this year witnessed a reduction over 1912. Next season will see the power go still lower. With reduction in horsepower and the using of smaller motors there will be increased necessity for greater gearchanging. The four-speed gearbox will come into more general use as it has in Europe. With the advent of such a regime it is highly important that the work of gearchanging be reduced to the minimum; and if the electrical or the mechanical change device can be installed to give uniform satisfaction and the cost of installation is not out of proportion with the results received, then it is a certainty that such devices will come in for practically as general use as the self-starter of today. The rational will always win out and simplifying gearchanging is a rational step. Hundreds of drivers are unable to change gears without that disagreeable grating noise of the teeth of one gear grinding against those of another when engaging.

Felix Nazzaro Wins Targa Florio Race

PARIS, May 13—(*Special cable*)—Clipping more than four hours from last year's time, Felix Nazzaro in a Nazzaro car won the Targa Florio 2-day race round the island of Sicily, covering the 620-mile course in 19 hours 28 minutes 40 seconds. The race started on Sunday, the first stage of 370 miles ending at Girgente, being entirely over mountain roads, including some very steep gradients.

Thirty-five cars started, including two Fords, a Studebaker and an Overland. At midnight Marsaglia on his Aquila was given second start round the island to Palermo, others going at short intervals. At an early hour a stone broke Marsaglia's headlight, giving Nazzaro, who had started half an hour later, a chance to creep up. Snipe, last year's winner, was unable to finish the race. Numerous accidents happened to machines but no personal injuries are recorded. Eleven cars finished within the 24-hour time limit. The results are as follows:

No. Driver	Car	Time
1—Nazzaro	Nazzaro	19:28:40
2—Marsaglia	Aquilla	20:43:49
3—Gloria	Devecchi	21:48:04
4—Berra	DeDion 8-cyl.	22:22:55
5—Giordano	Fiat	22:26:04
6—Sivocci	Devecchi	22:47:00
7—Lopez	Overland	23:12:47
8—Bordino	Lancia	23:43:45
9—Diana	Isotta	23:46:00
10—Stabile	Minerva	23:59:04
11—Turner	Renault	24:30:00

At the end of the first day Marsaglia had a lead over Nazzaro, Bordino, Giordino. The Overland, driven by Lopez, was the only American car among the sixteen finishers.

NEW YORK CITY, May 13—Theodore Pilette, from Brussels, Belgium, who will drive the Mercedes-Knight car entered by E. C. Patterson, a Chicago sportsman, in the Indianapolis race, arrived on the *George Washington* today with his Belgian Grand Prize racer and will leave at once for Indianapolis, reaching there not later than Saturday. This is Pilette's first visit to America. His Mercedes-Knight car was given a 15-day overhauling in the Mercedes factory previous to shipment and Pilette expects to average close to 90 miles per hour on the Speedway. The motor is a small high-speed type, approximately 4-inch bore by 5.1-inch stroke. It has a piston displacement of approximately 250 cubic inches, and greatly under the maximum of 450 cubic inches permitted in the rules. The car is fitted with Bosch magneto; Mercedes single-jet carbureter, and Rudge-Whitworth demountable wheels. This car uses a double cone clutch, and also the Mercedes double-bevel differential system.

With a gasoline capacity of 35 gallons, Pilette estimates he can travel 720 miles without refilling, so that it should not be necessary for him to stop during the race. He expects that owing to the light weight of the car, approximately 2,000 pounds, and the large size of tires used, he will be able to make the entire distance without a stop.

Pilette's experience as a driver dates to 1904 when he began tricycle racing. In 1906 he drove a 90-horsepower Mercedes in the Ardennes Circuit, but was prevented from finishing by carbureter troubles. He has been in the racing field more or less ever since, although his business as Mercedes agent in Brussels prevents him from following the racing circuit to the same extent that other drivers do.

Only Two Events at Elgin

CHICAGO, May 10—The Chicago Automobile Club and the Elgin Automobile Road Race Association entered into a formal contract last night which insures the promotion of the annual Elgin road races on August 29-30. The prize list has been definitely set and the card arranged.

There will be only two races this year, as against five in 1912. The promoters have come to the conclusion that better results may be obtained by having one race each day and making each a star attraction.

Therefore, this year at Elgin the first day's race will be as important as will the second day's, although the sizes will be different. The same money will be hung up in each and the distances will be the same—306 miles. In each race the prize money will total $2,500, and in addition there will be a $200 cash prize for the fastest lap in each race. On the first day this speed bonus will be given by Ira M. Cobe, former president of the Chicago Automobile Club, and on the second day the money will be hung up by Referee David Beecroft.

The first day's race will be for cars of a piston displacement of 300 inches and under, and the trophy will be known as the Chicago Automobile Club cup. It is the old Cobe trophy given a new name. The Cobe cup, it will be remembered, first was contested for in 1909 at Crown Point, Ind., at the meet promoted by the Chicago Automobile Club and was won by Louis Chevrolet in a Buick. The next year it was contested for on the Indianapolis speedway and was won by Joe Dawson in a Marmon. Since then it has been out of competition.

On the second day the race will be for cars 450 inches and under, and besides the $2,500 in cash the Elgin National trophy will be the consideration. This famous cup has been run for three times. It was won first in 1910 by Ralph Mulford in a Lozier; in 1911 by Len Zengel in a National, and in 1912 by Ralph de Palma in a Mercedes.

Thirty-one for Cyclecar Grand Prix

PARIS, May 3.—Entries have just closed for the cyclecar and motorcycle races which will form the second day's program of the French Grand Prix at Amiens. There are thirty-one machines in the cyclecar class, thirteen of these being of English origin, one a German, and the rest French. The cyclecar race will be run on the afternoon of July 13, the course being a triangular one and a portion of that employed on the previous days for the big cars. Under the racing rules a cyclecar is a four-wheel machine having a cylinder capacity of not more than 1,100 cubic centimeters, weighing not under 385 pounds and not more than 661 pounds. If the body is entirely detachable, the maximum weight may be 171 pounds. Each machine must carry two persons.

PARIS, May 3—According to an official announcement from Turin, Felix Nazzaro has signed an agreement to race with one of the Itala rotary-valve cars in the French Grand Prix at Amiens on July 12. Unable to prepare one of his own cars for the French race, he has offered to steer an Itala for the Itala company. It is believed that a second car from this factory will be handled by Cagno, the winner of the first Targa Florio race. Among the well-known race drivers hooked for the French Grand Prix are Georges Boillot, Coux and Zuccarelli for Peugeot; Albert Guyot and Bablot for Delage; Christiaens and Arthur Duray for Excelsior; Gabriel, Champoiseau and Thomas for Schneider; Victor Rigal, Gustave Caillois, Resta and W. Lee Guinness for Sunbeam, and Opel for the Opel car.

Cleveland Special for Indianapolis

CLEVELAND, O., May 12—The Cleveland Automobile Club has arranged for the third annual Cleveland Automobile Special Train to run from Cleveland to Indianapolis and back at the occasion of the Memorial Day Indianapolis Sweepstakes.

INDIANAPOLIS, IND., May 12—This week will see most of the drivers who are to participate in the 500-mile race at the Indianapolis Motor Speedway, May 30, at work at the speedway, tuning up the cars. The Stutz cars have been at work for some little time. The Henderson will be on the track before long. Bob Burman and his Keeton are here, as are Billy Liesaw and the specially-built Anel. The Isotta team is expected next week. De Palma and his Mercer probably will be here before the end of the week. Word has been received that the Tulsa, entered by oil promoters of Broken Arrow, Okla., has been shipped and is on its way. Clark, the driver, will be here in a day or two. It is not known when the other cars will arrive, but they are expected momentarily.

A. R. Pardington, referee, was in the city a few days ago and expects to return about May 25 to remain until after the race. Plans for the race are well under way. The advance seat sale is up to expectations and local hotels are planning to entertain the largest number of guests in the history of the speedway.

Isotta Cars on the Way

MILAN, ITALY, May 13—(*Special cable*).—Word has been received that the three Isotta Fraschini 36 racing cars that are coming to compete in the 500-mile race at Indianapolis are on their way and will be shipped from Havre on the Lorraine next Saturday. They are in charge of Vincenzo Trucco who is to drive one of them. It is likely that Dave Lewis, well known as an American driver, will act as a relief man for the Isotta team.

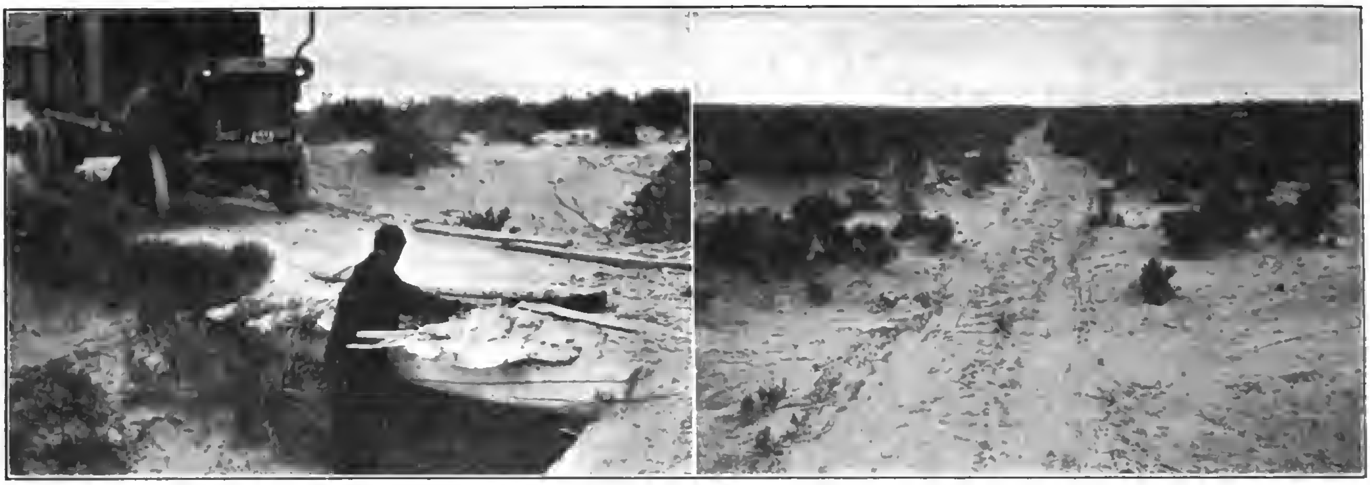
The Indianapolis management has allotted numbers 26, 27 and 28 to the Italian cars. The first number is Harry Grant, the second Tetzlaff's, and the third Trueco. Red and green has been selected as the racing colors in order to get as close to the Italian national colors as possible.

Tacoma Road Races for July 5-6

TACOMA, WASH., May 8—Three road race events will be held during the Montamara Festo, on July 5 and 6 on the roads of Pierce County. Prizes will be hung up to aggregate $10,500. The first event will be the Inter-City Century run, approximately 100 miles over the 3.5-mile course, the prize being a perpetual challenge trophy and $1,500; the second event is the Golden Potlach Trophy, and a cash prize of $3,500; the third event is for the Montamarathon trophy and $5,500 cash. All three races are for non-stock cars.

Hoosiers Pacific Route Fixed

INDIANAPOLIS, IND., May 13—*Special Telegram*—The Indiana Automobile Manufacturers' Association has adopted the following route for the Indiana-Pacific tour leaving here July 1: National road to Terre Haute, Alton way to St. Louis, Missouri state highway to Kansas City, Golden Belt route to Limon, Colo., Utah link midland trail to Salt Lake City, Nevada branch midland trail through Nevada, thence to Los Angeles via Stockton, Oakland, San Francisco and coast road. The cars will arrive at Los Angeles on August 2. The distance is 3540.1 miles; the cars will return by rail. Ray McNamara, in a Premier, will be the pilot.



Left—A large culvert 10 miles west of Kelton supported on logs having their ends laid directly on the earth. A relic of bygone cattle days when much freighting of supplies was done in horse-drawn vehicles. The top has been protected as it weakened, or broke, by a cushion of earth. Since the photograph was taken it has been replaced with a new structure of present day construction. There are not more than four of such and all are replaced with wooden ones.

Right—A sage brush trail that is largely dependent upon automobile travels to keep its lines defined. There also shows the faint markings of a cross trail occasionally used by sheep camp wagons from some far-away ranch. This trail is to be improved for automobile tourists. This section is 15 miles and is part of a 125-mile improvement.

A Transcontinental Hodge-Podge

By Ernest L. Ferguson

Part IV

Salt Lake City to California

FROM Salt Lake City, the Mormon capital, to the California line is 700 miles. It is customary to look upon the California line as the end of a transcontinental trip because the remaining 300 miles to the Pacific ocean are over boulevard roads, with which the eastern motorist is familiar.

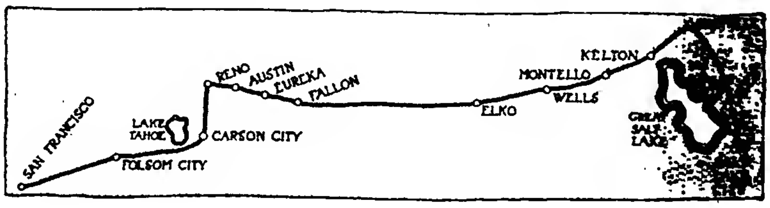
From Salt Lake City to the Nevada-California line, the route roughly divides itself into two divisions: the first one-fifth being through Utah and the remaining four-fifths across Nevada. In looking at the division across Utah, the first one-quarter of it is through a well-settled country; the second quarter crosses a low mountain range; and the last half is foothill country, in which the roads are being improved. In this trip there is a 80-mile stretch between Snowville and Lucin in northern Utah, the country is unsettled, there not being habitation of any nature between these points.

The Nevada section of this trip is over rolling mountain country with a gravelly soil which reaches its mountain climax in the Sierra-Nevadas of the state line. When crossing Nevada you do not encounter any deserts, as desert is understood in the popular conception of the term. It is true that central Nevada has long stretches of country without settlements, the longest of these being 70 miles, between Eureka and Austin, in which not a sign of habitation relieves the eye. The last, or western, third of the state width has settlements all along the roads and the irrigation work is being pushed, so that in summing up Nevada the tourist should bear in mind that the first third of the trip across it is well settled, the middle third without settlement, and the last third well settled.

From the Great Salt Lake to Lake Tahoe on the Nevada-California dividing line the transcontinentalists will find their road comfort is being rapidly improved. Just as to the east and to the west of these two states, there is an awakening appreciation of the value in hav-

Upper—Why one county in Utah is reconstructing a road along the opposite side of the paralleling railroad grade. A series of rains beyond all previous records turned the roadbed into a deep chasm split crosswise by a larger flow of water. The zig-zag lines in the foreground show how alkali mud cracks in baking. Arrows indicate line of old road grade. Circle shows railroad grade.

Lower—Another view, in the opposite direction. On the left can be seen the railroad grade that dammed the rush of water and forced it along the roadway. This railroad grade is now to protect the new roadway to be built to the left of that same grade; this because the shape of the land brings all the water from the right, which is north.



ing tourists go along the way without road difficulties that mar the otherwise pleasant journey.

For some distances around Salt Lake City and Ogden, climate and soil are peculiarly adapted to fruit growing and the success and profits are reflected in the many miles of improved roads and highways. These extend in some measure to the eastward, but are more noticeable toward the north along the country bordering the lake.

Heretofore, following the line of the railroad, transcontinental touring has swung north and west around the lake, encountering difficulties in the overflowed flats that extend some miles from the lake, either from weather or the intermittent tidal rise of the lake. Recently a combination of automobile dealers, newspaper men and hotels have devoted much time to find a way that would obviate the previous natural difficulties. The effort has been successful and now automobile travel is directed northwest to nearly the Idaho state line. In distinction this is called the mountain route. By this it is not to be inferred that mountain climbing makes up the work of the car. The route leads through, rather than over, a small range of mountains, and all grades are gradual and of no great length.

This road has its value in that it is largely surfaced with gravel that has been washed from the mountains for untold ages giving many miles of natural roadbed that is nearly perfect. The thing to be feared is that sometime, in the trend of events, there may come an attempt to construct a highway by tearing up and reshaping the new surface. Bold as the statement is, that would be nearly destruction, as underneath the gravel is that same finely pulverized alkali soil. The most that ought to be done is to provide side drainage for water and snow precipitation, leaving the now excellent surface severely alone.

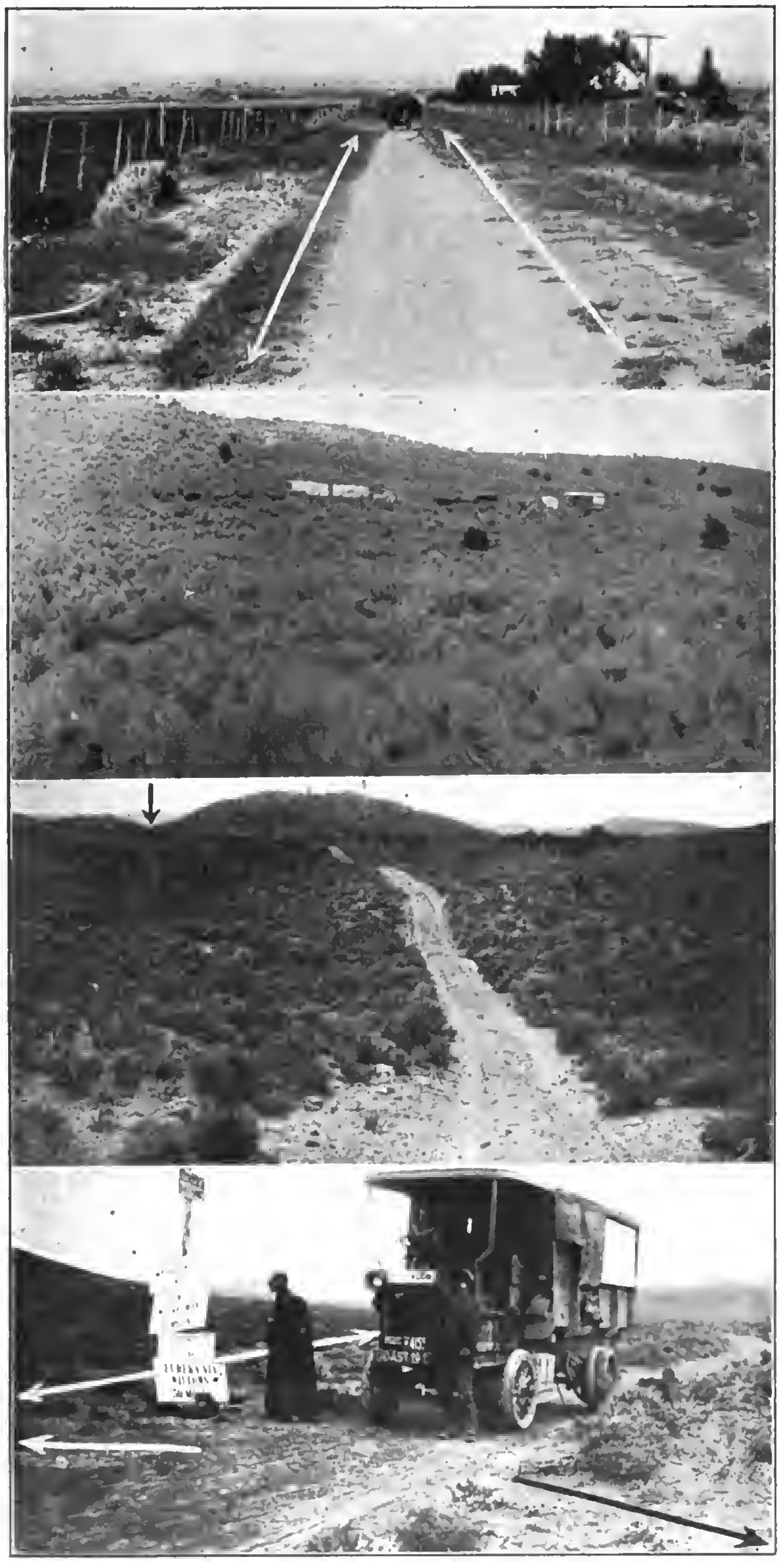
Just south of the Utah-Idaho line the route turns southwesterly until it comes near the extreme northwest arm of the Great Salt Lake where it bends west to again avoid the flats. Then it runs southwesterly finally coming to the old line of railway used before the cut-off was built across the lake, whence it keeps close to the railroad to the Nevada line. This last section carries it along the northern borders of the Great American Desert, but this is necessary to avoid the precipitous ranges of the Raft river mountains.

Upper—The effects of a long series of cloud bursts in the nearby mountains 19 miles east of Lucin. Arrows show original level.

Lower—The straightaway cross and forking trails 12 miles east of Lucin. The straightaway main trail is the one running lengthwise of the illustration. Arrows show trails and a bank.

Left—Starting the work on the new roadway south of the railroad grade in Northwestern Utah. A steel rail, used either in its normal straight line or else bent into V-shape, is pulled by four horses to tear out the sage brush and other growth. For the first attack a straight rail gives a greater strain.

Right—After sage brush has been railed out by its roots to the desired road width, then comes the shaping of the road by crowning for drainage.



Top—A well-kept road in a fertile valley in northwestern Nevada that is irrigated by small streams from nearby mountains. The culverts are narrow—one or two boards wide—and the water shallow, so that upkeep is simple, and a broken culvert does not materially impede travel. At either end of this section are sandy or alkali roads. There is very little rainfall in this section, so that side ditching is not prominent. Arrows show growth wearing away.

Upper Middle—As the tourist turns south toward the middle of Nevada there is a low mountain range to cross. The old road up the mountain has been washed away and the new is yet soft, making the climb slow traveling, particularly after a rainstorm. Horse freighting is slow work, and overtaking automobiles must wait for the one or two turnouts before passing. This scene is 3 miles south of Elco. Arrow indicates road route climbing the Humboldt range.

Lower Middle—Traveling east and west midway the state of Nevada there are stretches of well-defined trails that wind in and out between the low ranges, with now and then a climb to the lowest gap between two crowns. Between Eureka and Austin it is 70 miles and there is nothing but roads such as illustrated.

Bottom—Cross a plain 70 miles between habitations is made a matter of certainty at forking and cross trails by newly painted sign posts erected by the county. It is not unusual to come to groups of six or eight of these signs that are sources of comfort to the strangers not used to magnificent distances. Arrows indicate trails.

This latter portion of the touring road best illustrates the spirit that is alive in the matter of providing roads for the outsider to use. For not less than 125 miles this road is in one county, Box Elder, and recently the county issued road bonds for $175,000 to improve the road up to the Idaho line and then south and west to the Nevada line. The magnitude of this undertaking and the public spirit displayed can be appreciated when it is known that the county has but 14,000 widely scattered inhabitants, and that it is largely a sheep-grazing section—and sheep grazing does not require roads that are graded.

For the last 16 miles an entirely new road line was worked upon during August and September. Heretofore the road in that locality ran north of and alongside the old railroad. This meant that all the wash from the mountains close by on the north swept across the road and, banking against the railroad grade, surged back to the road again, thus doing double destruction. The new road line runs alongside the railroad grade, but south of it. This change was made that the banking of the railroad grade will act as a buffer in rainy weather for the new roadway. Small bridges and culverts have been constructed at logical points, that is, to match those of the railroad.

To Avoid Long Climb

Bending slightly away from the railroad the route now traveled continues by climbing nearly to the top of a mountain, then dips down again to the Utah-Nevada state line. It is part of the county plans to change this line to one that avoids the long climb. To make this change effective it will be necessary for the county across the state line to reconstruct its line of roadway as a continuation. The promise of the county in Nevada has been given the authorities in Utah and work on the change will be carried out during 1913.

Touring across Nevada brings with it several stretches some distances from the railroads. The old trail along with the line of the through railway is not generally used as reports on its character deflects the automobile contingent shortly after entering the state either from the east or the west. However, there is a probable gain to the tourists as the middle half of the trip takes one through several famous mining towns of long standing.

Some Good Roadway

Entering the state from the east there is at first encountered considerable sand and alkali, with later several miles of old railroad grading that furnishes excellent traveling. There is also a long stretch of well-cared-for roadway in a prosperous irrigating section. This irrigation is by many small streams from the near-by snow-clad mountains, and the soil has some gravel in it, also from the mountain sides. This combination tends to give good roads with the least effort which are not affected by the irrigation system, as is the case on the plains east of the Rocky Mountains, where the water is carried in large volumes through great main channels and with soil that is alkali almost throughout.

Soon after entering the state from the east the route turns south to nearly the middle of the state and then turns in an almost direct westerly direction. It is after this latter turning that are the fairly long distances between railroad points.

For the greater portion of this section the natural structure of the soil gives excellent traveling. It is generally a gravelly surface due to centuries of washings from the nearby mountain sides. Like the similar section referred to in Utah, as a touring roadway this would be spoiled by the average method of improving. Rain, in quantity, is abnormal, and the most that ought to be done is to side-ditch the traveled way to prevent the cross-flowing of water.

The erection of guide posts by the counties is quickly taking place, and it is impressive to find them at the forks and crossing trails where towns or settlements of any sort are 70 miles apart. Those counties that are placing sign posts are also improving the mountain climbs by grading, also by widening the turns on the grades, that have in the past been none too easy to negotiate with the long wheelbase which is characteristic of so many of the automobiles designed in America during the past few years.

After three-fourths of the state has been traversed the towns become fairly frequent and near together. The industry of farming is rapidly settling a considerable section and the spirit to improve the roads for intercommunication is evident on all sides.

A Parting of the Ways

When the automobile transcontinentalist has come to Nevada's metropolis, at Reno, there again occurs a parting of the ways that must be chosen before starting for the nearby California state line. Probably the majority decide for the route running nearly west from Reno that takes them through the famous sheds west of Truckee that protect the railroad tracks from snow-slides.

The chief objection to this route by those who have tried this and the other, told below, is the necessity of passing at right angles with their length, through these sheds at the crossings of the railroad tracks. These passages are at sharp inclines and without the possibility of a turn-out from any cause. The sheds completely hide the trains and those who are most familiar with the "blind" conditions send ahead someone of the party to see that a train is not coming through the sheds.

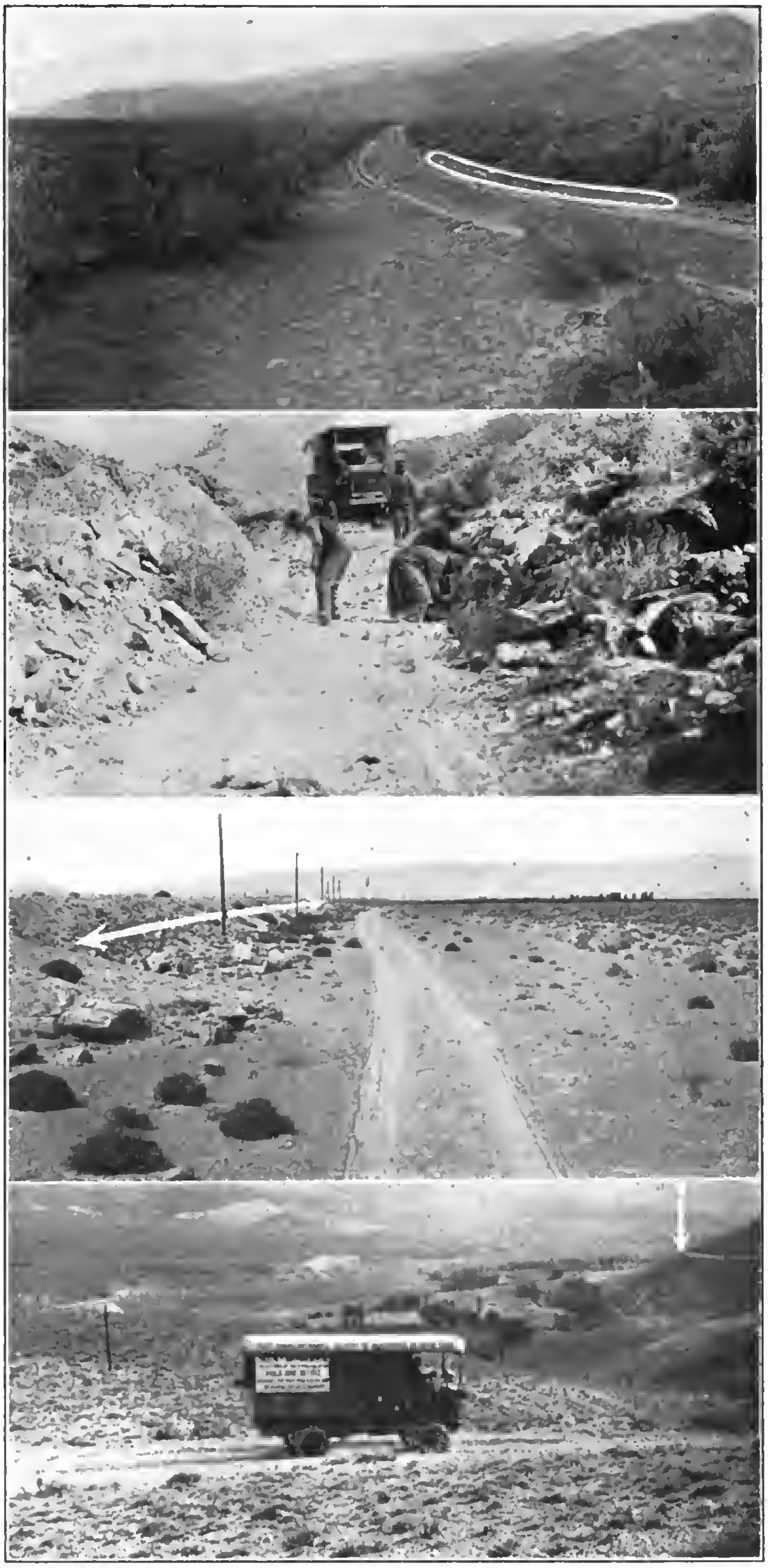
Largely from the lack of information to be secured in the east the other route going south through Carson City is not so well known. Information regarding it is gradually spreading and there is an ever-increasing number who are using it to avoid the snow-shed crossings. Time only will determine which will become the most used route, depending largely on the activity of those most to be benefited in the Capital City. Both routes come together again at Sacramento.

Over the Sierra Nevada

A modern, newly built highway extends south from Reno and is soon to be completed to Carson City. From then on the route is somewhat southwest and crosses the Sierra Nevada Mountains. Coming down from the divide the west state line is crossed at Lake Tahoe. This lake, of over 1,800 feet in depth and more than 6,000 feet above sea level, is thickly dotted with hotels along its boundaries of more than 23 miles in length and 13 miles in width and furnishes pleasant variation in scenery.

By either route climbing the Sierras commences just before crossing the state line into California. That by Truckee is perhaps less in distance, but has sharper grades for short distances. Via Carson City the climb commences in town, and is several miles long, but is quite well graded with few, if any, severe pitches. In either instance the climb is the greatest one encountered in going from the Atlantic to the Pacific, and both present views that are magnificent beyond description.

(*Concluded.*)



Top—Not all sage brush country has clear alkali soil. Now and then there are some stretches with rock in them that give good going. One soon learns to tell in advance the character of the road bed by looking ahead and noting the shade of the sage growth. These shades vary from a dark green to a green that is hardly more than a delicate tint. The deep and light green sage indicates a rather heavy alkali; the medium green a gravelly soil. Area marked in white is covered with stones.

Upper Middle—A particularly narrow canyon that passes the tourist through the Desatoya range of mountains into a valley that was on the old pony expresse route. It is west of Austin and the canyon is 4 or 5 miles long.

Lower Middle—Just naturally good automobiling over a gravelly surface with some rock in the subsoil approaching Wadsworth, Nev. A vast area in western Nevada has been recently opened to irrigation settlement, and where not cut up by the iron tires or horse vehicles the surface gives fair to excellent going. Otherwise, it is deep in sand and alkali. On the left is the retaining bank of a large irrigation main channel. Arrow indicates earth retaining walls.

Bottom—Nearing Reno the roadway, to keep out of the low, wet valley, winds along a bench about half way up the side of the mountains. It frequently makes sudden and sharp ascents and descents with hairpin turns that require good driving ability and brakes in the best condition. Arrow shows where road runs around a "nose" of the mountain.

The Engineering Digest

A Digest of Technical Information from the Engineering Journals

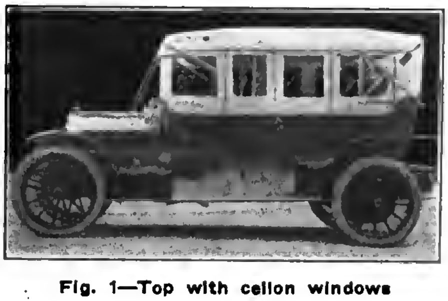


Fig. 1—Top with cellon windows

How Non-Inflammable Celluloid Is Actually Used for Automobiles and Aeroplanes—According to statements from body builders, glass and ordinary celluloid are still the materials used, and the only ones commercially obtainable in this country, for all those purposes in automobile construction for which a transparent sheet is required. Glass panes must be thick in order to minimize the danger of breaking them and wounding those near them with the splinters, and for the same reason the vehicle body, or other structure in which they are framed, must be rigid and heavier than otherwise would be necessary. Celluloid, on the other hand, easily takes fire and burns with great rapidity, and with a shooting flame which is likely to ignite adjacent parts. Naturally its use is limited to safe locations and to the smallest possible areas by which the purpose in view can be ostensibly served. These materials therefore impose a considerable restraint upon the builder's ingenuity, especially in the matter of providing closed vehicles of a very light type, tops which will afford both protection and an unrestricted view of the landscape in rainy weather and windshields which will be neither too heavy nor too delicate and fragile. The accompanying illustration, Fig. 1, shows something of the effect which can be obtained when a tough and non-inflammable substitute for celluloid can be used instead of the ordinary kind. It represents a German Daimler car equipped with a summer top with flexible cellon windows of generous size and number.

With regard to cellon and some of its other recent applications, Dr. A. Rost gives some timely information in *Kunststoffe*, and this journal at the same time sends out a sample of the material, from an examination of which it appears that cellon is slightly less uniform in texture and transparency than first-class nitro-celluloid, and that it burns slowly when a flame is held to it but does not sustain a flame. It shows traces of unsolved cotton fibre at the edge where a portion is torn off. It is softer, tougher and more pliable than a celluloid film. These characteristics may account for the fact that no legislative steps have been taken to make its use for motion-picture films compulsory, in spite of the fire risk encountered with nitro-celluloid films. Another reason may be found in the fact that the cellon material is made by a process patented to Dr. Eichengrün and practically is the basis of a monopoly, so long as other incombustible, or rather uninflammable, celluloid substitutes cannot be produced industrially at a competing price. It is made by a single concern located in Cologne.

Dr. Rost calls attention to the experience that artificial substances which originally are produced in imitation of a natural material, or of one which has been in the market for a long time, rarely get into the competition intended but find their employment in new fields, just because they vary more or less from their prototypes, falling short at some points and excelling them at others. Although Germany, for example, produces more than 10,000 kilograms of artificial silk per day, scarcely a single garment, not even a veil, is probably made from artificial silk alone today. The silk worm culture continues unabated. Galalith, which was intended as a substitute for horn and was made and marketed at first with that purpose in view, has gained its field as a substitute for ivory, ivory nut, wood, onyx and marble. Bakelit was meant to replace copal lacquers and amber but is actually used for cane and umbrella handles and extensively for buttons. Cellon, similarly, does not now seem to threaten celluloid as a material for the numerous household and toilet articles made from this substance but is opening up new avenues for itself in connection with automobiles, motor boats and aeroplanes, in which lines celluloid of necessity has played a very modest part. The possibility of having numerous, large, light and pliable areas of completely transparent material for vehicle tops, boats, awnings, tents and aeroplane bodies, without running the risk of having the entire equipment consumed as the result of a trifling accident with a match or a cigar, has struck a very receptive mood where new effects and conveniences relating to transportation by motor are studied.

Rain curtains hung at the side of the chauffeur and arranged to be rolled up or down, in either case leaving a clear view to the sides, have been found practicable, and for taxicabs and mail wagons strong sheets, from 1 1-2 to 2 millimeters thick, offer a substitute for glass planes which is appreciated not only because the glass is so frequently broken in this class of vehicles but also because the cellon panes can be made larger. Aside from the avoidance of fire risk, they have the advantage over celluloid windows that they do not turn yellow from the effect of sunlight and, being more leathery in structure, the material can be sewed to textiles without difficulties and can be rolled, folded and bent almost like woven goods. It is however in the aeronautic industry that cellon has taken a place for which no other material can even come into the question. Count Zeppelin showed the way in this respect. Cabin windows and windshields for the gondolas of the big airships came first, but the cellon was soon also used as material for side walls and bottoms of gondolas, being strong enough, in the right dimensions, and lighter than aluminum. Its employment in aeroplanes has been of similar nature, and, going further, Professor Reissner in Aix-les-Bains tried in 1910 to use the material exclusively for the frames and membranes of the planes, in an effort to make the whole machine practically invisible at a moderate altitude, and the military aeronautic corps in several countries have carried on experiments with the same object in view. But the results obtained have not as yet been decisive, for cellon is after all only a plastic material, and the toughness it possesses is comparative; its tensile strength is not as high or reliable as that of a fibrous or metallic texture.

By far the most important application of the cellon substance in the art of building aeronautic craft has been found by using the material in solution as a varnish or lacquer for air proofing and waterproofing the silk or canvas employed for the balloon and aeroplane surfaces. Indifferent to castor oil, gasoline and atmospheric influences, including sunlight, as well as to grease, oil and soap, and so perfectly smooth as to reduce air resistance materially, the cellon varnish has had much to do with the improvements recorded in the durability and speed of aircraft. It has been shown that an impregnation with rubber leaves the tensile strength of canvas or muslin practically what it was before and that linseed oil reduces it about 10 per cent., while sizing with starch has a more complicated deleterious influence causing the material to rip readily where a rent is started, and, on the other hand, the aero-technician Dr. Quittner has found by tests that the lacquers produced on the same chemical basis as cellon increase the tensile strength of the textiles a clear 50 per cent. and reduce skin friction about 20 per cent.

These developments in the aeronautic field, to which Dr. Rost refers with more detail, have served to demonstrate the properties of the material for the benefit of the automobile industry, so that it may be tried out in those applications for which it may be considered suitable without the misgivings usually entertained with regard to merely commercial recommendations. Some special uses of the cellon lacquer, as a coating and preservative which may be removed bodily when this is desired, are related by Dr. Rathgen in *Zeitschrift für Museumskunde* for January and have reference to the results obtained by the directors of the royal museums in Berlin. It seems possible that this application may be of interest for the conservation of patterns and gauges made to a high standard of accuracy.—From *Kunststoffe*, April 15.

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ADAPTING Spring Suspension to Varying Loads.—The knotty problem of devising a spring suspension which will serve equally well for underloads, normal loads and overloads is receiving considerable attention in Europe, especially since the trade in commercial vehicles has grown to respectable proportions. So far no radical solutions are offered, and the palliatives which have been devised have not sufficient scope in their action to span the difference in requirements between an empty and an overloaded delivery wagon or truck. The efforts run in two directions. Either the springs fitted to the vehicle are purposely made so strong or stiff as to support the maximum load or shock, and the loads between minimum and maximum are supported upon auxiliary shackle-springs which must be mounted at an initial tension equal to the minimum load (though this is not always observed), or springs of sufficient flexibility to afford comfort and protection under normal conditions are supplemented with shock absorbers which limit and retard oscillations, under abnormally severe conditions, especially the violent recoil which, without them, the main leaves alone would be called upon to resist. The first system requires shock absorbers, anyway, in order to take care of unusually severe shocks sustained with maximum load, and shock absorbers alone give no static support for overloads and therefore have a reduced range of action under overload conditions. In brief, auxiliaries are for stiff springs, and shock-absorbers are for flexible springs.

One of the latest devices designed to supply something better belongs in the first class and is shown in section in Fig. 2. It is called the M. S. shock absorber but is an auxiliary and adjustable air-spring. The lower cylinder is hung from the upper bolt which is journaled in the end of the leaf spring. The upper cylinder, which works as a piston in the lower, is hung from the lower bolt which is secured to the vehicle frame or the C-spring extending from it. The interior space between them is filled with air whose tension may be regulated to correspond to the load by means of inflation at the air valve V. The bearings between them are so safeguarded with packings and pressed leather bushings M, M that no air can escape from the inside to the atmosphere. Between them there is a small annular chamber C, however, and it is stated that air enters this chamber from the outside through the upper leather bushing when the piston is moved downward by shock or load, the air in C being rarefied by this movement, so as to cause suction. On the other hand, when the spring coil causes the piston to move up again, the air which has thus entered C brakes the recoil movement. It is not stated how the additional air in C gets out again in time to receive the next shock under the same conditions as obtained for the first one, but it seems to be assumed that there is sufficient leakage for this purpose through the upper leather bearing, while the lower one remains tight under all conditions. It is the idea set forth that a few strokes with an air pump will fit this device for increased loads, but it is evident that the mechanism ceases to operate as an auxiliary spring and recoil check when the tension of the air becomes equal to the tension of the leaf spring to which it is fitted. The lateral rigidity of the mechanism seems to be amply secured, so as to obviate rolling of the vehicle-body and irregular wear and action of the two cylinders.—From description in *La Vie Automobile*, April 26.

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MASS-PRODUCTION the Source of Perfected Construction.—In an explanation to the general public of the methods by which low price and high quality can be combined in the manufacture of automobiles, Dr. Riedler of Berlin, whose works on the scientific valuation of automobiles have won great renown, succeeds in sketching up a very comprehensive subject in a few illustrated pages, which the layman after all will find it very difficult to understand, since he has no key which will unlock the true meaning of the general term necessarily used in the explanation. But apart from the leading part which personal ability plays in constantly devising new means for reducing cost and enhancing quality in the manufacture of motor vehicles —as demonstrated in all the producing countries but to which the author does not refer—the word picture given by Dr. Riedler comes perhaps as near to representing the facts as any other ever drawn. An attempt is here made to represent the gist of his remarks on a 10 to 1 scale of reduction.

A certain degree of standardization is indispensable as well as a reduction of variety in types of vehicles. To hold on to superannuated, be they ever so time-honored construction forms, where mass-production is contemplated, is a blunder that brings its own punishment. To standardize what is unripe is worse yet. Decisions on these points are heavily fraught with danger but must be taken.

In the making of parts time and cost must be saved everywhere; accuracy and quality must be enhanced at all points. Rigorous organization, perfected machine tools and numerous jigs are necessary. The basis is the stock of raw materials. Each piece in it must be prepared in advance for the manufacture. High-speed-tool steel and machines powerful enough to utilize it to the full are necessary. The specially built machine tools must cut special shapes as rapidly as the general machines cut or mill the standard shapes and surfaces. Many have thought that automatic tools dispense with intelligent handling and choke down the personality of the workman, and they have received no return for their investment when acting on this theory. It devolves upon the engineer to make the new and special tools call out new and higher abilities in the wokman, making him the boss who will drive the machines in his charge to their best.

After the time-saving comes the accuracy. Tools are used which remain accurate under wear. Not only the machines but also the working process must be perfected with accuracy in view. Only mass-production can afford the expensive innovations required. Main parts must be turned with an accuracy of 1/100 millimeter, and some of them still much closer to gauge, while ordinary shops do not work with

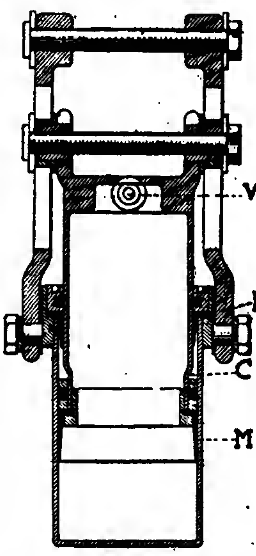

Fig. 2—Auxiliary air-spring adaptable to load

more than one tenth of this accuracy and the unskilled workman scarcely knows 1 millimeter in this sence. Every piece must be measured with the so-called tolerance-gauge, which is a pair of fixed calipers, one made accurately to the min' s and the other to the plus tolerance of the piece. If one will pass, the other must stick. There must also be a testing department independent of all other departments in the production. The men here employed measure every piece over again and throw out those that are not strictly interchangeable with all others of the same kind.

Special fitting and after-work is not to be tolerated. In its avoidance lies the reward for the painstaking control of accuracy. The cost of fitting is excessive and incompatible with economy. It also never results in uniform measurements, and the latter are indispensable for establishing a system and stock of spare parts for replacements. For this reason alone no car should be bought nowadays whose parts are not made interchangeable from the start. Inaccurate parts always cause a heavy upkeep cost to the user. Flaws in materials come in the same class and are avoided by continuous testing in the stock department, independently of the tests made at the steel works. These tests should serve economy rather than fancy.

Formerly difficult parts were cast or worked out of a rough-forged piece. Now castings are practically excluded for working parts, as they do not afford the desired weight-reduction nor the full assurance of strength. Forgings are now brought very close to their final shape before machining, to save waste of costly material and work. To this end, a whole series of dies, presses and drop hammers has to be provided, but the bill for materials is reduced to a fraction of what was required by earlier methods. And the enhancement of quality caused by the mechanical working processes now employed goes hand in hand with savings due to the rapidity of these processes.

The main source of silence in the operation of a car lies in the use of automatic grinding machines by which the teeth of gears, after hardening by heat treatment, especially casehardening, are shaped to perfect accuracy, the accuracy of the curved face of the teeth causing not only the silent running of the gears but also reducing wear to a minimum.

Every test of a motor costs several hundreds of marks which can be saved if saving alone is the object, but these tests and similar ones relating to springs, rear axles and gears explain many differences in the prices asked for the best cars and for those not quite so dependable.

Modern automobile construction has become one in all details highly developed specialty. Unperfected empirics and onesided experience are no longer sufficient. The co-operation of science and experience is as necessary as in all other highly developed building of machinery. The manufacturing facilities can however be utilized in different manners: Either for simultaneous perfecting and cost-reduction of the product or for cheapened mass-production alone, the latter being the main aim in too many instances.—From *Automobil-Rundschau*, April 15. [Reprint of article in new German technical cyclopedia.]

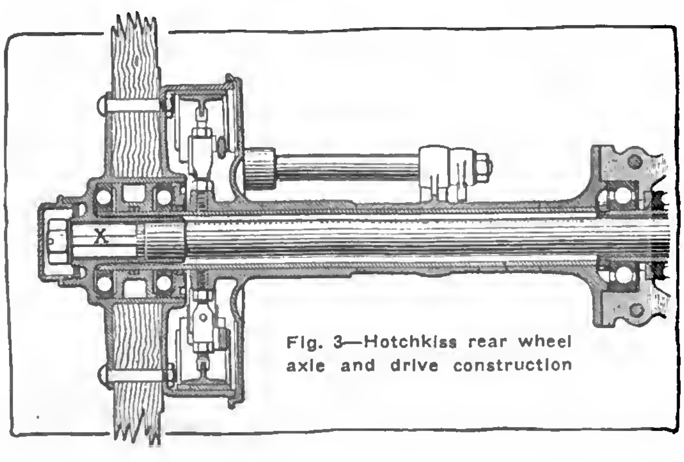

Fig. 3—Hotchkiss rear wheel axle and drive construction

THE Lighting of Shops.—With the different methods of illumination now used in factories, the question of which kind of rays fatigues the workman's eyes most has come to the surface. Many persons believe that the ultraviolet rays are as dangerous as Roentgen rays, especially since it has been proved that they can be used to sterilize water. In reality there is a marked difference, since the Roentgen rays pierce many solids, such as wood and the human body, while ultraviolet rays have only a superficial effect and are absorbed in opaque substances and even in some transparent ones, notably in common glass. The mercury arc lamp emits ultraviolet rays if the tube is made of quartz, and to avoid all danger it is considered advisable in that case to place a glass screen between the tubes and the workmen. If glass tubes are used this is unnecessary, as the glass holds all the ultraviolet rays inside of their walls. For that matter, with quartz tubes, a distance of a few meters neutralizes the effect of the rays, so that such lamps can be used in lofty places where the lamps are hung high. Recklinghausen relates in *Lumière Electrique*, February 22, some comparative tests he has made of the influence upon the eyes of different kinds of light, measuring the fatigue partly by reading and partly by the so-called blink-test which consists in counting the number of times the eyes are blinked in a given time. The red light proved the most fatiguing, the light from incandescent lamps or Auer jets was less so, and the mercury vapor lamp showed a clear superiority.

The automatic closing and opening of the eyelids and the contraction and expansion of the iris, caused by variations of the quantities of light received, or by variations of its sufficiency for the work on hand (this being the most important element in practice) constitute a serious cause of eye fatigue. In order to reduce it, indirect lighting is used, but this is far from being an ideal solution, because the absence of shadows makes it impossible to see distinctly in a room so lighted. Where accurate work is desired it is found necessary to give the light a direction sufficiently definite for producing visible shadows.—From *Génie Civil*, April 5.

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PROTECTION for Ball-Bearings in Wheel Hubs.—A construction which goes far toward protecting the balls and ball races in driving-wheels against excessive strains and which also serves to prevent oil from reaching the brake in more than negligible quantity, is noticed in an illustration showing the rear-axle mechanism of a 20-30 horsepower Hotchkiss car—one of those which, though built in France, are sold perhaps mostly in England. The most interesting portion is reproduced in Fig. 3 showing the axle end with wheel and brake drum. The hub has a central tubular extension reaching into the interior of the axle-end, fitting loosely therein, and the wheel-shaft has a shoulder fitting snugly in the extension, while its extreme end X is keyed in the outer portion of the same, in the manner customary for floating shafts. The two ball-bearings are also mounted upon the axle-end in the usual manner, separated however by a ring-shaped piece—with a deep groove for lightness and oil—which acts as a reinforcing parallel bearing, having a slightly larger minus-tolerance, apparently, than the ball bearing, so as to come into action only if stresses upon the ball-bearings tend toward the allowable maximum, and subject to no wear except at such moments. The wood wheel is assembled directly upon the hub, in accordance with modern American practice, and the brake drum forms an integral flange of the inner one of the two hub disks, but the inner disk is the loose one, in this case, and comes last in the assembling. The design suggests powerful hydraulic press work rather than forging as the method of production for all pieces save the wheel-shaft.—From *Omnia*, April 26.

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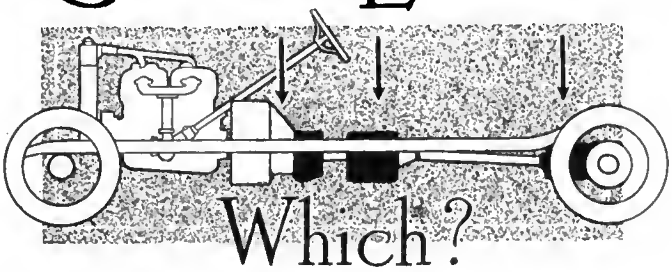
Paving by Motor—Berlin has an 18-horsepower automobile paving machine, the motor propelling the vehicle and also operating six pneumatic hammers which do the work formerly requiring six sturdy workmen, each with a heavy paving ram. Each hammer delivers 90 blows per minute.

The Engineers' Forum

Gearbox Location



Part III

Unit Construction Favored by Four Engineers; Three Prefer Amidship Location and Two Rear Axle

Riker Prefers Location Amidship
Lacy Likes Unit with the Motor
Amidship Plan Appeals to Dorris
Stutz Finds Rear Axle Satisfactory
Rogers Approves of the Amidship Type
Amidship Is Simplest, Says Schwitzer
Felicke Disagrees with Waldon's Views
Bird Thinks Unit with Motor Is Wisest
McCulla Cites His Racing Experience

THIS week the last instalment of the discussion of gearbox location by the leading automobile engineers of the country appears in THE AUTOMOBILE. This topic has been considered from every possible angle in this and the preceding articles and has excited a great deal of interest in engineering circles. Herewith are appended the opinions of nine well-known authorities in the automobile engineering field:

Amidship Best for Big Cars—Riker

BRIDGEPORT, CONN.—Editor THE AUTOMOBILE—The question of gearbox location has something to do with the size of the powerplant you are putting in your car. I think in a small powerplant you probably could combine your engine and your gearset, or you can, if you like, put your gearset on your rear axle. It seems to me when you put the gearset in a car capable of developing 80 to 100 horsepower it is preferable to distribute your weights instead of concentrating them either at one end or the other, and I think it is a fact that the distribution of weight produces an easier riding car. **The car that will hold the road best at high speed is the old double-chain-drive car,** and the car that has the least dead weight on the rear tires, unsprung weight. I know that this has been the opinion of the engineers in designing racing cars when races were held on the roads, to use a double-chain-drive car for that very reason.

Now it seems to me if you want to approximate these same conditions in the shaft-drive car you have to approximate as nearly as possible the design of the chain-drive car. That means take all the weight off the rear axle you can and distribute your weight as well as you can between your front and rear axles. I myself believe in the separate unit system with the gearbox on the chassis frame, possible because we are building a high-powered car; but it seems to me that is the logical disposition of your weight, and while I admit that it probably is not applicable to the lower-priced cars, because it is a more expensive proposition, yet I feel that for **the large powerful car the separate unit system, with the gearbox on the chassis is preferable to the unit system on the rear axle form.**—A. L. RIKER, Vice-President, Locomobile Co. of America.

Make It Unit with Power Plant—Lacy

ROCHESTER, N. Y.—Editor THE AUTOMOBILE:—I am favorable to making this piece of apparatus a part of the power plant unit. There are, of course, arguments for all three of the locations which are to be found on various cars at the present time, but **it seems most reasonable from the writer's standpoint to put the motor, clutch and gearbox all in the same unit.** It has the particular advantage of compactness, and avoids the necessity for universal joints between clutch and gearbox, thereby reducing mechanical complication and multiplicity of parts.

Universal joints between the clutch and the gearbox are the source of more or less annoyance in the way of looseness which causes objectionable rattles. This unit construction as we have designed it permits of very quick removal of the gearbox as it is carried entirely on an annular row of bolts joining the front end of the gearbox with the rear end of the crankcase, there being no rear support. We have used this construction for something over 3 years, and have found it entirely satisfactory.

I object to axle gearboxes as they increase the amount of dead weight on the tires. The weight is on the tires, of course, regardless of the location of the gearbox, but if carried in the chassis, the shocks due to this weight are transmitted to the axle and tires through the springs, thereby reducing wear and tear on the axle mechanism and tires.

Another very desirable feature of locating the gearbox in the chassis, either on the frame or as a unit with the motor, is in that control lever arrangements may be designed to be attached directly to the gearbox, thus making these parts also a unit with the power plant. My 3 years' experience with this construction is convincing evidence to me that it is a most reasonable arrangement both from the standpoint of the manufacturer and the use of the car.—H. V. E. LACY, Chief Engineer, James Cunningham, Son & Co.

Amidship Preserves Alignment—Dorris

ST. LOUIS, MO.—Editor THE AUTOMOBILE—Regarding the question of the best location of the gearbox, my opinion of this matter is as follows:

Every pound of weight in a rear axle, wheels and other unsprung weight, severs as a direct hammer on the tires. These parts will not yield to road surfaces so freely as a lighter axle. This results in the heavy axle hammering the tires more and the springs less than in the case of the lighter axle which reverses this condition. As the springs are practically free from wear and maintenance cost and the tires the biggest item in the cost of operation, the tires should be favored as much as possible.

A heavy axle also consumes more power to vibrate it over the road surface, hence more gasoline is consumed to do the same work, thus increasing the second largest expense item.

The gearbox placed amidship is an improvement on the rear axle location, as it permits of a lighter rear axle. The gearbox being carried on the springs also increases the fixed load to live load carried on the springs, improving the easy swing or riding qualities.

The unit powerplant shares the same advantages with the amidship location over the rear axle location and has the following advantages over the amidship location: It eliminates the necessary wear and renewal of universal joints between motor and gearbox. Perfect alignment of crank, clutch and mainshafts can be maintained. It is lighter construction and eliminates necessity for a subframe. It gives a longer propeller shaft and consequently reduces angle friction and wear of universal joints. It is more accessible, being immediately below the front floor.—G. D. Dorris, Vice-President Dorris Motor Car Co.

Rear Axle Location a Success—Stutz

Indianapolis, Ind.—Editor The Automobile:—We are interested in the present discussion whether the gearbox is more suitable on the rear axle or amidship.

From our past experience we have had splendid success with the gearbox located on the rear axle and we attribute the following reason for our success: For instance, if a gearbox were geared 10 to 1 on low speed and you were using a 40-horsepower motor and developing the full amount of horsepower, which would be 40, your driveshaft and knuckle joints would only be transmitting 40 horsepower with the gearbox located on the rear axle, or if the same gearbox were located amidship or on a unit power plant with the motor these poor little knuckle joints and driveshaft would have to transmit ten times 40 horsepower, or 400 horsepower, in order to perform the same function that they would with rear axle gearbox.

The accessibility of a gearbox located on the rear system and the absence of the grind of the gears being transmitted through the body, etc., with a gearbox located amidship. There is no question in the writer's mind but what there is a decided advantage of having a gearbox located on the rear system.

This outfit, if properly designed, is but very little heavier than the ordinary rear system and we wish to go on record that **we are firm believers in a rear axle gearbox and gearbox unit.**—H. W. Stutz, President, Ideal Motor Car Co.

Amidship Is Most Flexible—Rogers

Racine, Wis.—Editor The Automobile:—With reference to the mounting of the gearbox, would say that we favor the central location because it is very flexible, and there are fewer opportunities for misalignment. It is also more accessible than one connected with either the rear axle or the power plant unit. The gearbox control is more simple than the one requird when the gearbox is mounted on the rear axle, and it also gives better distribution of weight.

Another of our objections to mounting the gearbox on the rear axle is that this construction necessitates an abnormally heavy rear axle.—G. V. Rogers, Factory Manager, Mitchell-Lewis Motor Co.

Unit with Motor Is Wisest—Schwitzer

Indianapolis, Ind.—Editor The Automobile—We are building the gearbox as a unit with the motor because we consider it a better proposition from the manufacturing point of view, as well as from the mechanical aspects.

It eliminates universal joints between clutch and gearbox and allows with the simplest means a rigid dust and oil-tight construction for clutch and shifting mechanism without affecting the accessibility with the proper design.

With center control the number of parts for the latter, as joints, rods, etc., is reduced to a minimum, making a great saving in cost and weight as against the arrangement of the gearbox amidship or on the rear axle. It is an easy matter to attach both pedals and levers to the unit, which can be assembled as a whole and hung this way in the chassis an an ideal assembly proposition.

With the gearbox on the rear axle a great deal of weight is carried directly on the tires, while with the unit powerplant it is all suspended on springs and the material probably not so badly subjected to crystallization.

As to weight distribution, we believe, at least with the smaller cars, that the motor unit construction gives a better-balanced machine. The simplicity and cleanliness of design of a chassis with a unit powerplant which has hand and foot control attached to it and is arranged for straight-line drive with only one universal joint necessary is an appealing feature.

It is true that with the gearbox on the rear axle the strains on universal joints are greatly reduced. But as the weights on these parts are not very considerable and as they have small diameters, with an increase of a negligible amount of material it is possible with the unit powerplant to increase strength and bearing surfaces to give services under all contions.—Louis Schwitzer, Engineer, Empire Automobile Co.

Rear Axle a Bad Location—Felicke

Indianapolis, Ind.—Editor The Automobile:—We do not agree with the views expressed by S. D. Waldon in favor of the gearbox axle. We have the following objections to this construction:

First: It increases the unsprung weight of the car. Mr. Waldon states that the Packard gearbox axle is lighter than any other axles without gearbox used on cars of similar weight and power. While this statement reflects great credit upon the designers of the Packard axle, it misses the point entirely, for if an axle is strong enough now with the gearbox it will be strong enough after the gearbox has been removed and the whole weight of the latter must be considered, therefore, as additional dead weight.

That a saving in unsprung weight is of great value is certain. The rear axle is recipient of all the shocks and jolts caused by the unevenness of the road. It is continually thrown up and down and **as the magnitude of the shocks is in direct proportion on the mass of the axle, they will be smaller, the lighter the weight of the axle.** Every unsprung part has to stand the undiminished force of the road shock and it becomes clear that a gearbox axle with about 85 pounds more dead weight than the average axle will be hard on the tires, wheels, bearings, the axle housing and the road.

The reduction of the unsprung weight has long been the aim of automobile designers. Some have gone even so far as to suspend the differential housing on the frame and to transmit the power by two universal joint shafts to the wheels (DeDion-Bouton and Roland-Pilain); others have taken the weight of the springs off the axle and suspended it on the frame (Lanchester, Edwards and King).

Another bad feature of the gearbox axle is that it exposes the power transmitting parts to the sudden shocks caused by the unevenness of the road. When a car is in motion the speed of the power transmitting parts is in a certain relation to the speed of the car. If, now, the rear wheels drop into a hole or go over a bump, they are forced to roll off in a certain time a greater distance than corresponds to the speed of the power transmitting parts. In other words, the latter receive a certain acceleration or shock. When the gearbox is connected with the motor or placed amidship the gearbox gears are protected by the long propeller-shaft and the blow on the rear axle gears is also made ineffective by the backing of the elastic propeller-shaft. If, on the other hand, the gearbox is connected with the axle, there is no elastic part to give and the parts have to stand the full force of the blow. This is the reason why gearbox axles are notoriously hard on gears and shafts.

Of course, all of these forces can be taken care of by increasing the size of the parts, but what has been gained by carrying the high-speed members back to the axle and using smaller universal joints is more than offset by this.

Besides these, there are many other objections to the transmission axle. The bevel gears cannot be adjusted—the gearbox is very inaccessible when used in connection with the torsion tube, as is frequently done. The floorboards in the tonneau have to be raised to give sufficient clearance, which makes it impossible to get a low car, etc.

For all these reasons we are not in favor of the transmission axle and have adopted the unit power plant construction on our cars.—KARL FELICKE, Chief Engineer, the Motor Car Mfg. Co.

Unit Equalizes Weight Best—Bird

JACKSON, MICH.—Editor THE AUTOMOBILE:—We believe that the unit power plant construction, which incorporates the motor, clutch and gearbox in one housing, is preferable to the practice of carrying the gearbox on the rear axle. **We do not believe it is good policy to put any more weight on the rear axle than is absolutely necessary, because the unsprung weight has such a marked influence on tire wear.** The tire cost is an important factor in the total cost of the upkeep, and we believe that we cannot be too careful in adopting such methods of design as will minimize it.

The gearbox, when incorporated in the unit power plant, is placed in absolute alignment when the motor is assembled, and is never affected by road strains. Any strain which is applied to the power plant affects it as a whole and does not tend to throw the moving parts out of alignment.

We believe that the gearbox control is very much simpler in the case of the unit power plant than with the gearbox on the rear axle, where the shifting rods must be permitted to work freely with the spring action of the car. The unit power plant construction makes the gear-shifting connections shorter and fewer, thus eliminating a great deal of lost motion.

Last but not least, we find that the incorporation of the gearbox with the motor helps to equalize the weight on the front and rear axle. This makes the car ride more easily, and aside from the question of unsprung weight, gives an advantage to the tires.—CHARLES I. BIRD, Engineer, Jackson Automobile Co.

Rear Axle Location in Racing—McCulla

DETROIT, MICH.—Editor THE AUTOMOBILE:—I notice in THE AUTOMOBILE, in the discussions regarding the proper location of the gearbox, that several of your contributors remark that the gearbox is in the best location when it is placed up front, from a racing viewpoint.

I do not quite agree with this, for I have driven a great many high-powered foreign racing cars, both on the road and track, and it is my firm conviction that the proper place for the gearbox is on the rear axle.

If you remember, it was the general consensus of opinion during the 1905 and 1906 Vanderbilt Cup races that the winning Darracq was by far the steadiest car on the road and took the corners with less skidding, etc., than any other car, and with less tire trouble.

It was also remarked during the first 500-Mile-Race at the Speedway that the winning Marmon hung to the track much better than any of the competitors, and with far less tire trouble.

Of course, I fully realize that in the case of the Darracq, the car had no differential; but, then, again, I have never driven a foreign racing car, either chain or shaft driven, that had a differential.

I am not applying any theory whatever to this letter—but it is merely my personal, practical experience.—WM. R. MCCULLA, Assistant Research Engineer, Packard Motor Car Co.

Considerations in Automobile Spring Design

From a Paper Read Before the Society of Automobile Engineers by Leavitt J. Lane

THE ideal automobile spring must fulfill three conditions: first, it must have sufficient resistance and elasticity to support its maximum load without its shape being permanently altered; second, it must be stiff enough to take care of its heaviest work and at the same time be not too unyielding to slight inequalities of the road; and, third, it must decrease the resistance to rolling.

The first consideration in spring design is the steel composition. The ordinary spring steel lacks strength and elasticity and has not the resistance-to-fatigue characteristics of some of the comparatively recent alloy steels. Manganese, nickel, silicon, chromium, vanadium and high carbon steels are used to a greater or less extent, but the best results seem to be given by springs made of alloy steel compositions, such as chromium-vanadium, nickel chromium or silico-manganese. Of these the vanadium alloys are to be preferred. But no matter how good the steel primarily, the secret of the steel spring lies in the end in the heat treatment. A recent comparative table of the physical properties of vanadium and other crucible steels gives the following peculiar properties of vanadium steel. The different steels were oil tempered at 1,500 degrees Fahr. and drawn to 600 degrees Fahr.

	Tensile Strength Pounds per square inch	Elastic Limit Pounds per square inch
Carbon	126,300	101,100
Nickel Chromium	150,300	134,500
Nickel Chromium Vanadium	163,700	152,300
Chromium Vanadium	233,090	210,500

Vanadium steel is practically non-fatiguable and consequently does not become crystallized under the repeated shocks to which a spring is subject. According to one authority, William E. Snow, from one of whose articles the above table was taken, a crucible carbon steel spring was broken at 125,000 alternations of the testing machine, while the chromium vanadium steel spring withstood 5,000,000 alternations and remained unbroken.

In taking up the design of the spring as regards shape, number and thickness of leaves, etc., the use of existing formulas must be regarded as merely a basis for determining just what is required under the known fixed conditions. By experimentation alone can a spring be built most nearly approximating the ideal for its particular case. There are certain fundamental rules which must be followed in all cases, but no formulas can be depended upon to give the best results under the varying conditions of motor car use. A long spring is more limber than a short one. The narrower the spring the more limberness it has. Increase the number of leaves and the stiffness is increased. The more the angle of the spring curvature arc is decreased the stiffer the spring becomes.

In regard to the various types of springs in vogue at the present time, the following table was made up from statistics of recent pleasure car models:

Front springs		Rear spring	
Semi-eliptic	91 per cent.	Three-quarters-elliptic	58 per cent.
Full-elliptic	4 per cent.	Semi-elliptic	19 per cent.
Miscellaneous	5 per cent.	Full-elliptic	8 per cent.
		Three-quarter-platform	10 per cent.
		Miscellaneous	5 per cent.

In commercial car practice there is little uniformity, due probably to the relative recent development of this part of the industry.

Design for Streamline Runabout Body

Body for Edwards-Knight 25 Has Hood and Cowl in Continuous Line—Large Locker Space Provided

By George J. Mercer

A RUNABOUT body design possessing lines that suggest power and speed is shown in the accompanying scale drawings. The chassis to which the suggested design is applied is the Edwards-Knight 25-horsepower model, which has a four-cylinder motor with a bore and stroke of 4 by 5.5 inches, and worm drive. The wheelbase is 120 inches, and wire wheels, 36 by 4.5 inches with Q. D. rims, are fitted. The frame is of the double-drop type which permits the low body position in relation to the hood that is clearly brought out in the side view, Fig. 2.

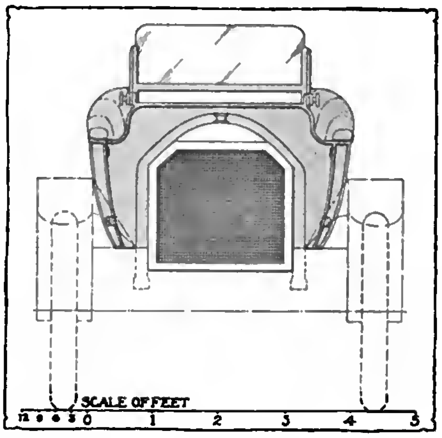


Fig. 1—Front view, showing low position and compact form of body design

It will be seen that the type of body shown adapts well to the chassis, producing a robust and harmonious appearance. The upward slope of the hood permits of the cowl being a continued straight line and the minimum of wind resistance is thus obtained. This effect is also enhanced by the slanted top of the radiator.

The application of wind-cutting surfaces is the keynote of body designing today. Every inch of flat surface eliminated from the front of the car means a considerable saving of power besides having the additional merit of improving the appearance.

The introduction of this feature in body design will be noticed in Fig. 2, and the same idea is carried out in connection with the sides, as shown in the plan, Fig. 3. Flat or obstructing surfaces are avoided by blending the sides of the body into the hood. The body lines are thus continuous in both sides and top, producing a smooth streamline effect.

The sizes of all doors are indicated in the drawings. At the front of the entrance doors there are two good-sized flutings on each side of the body for ventilating, in addition to which there is a ventilating device at the base of the windshield. This ventilator is in the form of a half circle of metal with the ends closed. The lower side is always open, while at the front, there is a door, running the entire length of the opening, that is hinged at the top and is operated by two wing nuts. This door can be opened to any extent desired, and the semi-circular shield serves to deflect the wind under the cowl and away from the faces of the occupants.

This windshield is a new feature used in conjunction with runabouts. The frame that holds the glass extends along the bottom and part way up the sides, the top edge being glass only and free from any obstruction to a clear vision. This windshield as a unit can be swung to any angle, or lowered to lay flat on the cowl. The frame that holds the glass is of wood and is strengthened considerably by the metal that forms the hinge. The ventilating device is integral with the windshield and moves with it.

A commodious locker compartment is provided at the rear. This locker space, the large size of which can be readily noticed by comparison with the pair of suit cases shown in dotted line in Fig. 2, is subdivided, and loading and unloading is by means of three hinged doors, one on the top and one on each side. These doors are made watertight by having copings projecting from the body .25 inch, over which the edges of the doors fit.

Provision is also made for carrying two spare wheels, the body being flattened off at a suitable angle to receive them. The panel on the body at this point is depressed to receive the pro-

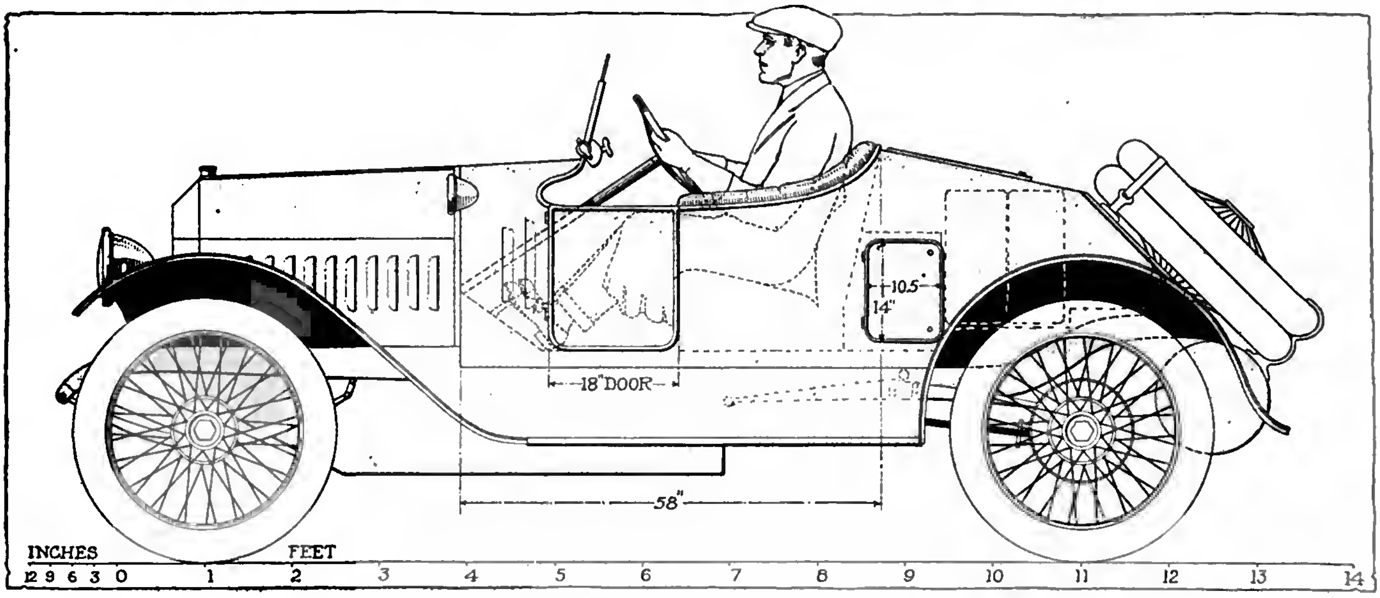


Fig. 2—Side elevation to scale of suggested runabout design adapted to chassis of Edwards-Knight 25

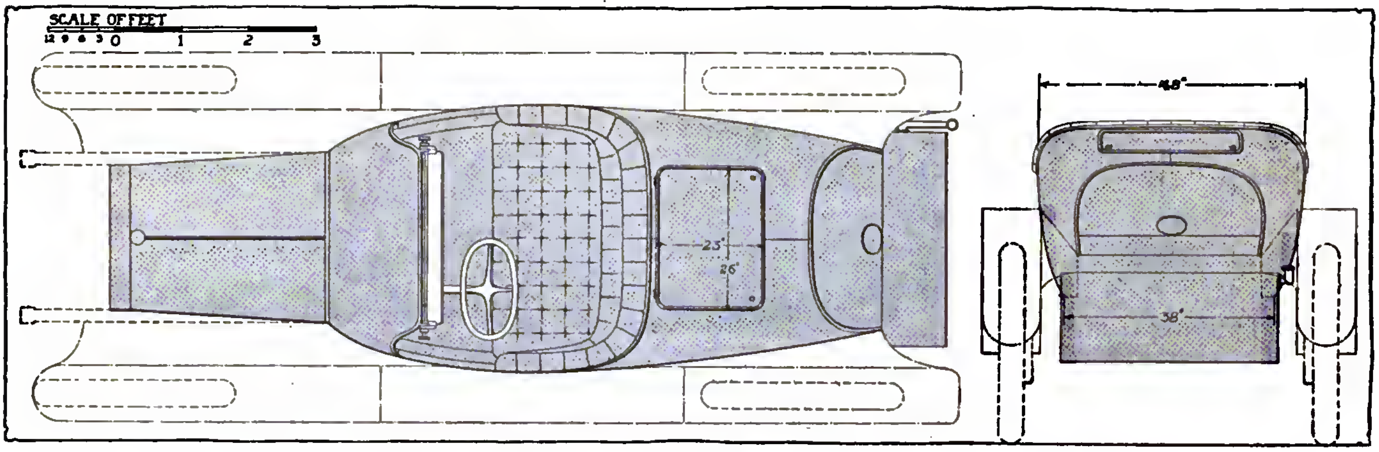


Fig. 3—Plan showing continuous streamlines of body exterior. Fig. 4—Rear view

jecting hub of the wheel. The fastenings are on the gasoline tank and on the body.

For the construction of this body wide sheets of metal are required. The cowl is one piece, forming the two sides and the top and from the dash to the front of the door. The narrow sheet under the door is separate, and is butted between the front and rear sheets. The rear sheet extends from the rear of the door to the back end of the chassis. It is cut off on line with the flat formed for carrying the spare wheels and is then continued up to midway of the top, where it joins the corresponding sheet from the opposite side. This joint is a carefully made butt and the two ends are flush riveted on the outside. On the under side is the customary reinforcing strip that crosses the joint and through which the rivets pass. This joint is not a very long one as the door or lid occupies the greater part of the distance from the seat line to the tire space. After riveting, the joint is carefully wiped with aluminum solder.

The size of the one sheet for the cowl is 74 inches by 18 inches, and for the two rear sheets 70 inches by 53 inches each. All are of aluminum 16 gauge. Aluminum is the most suitable metal for these sheets as considerable hand work is necessary and the extra cost of aluminum over steel is infinitesimal as compared with the added cost of working up steel for the purpose. On the flat sheet at the rear, however, 22 gauge steel can be used to advantage. The joint of this flat sheet with the side panels is covered with a moulding.

On the sides the small doors are cut out of the flat stock, and, as mentioned before, the door openings, both of the side and the top, are reinforced by copings that serve to shut off the entrance of water. The framing inside is of wood, with the necessary iron braces at the entrance doors and under the back end to support the spare wheels. The divisions in the luggage compartment will help in making the top rigid.

This body presents comfortable accommodation for two people, and in order to give a clearer impression of the body proportions relative to the passenger, the figure of a driver 6 feet tall is outlined in Fig. 2.

With regard to painting, although this body is odd in its outline, nothing of the loud in colors should be used. The best combination is the dark blue so much in evidence as the body color with black mouldings and fine hair line striping of lighter blue, together with black leather and black and nickel mountings.

The appointments on a car with this type of body are generally very simple, pockets on the doors being the only part of the trimming of any importance. The horn is placed under the hood and the electric side and headlights and the fenders are standard equipment.

English Limousine Designs Show Novel Features

TWO fine examples of body building, possessing several novel features in design, have just been completed by two well known English motor-carriage builders, Messrs. Mulliner, London, and The Regent Carriage Co., for the Vauxhall Motor Co., England. These are intended for exhibition at St. Petersburg.

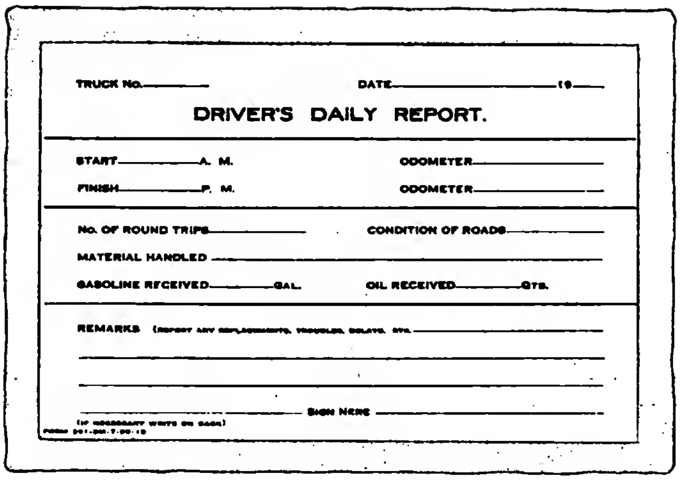
The Mulliner product is an inclosed front limousine with a V-shaped front, that is, the wind screen is in two flat planes extending from cowl to hood and meeting in a vertical cutting edge in the center. A reversed bow window divides the front and rear portions of the body. The glasses, which are frameless, are made to slide past each other, as in a circular fronted brougham, and conversation can be conveniently carried on by the friends in the interior. The window on the right of the driver is divided from top to bottom and slides, so that signals can be made to any overtaking traffic. Two occasional seats are fitted under the front seat, and draw out, lifting up into position against the division.

The upholstery is carried out in fine material of grayish-blue tone, harmonizing with the gray sycamore which is employed in the decoration and finish of the upper part and the roof.

The limousine which has been constructed by the Regent Carriage Co. has an interior treated in an entirely novel manner. The front is of the usual open type, with large and comfortable driver's and passenger's seat, and is finished in black leather, the ceiling being finished in dead white. The upholstery is in a pale-gray corded silk, with a faint relief, and is confined to the lower part of the carriage and the center oval of the roof. The oval type of the body is carried out in the arrangement of the interior. The panels of the doors, the front, and the roof take this shape, as well as the rear window and the outline of the flanking cabinets. These contain the usual accessories to be found in an enclosed car, a barometer forming the centerpiece of one panel and a clock that of the other.

The fine wood employed is harewood, relieved with a fine inlay, and the mouldings round the lights and windows are of a very elaborate character and beautifully and sharply finished. The space between the tops of the doors and the centerpiece is filled in with harewood inlay, very highly polished and finished. The centerpiece is a floral design in silk, of the same shade.

In the center there is a roof ventilator, and four electric lamps illuminate the interior. The windows, all of which, with the exception of the rear one, are made to drop, are balanced and held in place by bolt catches. In addition, sun blinds of stout celluloid, with ground faces, are fitted, so that the car can be used with comfort in the most tropical sunlight.—From *The Motor*, England, April 29.


TRUCK NO.______ DATE______19___

DRIVER'S DAILY REPORT.

START______A. M. ODOMETER______

FINISH______P. M. ODOMETER______

NO. OF ROUND TRIPS______ CONDITION OF ROADS______

MATERIAL HANDLED ______

GASOLINE RECEIVED______GAL. OIL RECEIVED______QTS.

REMARKS ______

SIGN HERE ______

Fig. 1—Driver's daily report card for Locomobile trucks

Locomobile Truck System

Devised for the Vehicle Users' Cost Keeping

ONE OF THE companies who are making intense efforts to increase the operating efficiency of their trucks used for commercial purposes is the Locomobile Co. of America, Bridgeport, Conn. This concern not only conducts an up-to-date service department in the heart of Manhattan, from where all trucks operating in the Metropolitan territory can be promptly served, but in addition has introduced an inspection system and has devised an elaborate cost-keeping system for users of Locomobile trucks. This system, in addition to the demonstrating and inspection report system of the company, is described below.

The user's cost-keeping system comprises eight blanks, the demonstrating system two and the inspection system one. Before taking up the various forms, it should be remembered that while drafted by the Locomobile company for average truck service, the forms do not meet and are not expected to meet each and every specific condition of truck operation; but they will form a good basis upon which truck operators in various lines of business can design their specific record forms.

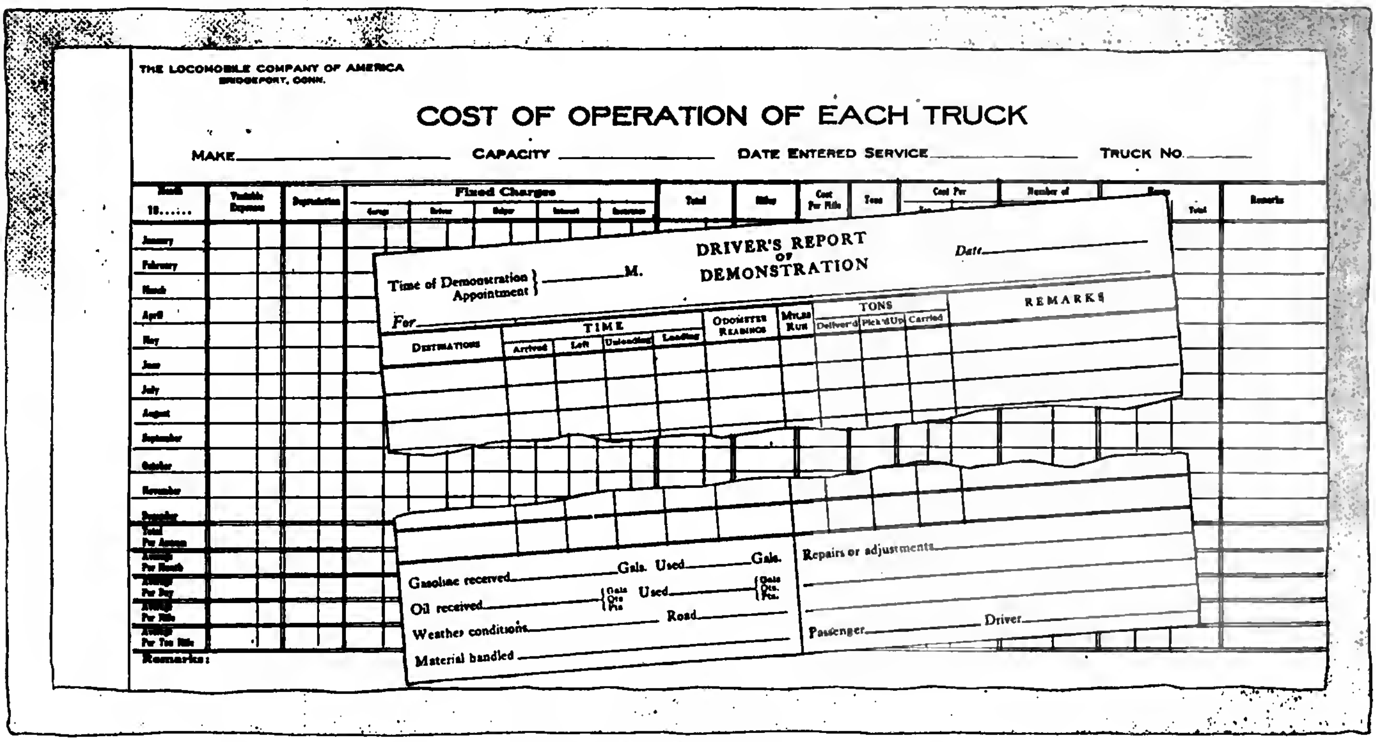
Following are the eight forms used in the cost-keeping system for the operator of commercial vehicles.

1—Driver's daily report card.
2—Daily truck cost report.
3—Monthly variable-expense sheet.
4—Twelve-months' truck-operation cost record.
5—Comparative record of cost of trucks.
6—Tire cost-record and history blank.
7—Repair tag, front and back side.
8—Stock card of repair parts room.

Taking up these forms in the order above, the first blank is

1. Driver's Daily Report Card—This card, Fig. 1, is 6 by 4 inches, printed on thin white cardboard, black, on one side only. The driver starts the form in the morning when starting from the garage, filling out the date, the time of starting and the odometer reading at that time, as well as the amount of gasoline received; likewise, the oil. He records, during the day, the number of round trips made and the nature of the material carried on the truck, and if there are any accidents, if he is forced to call on anyone's help or labor, if there arises the need of buying some material, he records this on the card. In the evening, when he brings the truck back into the garage for the night, he puts down the time of arrival and the odometer reading at that time. The information compiled by the driver is utilized in making up the second form, namely:

2. Daily Truck Cost Report—Fig. 6 shows a sample form of this kind, printed on letter-size paper so as to fit the typewriter. There are spaces on this blank for entering the daily items given under the headings of Fixed Charges and Variable Expenses. In addition to these, there are spaces for recording the time of start and finish, the odometer readings at these times, the number of round trips, the material hauled and the weight carried in tons; as well as the gasoline and oil received and eventual tire adjustments and their cost. Remarks appearing on the driver's report are transferred to this form. As it has been completed by an office clerk, it is forwarded to the transportation manager or delivery superintendent of the business who scrutinizes all the items and if anything is unusual follows it up. Thus, all waste and inefficiency is promptly discovered and may be remedied in short order, or at least recurrence avoided. Under remarks bonuses paid to the drivers for extra trips are recorded, a practice often used to enhance their efficiency.


THE LOCOMOBILE COMPANY OF AMERICA
BRIDGEPORT, CONN.

COST OF OPERATION OF EACH TRUCK

MAKE______ CAPACITY______ DATE ENTERED SERVICE______ TRUCK NO.______

Month 19...... | Variable Expenses | Depreciation | Fixed Charges | Total | Miles | Cost Per Mile | Tons | Cost Per | Number of | Total | Remarks

January, February, March, April, May, June, July, August, September, October, November, December, Total, Per Annum, Average Per Month, Average Per Day, Average Per Mile, Average Per Ton Mile

Remarks:

DRIVER'S REPORT OF DEMONSTRATION

Time of Demonstration / Appointment ______M. Date______

For______

Destinations | TIME: Arrived, Left, Unloading, Loading | Odometer Readings | Miles Run | TONS: Deliver'd, Pick'd Up, Carried | REMARKS

Gasoline received______Gals. Used______Gals.

Oil received______Gals. Qts. Pts. Used______Gals. Qts. Pts.

Weather conditions______ Road______

Material handled______

Repairs or adjustments______

Passenger______ Driver______

Fig. 2—Twelve months' truck-operation cost record. Fig. 3—Driver's report of demonstration

THE LOCOMOBILE COMPANY OF AMERICA
BRIDGEPORT, CONN.

VARIABLE EXPENSES OF EACH TRUCK

TRUCK NO.__________

MONTH__________

Date 19......	Gasoline	Oil	Grease	Supplies	Outside Repairs	Labor	Total	Miles	Cost Per Mile	Number: Trips	Days	Tons	Hours: Running	Standing	Total	Remarks
Total Per Month																
Avg. Per Day																
Avg. Per Mile																
Avg. Per Ton Mile																

Remarks:

Form [illegible]

THE LOCOMOBILE COMPANY OF AMERICA
BRIDGEPORT, CONN.

TOTAL COST OF OPERATION

MONTH__________19.

Make	No.	Variable Expenses	Fixed Charges	Total	Miles	Cost Per Mile	Tons	Cost Per: Ton	Ton Mile	Trips	Days in use	Hours: Running	Standing	Total	Remarks
Total															
Average Per Truck															
Average Per Day															
Average Per Mile															
Average Per Ton Mile															

Remarks:

Form [illegible]

Fig. 4—Monthly variable-expense sheet. Fig. 5—Comparative record of cost of trucks

3. **Monthly Variable Expense Sheet**—On every day of the month the variable expenses are not only given on the report, Fig. 2, but they are also recorded on the ledger blank, Fig. 4. This latter is 14 by 8.5 inches, ruled red and printed black on white paper. The prices paid on that day for gasoline, oil, grease, supplies, repairs done outside of the company's shop, repair work done in the shop and their total are given; likewise, the number of miles traveled during the day and the variable cost per mile for the day. The number of trips and the tons carried, as well as running, standing and total-operating hours for the day are also recorded. At the end of the month it is easy to strike averages.

4. **Twelve-Months' Truck-Operation Cost Record**—In addition to the monthly variable-expense sheet a 12-month record form is kept for every truck in use by the company. The form, Fig. 2, is of exactly the same size and of similar design as the previous form. The monthly totals of variable expenditure are put down on this form, only the depreciation is recorded by itself on account of the importance of this item, it being a means of gauging the extent to which the truck itself, or its life, is consumed by service. The fixed charges are also given by monthly total, and then all these various items are added, giving the monthly grand total expense. To afford ready balance with the work done by the truck for this work, the miles traveled, tons carried and cost per mile, ton and ton-mile are given; so are the working days of the month and the number of trips made, the hours spent in service, running and standing. Then average values for the year, every month of the year, every day of the month, every mile and every ton-mile are calculated.

5. **Comparative Record of Cost of Trucks**—This sheet, Fig. 5, may be used to compare the operating costs of trucks during

John Smith Company
New York City

Daily Truck Report - Truck No. 12

Investment—$6,000

Driver Wm. Barnes Date March 14, 12

FIXED CHARGES

Driver	$	3.00
Garage		1.00
Insurance		.63
Interest		.42

VARIABLE EXPENSES

Depreciation	$	2.20
Tires		3.40
Repairs (regular)		
Repairs (accident)		
Gasoline (10 gallons)		2.30
Oil		.30
General		1.40
	$	14.45

MEMORANDUM

Start 8.15 a.m. Odometer 2,590
Finish 5.45 p. m. Odometer 2,640
No. Round Trips 5 Road Cond. Fair
Material Cement
Gasoline Received 10 gallons Oil rec'd [illegible]
Mileage 50 Tonnage 25
Tire Adjustments......Date 3/14/1912 Cost $125.00
Remarks (Delay, trouble, etc.)

Signed__________
Transportation Manager

Fig. 6—Daily truck cost report, filled out on the basis supplied by the information given on the driver's daily report and the calculations of all other expenses, as well as the work done by the truck

THE LOCOMOBILE COMPANY OF AMERICA

Truck No. ________ **Truck Inspection Report** Date ________ Time ________

________ Inspector

	AS FOUND	RECOMMENDATIONS
Body		
Brakes		
Carburetor		
Chains		
Chain Cases		
Circulation		
Clutch		
Driving		
General Care		
Ignition		
Lamps & Horn		
Lubrication		
Mileage		
Motor		
Springs		
Steering Gear		
Tires		
Transmission		
Wheels		
Miscellaneous		

Fig. 7—Truck Inspection report of Locomobile Co. of America used by its inspectors and from which the letter to the truck owner on condition and needs of the vehicle is prepared

any given period, be it a month, half year or a year. The purpose of this form is to obtain exact information as to the operating values of the several trucks used by the company, which are perhaps of different makes. Thus, there is a space for the make and number of each truck, the variable expense total for the period, the fixed charge total and the grand total, as well as all the other items appearing on the two preceding forms and at the foot of the page are spaces for calculating the averages of each item for the period, on the bases of days, trucks, miles and ton-miles traveled.

6. **Tire Cost-Record and History Blank**—This form, Fig. 9, is designed in the same style as Figs. 2, 4 and 5. One form is used for each wheel of every truck, or rather, for each tire. The make of the truck and its capacity, the number and size of the wheel are noted on the top of the sheet. In the ruled section, the make of the tire used on the wheel, its manufacturer's number, the date of installation and demounting and the mileage got out of it are noted. The cost or price of the tire paid when it was bought is also recorded. In case of an adjustment, if a new tire is obtained from the tire maker on additional payment, the order number, tire number, etc., are recorded. When the new tire is worn out, the mileage is also noted, as is the cost, and by adding costs and mileages for both tires an average cost per mile for the tire is obtained.

7. **Repair Tag**—The truck purchasers are also given repair tags so as to keep track of the cost of repairs and materials and labor used for them. The tag is, of course, needed only where a regular truck fleet is used and a consequently large repair shop and stock of repair parts is maintained. Fig. 10 shows the front side of the tag and Fig. 11 the back side. When a driver brings in his truck in the evening and finds that it is necessary to do any repair or overhaul work, he fills out the front side of the tag. The reverse side is used for a statement of how the instructions given on the front were carried out, together with the cost of the job. The repair work being done, the card is sent to the office the same day, so that on the following morning, when the cost reports for the day past are made out, the cost of the job is included in the expense charged to the specific truck.

8. **Stock Card of Repair Parts Room**—A suitable card designed by the Locomobile company for repair-parts rooms bin and card-files is shown in Fig. 12. This card is 6 by 4 inches, ruled red and blue and printed black. Whenever new material is taken into stock it is entered on the card and outgoing parts are checked off, both on the bin card and file card, which two must always correspond and are balanced at regular periods.

The system used for keeping record of truck demonstrations is also very simple, but fully sufficient to note all important and interesting data. Two forms are used for this purpose by the company.

Fig. 3 is filled out by the driver of the demonstrating truck at

Locomobile Company of America

Date ________

Report of Demonstration

Made for ________

Time of Demonstration / Appointment ________ M.

DESTINATIONS	TIME: Arrived	TIME: Left	Elapsed: Unloading	Elapsed: Loading	Elapsed: Standing	Elapsed: Running	Miles Run	TONS: Deliver'd	TONS: Pick'd Up	TONS: Carried	REMARKS
Total Stops ________	Elapsed Time ________	Total	Total	Total	Total	Total	Total	Total	Total	General Remarks:

Material handled ________ Weather Conditions ________

Results: Road Conditions ________

Total time elapsed ________ Average between stops ________ miles

Time loading ________ Unloading ________ Gasoline used ________ gallons

Time standing ________ Running ________ Lubricating oil used ________ quarts / pints

Total miles ________ Miles per gallon gasoline ________

Average miles per hour ________ Cost of supplies ________

Number of stops ________ Driver ________

Total tons carried ________ Passenger ________

Repairs or adjustments ________

Salesman Demonstrating ________

Fig. 8—Office file copy of demonstration report

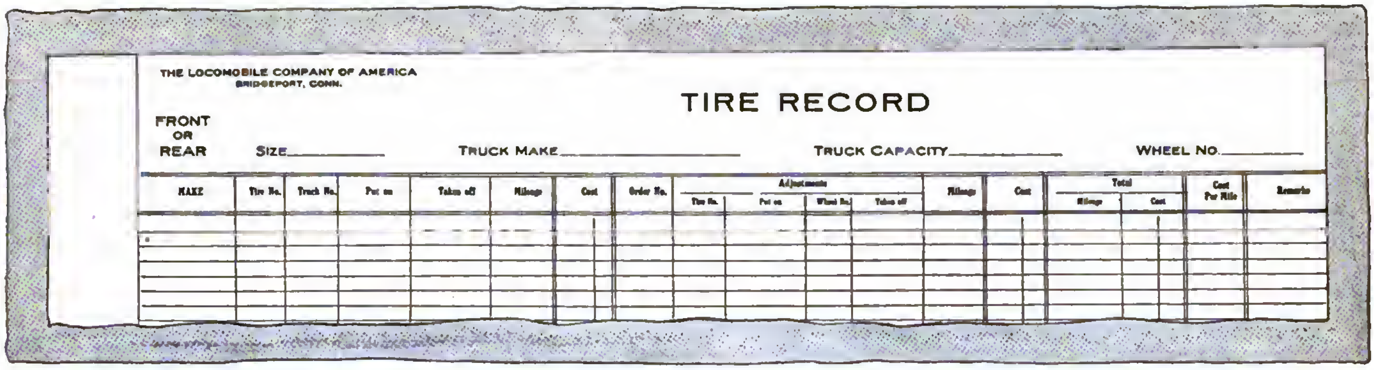


Fig. 9—Tire cost record and history blank

the occasion of every demonstration made. It is 8 by 6 inches, printed on rather stiff tan paper and ruled black. The driver fills out the date, the hour of the demonstration appointment and the name of the company for whom the demonstration is arranged. Then he begins to use the space lined for tabulated work, as he takes up the actual demonstrating work. He fills in the first column with the destination of the first trip, the time of arrival at the point of destination, the time of leaving, and the time spend in unloading and loading. At each place the odometer reading is taken and the length of the way from the previous stop calculated. Likewise the loads are reported. At the end of the day the miles traveled, the loads carried, the time spent in waiting, loading and unloading are totaled. Gasoline and oil received and used during the day are also recorded, as are the weather, the kind and conditions of the road traveled, the material handled, and repairs made during the day. The driver and a representative of the prospective customer sign the card, which is delivered to the office of the Locomobile company when the truck returns to the garage.

In order, however, to have a clean, accessible record on hand in the office at all times, not only are all driver's demonstrating reports kept in a file for just these cards, but a copy is made of every report as a card is brought in by a driver. For this copy, a blank, Fig. 8, is used, which is printed black on a sheet of white paper, 15 by 11 inches. This form is filled in on the typewriter to give a clean, legible statement.

The inspection report, Fig. 7, is filled out by the Locomobile company's inspectors whenever a truck is looked over. Once a month this is done, and the company sends its inspectors out to meet the trucks at their own garages or on the road, where it is more suitable. The inspector, upon reaching the truck, looks over the motor, running gear and all other parts of the car and makes notes of which parts are in good condition and which are requiring attention. This report form is dated and signed.

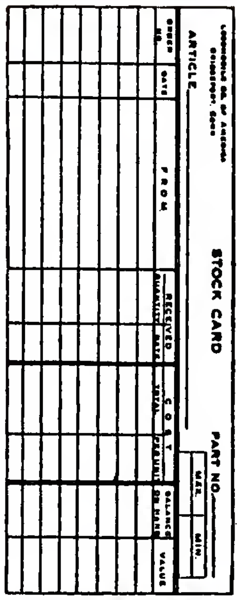


Fig. 12—Stock card

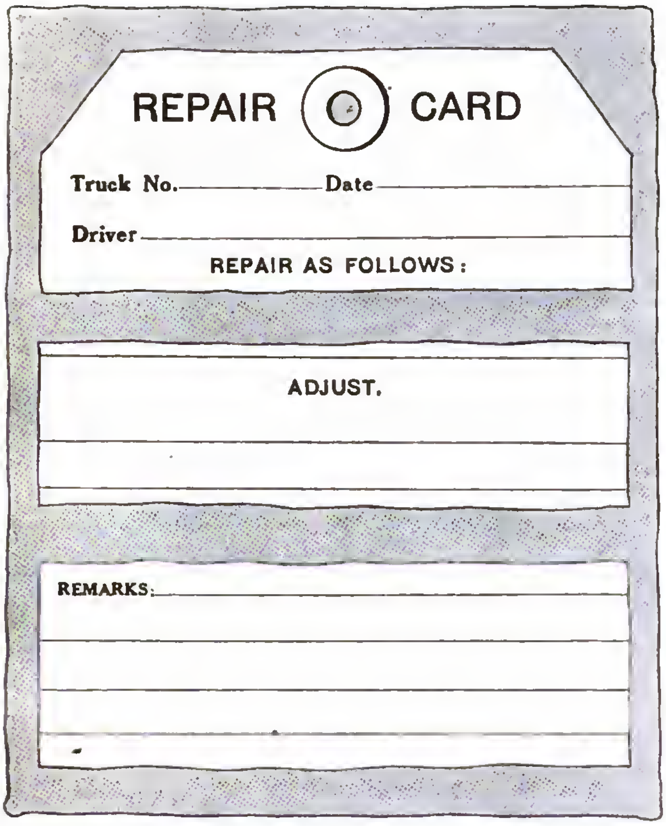


Fig. 10—Front side of repair tag

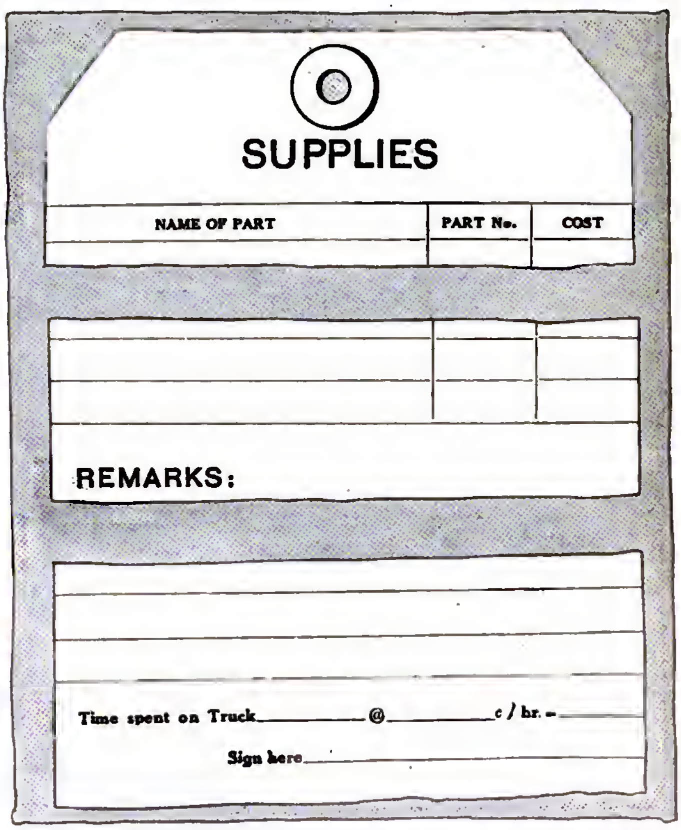
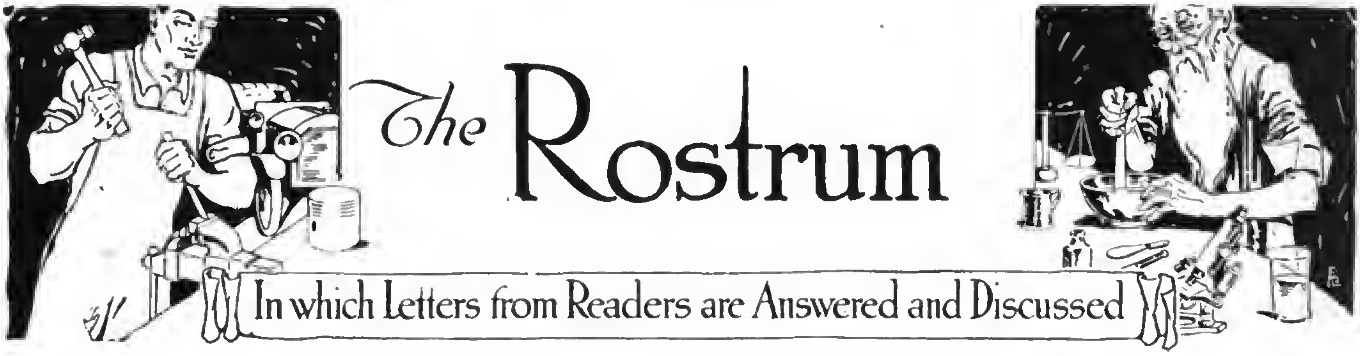


Fig. 11—Back side of repair tag



Dirty Carbureter Causes Trouble—Mysterious Ignition Trouble—Buying Slipcovers Out of Town—Horsepower of Late Sixes—Electric Gearshift Provokes Interest—Likes Rear Axle Gearbox—Defining A. L. A. M. Plug

Trouble Caused by Dirty Carbureter

EDITOR THE AUTOMOBILE:—I have a model 10 Buick, 1909, in first-class condition, equipped with model L Schebler carbureter, Remy magneto, Mosler spitfire breach block plug and is well timed. When running the car idle it will throttle down and will speed up without missing with spark retarded and when spark is advanced half way, but will miss when spark is fully advanced and throttle opened all the way. When running on high gear, the car will run 25 miles an hour without missing with the spark fully advanced but will miss after that speed. If spark is retarded half way the car will run 30 to 40 miles an hour without missing. The car has been running like this for the last 2 years. Engine never knocks, will pull until dead without knocking and will run perfect at 6 miles an hour. Magneto was overhauled by factory last year and new wiring installed on the car; the valves are ground every 3 months; I keep the points cleaned on the timer. The platinum point is not burned on the timer and makes a contact.

Mt. Vernon, Ind. J. ROSENBAUM.

—Your trouble is one of carbureter adjustment, or it might be that the gasoline line is not clean and you may be reasonably sure the latter is the case if you have not cleaned it out during the past 2 years, during which time the trouble has existed. It would be advisable to take the carbureter off, remove the float chamber and clean it out. If you have a screen in your gasoline line, take that out and clean it also. If this fails to give results try a different air adjustment on the carbureter. Should the miss still continue after you have done everything in your power in this direction, consult the Schebler company as to the correct size carbureter to use on your car. It may be that through some error you have a carbureter which is too small.

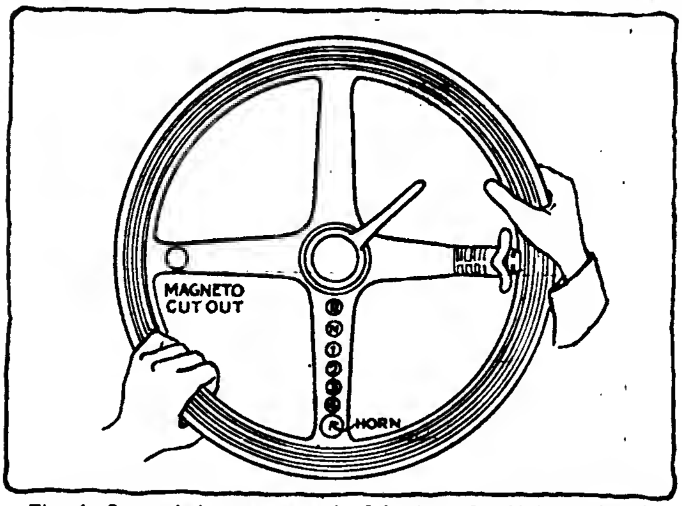


Fig. 1—Suggested arrangement of buttons for Vulcan electric gearshift

Difficulty with a New Coil

Editor THE AUTOMOBILE:—We would like to relate a little experience we had today and ask you what the trouble was. An E. M. F. car of about the year 1909 or 1910 came to have us put on a new Splitdorf non-vibrating coil in place of one of same make that came on the car. We put it on and connected it just as the old one was (by-the-way, the car was running fairly well on either battery or magneto when it came in), and never could get a spark from the magneto, but it ran as well as ever on the battery. As the customer was in a hurry and was afraid of his battery, we put back the old coil and the car went off just as it came in. Now, why wouldn't it run on the magneto the same with either coil? Was the trouble in the new coil? We took it out of the express office for him and think it was direct from the agency.

Bosworth, Mo. BOSWORTH GARAGE.

—The trouble could have been due to either one of two things. First, the wiring may have been incorrect and second there may have been a break down somewhere in the coil. In the first case the probable mistake in wiring would be the connection of the A post on the magneto, the armature, to the ground instead of to the A post on the coil would cause it to run properly on the batteries but not on the magneto. Secondly a breakdown in the switch box of the coil could cause the same thing.

Wants Cloth Slipcover on Overland

Editor THE AUTOMOBILE:—1—Which is correct, carburetor or carbureter?

2—What firms make seat and back cloth covers for Overland 69-T cars? About what is the cost?

3—Can the S. G. V. Vulcan electric gearshift be applied to an Overland 69T, equipped with the U. S. L. lighting and starting apparatus?

4—Would you advise connecting the auxiliary air opening on Schebler carbureter to exhaust pipe in order to get hot air, the fixed air opening being already so connected?

Inman, S. C. C. G. F.

—1—Both methods of spelling are correct.

2—Practically every automobile paint shop in the country has arrangements with some upholsterer where this work can be done. The cost will vary according to the quality of the goods used in the cover. Mohair makes an excellent material for this and you can have a set made up by the Gotham Auto Top Co., of New York City for $45. This concern handles the Overland work and can make the covers from the standard dimensions and ship them to you.

3—The gearshift is made by the Vulcan Electric Devices Co., of Philadelphia, Pa. This company could no doubt fit the device to your car but it would mean that the entire gearset would have to be rebuilt.

4—This would not be a bad idea and would probably give a little higher efficiency in cold weather. In warm weather the difference would not be noticeable.

Horsepower of Late Sixes

Editor THE AUTOMOBILE:—1—What is the mean brake horsepower of the 1914 big six American, 1913 big four Apperson, 1913 big six Knox and 1913 big six Mitchell?

2—Do the Apperson and National companies make six cylinders? If so, what are the dimensions?

3—What is a good weight for a six- or seven-passenger touring car of about 48 to 50 horsepower, A. L. A. M. rating for touring?

Lakewood, O. C. S.

—1—The 1914 big six American develops 65.4 horsepower at 1,000 revolutions per minute; the Apperson develops about 40; the Knox 60 and the Mitchell about 50 at 1,000 revolutions per minute.

2—Neither Apperson or National have a 1913 six-cylinder car.

3—The car should weigh, with the body, within 500 pounds either side of 4,000 pounds. The average is about 4,000 pounds.

Operating Electric Gearshift

Editor THE AUTOMOBILE:—Kindly explain the principle of the S. G. V. electric gearshift. Is it possible to effect a change by pressing number two some time before releasing clutch and have gears shift when clutch is thrown out? That is, if running on third speed and wishing to change to second you press number two before you change. Would the gears shift into second when clutch is thrown out after the button had been pressed when ready to change even after a considerable interval?

Worcester, Mass. J. GLASS.

—The electric gearshift used on the S. G. V. car which was described in a recent issue of THE AUTOMOBILE is operated by a system of solenoid coils which pull the gears into position with a force of 300 pounds. It is impossible to pull two gears into position at the same time on account of the interlocking buttons which are so arranged that only one can be down at a time. If two buttons are pressed at the same time, but one will go down, or if one button is pressed while another is down the latter will jump up. You may press down a button any length of time you desire before changing to the speed corresponding to that button. If you press down No. 2 while you are running in third gear the gears will shift when you press down your clutch regardless if the time elapsing was a week or 2 minutes. If you change your mind as regards the gear you intend to shift to it is only necessary to press down another button and the one which is already in position will come up.

Arrangement of Shifter Buttons

Editor THE AUTOMOBILE:—I am sending a suggestion, Fig. 1, for a better arrangement of the buttons on the steering wheel of the S. G. V. The correct position of the hands when driving makes it more convenient for the driver to reach the buttons than in the arrangement used by the S. G. V. company

Mokelumne Hill, Cal. CLIFFORD H. MEAD.

—The arrangement of the gear shifter buttons on the demonstrator model of the S. G. V. car is shown in Fig. 2. This arrangement is used on the first few cars that were equipped with the electric gearshift. The regular arrangement will be that shown in THE AUTOMOBILE for April 3, page 778.

Likes Rear Axle Gearbox Best

Editor THE AUTOMOBILE:—I am in favor of a gearbox mounted on rear axle as close to differential as possible. From the scientific side, the universal joint and propeller shaft have only the strain delivered direct from engine and not multiplied or stepped up, through the gear ratios in the transmission. Another advantage, the transmission is away from any underpan and any noise in same is not as perceptible as when mounted on motor as a unit. Transmission on motor as a unit makes an easier assembling proposition in building up chassis, but fastens more or less noise direct on motor, and gear noise is very apt to be telephoned to different parts of motor, especially where fly-

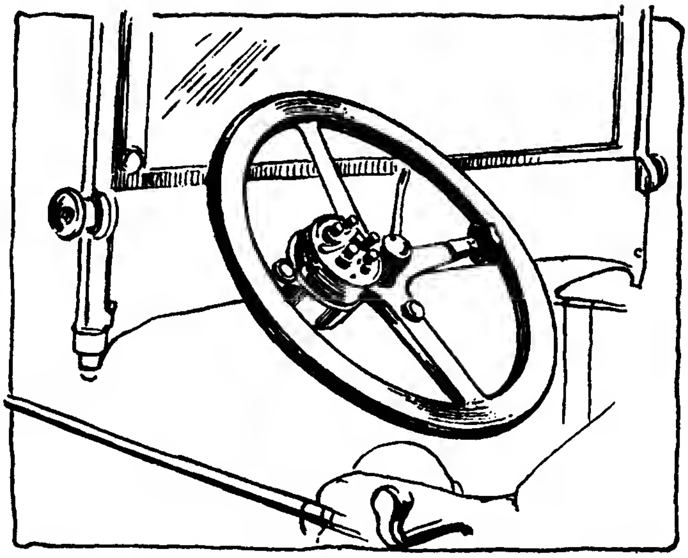


Fig. 2—Arrangement of buttons for Vulcan gearshift on S. G. V. demonstrator

wheel is incased. If forced to have a unit with motor, would prefer to arch around, and leave flywheel open with universal joint between transmission and flywheel. Transmission amidship is good construction but a little harder to assemble and line up, but has some good advantage also.

Connersville, Ind. E. M.

Dimensions of A.L.A.M. Thread

Editor THE AUTOMOBILE:—1—What is the difference between the A. L. A. M. standard, half inch, and the metric spark-plug threads?

2—Where is the safety spark gap on the Ford ignition system?

3—Did the Ford Motor Car Co. ever use a brush in its timer instead of a rolling contact?

4—On a 22.5 horsepower A. L. A. M. rating, could the horsepower be increased as in the Ford model 7, by putting on a larger flywheel, leaving the magneto out?

Nora, Neb. A MOTORIST.

—1—The .5-inch spark-plug employs the regular .5-inch gaspipe thread, which is a taper thread. The old A. L. A. M is a .875-inch straight thread with a gasket top There is a .0625-inch allowance for the gasket at the top of the plug above the thread. The metric thread, which is used to a large extent in foreign cars, is 18 millimeters or .7087 inches in diameter and has a pitch of 1.5 millimeters or .059 inch. The A. L. A. M. has now passed out of existence and the .875-inch straight-thread plug has been adopted as the S. A. E. standard. The plugs now in most general use in this country are the .5-inch gaspipe and the S. A. E. standard, but the latter is being gradually adopted as the preferred type.

2—There is none.

3—No.

4—The horsepower developed by the motor would not be increased but the magneto would not be there to absorb the power necessary to create the electric energy to form a spark. This would give a slightly greater output to the road wheels if you cared to run on batteries. This would be a very foolish move, however, as is no doubt self-evident. The power absorbed is so small as to be unnoticeable and the batteries should only be used in starting or for emergency equipment.

Knocks While Running Idle

Editor THE AUTOMOBILE:—I have a Ford car which I had overhauled last winter. The repairman tightened up all bearings. After running a while the motor developed a knock when running idle. It does not knock when running fast. What do you think causes this knock?

Jacksonville, Ill. J. A. HASP.

—There is a possibility that the spark is too far advanced and

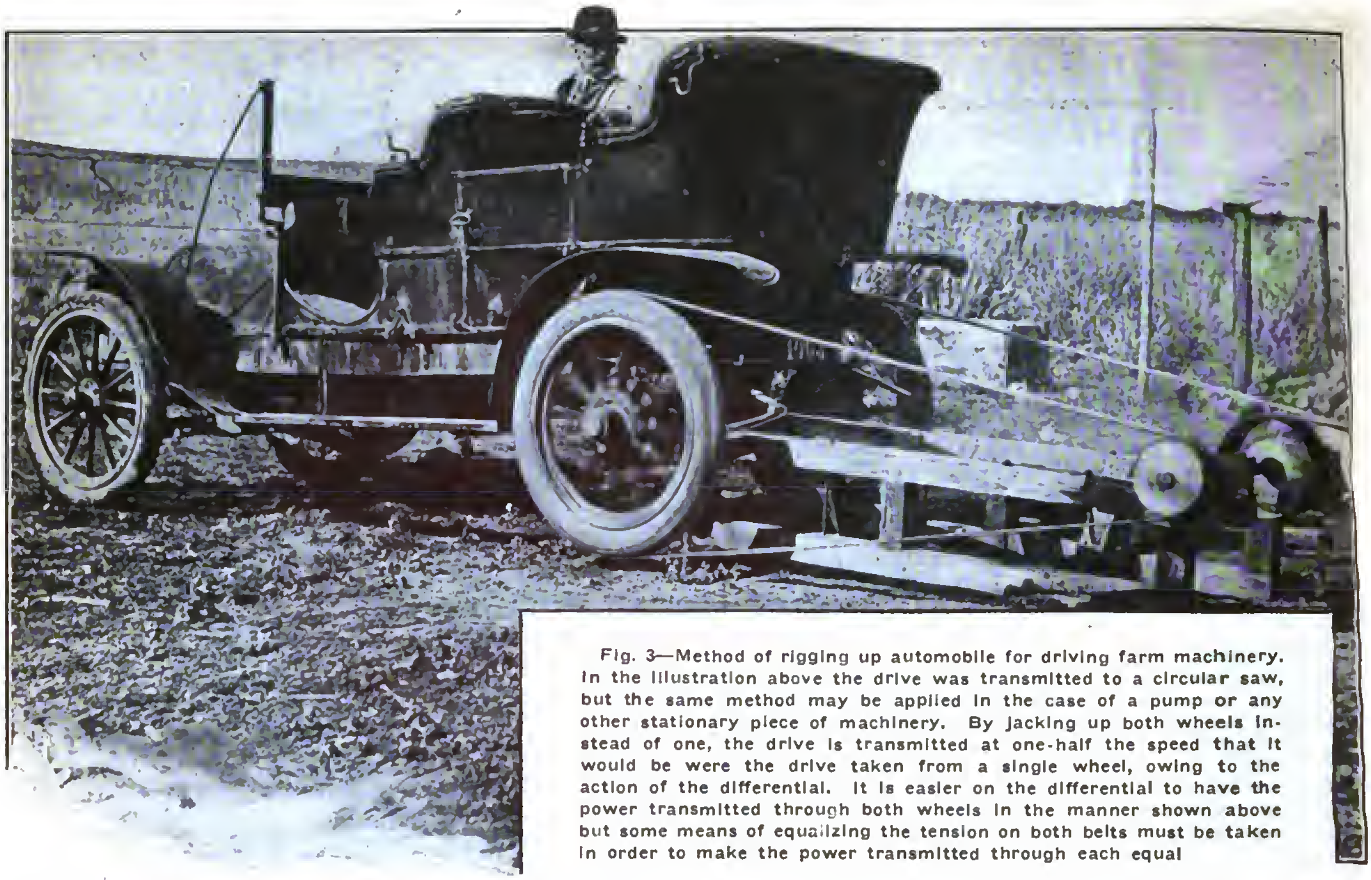


Fig. 3—Method of rigging up automobile for driving farm machinery. In the illustration above the drive was transmitted to a circular saw, but the same method may be applied in the case of a pump or any other stationary piece of machinery. By jacking up both wheels instead of one, the drive is transmitted at one-half the speed that it would be were the drive taken from a single wheel, owing to the action of the differential. It is easier on the differential to have the power transmitted through both wheels in the manner shown above but some means of equalizing the tension on both belts must be taken in order to make the power transmitted through each equal

that you do not get sufficient retard for idling. When the motor is idling the spark should occur very late or the knock is bound to occur. There are many other possible causes for the knock besides the faulty ignition timing outlined above. The trouble might arise from a piston slap, a loose connecting-rod bearing, a loose main bearing, a short circuit, a carbon point or many other causes which may be of an indirect nature and which would never be suspected.

Wants to Change Bendix Drive

Editor The Automobile:—I have a Bendix car of the vintage of 1908 which can still give good service on bad roads but is noisy and needs frequent attention in its transmission box. I desire to change it from a double disk to a single disk drive, connecting the one disk direct to the engine. To make this change it will be necessary to have but one jackshaft, which must have a differential. The method of sliding the one disk to engage or disengage the power must also be altered. The shift can readily be placed on the other side. Your assistance is desired in giving me the name of some maker of jackshaft differentials and devising some way to slide the disk on its shaft. The car weighs 2,350 pounds, hence a differential like that used in the Metz car is too light to stand the work. Plan view of the Bendix chassis is herewith inclosed.

Fulda, Minn. H. Emil King.

—The best course for you to pursue would be to purchase an entire transmission unit from one of the concerns specializing in this kind of work. To attempt to design a new friction set and then to have it made up specially for your car would be an expensive undertaking and would not be justified. The nearest large concern to you which specializes in this kind of work is A. O. Smith Co., Milwaukee, Wis.

Carbon Deposits Due to Gasoline

Editor The Automobile:—I see so many of the oil companies advertise that they have an oil that does not cause carbon and this has led me to believe that there must be other causes for the carbon annoyance to which we are all submitted. Could the Rostrum give some information on this?

2—Does poor scavenging affect some of our modern automobile motors?

New York City. Reader.

—1—Carbon accumulations are frequently due to gasoline. In the past there has been so much talk about the cracking of the lubricating oil and the formation of a deposit of carbon out of the same, that automobilists generally labor under the false impression that the excesses of carbon, of which they so justly complain, are entirely due to the use of poor oil, or the flooding of the cylinders with the same. It is highly improbable that a pure hydro-carbon lubricating oil will deposit carbon in the combustion chamber space in sufficient quantity to give any trouble at all. If the lubricating oil is adulterated with resinous oil there may be some cause for complaint. Automobile gasoline is at the bottom of a large percentage of the carbon trouble. it being the case that this type of gasoline volatilizes but slowly at best, and, unfortunately, it is a fault of carbureters in general to deliver an excess of gasoline at the higher range of speed if the amount of the gasoline is in the right proportion at the low speed. For the purpose of illustrating the lack of volatility of automobile gasoline all that is necessary is to take a blow-torch, fill it with automobile gasoline, light the torch in the regular way and set it down in front of a plate at a distance of four or five feet from the same, and then by turning on the gasoline so that it squirts out with considerable pressure it will be found that the more volatile fractions of the liquid will burn, and the less volatile parts will strike the plate and fall down to the ground without burning at all. If this less volatile product is collected in a pan until there is a considerable amount of it, and it is then allowed to cool off, as a further proof of its non-volatile properties a piece of newspaper may be set on fire and thrown into this pan of liquid, only to find that it will quench the flame. The non-volatile part of the average automobile gasoline mixture is not far from 50 per cent. of the whole content.

2—Incomplete scavenging is at the bottom of some of the poor performance of motors. The time available for the removal of the products of combustion after the power stroke in the motor is too short to permit of complete scavenging in any case. How to realize the best possible condition of scavenging is the remaining problem. In view of the fact that the piston does not sweep the whole space, some of the mixture, after it is burned, must depart under the force of its terminal pressure. After the terminal pressure dies out the part of the gas that is usually left behind is that which accounts for the bad scavenging relation complained of. It has been found in practice that the scavenging condition may be improved by using a small-diameter pipe between the transfer port on the exhaust side of each cylinder of the motor, and a receiver. In this plan, owing to the small diameter of the connecting pipe, the speed of the departing exhaust product is accelerated, and the exhausting "fluid' is compacted, and not unlike the performance of a "comet," the gas molecules persist in accompanying each other on the journey, and the tail of the gas body (comet) follows the head, and in this way the rarefied gas in the combustion chamber at the tail end of the exhausting period follows in the train of the departing "fluid," thus more or less completely scavenging the space. It has been found under certain well defined conditions that a vacuum will reside in the cylinder after the exhaust leaves, which vacuum very readily fills with the incoming mixture, and the performance of the motor from the power and thermal efficiency point of view is thereby much enhanced.

Taking Power from Rear Wheels

Editor THE AUTOMOBILE:—In THE AUTOMOBILE for April 3, page 748, I see a cut of a motor truck with one rear wheel jacked up, belted and running a pump. Does it injure the differential to jack up one wheel and use it for power purposes in this way? Do you know of any better way of utilizing a car for running a pump, or any work requiring stationary power? I want to use my car for power purposes occasionally and would like to know the best way to connect it.

Wasta, South Dakota. A. MATHIAS.

—In using either a passenger car or a truck for stationary power plant purposes it is best to take the power from both wheels as shown in Figs. 3 and 4 rather than by jacking up one wheel. If the car is to be used only occasionally for this purpose jacking up a single wheel would be satisfactory and would not be detrimental in any way to the car, but it would be better where the car is to be used very often for this purpose to erect a small plant like that shown in the illustration. The differential gearing is not put to so severe a strain as it is where only one wheel is used, and besides that the speed is kept down to one-half that which it would be where one wheel is used. The action of the differential is such that it doubles the speed when one wheel is held stationary and the other is free to turn. The accompanying illustrations show the car rigged up to run a sawmill, but the principle is the same when applied to the pump. A truck has recently been brought out which includes an attachment by means of which it serves the purpose of a stationary power plant. This is known as the Service truck and is illustrated in Fig. 5. The pulley seen on the rear end of this truck is driven by independent friction drive device which can be thrown in and out at will.

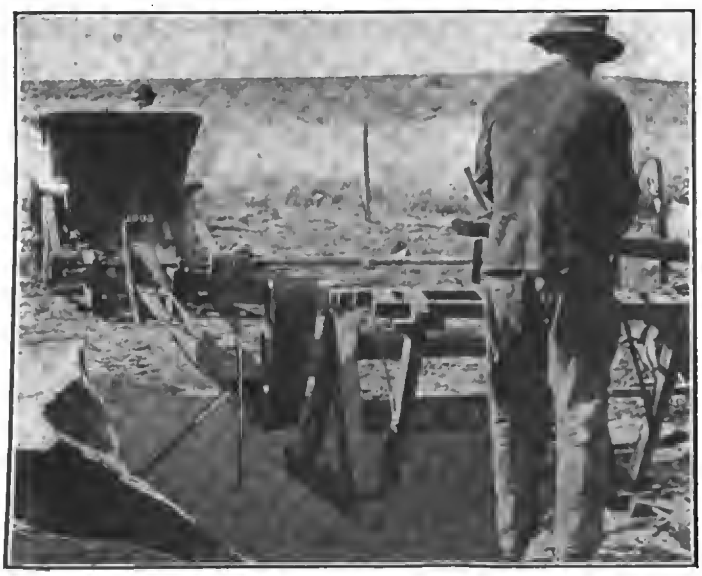
Duryea for the Light Vehicle

Editor THE AUTOMOBILE:—The remarks of Mr. Bourgette on page 906 of THE AUTOMOBILE for April 24, that "There is nothing so fraught with danger to the automobilist as the skid," states concisely a great truth, and Mr. B.'s suggestion as to how to remedy a skid is valuable, provided there is room to put it into effect; but the man who is already on a narrow road dare not turn into the ditch when his rear wheels begin to skid off the road. The cure would be just as disastrous as the disease. It seems to me much wiser to select a construction which minimizes skidding. Every mechanic knows that once the standing friction is destroyed, one part will move upon another easily in practically any direction. A sudden application of power of the brake, or sudden change of direction destroys the hold of the wheels on the road, and the skid begins. What is wanted is some provision which prevents this beginning. My experience, proven by many years of construction, is that heavily-loaded drivers with lightly-loaded front wheels seldom skid. The reason is that the weight on the drivers hold them in contact with the ground, and there is little likelihood that a sudden application of power, or the brake, will start them slipping, because the front of the vehicle is so light that no great effort is required to overcome this inertia. How long will it be before the automobile-using public realizes the many advantages of carrying the load on the propeller and braking wheels? The locomotive builder learned this fact years ago. The cycle rider knows the advantage of a lightly-loaded front, but the automobile buyer refuses to profit by their experience, and continues to use vehicles which are both expensive and dangerous, not only to himself, but to others.

Saginaw, Mich. CHARLES E. DURYEA.

Please Sign Your Inquiries

The Editor of this department is in receipt of several letters which bear no other signature than the sender's initials or some such word as "Reader" or "Subscriber." While the sender's name will not be published if he desires that it be witheld, the signature must accompany the letter. In cases where a quick answer by mail is desired to inquiries, a stamped and self-addressed envelope should accompany the letter.



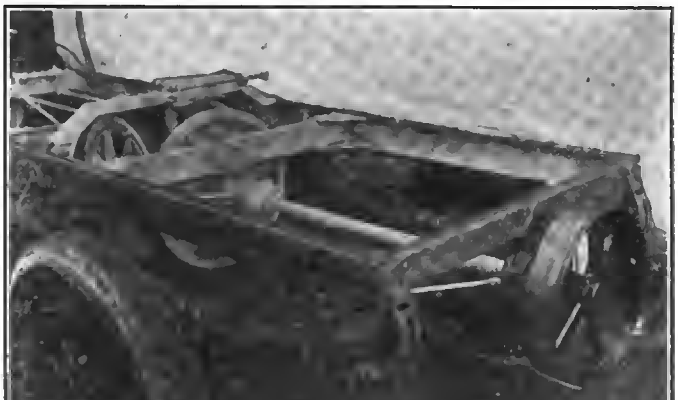


Fig. 4—This shows the method of driving the saw from a central wheel between the two pulleys, through which the power is transmitted through belts from the road wheels

Fig. 5—This truck has a friction drive pulley wheel mounted independently of the road wheels. This permits stationary operations to be performed without jacking the wheels

Showing the contestants at the finish of the parade down Pennsylvania avenue, Washington, D. C.

Vulcan Wins Washington Contest

(*Continued from page* 1011)

No. 5 Wilcox, gross load, 6,260 pounds, U. S. demountable, fronts 36 by 3.5, rears 36 by 4. "Right rear blew out or burst about 7 miles before reaching Hagerstown, noon stop on first day's run. Was replaced following morning in 24 minutes by driver. Second right rear slightly cut."

No. 8 Rowe, gross load, 11,435 pounds, Goodyear side flange demountable, fronts 36 by 5, rears 36 by 3.5, block duals. "Front tires in good shape; rears badly cut and broken."

No. 9 Hupmobile, gross load, 3,120 pounds, Goodyear pneumatic plain tread in front, non-skid tread rear, fronts 35 by 4, rears 35 by 4. "Had one puncture in front and put on Goodrich. One puncture in rear and put on Goodrich."

No. 10 McIntyre gross load, 7,575 pounds, Swinehart side flange in front and Swinehart duals rear, fronts 34 by 3.5, rears 36 by 3 duals. "A few miniature cuts."

No. 11 Autocar, gross load, 7,125 pounds, Swinehart side flange in front and Swinehart cellular in rear, fronts 36 by 4, rears 36 by 4.5. "Fronts considerably cut on treads, rears slightly worn and filled with a number of small stones."

No. 12 Lauth-Juergens, gross load, 9,715 pounds, Goodyear demountable, fronts 36 by 4, rears 36 by 5, solids. "All four tires in fine shape."

No. 13 Atterbury, gross load, 4,720 pounds, Goodyear solid clincher fronts 36 by 3, rears 36 by 3. "Front tires in good shape, rears badly cut from sharp stones. Was undertired."

No. 14 Atterbury, gross load, 6,150, Goodyear side flange, fronts 36 by 3.5, rears 36 by 4. "A few slight cuts in the sides caused by sharp stones."

No. 15 Atterbury, gross load, 7,475 pounds, Goodyear solid demountables, fronts 36 by 3.5, rears 36 by 5. "Fronts in first-class shape. Right rear slightly cut on inside by sharp obstruction. Left rear in fine shape."

No. 16 Atterbury, gross load, 9,650 pounds, Goodyear side flange, with rear duals, fronts 36 by 3.5, rears 36 by 3.5. "Fronts in fine shape. Inside rear dual a little loose at base."

No. 17 White, gross load, 5,175 pounds, Goodrich pneumatics front, Kelly pneumatics rear. Fronts 34 by 4, rears 34 by 4.5. "A few slight cuts in treads, otherwise in fine shape."

No. 18 White, gross load, 7,950 pounds, Diamond pneumatics, rear duals, fronts 36 by 4, rears 36 by 4.5. "Right rear inside tire had bad cover cut; left rear inside blew out near Baltimore; slight cuts in others."

No. 19 International, gross load, 3,675 pounds, Firestone side wire, fronts 42 by 2, rears 42 by 2.5. "Miniature cuts in right rear."

No. 20 Atterbury, gross load, 4,680 pounds, Goodyear non-skid pneumatics, fronts 35 by 4.5, rears 35 by 4.5. "Tires hardly worn, in fine shape."

No. 100 Brown, gross load, 6,780 pounds, Overman cushion, fronts 36 by 5, rears 36 by 5.5. "The inside notches of the tread slightly raised up from the outside, tires generated a lot of heat."

No. 101 F W D, gross load, 7,480 pounds, Goodyear non-skid, fronts 36 by 5, rears 36 by 5. "All tires in perfect shape."

No. 102 White, gross load, 6,630 pounds, Overman cushion, fronts 36 by 4, rears 36 by 4.5. "Tires the same as No. 100 Brown."

The brake tests at the completion of the run were made on a level asphalt street, the trucks carrying the load they had during the demonstration. Each vehicle approached the braking line at its contesting speed. At a signal the foot brake was applied and the distance in feet required to bring the truck to a stop measured. The hand brake was similarly tested. The rules allowed a distance of 50 feet without penalty and imposed one point per foot or fraction thereof for all distances above the 50-foot mark. Only one vehicle was penalized, that being No. 101 Four-Wheel-Drive which had its braking interfered with by the differential between the gearbox and the forward axle being damaged on the last day of the run. It required 74 feet with the hand brake but stopped in 46 feet with the foot brake.

The 50-foot rule in which a truck must stop is a hand-down from passenger car tests. This distance is entirely too great for trucks; in fact, it is questionable if 30 feet would not be a better rule.

The following tabulation shows the distances required by the different trucks, together with the speeds at which they took these tests and the load classification they were under:

No.	Name	M.P.H.	Load	Foot	Hand	Penalty
1	Vulcan	8	4 tons	27	46	0
2	Mais	10	1.5 tons	12	27	0
3	Little Giant	11	1 ton	23	48	0
4	Witt-Will	10	1.125 tons	33	18	0
5	Wilcox	11	1 ton	17	19	0
8	Rowe	10	2.5 tons	14	46	0
9	Hupmobile	12	.4 ton	31	28	0
10	McIntyre	10	1.5 tons	43	29	0
11	Autocar	10	1.5 tons	36	36	0
12	Lauth-Jurgens	10	2 tons	25	33	0
13	Atterbury	12	.75 ton	49	46	0
14	Atterbury	11	1 ton	27	19	0
15	Atterbury	10	1.5 tons	46	28	0
16	Atterbury	10	2 tons	50	36	0
17	White	12	.75 ton	20	30	0
18	White	10	1.5 tons	12	13	0
19	International	12	.5 ton	19	43	0
20	Atterbury	12	.75 ton	45	22	0
100	Brown	12	Persons	39	46	0
101	F. W. D.	12	Persons	46	74	24
102	White	12	Persons	19	27	0

This tabulation shows that the best brake test was made by No. 18 White, making its stops in 12 and 13 feet, but a few inches more than the vehicle's wheelbase.

In addition to a brake test, each vehicle was given a clutch and transmission test. The clutch test consisted in bringing the front wheels against a vertical 8-inch curb. The low gear was engaged and the trucks then required to mount the curb, spin the rear wheels or stall the motor. Vulcan, Wilcox, Rowe and No. 18 White mounted the curb with ease. Witt-Will, Hupmobile, McIntyre, Lauth-Juergens, No. 14 Atterbury, No. 17 White and Brown, Four-Wheel-Drive and No. 100 White, spun the rear wheels, either one or both. The remainder stalled their motors with the exception of No. 20 Atterbury, which had a slipping clutch and was given 5 points penalty under the rules.

The transmission tests consisted solely in seeing that the different trucks could travel on their respective speeds, that is, reverse and all of the forward speeds. Not a penalty was imposed in this test.

The contestants had during the entire road demonstration looked forward to the technical test at the end of the run when all parts of the chassis would be looked over carefully for broken damaged or sprung parts. This examination was made the afternoon following the completion of the run and the work of the technical committee occupied 5 or 6 hours. Few serious defects were discovered, but all were given the penalty as required by the rules.

The following is the complete result of the technical examination with the penalties assessed in each case as well as a day-by-day report of road penalties:

The following is a complete day-by-day record of the penalties that were made on the road. Points were not assessed against loose stove bolts to hold mud aprons in place, there being scarcely a truck without some of these bolts lost or having loose nuts. Manufacturers can make progress in this matter. No knowledge was taken of lost grease cups, if not from vital portions of the trucks. There were three or four examples of cups being lost although there were no cases of lost cups from vital points, what losses there were should be eliminated in future. The record follows:

FIRST DAY'S PENALTIES

Car	Points
No. 1, Vnlcan:	
Repairing broken chain	100
Late 29 minutes	58
Total	158
No. 2, Mais	0
No. 3, Little Giant:	
Took gasoline twice out of controls	6
Took water twice out of control	6
Total	12
No. 4, Witt-Will:	
Working on carbureter	87
Replacing breaker-box	2
Total	89
No. 5, Wilcox	0
No. 8, Rowe:	
Repairing fan belt	44
Motor stall	2
Total	46
No. 9, Hupmobile	0
No. 10, McIntyre	0
No. 11, Antocar:	
Taking water six times	18
Stalled motor	2
Total	20
No. 12, Lanth-Juergens	0
No. 13, Atterbury:	
Taking water	3
No. 14, Atterbury:	
Taking water twice	6
No. 15, Atterhury:	
Repairing broken chain	17
Adjusting carbureter	12
Water, twenty-one times	63
Total	92
No. 16, Atterbury:	
Water, twice	6
Work on floor boards	10
Work on radiator petcock	18
Total	29
No. 17, White	0
No. 18, White	0
No. 19, International	0
No. 20, Atterbury	0
No. 100, Brown:	
Radiator cap. 1; buh cap.; petcock	1
Total	3
No. 101, Four-Wheel-Drive	0
No. 102, White	0

SECOND DAY'S PENALTIES

Car	Points
No. 1, Vnlcan:	
New bolt in fan belt bracket	30
Tightening radiator cap	1
Total	31
No. 2, Mais	0
No. 3, Little Giant	0
No. 4, Witt-Will:	
Adjusting carbureter	3
Work on breather pipe	1
Total	4
No. 5, Wilcox	0
No. 8, Rowe:	
Connecting gasoline line	1
No. 9, Hnpmobile	0
No. 10, McIntyre	0
No. 11, Antocar:	
Replenishing water	3
No. 12, Lauth-Juergens	0
No. 13, Atterhury	0
No. 14, Atterhury	0
No. 15, Atterbury:	
Replenishing water	9
No. 16, Atterbury	0
No. 17, White	0
No. 18, White	0
No. 19, International	0
No. 20, Atterbury:	
Replenishing water	6
Tightening connecting-rods	116
Replenishing oil	6
Total	128
No. 100, Brown	0
No. 101, F-W-D:	
Cleaning gasoline line	15
No. 102, White	0

THIRD DAY'S PENALTIES

Car	Points
No. 9, Hupmohile:	
Leak in gasoline line 11 miles ont of control	8
Adjusting carhureter	5
Total	8
No. 12, Lanth-Jnergens:	
Replenishing with oil	3
No. 17, White:	
Working on carhureter and gasoline line	30
No. 1, Vulcan:	
Fan bracket breaking loose injuring radiator work	10
Replenishing with water	3
Total	13
No. 8, Rowe:	
Cleaning gasoline line and working on same	58
Work	9
Motor stop	8
Total	70
No. 11, Autocar:	
Adjusting carbureter and taking on water	9
No. 18, Atterbury:	
Loose nnt on driving sprocket of rear wheel, work on same	13
No. 15, Atterhury	22
No. 20, Atterhury:	
Working on oiling system	24
Replenishing with oil	3
Total	27
No. 100, Brown:	
Adjusting and cleaning carhureter	19
No. 101, Four-Wheel-Drive	10

FOURTH DAY'S PENALTIES

Car	Points
No. 1, Vulcan:	
Adjusting brackets	12
Water	3
Total	15
No. 4, Witt-Will:	
Adjusting carbureter	22
No. 8, Rowe	28
No. 11, Autocar:	
Water	3
No. 12, Lanth-Juergens:	
Engine bearings work	129
No. 13, Atterbury:	
Replenishing of water and gasoline	6
No. 14, Atterbury:	
Adjusting carbureter and cleaning gasoline line	63
No. 16, Atterbury:	
Water	3
No. 100, Brown:	
Stalled motor	1
No. 101, Four-Wheel-Drive:	
Differential trouble to front axle	272

TECHNICAL EXAMINATION REPORT

Car	Points
No. 1, Vulcan:	
Leaky radiator	20
No. 2, Mais	0
No. 3, Little Giant:	
Hub flange bolt lost	1
Six loose spokes	30
Total	31
No. 4, Witt-Will:	
One water connection leak	1
No. 5, Wilcox	0
No. 8, Rowe:	
Water leak in hose connection	1
Broken fender iron	6
Gasoline leak	1
Total	8
No. 9, Hupmobile	0
No. 10, McIntyre	0
No. 11, Autocar:	
One lost muffler support bolt	1
No. 12, Lauth-Juergens:	
Handle of carbureter shutter valve rod lost	1
No. 13, Atterbury:	
Loose steering connection	15
One nut lost	1
Total	16
No. 14, Atterbury:	
Leaky water connection	1
No. 15, Atterhury:	
Loose muffler pipe	1
No. 16, Atterbury:	
One water leak between cylinder and water jacket top plate	1
No. 17, White:	
Loose steering connection	15
No. 18, White	0
No. 19, International	0
No. 20, Atterbury	0
No. 100, Brown:	
Loose steering column dash bracket	2
No. 101, F. W. D.:	
Broken differential	150
Lost spring hanger bolt	1
Total	151
No. 102, White	0

Horsepower as Basis For Tax Discussed

Majority of Prominent Automobile Engineers Consider S.A.E. Rating as Fair to All Concerned—Many Differ

Several Object to Making Horsepower of the Motor the Basis for Calculating Amount of State Tax

THE article entitled "Cars Taxed on Unused Horsepower," which appeared in THE AUTOMOBILE for March 27, aroused a great deal of interest among automobile engineers, and their letters on this subject have been numerous and very interesting. A number of them are published herewith:

S. A. E. Formula Under-rates Motors—Dunham

DETROIT, MICH.—Editor THE AUTOMOBILE:—In my estimation there is but one way to rate a motor, and that is by its actual performance at 1,000 feet piston speed and not by some formula which does not give a fair rating.

The A. L. A. M. rating of today for motors considerably underrates them. It seems to me that if we are to rate cars in connection with tax matters by a formula which will underrate them, we might as well make up a new formula which will underrate them still more.

I should think it would be better to be fair in the matter, and rate the motors according to their actual developments, and endeavor to get a reasonable tax on them.

However, it seems to me both methods are wrong. If you own a house or a piece of property, they do not rate you on how big the house is, or how many rooms you have in it, or the kind of furnace you have in it, but they rate you on the value of the house. Could anything be more fair in the way of automobile taxation than rating the cars according to the amount of money they are worth? Why should a man buying one of the low-priced cars with a big engine in it pay more taxes than the man who has been able to afford a high-priced car, with a small engine?

I understand of course, that the supposition is that the larger the car, the more wear and damage it gives to the roads, but would not the whole thing equalize up as well if based on the money value of the car?—GEO. W. DUNHAM, Chalmers Motor Co.

S. A. E. Formula Cannot Be Bettered—Lewis

MILWAUKEE, WIS.—Editor THE AUTOMOBILE:—While there have been many horsepower formulæ proposed and tried. I do not believe that the formula now accepted by the A. L. A. M. and the S. A. E. can be bettered under present conditions.

The vogue of the long-stroke motor, of course, has a new bearing on the subject, but too many of our legislators who are not thorough fail to recognize the fact that piston speed is the determining factor. All piston speed taken as standard under the above formula I do not believe that the average motor under average touring conditions would exceed its A. L. A. M. horsepower rating.

I desire to add voice to those who would retain, for the present at least, the standard of rating adopted by our foremost manufacturing and engineering bodies.—RALPH C. LEWIS, F. S. Motors Co.

No Other Formula Is Necessary—Fergusson

BUFFALO, N. Y.—Editor THE AUTOMOBILE:—I do not think that any other formula than the S. A. E. is necessary or desirable in connection with manufacturers' rating, either for catalogue purposes or for state taxes. Much misunderstanding about this rating would be cleared up if it was appreciated that this horsepower is the rating at 1,000 feet per minute piston speed of the engine under consideration. Although the better made engines can be operated to give a greater horsepower than this formula, yet I doubt if the average automobile after it has been in use for a few weeks will give more horsepower than the S. A. E. rating, due to the valves not being kept in the proper condition. A pleasure car in use on the road rarely, if ever, is called upon to develop its maximum horsepower. The average running speed is about 25 miles per hour and at this speed on good, level roads the horsepower developed by even high-powered cars is rarely over 9 or 12, and only when running through heavy roads or up steep hills is anything like the maximum power of the engine developed. We believe that it is under these conditions only that the engine is scarcely ever called upon to develop more than 75 per cent. of its maximum horsepower. It would, therefore, be wrong to tax pleasure cars according to their maximum horsepower. It would be better to have a formula that would give the average horsepower developed. For this reason, we believe that the S. A. E. formula answers all purposes.—D. FERGUSSON, Pierce-Arrow Motor Car Co.

It Is Merely a Matter of Income—Mears

CLEVELAND, O.—Editor THE AUTOMOBILE:—It appears to me that, if a state is anxious to secure a given income from motor car, the horsepower rating will have very little to do with it inasmuch as the tax from horsepower could be varied to suit any change that the manufacturers might make in their rating. If we cut our horsepower in two, it would be an easy matter for the state to double its rate per horsepower.—CHARLES W. MEARS, Winton Motor Car Co.

S. A. E. Formula Is Much Too High—Sweet

DETROIT, MICH.—Editor THE AUTOMOBILE:—While the S. A. E. formula furnishes a means for the customer to make some comparisons of the various motors, it is altogether too high for the purpose of taxation if the motor is to be taxed according to the average horsepower developed in road work.

I have made some brief tests to determine the actual amount of power developed to propel a five-passenger touring car, with two passengers in it, over the ordinary city streets and boulevards. In said test, an engine was used that according to the S. A. E. formula was rated at 32 4-10 horsepower. The test did not consider any rapid accelerations nor any hill work. We found that it only required an average of a little less than 8 horsepower to propel the car at speeds ranging from 18 to 22 miles per hour, which we consider an average speed for general road work. Therefore, the power actually required for the average level road conditions is less than 25 per cent. of the S. A. E. rating.

It seems that if the rating is to have consideration for taxation purposes, it would be more just to cut the present S. A. E. rating in two in the middle.—S. E. SWEET, Cadillac Motor Car Co.

Weight a Better Basis for Taxation—Crane

BAYONNE, N. J.—Editor THE AUTOMOBILE:—Personally I would be very sorry to see the manufacturers in this country induced as they have been on the other side to build motors of excessively small bore and long stroke by any horsepower rating system used by engineers or by the public authorities. As a matter of fact, from what we now know a rating depending entirely upon piston displacement would result in a very satisfactory engine development. I do not see that the question of rating has anything to do with the charge for licensing, which, if the license charge is fair at all, as I do not believe it is, should be based on weight as well as on horsepower.

Regarding the amount of power used on the road in cars of our manufacture, these cars develop their rated horsepower under the S. A. E. formula at 750 revolutions, corresponding to a car speed of about 28 miles an hour with our standard rear axle gear ratio. All of us who have driven cars know that in this country an average speed of 28 miles an hour for a trip of any length is very high. As a matter of fact, under full throttle at 28 miles an hour our cars will hold their speed on a grade of at least 8 per cent. It is my opinion without having made any actual tests that the average horsepower delivered by the motor on ordinarily good roads is not over 25 or 30 maintaining a 28-mile average, and considerably less in maintaining a 20-mile average.—H. M. Crane, Crane Motor Car Co.

S. A. E. Formula Is Not Consistent—Lee

Detroit, Mich.—Editor The Automobile:—The horsepower rating of our motor is entirely due to the attitude of the buying public, who have been educated up to the prevalent practice of over-rating, which results from competitors endeavoring to utilize every possible selling point, any departure from which would be detrimental to the company.

The Briggs-Detroiter Co. stands ready to adopt any practical formula which will give a reasonable horsepower rating. However we do not consider the present S. A. E. formula as being consistent. Inasmuch as any motor whose dimensions are 3 3-8 by 3 3-8 will give the same results as one whose bore and stroke respectively are 3 3-8 by 5 inches.

It is safe to say that all automobile manufacturers would welcome any standard formula which would be approximately correct. If it were possible for all of them to come together in a meeting with their chief engineers, then there would be no doubt but what a thoroughly practical as well as simple mathematical computation could be formulated.—W. S. Lee, Briggs-Detroiter Co.

Stroke Should Be Considered—Stutz

Indianapolis, Ind.—Editor The Automobile:—I am of the opinion that the A. L. A. M. rating is no doubt somewhere near correct. Of course, there are some injustices in this rating owing to the proven fact that stroke does cut some figure with the amount of horsepower the motor is competent of delivering, but I am quite positive that the rated horsepower of a motor and a car as well should not be based on the maximum horsepower which it is possible to obtain, under the best possible condition, as the automobile does not remain in this condition when in the hands of the ordinary user only momentarily as the valves soon need attention, valve clearance is altered, carbon fixed and other instances happen which render the maximum horsepower rating absolutely worthless. The proportioned horsepower of the A. L. A. M. rating according to size of motor seems to be somewhere near correct, but the writer is of the opinion that stroke should be reckoned with in some cases.—H. C. Stutz, Idieal Motor Car Co.

Volumetric Displacement Important—Averell

New York, N. Y.—Editor The Automobile:—The horsepower rating should be determined by the volumetric displacement and not upon the bore alone. I think this is both equitable and will lead to better motor proportions. I also believe that the taxation should be based on a combination of horsepower and weight. I know this sounds slightly complicated and may be rather difficult to work out, but the most destructive elements to the roads are certainly horsepower, which means available sustained speed and weight.—S. G. Averell, American Locomotive Co.

Standardization Is Needed—Reed

Martinsburg, W. Va.—Editor The Automobile:—I believe that many makers can obtain surprising results in the way of power from our motors. We cannot make the statement that 75 per cent. or even 50 per cent. of this is delivered at the point of contact of the rear wheels and the ground.

Taking the average six-cylinder touring car, which we will assume has a piston displacement of approximately 375 to 400 cubic inches and rated by the makers at 60 horsepower, more than that which the motor itself will develop on the block.

This car running at a speed within the reguations set down by law of 20 to 25 miles per hour in the country, is requiring but approximately 18 to 20 horsepower to drive it, and with the efficiency of power transmitting and speed-reducing machinery that has been reached today, 25 to 30 horsepower is the maximum you can credit to the motor, as it would probably be turning about 700 revolutions per minute.

The rating of gasoline motors for automobiles has become so complex that the layman has really no way of telling that a certain motor rated at 30 horsepower can out-pull two motors in cars of another make rated at 40 horsepower; and there should certainly be some standardization of this among the many other lesser matters which are brought to certain classifications.—W. S. Reed, Norwalk Motor Car Co.

More Actual Horsepower—Potter

East Orange, N. J.—Editor The Automobile:—In any logical rating, such as the S. A. E. or one considering stroke, weight, price or size, is absolutely fair to all concerned. The necessary raise in taxation in order to keep the highways in good condition, together with the necessary or unnecessary increase in the price of gasoline makes it important that the American engineer should study and consider more thoroughly the absolute necessity of building a motor that will develop more actual horsepower.

Not only do the racing results of foreign countries, but also the stock road endurance runs show that the foreign engineer is getting more horsepower with less fuel consumption. A recent test made by the Automobile Club of America on one of the leading automobile manufacturer's motors showed anything but a satisfactory and economical result. The gasoline consumption as given by the average automobile salesman compares favorably with that actually obtained by owners of foreign machines, but the actual speed in miles per hour obtained by the American car owner falls short of that claimed by the salesman by 6 to 9 miles per hour.

I believe that the race on Decoration Day at Indianapolis will prove conclusively to the American engineer that he must consider more carefully the weight of moving parts, compression, valve diameters and lift, cam design, size, dual length of the intake manifold.—M. H. Potter, Junior Member, Society of Automobile Engineers.

Surplus Power Tax Is Unfair—Batenburg

Clintonville, Wis.—Editor The Automobile:—In actual operation on highways, and especially in towns where the speed is limited, the amount of horsepower produced is far below the S. A. E. or A. L. A. M. rating.

The amount of power not produced to the wheels will depend more or less on the entire construction of the car, and the weight and type of body and character of load.

In my opinion the A. L. A. M. or S. A. E. rating is more than high enough on touring cars as well as trucks. Of course, in truck service the amount of horsepower produced will occasionally show higher than the above rating, especially by overloading, but, on the other hand, bear in mind the number of times that the car runs empty or with light load, and at low speed, and in such cases the power produced is way below the A. L. A. M. or S. A. E. rating. All automobile designers of today are figuring on sale overload and also to take care of a large amount of reserve power.

It is only a question of whether the secretary of state will give us credit for the amount of horsepower that is used under average conditions, which we would judge is full power only 25 per cent. of the time during the entire year. If we are charged up with surplus power during the idle period it would be unfair. —P. Batenburg, Four-Wheel Drive Auto Co.

Accessories for the Automobilist

A. PETERSON, of the service department of the Garford company, New York City, has designed a valve spring compressor by means of which it is possible to raise the valve spring in 10 seconds and have both hands free when the spring is in that position to remove the key. The method of operation of this simple instrument and the principle upon which it operates may be seen in Fig. 1. The compressor consists of four parts:

1—A curved bar A, having a fork at its lower extremity. The fork slips beneath the lower spring support.

2—A right-angle bell-crank lever B. This operates in a clevis at the top of the curved bar and does the lifting.

3—A pin C, suspended from the bell-crank which fits into the center of the valve head and takes the thrust occasioned by compressing the spring.

4—A shoulder piece D, located on the pin. This fits into the valve aperture at the top of the cylinder and centers the pin so that it strikes the hole in the center of the valve head.

The operation will no doubt be clear from the foregoing description of the parts. The operator merely slips the lower end of the forked bar A under the spring seat at the bottom of the valve and the pin C down through the opening above the valve. The shoulder D will come over the opening in the cylinder caused by removing the valve cover. The bell-crank lever is moved from the position it occupies in the left view of Fig. 1 to the position shown at the right. This will cause the spring seat to be lifted up and will leave the pin free to be removed.

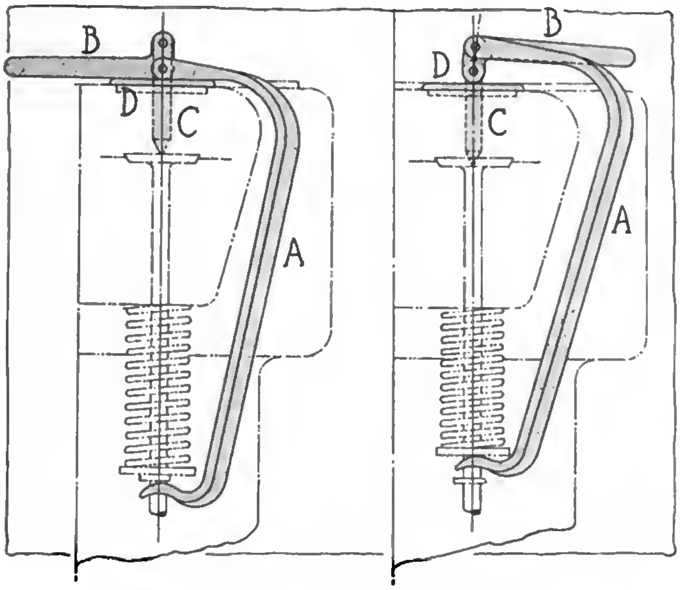


Fig. 1—Peterson valve spring compressor

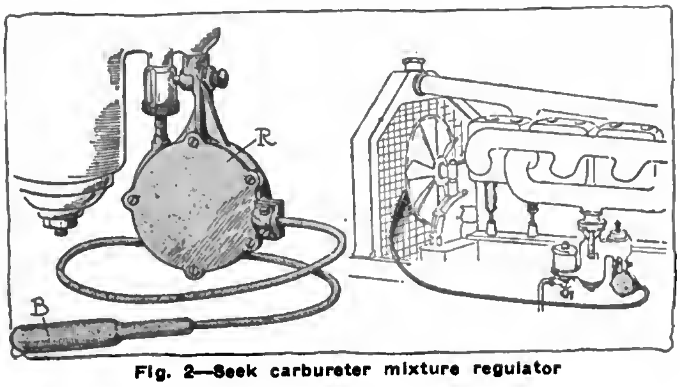


Fig. 2—Seek carbureter mixture regulator

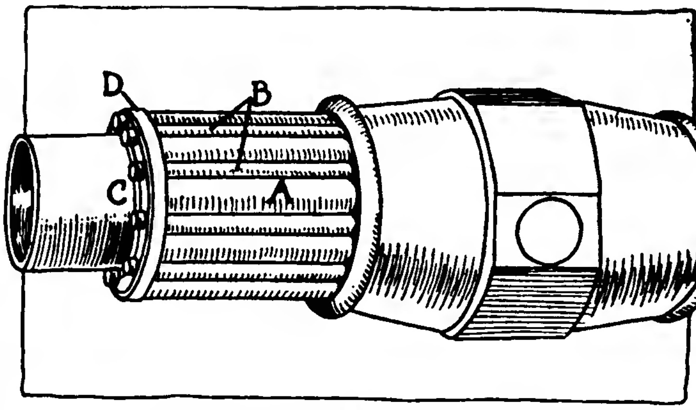


Fig. 3—American greaseless roller bearing

Owing to the fact that the bell-crank lever is slightly over the center position, the upward thrust tends to press the handle of the bell-crank more tightly against the top of the forked bar. In other words, it has no tendency to release the valve regardless of the amount of thrust.

The J. R. Almond Mfg. Co., Ashburnham, Mass., makes the flexible casing, Fig. 6, which is composed of a double-wound wire tube. The inner wire is of tempered spring steel and has a flat surface coiled toward the inside to support the flexible shaft; the outer wire coil provided to make the casing oiltight is of solid brass wire, rustproof, and has the appearance seen at the ends of the two sample pieces shown in the illustration.

Seek Regulator—A carbureter attachment designed to automatically regulate the mixture according to variation in the temperature of the water cooling system of the motor has recently been introduced by the Seek Regulator Co., Chicago. Fig. 2 shows the device A and the method of applying to motor. The Seek regulator may be attached to any make of carbureter without removing the carbureter from the car. Its operation depends on either the control of the air valve or the gasoline needle, according to choice or the particular make of carbureter. A flexible tube extends from the regulator itself to a bulb B, containing mercury, set against the motor side of the radiator and securely fastended there. The same result will be obtained if the bulb is applied within the water jacket, but it is preferably attached to the radiator so as to be sensitive to the temperature of the tubes and also to be influenced by air drafts. Whatever may be the temperature surrounding the bulb it influences the mercury in the bulb and immediately proportions the mixture, operating accurately within 1 degree indicated temperature and having a range of .3 inch of valve movement. When attached the carbureter is adjusted under normal weather conditions as nearly correct as possible, the regulator is then set in position to have no effect at this temperature, beginning to act only when the temperature of the water jacket falls below 180 degrees. It will then automatically care for the mixture. If a motor has been permitted to stand for some time in the cold this regulator will automatically give it a rich mixture at the start, and by degrees in accordance with the rise in the temperature will permit the mixture to weaken so that as soon as the motor has warmed to a temperature of 180 degrees it is running under normal conditions.

An anti-friction roller bearing requiring no lubricant has been designed by the American Roller Bearing Co., Pittsburgh, Pa., who claim to have tested it out on a 30,000-mile run. The construction is seen in Fig. 3, where alternate large rollers A carry the load, while smaller rollers B grooved at their ends act as separators, running in tracks C. Retaining rings D, which are freely movable, hold B in place. By this construction only rolling contact is obtained and all sliding friction is avoided.

The Elgin Spark-Plug & Ignition Co., Elgin, Ill., manufactures the spark-plug, Fig. 7. This plug consists of a steel shell, a steel bushing and a porcelain, which latter is separated from the shell by a copper ring and by an asbestos washer. The most interesting features of this plug are the specially designed porcelain and the electrode. The former is seen in Fig. 7, where the shell is cut away at one point. The shape of the porcelain is such as to form a primary ignition chamber above the lower, diverging end of the porcelain, and the upper edge of this chamber is formed by the asbestos washer, which is pressed tight against the insulation by the very explosion pressure. The electrode is of wire bent in a right angle toward the shell, a metal cap forming a shield over it against the porcelain and preventing leakage of gas through the passage containing the wire.

An automatic carbureter, designed by the engineer Edouard Cannevel of Levallois, France, is shown in Fig. 9. The principle utilized in this carbureter is the breaking up of a liquid by means of a fixed orifice which is called a compensator in relation to the velocity of air passing through the carbureter. The design here illustrated not only has the ability of impoverishing the mixture in proportion with the decreasing suction, but it also permits of complete supression of the carburetion of air, when the motor reaches a certain velocity at which the suction created by it, the velocity of the air drawn in and the difference of fall between the two fuel orifices are at equilibrium. Coming to a description of the mechanism itself, the latter is of the float-feed type, the level of the fuel being a millimeter or two above that of the gasoline nozzle. The latter has three orifices, the top one being that which serves for principal action, while the two lower ones which are on one level permit of fuel leaving the inner lead and being diffused around the upper orifice, thereby breaking up the principal or, rather, the single jet. The canal into which the two lower orifices discharge before reaching the level of the upper orifice form a storage space in which fuel is kept for the purpose of starting, being available at the first bit of suction of the motor. In operation, the upper jet is the only one used at low speeds, when the motor suction is relatively small. When, however, the motor is accelerated by the opening of the throttle, the gasoline stored in the channel surrounding the lowest portion of the lead bored through the body of the nozzle is sucked up and mixed with the fuel discharged through the main orifice, thereby enriching the mixture. In order to protect the lower orifices against too great a suction, a disk is placed above them around the nozzle body, providing at the same time a larger surface for the fuel to cling to, which also facilitates evaporation.

The Ohio Top hoist, Figs. 4 and 5, is being made by the Ohio Top & Mfg. Co., Toledo, O., for the purpose of making it easy for one person to operate the automobile top. It consists simply of two long rods which attach to the points where the front and the rear uprights of the automobile top are united. As Fig. 4 shows, each rod consists of two sections, one of which is fastened to each of the points mentioned, they being held together by a screw-thread. The device is used in the following manner. If it is desired to put up the top, the driver attaches the rear sections, slips the front sections through the eyelet ordinarily used for attaching the front supports and then screws the sections together, which form a rod for the front support connection to slide upon.

The Johnson Steel Works Corp., Boston, Mass., manufactures the steel wheel illustrated in Fig. 8. The latter is built heavily of cast crucible steel alloyed with vanadium and titanium, and specially heat-treated. As a result the steel is tough, strong, ductile and well capable of resisting shocks. It is also made of acid-open-hearth steel, but the intention of the company is to use in the future only electrically-made steel and alloy steels of the above description. A tensile strength of 75,000 to 80,000 is thereby obtained, which is much in excess of the strength of any wooden wheel. The weight of such a steel wheel is of course greater than that of a wooden one, but to make up for that it is applicable to a wider field, being capable of carrying loads too great for wooden wheels. As Fig. 8 shows, the wheel is made both single and dual, with eight or ten spokes respectively. These wheels are shod with steel tires to give good service and seem to be recommendable, especially in the case of heavy trucks and omnibuses.

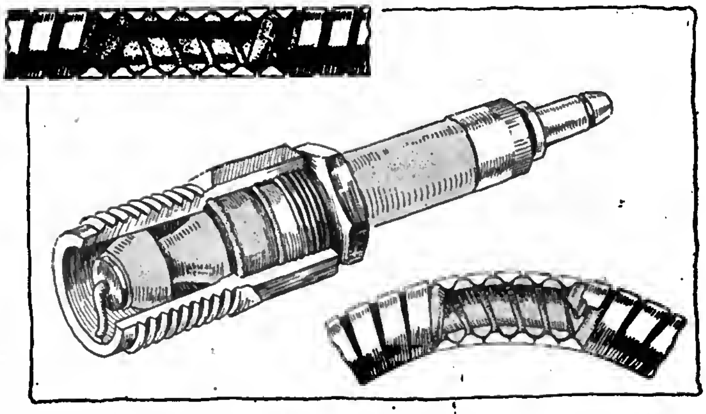


Fig. 6—Almond flexible casing. Fig. 7—Elgin spark-plug

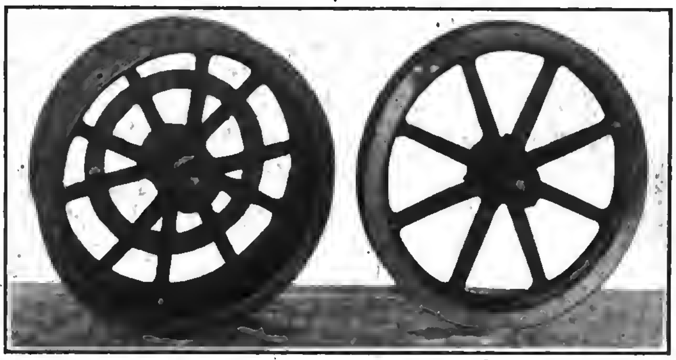


Fig. 8—Johnson steel wheel for commercial cars

Fig. 4—Ohio Top hoist in use. Fig. 5—Being dismounted

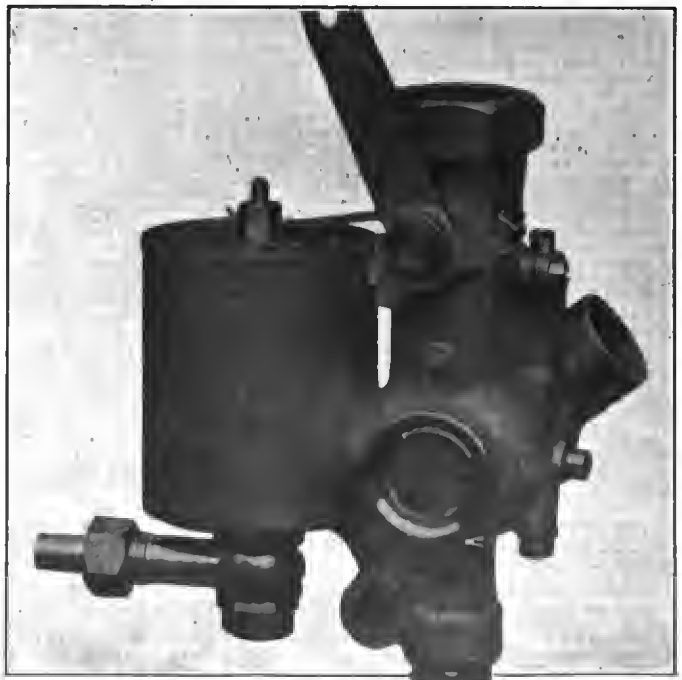
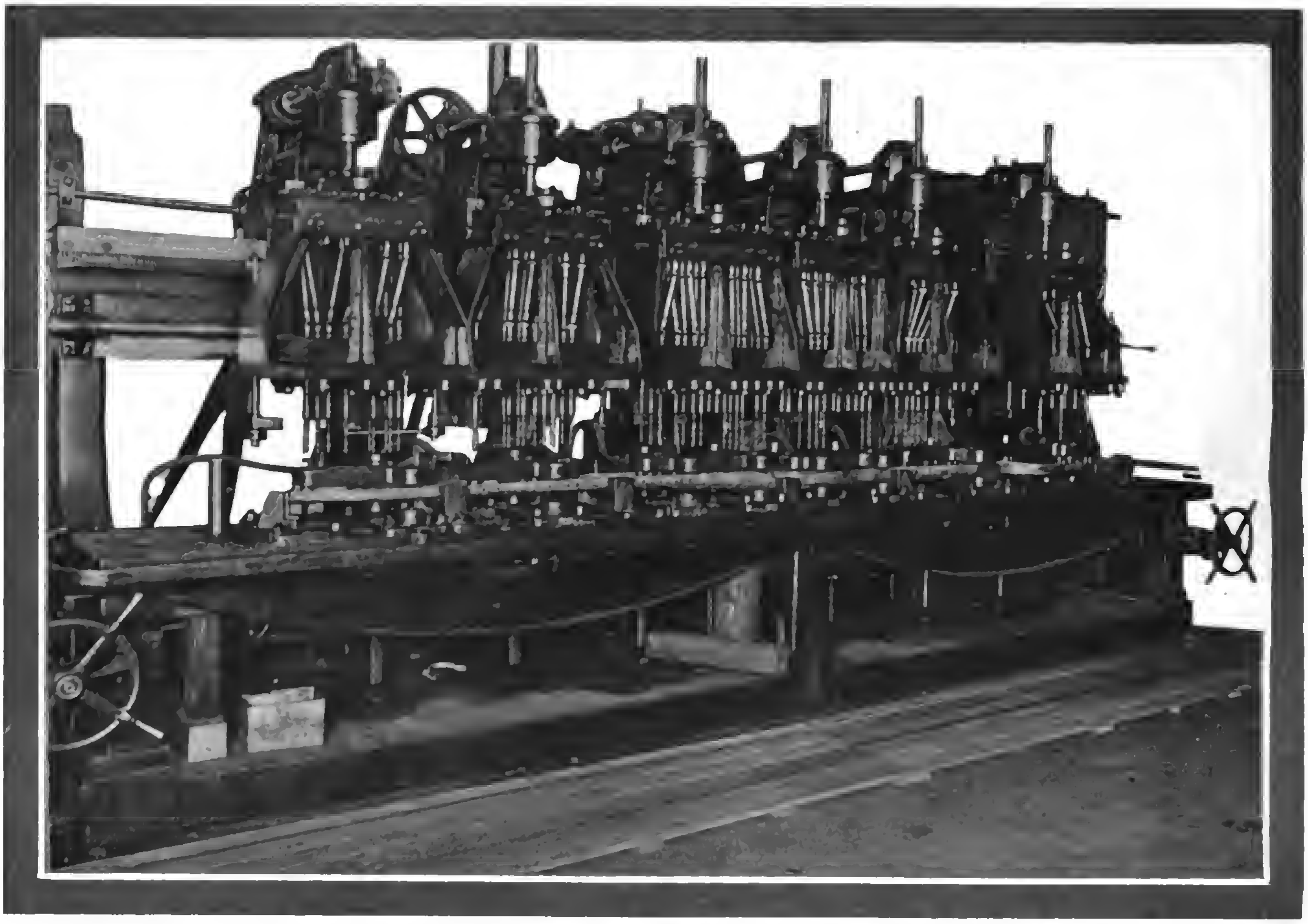


Fig. 9—Cannevel automatic compensating carbureter

Factory Miscellany



Cadillac multiple spindle gang drill for frame side members. It drills seventy-two holes in 30 seconds

AUTOMOBILE manufacturing work calls for many drilling operations. This is especially true of the frame members which have to take the connections binding the frame together besides all the members of the car itself, which are carried and supported by the frame. The multiple spindle drill in the above illustration is said to be the largest in the world used in connection with the automobile industry. It is installed in the factory of the Cadillac Motor Car Co., of Detroit, Mich., and is used exclusively for drilling the holes in the side bars of the frame. The machine is capable of drilling seventy-two holes at one operation. Two men working on this machine will drill all the holes in a frame side bar in about 30 seconds. This is just thirty-six times as fast as would be accomplished by former methods—a gain of 3,600 per cent. in time. A thousand right-side frame channels are drilled at one set up and then in 2 hours the drills and jigs are changed and the machine is ready for drilling the holes in a thousand of the left-side channel bars. The machine occupies 8 by 18 feet of floor space—just a little more than would be occupied by two single-spindle frame drilling machines with their stands for supporting the bars. Including the time for shifting the stock, etc., the capacity of this machine is about 100 pairs of side bars per day.

ESTERLINE'S New Factory—The Esterline Co., Indianapolis, Ind., moved into its new factory recently. This plant has a floor space of 108,000 square feet, which is an increase of more than 100 per cent. over the former plant. The building is three stories high, of reinforced concrete construction throughout. The employees number 200 and the entire plant at its full production will be in the neighborhood of 450. This company manufactures lighting and starting systems, lamps, headlights and the Esterline graphic meter.

Universal Machinery Has Fire—The Universal Machinery Co., Milwaukee, Wis., builder of Progress motor trucks and parts, sustained a loss of $5,000 by fire recently. Several departments suspended operations for 10 days while repairs were under way.

Rubber Plant in Columbiana—The Columbiana Land Co., Columbiana, O., has purchased a tract of land in that city on which they propose to erect a rubber plant. A. E. Albright of Carrollton, O., is president of the company and D. A. McIntosh of East Palestine is vice-president.

Marathon's Addition—The Marathon Tire & Rubber Co., Cuyahoga Falls, O., is arranging to enlarge its plant to take care of increasing business. The new additions in course of erection will afford 2,200 square feet of floor space. Additions are being made in the vulcanizing and puring rooms.

M-A-Z Plant in Kenosha—H. M. Mink, Edward Anderson and J. P. Zens have formed a corporation under the style of M-A-Z Concealed Hinge Co., capital stock $10,000, to manufacture hinges and locks for motor car bodies and other purposes. A plant will be established in Kenosha, Wis., at once.

Hans Equipment's Plant—The Hans Motor Equipment Co., La Crosse, Wis., will be the first industry to occupy a share of the 64-acre tract of land purchased by the Industrial Association of La Crosse to provide free factory sites for new industries locating in that city. The tract is touched by two trunk railroads and is connected with the Mississippi River by the Black River. The company is so crowded for space that several automatic machines have been anchored on planks and covered with a large canvas tent.

Milwaukee Motor's Increased Output—The Milwaukee Motor Co., Milwaukee, Wis., manufacturing motors and unit power plants for the trade, has increased its capital stock from $250,000 to $300,000. The plant was recently enlarged so that the output is at present from 40 to 60 per cent. in excess of the production a year ago.

Lamp Factory in Indianapolis—A factory for the manufacture of motor car lamps and sundries will be established in Indianapolis, Ind., by the newly organized Auto Headlight & Oscillator Co., in which N. E. Carter, C. R. West and C. F. Gordon are interested. The company has been incorporated with an authorized capitalization of $50,000.

Enlarge Hudson Plant—The Hudson Motor Car Co. is erecting a new building at Detroit, Mich. The new structure is to be 578 feet in length by 90 feet in width and will supplant the section of the factory grounds which resembled a tented city. The latter existed because contractors would not complete buildings fast enough to take care of the output of the cars.

New Sheboygan Plant—The American Gas Engineering Co., Sheboygan, Wis., recently organized at that city with a capital of $50,000, has broken ground for a plant consisting of three buildings. The company will first engage in general machine work, cutting, welding, etc., and later intends to manufacture gas and gasoline engines. Automobile work will be featured.

Remodeling Building for S. & M. Tire—The remodeling of the old Premium building on Cambridge street, Coshocton, O., for the S. & M. Tire & Rubber Co. will begin at once The new industry, which is moving there from Akron, O., expects to be in operation within 90 days. The company expects to arrange for the erection of a steel plant for the manufacture of steel rims for tires.

John Brown's New Site—Announcement is made by the J. W. Brown Mfg. Co., Columbus, O., that a new site consisting of 5 acres on the Marion Road has been acquired and the work of constructing a modern plant will be started at once. This move was made necessary because of the large increase in the business of the concern, which manufactures automobile lamps and trimmings.

Power for Automobile Supply Factories—The Ross & Young Machine Co., which is erecting a new factory in Detroit, Mich., for building the Page automobile, is installing a 4-cylinder, 100-horsepower Bruce-Macbeth gas engine, which will supply power and light. The Willard Storage Battery Co., Cleveland, O., which a few years ago placed its fifth repeat order for these engines, recently placed another order for a 150-horsepower.

Proposed Plant at Jefferson—E. A. Woodruff of Jefferson, Wis., has had a conference in that town with W. G. Moore and C. J. Smith of Cleveland, O., with a view of interesting these gentlemen in the construction at Jefferson of an automobile factory. The company proposed to manufacture the body, but would buy wheels, tires, electrical equipment and motors outside the factory. The initial equipment will consist of a 250-horsepower gasoline engine, motors for machines, gas furnaces, hydraulic stamps, etc. A subscription of $40,000 to the company's capital stock is asked as a consideration of their coming to the city.

Wrapping room at the plant of the Goodyear Tire & Rubber Co., Akron, O. Here tires are wrapped prior to undergoing the second cure.

The Automobile Calendar

Shows, Conventions, Etc.

May 20-21.........Boston, Mass., Convention of Electric Vehicle Makers.
May 20-23.........Baltimore, Md., Spring Meeting, American Society of Mechanical Engineers.
June 2-7...........Racine, Wis., "Made in Racine Exposition," J. I. Case Co.'s foundry.
June 5, 6, 7........Detroit, Mich., Midsummer Meeting of Society of Automobile Engineers.
Aug. 28-30........Ghent, Belgium, Institute of Metals, Annual Autumn Meeting, Ghent International Exhibition.
October ....Paris, France, Automobile Show, Grand Palais; 10 days.
Oct. 13............Philadelphia, Pa., National Fire Prevention Conference, Philadelphia Fire Prevention Commission.
November ....London, Eng., Annual Automobile Exhibition, Olympia.

Race Meets, Runs, Hill Climbs, Etc.

May 14-15.........New York City, Start of 2-Day Hudson and Catskill Scenic Tour.
May 17............Atlanta, Ga., Automobile and Accessory Assn. Annual Hill Climb.
May 29-30.........Chicago, Ill., Inter-Club Reliability to Indianapolis, Ind., Chicago Motor Club vs. Illinois Athletic Club.
May 30............Indianapolis, Ind., 500-Mile Race, Speedway.
June 5.. ....New York City, Orphans' Day Picnic at Glen Island, Orphans' Automobile Day Assn.
June 7.............Philadelphia, Pa., Inter-Club Reliability, Quaker City Motor Club, Automobile Clubs of Delaware County, Philadelphia and Germantown.
June 14..........Cincinnati, O., Hill Climb, Cincinnati Auto Dealers.
June 16, 17, 18....Columbus, O., Reliability Contest, *Ohio State Journal.*
June 19............Chicago, Ill., Algonquin Hill Climb, Chicago Motor Club.
June 21............Cincinnati, O., Hill Climb, Cincinnati, O., Automobile Dealers.
June 25-28.........Chicago, Ill., Non-Motor-Stop Reliability, Chicago to Boston, Chicago Automobile Club.
July 1.............Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Assn. to the Pacific Coast.
July 1-16..........Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.
July 4.............Columbus, O., 200-Mile Track Race, Columbus, O., Automobile Club.
July 4.............Taylor, Tex., Track Meeting, Taylor Auto Club.
July 4-5...........Sioux City, S. Dak., Track Meetings, Sioux City Automobile Club and Speedway Assn.
July 5-6...........Tacoma, Wash., Road Race, Montemara Festa Automobile Committee.
July 8-16..........Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager.
July 11............Twin City, Minn., National Reliability Tour, A. A. A.
July 27............Grand Rapids, Mich., Tour, Grand Rapids Auto Club.
July 27-28.........Tacoma, Wash., Tacoma Road Races.
August 5..........Kansas City, Mo., Sociability and Endurance Run from Kansas City to Colorado Springs, Col., Kansas State Automobile Assn.
Aug. 12...........Kansas City, Mo., Reliability Tour, Kansas State Auto Assn.
Aug. 29-30........Elgin, Ill., Elgin Road Races, Elgin Road Race Assn.
Aug. 30-Sept. 6....Chicago, Ill., Reliability Run, Chicago Motor Club.
Sept. 1............Columbus, O., 200-Mile Track Race, Columbus Auto Club.
Sept. 9............Corona, Cal., Track Race, Corona Auto Assn.
Oct. 4-11..........Chicago, Ill., Around Lake Michigan Run, Chicago Motor Co.
Nov. 24...........Savannah, Ga., Vanderbilt Cup Race, Motor Cups, Holding Company.
Nov. 27...........Savannah, Ga., Grand Prize Race, Automobile Club of America.

Foreign.

May ....St. Petersburg, Russia, International Automobile Exposition, Building of Michael Maneze, Imperial Automobile Club of Russia.
June 3-7..........London, Eng., Third International Road Congress, Rees Jeffrey, General Honorary Secretary.
June 23-28........London, England, International Road Congress.
July 12............Amiens, France, Grand Prix Race.
July 13............Paris, France, French Grand Prix Cyclecar Race.
July 18-26......... London, Eng., Imperial Motor Transport Conference.
Sept. 21...........Boulogne, France, 3-Litre Race.
Sept. 25...........Isle of Man, International Stock Car Race.
October ....Paris, France, Paris Automobile Show.

The Week in the Industry

Engineer — Dealer — Repairman — Garage

Six of the seventeen remaining Shakers of Union Village, near Lebanon, O., start out for a short run in their six-cylinder Pierce

Reo car converted into a motor lawn mower by the Quincy Country Club, Quincy, Ill. This car was a 1907 model. The mower cuts the grass in less than one-sixth the time and at less than one-fifth the cost at which it was formerly done. The 1,100 acres of ground on this golf course are cut at a cost of less than 35 cents per acre. The two-passenger body and rear system of this runabout are retained intact, while the front is supported by a triple-armed frame which converges down to the axle running through an iron roller 2 feet in diameter and 3 feet long across the chassis frame. A 3-foot mower is attached in front of this roller and another at the left side of the car. These two mowers cut a swath 6 feet wide, which, at the nominal speed of 6 miles per hour, would mean 11 acres per day of 8 hours. Assuming that the cost of gasoline is 20 cents and oil 50 cents per gallon, and the driver is paid $3 per day, the cost per acre would be less than 35 cents. A few Reo cars, as far back as 1905, have been converted into power plants for a hay-blower, corn sheller, farm tractor, threshing machine, hoisting apparatus, delivery truck or a score or more of other mechanically interesting contrivances

AGED ENJOY AUTOMOBILE COMFORTS—That the seventeen remaining Shakers of Union Village, near Lebanon, O., intend to enjoy the rest of their lives to the utmost may be gleaned from the above illustration. These seventeen survivors recently sold a part of their vast farm, receiving quite a tidy sum from the sale. As the oldest among them is 82 and the youngest is 51, it is evident that none will die in want and they have set out to enjoy the remaining years of their lives mid luxury and pleasure. Several automobiles have been purchased, among them being a Pierce, shown above. Nearly all the women, as well as the men can drive the cars.

HEADLEE LOS ANGELES MANAGER—F. M. Headlee has succeeded A. C. Luby as manager of the Chalmers-Los Angeles, Cal., Co.

AKRON FIRM DOUBLES CAPACITY—The Akron Tire Co., Philadelphia, Pa. has doubled its capacity by absorbing the adjoining property, the two structures having been reconstructed into one building.

HOLZWORTH STEWART SALES MANAGER—George Holzworth has been appointed sales manager of the E. Stewart Automobile Co., Northern California distributer of the S. G. V. car in San Francisco.

DASEY HARTFORD SUSPENSION MANAGER—P. J. Dasey has been made manager of the Detroit, Mich., branch of the Hartford Suspension Co., Jersey City, N. J. His headquarters will be at 803 Woodward Ave.

BOSCH SERVICE STATION IN SPOKANE—The Bosch Magneto Co., New York City, has established a service station for the Inland Empire in Spokane, Wash., having arranged with the Spokane Cycle & Supply Co., to maintain this service.

McDUFFEE STEARNS FRISCO MANAGER—J. H. McDuffee has been appointed manager of the San Francisco, Cal., branch of the F. B. Stearns Co., Cleveland, O. He succeeds J. F. Toole, who goes to Atlanta, Ga., to take charge of the Stearns interests in the South.

GOUDIE WITH PENNSYLVANIA TIRE—J. Q. Goudie, for some time past the manager of the Detroit, Mich., branch for the Diamond Rubber Co., Akron, O., has become associated with the Pennsylvania Rubber Co., Jeannette, Pa., in charge of Michigan and Ohio, with headquarters at Detroit.

PHILADELPHIA FIRM BANKRUPT—Creditors of the Sweeney Automobile Co., Philadelphia, Pa., have filed a petition to have that concern adjudged an involuntary bankrupt. The creditors and the amounts of the claims are: H. F. Hare, $750; T. F. Brennan, $266, and August Friend, $520.

CLEARING HOUSE IN LOUISVILLE—The Automobile Clearing House Co. of Louisville, Ky., has opened up offices and salesrooms at 708 Fourth avenue for the purpose of buying and selling second-hand and rebuilt cars. The managers of the new firm are W. J. Welsh and C. L. Holden.

GASOLINE WAR IN CALIFORNIA—A gasoline war is on in Southern California and as a result some of the dealers have cut prices to as low as 14 cents a gallon. How long this generous price will continue has not been determined, but it is declared that heavy losses will be sustained if the war does not end soon.

CLEARING HOUSE WANTED IN HARTFORD—A movement is on foot in Hartford, Conn., for the organization of a dealers' second-hand car clearing house. Many of the dealers are overburdened with second-hand vehicles at this time and in one or two instances a crisis is being faced. At the beginning of the season it was understood that no old cars would be taken in exchange for new, but the scheme fell flat. Competition is very keen. Now the dealers realize that the situation is becoming alarming.

COLE PARISH FACTORY MANAGER—The Parish Mfg. Co., Detroit, Mich., has engaged S. J. Cole as factory manager.

BURKE BUICK CLEVELAND MANAGER—D. A. Burke is the new manager of the Cleveland, O., branch of the Buick Motor Co., Flint, Mich.

KIRCHER MANAGER PACIFIC COMPANY—C. F. Kircher has been named manager of the truck department of the Pacific Car Co., Seattle, Wash.

BROOKLYN ORPHANS' DAY OUTING—The Orphans' Day Outing held by the Long Island Automobile Club, Brooklyn, N. Y., will take place on June 3 next.

SELLS SECOND-HAND CARS—The York Auto Exchange, York, Pa., has opened a garage at 26 North Duke street for the sale of second-hand cars and accessories.

LOUISVILLE CLUB QUARTERS MOVED—The quarters of the Louisville, Ky., Automobile Club have been moved from the Hotel Henry Watterson to the Inter-Southern building.

HARSH WITH SANDUSKY AUTO PARTS—W. H. Harsh has been made assistant general manager and assistant treasurer of the Sandusky Auto Parts & Motor Truck Co., Sandusky, O.

REYNOLDS WITH CHAMPION COMPANY—E. H. Reynolds, Jr., formerly connected with the selling of Warren cars, has gone to the Champion Ignition Co., Flint, Mich., as an Eastern representative.

REO'S LOUISVILLE QUARTERS MOVED—The Clark Motor Car Co., agent for the Premier and Reo cars, has moved its offices and salesroom from Green street to the new building at 206 East Broadway.

CHICAGO SAINT LOUIS TIRE BRANCH—The Saint Louis Tire & Rubber Co., St. Louis, Mo., recently opened a branch in Chicago, Ill., at 2027 Michigan avenue. Mr. Alexander Hendel is in charge.

NEW VELIE FORCE—A. W. Bartlett has been made general manager of the recently incorporated Velie Motor Car Co., St. Louis, Mo. W. J. Carter and C. F. Swartz are also connected with the company.

HOPKINS RESIGNS FROM ALCO—N. S. Hopkins has resigned his position with the American Locomotive Co., Providence, R. I., where he had charge of the main manufacturing department for the past year.

LOZIER'S OFFICES CHANGED—The Louisville, Ky., Lozier Co., agent for the Lozier, Paige and Palmer-Singer, has changed its offices and salesroom from Seventh street and Broadway to 405 West Broadway.

FRENCH DISTRIBUTOR FOR MOTOMETER—Y. D. Rose, of 34 Rue Du Mont-Thaber, Paris, France, has been appointed the sole distributor for France of Boyce Motometers. Mr. Rose will make his headquarters in Paris.

FIFTY-SIX AUTOMOBILES DESTROYED—Fifty-six electric automobiles were burned recently in a fire that destroyed a garage and storage warehouse in East Forty-seventh avenue, Chicago, Ill., the loss amounting to $250,000.

MORRIS GETS GOODYEAR MANAGERSHIP—M. E. Morris has been appointed Pacific Coast manager for the Goodyear Tire & Rubber Co., Akron, O., succeeding W. T. Powell, who has resigned. F. E. Carroll remains manager of the local branch in San Francisco, Cal.

LOZIER FACTORY BRANCH IN SEATTLE—The Lozier Motor Co., Detroit, Mich., will put a factory branch in Seattle, Wash. Carl Schnorr has arrived to take charge of the mechanical end of the business. The Lozier branch will have headquarters in the Motor Bldg.

NEW FRISCO HOME—The new home of the United Motors Co., San Francisco, Cal., located at Van Ness avenue and Cedar street, will contain 17,600 square feet of floor space. The showroom will cover an area of 40 by 70 feet and will be finished in pearl white.

TWO-MILE TRACK IN SEATTLE—H. W. Doherty has interested a large number of Seattle, Wash., dealers and motorists in the project to build a two-mile brick or cement track adjacent to that city. Actively associated with Mr. Doherty in the proposed track is D. G. Van Brunt.

DOVE WITH HAVERS—H. E. Dove, who has been acting in the capacity of branch manager for the Buick Motor Co., Cleveland, O., has become associated with the Havers Motor Car Co., of Port Huron, Mich., in the capacity of Pacific Coast manager for that company. His headquarters will be at San Francisco, Cal.

GOODYEAR BRANCH'S NEW STRUCTURE—The Louisville, Ky., branch of the Goodyear Tire & Rubber Co., Akron, O., is now located at 331 East Broadway. The new structure is equipped after the general scheme of all Goodyear branches in the country. Two stories and a basement are occupied by the branch, there being about $150,000 worth of stock in the building.

N. Y. PULLMAN ALTERING QUARTERS—The Stewart Automobile Co., New York City, handling the Pullman car, has been compelled, owing to business enlargement, to make a number of alterations in its building, 231 West 54th street. The entire ground floor has been turned over to the sales force. The upper floors will be devoted to academic purposes and the service department.

CHANGES IN AMERICAN MOTORS—A number of important changes are announced by the American Motors Co., Indianapolis, Ind., in its sales organization. D. B. Williams, advertising and publicity manager, has resigned that position to take a position in the sales organization as district sales manager, with headquarters at Louisville, Ky., covering a number of the Southern states and devoting his whole time to the dealers handling the American cars and the development of that territory. G. L. Moskovics, formerly assistant advertising manager under Mr. Williams takes the place made vacant by him. E. H. Sherwood has been appointed assistant sales manager.

INTERNATIONAL MOTOR COMPANY CHANGES—Recent changes in the motor truck field are announced by the International Motor Co., New York City; Ambrose Monell succeeds Edmund C. Converse as chairman of the board of directors; W. C. Dickerman retires from the position of chairman of the executive committee, leaving its duties temporarily to first vice-president John Calder. E. C. Fink, lately assistant to the president, has been elected third vice-president. D. C. Fenner resigns as New York sales manager to accept special duties in the general sales organization, and is succeeded by Kenneth M. Blake, who adds to his sales duties those of branch manager. R. E. Fulton becomes chief sales manager and R. G. Randolph is appointed New York service manager.

Alco car with 145,000 miles record which will compete in Chicago-Boston non-stop reliability contest June 25-29

One day's shipment of ten Reo roadsters to the American Radiator Co., New York City, for use by their travelling salesmen

WAVERLEY ELECTRIC MOVES—The Waverley Electric Co., New York City, has moved into new quarters at 1922 Broadway.

ANGLADA'S NEW OFFICES—J. A. Anglada has moved into new quarters at 1790 Broadway, in the United States Rubber Bldg., New York City.

NEW CONCERN IN DALLAS—A new firm has opened in Dallas, Tex., by the name of Knight & Mitchell. This concern will be dealers for the Liquid Tire Tonic and will be distributors for the entire state.

SACKS GRAY & DAVIS MANAGER—C. O. Sacks, president and treasurer of the Rowland Advertising Agency of New York, has accepted the position of advertising manager for Gray & Davis, of Boston, Mass. He will take up his new duties about July 1, with headquarters at the plant.

MOTOR TRANSPORT IN CEYLON—The Governor of Ceylon has agreed to receive a deputation from the Ceylon Planters Assn. and the Colombo Chamber of Commerce regarding the need of introducing motor transport services in the Colony and of making the roads suitable for this purpose.

UNIQUE GUIDE BOOK ISSUED—A unique guide book is being issued by the Kansas Automobile Assn., Kansas City, Mo., giving the leading roads between all the towns of the state as well as the ten leading trans-continental routes. It is being distributed free to the members of the association. It will not be sold to anybody.

HAYNES INCREASES STAFF—The Haynes Automobile Co., Kokomo, Ind., has appointed Robert Crawford as advertising and publicity manager and L. E. McKenzie as assistant in the sales department. The state of Kentucky has been assigned to F. C. Headington, who will act as field representative there.

TURNS LIGHT ON TAXI TAXI CONDITIONS—F. Ducasse who has been in the taxicab and taximeter business for many years has submitted to the special committee of the New York City Board of Aldermen a statement on the taxicab situation in the city. An array of facts is set forth by Mr. Ducasse to prove the undesirability of abolishing private stands and of decreasing taxicab rates.

SHERIDAN BUS LINE ORGANIZED—The Sheridan Motor Bus Co., Sheridan, Ind., has been organized to conduct a motor bus business, carrying passengers and light freight between Sheridan and Noblesville. The line will also work in conjunction with the Union Traction Co., of Indiana, connecting with the electric interurban line at Noblesville. Two motor buses with a capacity of twenty passengers each will be used.

SYRACUSE DISTRIBUTOR MOVES—E. P. Young, distributor for central New York of the Regal and Maxwell cars, has moved into his new quarters at 212 Jackson street, Syracuse, N. Y. It is a new two-story building of concrete and steel, the front of pressed brick and cut stone. The ground floor will contain the office, salesroom and the garage proper. The second floor will have the service station and repair shop and there is a hydraulic elevator.

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

ATHENS, O.—City Automobile Co.; capital, $12,000; to deal in automobiles. Incorporators: Ura Butcher, Dana Connett, G. H. Junod, C. J. Allstock, Mabel Butcher.

AUBURN, N. Y.—Ross Automobile Co., capital, $10,000; to deal in automobiles. Incorporators: E. A. Ross, Maurice E. Tuller, H. A. Barr.

BOSTON, MASS.—Chandler Motor Car Co.; capital, $30,000; to deal in automobiles. Incorporators: R. O. Hood, E. G. Cleary, M. L. Albins Vincent.

BRITTON, OKLA.—Darling Automobile Mfg. Co.; capital, $25,000; to deal in automobiles. Incorporators: C. P. Stealey, A. W. Hedge, H. O. Crum, G. E. Crawford, S. L. Shlutaffer, D. L. Sellers, W. C. Settle, H. S. Emmerson, C. L. Stealey.

CHICAGO, ILL.—Auto Sales Co. of Illinois; capital, $2,000; to deal in automobiles. Incorporators: T. J. Peden, R. C. Merrick, J. W. Yeager.

CHICAGO, ILL.—Beeler Slide Valve Motor Co.; capital, $20,000; to manufacture motors and machinery. Incorporators: T. Burleigh Beelers, M. A. Hirshl, S. B. Hirshl.

CINCINNATI, O.—Allen-Reed Tractor Co.; capital, $50,000; to manufacture and deal in tractor engines of all kinds. Incorporators: Allen Reed, L. J. Colle, H. W. Reedy, W. C. Taylor, E. B. Lamping.

CLEVELAND, O.—Woodland Garage Co.; capital, $5,000; to deal in automobiles and supplies of all kinds. Incorporators: Jake Soglovitz, A. E. Bernstein, B. J. Sawyer, Sadie Cohn, I. Nungesser.

DETROIT, MICH.—Wahl Motor Car Co.; capital, $500,000; to manufacture motor trucks. Incorporators: G. H. Wahl, J. E. Hofweber, A. J. Hofweber, M. Kratchwill.

FALL RIVER, MASS.—Fall River Automobile Co.; capital, $10,000; to deal in automobiles. Incorporators: A. H. Harrington, P. M. Leavitt, B. A. Levy.

JACKSONVILLE, FLA.—S. & B. Motor Co., Inc.; capital, $10,000; to engage in the handling of automobiles, motorcycles, bicycles and vehicles. Incorporators: B. D. Spluney, Joseph Lockwood, J. S. Bertram.

JACKSONVILLE, FLA.—White Sales Co.; capital, $100,000; to deal in automobiles. Incorporators: J. R. Collins, P. D. Casidey, N. A. Collins.

KANSAS CITY, MO.—E. Landin Auto Co.; to deal in automobiles. Incorporators: M. J. Oldham, W. G. Bryant, M. S. Keuney, W. L. Gregg.

LOUISVILLE, KY.—The Automobile Clearing-House Co.; capital, $2,500; to handle automobiles and supplies. Incorporators: C. L. Holden, W. J. Welch, C. H. Welch.

MONTREAL, QUE.—The Montreal Autobus Co.; capital, $10,000,000; to manufacture automobile buses. Incorporators: H. S. Holt, U. H. Dandurand, F. L. Wanklyn, D. McDonald, J. S. Norris, Tancrede Bienvenue, D. Lorne McGibbon, Paul Gallbert, J. E. Wild.

NEOSHO, MO.—Neosho Auto Co.; capital, $3,500; to deal in automobiles. Incorporators: A. C. McGinty, J. F. Wills, S. D. DeLapp, F. S. Briggs, E. R. Rudy, O. L. Craven.

NEW YORK CITY.—Gallagher Carburetor Co.; capital, $300,000; to manufacture carburetors, engines, auto supplies. Incorporators: R. W. Gallagher, W. M. Foord, H. A. Johnston.

PEARL RIVER, N. Y.—Pearl River Auto Co.; capital, $5,000; to deal in automobiles. Incorporators: C. R. Kosel, Herman Gunther, Maria Kosel.

PORTLAND, ME.—M. B. Mank Motor Car Co.; capital, $10,000; to deal in automobiles. Incorporators: M. B. Mank, A. E. Mank, C. F. Mank.

UTICA, N. Y.—E. D. & A. F. Crouk; capital, $75,000; to deal in automobiles. Incorporators: Harry Lancaster, F. H. Doolittle, O. J. McKeown.

WASHINGTON, D. C.—Washington Motor Car Co.; capital, $300,000; to manufacture automobiles. Incorporators: A. Gary Carter, Frank L. Carter.

GARAGES AND ACCESSORIES

AKRON, O.—Quality Tire & Rubber Co.; capital, $1,000; to manufacture and deal in automobile tires and rubber goods. Incorporators: R. E. Smith, J. G. Guither, E. D. Smith, E. L. Smith, J. H. Robertson.

BELLEVUE, PA.—Bellevue Garage; capital, $10,000; to carry on a general garage business. Incorporators: E. A. Shaner, C. W. McCall, W. M. Barnhardt.

BUFFALO, N. Y.—Couch-Georger Tire & Mfg. Co.; capital, $10,000. Incorporators: C. A. Couch, E. F. Howell, F. P. Georger.

CHICAGO, ILL.—Federal Services Co.; capital, $2,500; to manufacture automobile supplies. Incorporators: L. O. Hack, R. S. Wertheim, S. H. Rothschild.

HAMILTON, O.—Star Taxicab Co.; capital, $5,000; to operate a taxicab and automobile service. Incorporators: G. C. Skinner, A. M. Skinner, William Miller, Merle Fenner, Millikin Shotts.

KENOSHA, WIS.—M-A-A Concealed Hinge Co.; capital, $10,000; to manufacture hinges and locks for automobile bodies and other purposes.

MIDDLETOWN, N. Y.—North End Garage Corp.; capital, $10,000; to carry on a general garage business. Incorporators: Edward Van Duser, J. G. Eager, F. F. Sheerin.

MINNEAPOLIS, MINN.—N. W. Liquid Tire Tonic Co.; capital, $50,000; to deal in automobile tires and accessories. Incorporators: F. M. Rutten, H. W. Ewing, L. P. Fay, A. G. Rose, Jr.

NEW YORK CITY.—Globe Auto Specialty Co.; capital, $4,500; to deal in automobile accessories. Incorporators: Jacob Stam, J. B. Stam, D. S. Messeson.

NEW YORK CITY.—Globe Rubber Tire Mfg. Co.; capital, $1,500,000; to manufacture automobile tires. Incorporators: H. D. James, J. P. Hall, Spencer Weart.

NEW YORK CITY.—H-H-H Tire & Mfg. Co.; capital, $50,000; to manufacture and deal in automobile tires and rubber goods. Incorporators: John Dravia, W. C. Burroughs, J. J. Coyle.

NEW YORK CITY.—J-M Shock Absorber Co.; capital, $1,000; to deal in automobile shock absorbers, etc. Incorporators: Maurice Rosvold, E. Molanchetr, Erie Aquist.

NEW YORK CITY.—Packard-Bretey Auto Renting Co.; capital, $2,500; to engage in automobile renting. Incorporators: Henry Pearlman, John Blumenthal, S. J. Loeb.

NEW YORK CITY.—Sunswick Garage and Livery Co.; capital, $2,000; to operate a garage. Incorporators: W. H. Quinn, P. J. McGlynn, T. J. O'Hanlon.

PHILADELPHIA, PA.—The New Idea Tire Co.; capital, $500,000; to manufacture automobile tires. Incorporator: F. R. Hansell.

PITTSBURGH, PA.—City Garage & Sales Co.; capital, $50,000; to carry on a garage. Incorporators: W. G. Venn, M. H. Ward, H. N. Stackpole.

PORTLAND, ME.—Berry & Winslow Garage Co.; capital, $10,000. Incorporators: Charles W. Berry, Ralph W. E. Winslow, Thomas A. Sanders.

TROY, N. Y.—Troy Auto-Bus Corp.; capital, $20,000; to operate an automobile bus line. Incorporators: John Burdick, E. L. Snydr, John McGlynn.

CHANGES OF NAME AND CAPITAL

CLEVELAND, O.—B. M. Allen Motor Sales Co.; change of name to the Velie-Paige Motor Car Co.

CLEVELAND, O.—Grant-Lees Machine Co.; change of name to the Grant-Lees Gear Co.

DETROIT, MICH.—Regal Motor Car Co.; capital increased from $1,000,000 to $3,000,000.

INDIANAPOLIS, IND.—Ideal Motor Car Co.; change of name to the Stutz Motor Car Co.

MASSILLON, O.—Croxton Motor Co.; capital decreased from $250,000 to $12,500.

New Agencies Established During the Week

PLEASURE VEHICLES

Place	Car	Agent
Aberdeen, S. D.	Hupmobile	Hanus Bros.
Birmingham, Ala.	Little	Thos. E. Morris, Jr.
Blair, Neb.	Hupmobile	U. G. Garner.
Cairo, Neb.	Hupmobile	Dell Thompson.
Columbus, O.	Apperson	G. L. Sitgreaves.
Columbus, O.	Mercer	G. L. Sitgreaves.
Columbus, O.	Simplex	G. L. Sitgreaves.
Creighton, Neb.	Pathfinder	C. C. Colby.
Fremont, O.	Abbott-Detroit	Younkman Bros.
Fremont, O.	R-C-H	Younkman Bros.
Fullerton, Neb.	Hupmobile	F. A. Billings.
Garfield, Wash.	Velie	Garfield Auto Co.
Genesee, Idaho	Velie	Meyer & Flomer.
Kenton, O.	Studebaker	Arnett Auto Co.
Little Rock, Ark.	Franklin	Jones & Lewis.
Logan, O.	Hupmobile	Main Motor Car Co.
Madison, Neb.	Hupmobile	Frank Kamroth.
Mansfield, O.	R-C-H	Myers & Morris.
Matador, Tex.	Franklin	Jack Luckett.
Morris, Ill.	Franklin	D. S. Huff.
Mullen, Neb.	Hupmobile	Gregg & Huffman.
Newman Grove, Ia.	Hupmobile	Newman Grove Auto Co.
Palouse, Wash.	Velie	Palouse Hardware & Implement Co.
Pampa, Wash.	Velie	A. Camp.
Philadelphia, Pa.	Inter-State	Chas. Walton, Jr.
Pullman, Wash.	Velie	B. F. Campbell.
Red Oak, Ia.	Hupmobile	Luther Brening.
Republic, Wash.	Velie	C. J. Tompkins.
Rosalie, Wash.	Velie	I. D. Lemley.
Rosalie, Wash.	Velie	Rosalie Hardware Co.
Schuyler, Neb.	Hupmobile	Schuyler Motor Co.
Tacoma, Wash.	Ford	W. O. Baldwin.
Tacoma, Wash.	Stutz	W. O. Baldwin.
Utica, Neb.	Hupmobile	W. C. Kenner.
Washington, D. C.	Hudson	Hudson Sales Co.
Washington, D. C.	Pullman	W. P. Barnhart & Co.

COMMERCIAL VEHICLES

Place	Car	Agent
Columbus, O.	Chase	N. Morton.
Fort Plain, N. Y.	Stewart	H. B. Gray Co.
Herkimer, N. Y.	Stewart	G. E. Clark.
Hudson, N. Y.	Stewart	Wm. Petry Garage.
Johnstown, N. Y.	Stewart	Johnstown Motor Car Co.
Northampton, Mass.	Stewart	Draper Garage.
Red Bank, N. J.	Stewart	Fred H. Van Dorn.
San Francisco, Cal.	Autocar	M. S. Bulkley & Co.

ELECTRIC VEHICLES

Place	Car	Agent
York, Pa.	Standard	Charles E. Motter.

The AUTOMOBILE

MAY 22, 1913 — 10 CENTS A COPY

The AUTOMOBILE

Spring Apparel for the Automobilist

Smart Dustcoats Mark This Year's Fashions

Fig. 1—The mackinaw is now a most popular automobile garment. Striking patterns are the rule

OBEDIENCE to the exacting dictates of Fashion is universal. It is amusing, not to say often pathetic, to realize how meekly the world submits. We all obey more or less blindly, but there are widely varying degrees of willingness manifested in the submission. And the factor which more than any other governs the readiness with which a new law of fashion is accepted is utility. We are grateful for any new rule in dress that can boast of the least suggestion of reason for the change. Too many have none; and the innate craving for something rational has to be stifled so that we can venture out into the open wrapped up in that mystery which the fashion writers delight to call *le dernier cri.*

Fashion has now to be reckoned with in the automobile. We have long passed the stage when the car itself was the thing. How to appear in it with comfort and distinction is receiving more and more consideration. A review of the automobile clothing shops reveals the fact that the satisfactory blending of appearance with utility is the keynote of this year's apparel for the automobilist. It has always seemed incumbent on the motorist to wear something different than the man in the street. In the early days he was looked on by many as a crank, and it must be confessed that if he did not intentionally dress for the part his efforts to destroy the general impression were not very noticeable. His manner of enveloping himself cocoon-like in huge and needless masses of fur was seized on with avidity by the comic artists of the period, and with good reason. Winter coats of the present time have the quality of warmth without this loud mark of external eccentricity. In this and other directions, the sartorial artist has turned his attention to the profitable field of the automobile with results that can only be looked on as satisfactory.

The general trend has been to produce garments that while supplying the peculiar needs of the automobilist do so without making the wearer conspicuous should he take to the sidewalk for a few blocks. Many of this year's overcoats, indeed, are hardly distinguishable from the ordinary overcoat. The differences lie in the direction of increased roominess, particularly at the junction of sleeve and shoulder and also about the skirt. These variations from the everyday cut are conducive to comfort in the sustained sitting posture of the motorist and hinder fatigue at the shoulder when holding the steering wheel.

Spring is now with us, the poet has had his say—or hasn't, which is just as well, and the mind of the enthusiastic motorist is dwelling longingly on the delights of touring and the open road. The time is opportune to cast an eye over the automobile wardrobe and note what deficiencies can be filled.

The most indispensable of all automobile garments is the dust coat. This year an amazing variety of types, each possessing merits worthy of consideration make it a difficult matter to form a decision when purchasing. In all of them there is a marked difference to the duster of a few years ago. At that time the owner of a car was content with something light that kept him from dust and it was thought that there were not opportunities of introducing some semblance of style into the garment. Possibly it was considered that the cheapness of the material did not warrant any expenditure of thought over the cut. A glance at the long line of dusters on view at present shows that a really smart looking garment in the various light

Fig. 2—Light raglan waterproof with velvet collar and velvet trimmed half belt. Price $25

Fig. 3—Double-breasted duster in striped gray poplin with convertible collar. Price $22.50

Fig. 4—Handsome dustcoat in light poplin with wide half belt. Listed at $25

Fig. 5—Smart duster in cravenneted worsted with breast pocket and close-fitting collar, $20.

materials that are used for this purpose can be produced at a reasonable figure. Favorite materials are mohair, linens, pongees and poplins, and there is an increasing demand for gray tones that will render the inevitable grease spots less noticeable.

The line of demarcation between the duster and the rainproof is not very definite. The rainproof proper is not so cool as the duster, but a combination garment formed by subjecting the lighter stuffs to water-proofing processes is meeting with an appreciative demand. These coats are all that is necessary to ward off the summer shower and save the trouble of changing into a rubber garment.

Many varieties of storm-resisting apparel are being displayed in the stores. The old term rainproof has been found wanting. The automobilist in a real downpour requires special protection, and any garment that can provide it is entitled to the stronger expression of being stormproof. The most perfect of these storm protectors is the so-called rubber apron much used by chauffeurs. In these, the only openings are the sleeves and a neck hole. Entry into the garment is rather a troublesome operation, but once there the elements can be defied. Besides the

Fig. 8—New driving glove with reinforced palm for hard wear

heavier types of black rubber storm apron some makers are listing a lighter type of a smarter appearance for owners.

Another form of rainproof that is popular is the white rubberized duck coat. This always remains spotlessly white and holds its shape, and trimmed with black velvet at the collar is a smart looking garment. For hot weather, however, where such a waterproof would seem uncomfortably heavy, a silk oil would better suit the purpose. These garments cannot claim anything in the way of appearance, but they are so astonishingly light, consisting practically of a transparent skin, and moreover are capable of being rolled up into such a small compass that they form a useful addition to the touring motorist's wardrobe.

With regard to the cut of the shoulder this year shows the raglan type to be still popular, although the regular inserted coat sleeve is in the majority. The collars are also divided into two camps—the tight fitting military and the conventional lapel. A type which is increasingly popular is called the convertible, and in this the lapels can be worn open during fair weather to get advantage of the breeze and folded over when protection of the throat is desired. This snug fitting of the neck is a matter that has received a great deal of attention at the hands of the designers, with the results aimed at. To prevent the entry of dust at this point goes a great way toward a tidy appearance when the garment is taken off.

Developments are also to be noted in other departments of automobile wear. Gloves, for instance, are now made with an eye on the hard usage that they are subject to on the driver's hands. Various kinds of reinforced palms are being exhibited, while the heat of a heavy driving glove is being obviated by incorporating lisle or other thin ventilating material into the backs and the unused parts of the fingers.

A glance at the displays of goggles and other face protectors shows that the main change to be noted is a demand for goggles that will be as inconspicuous as possible. There is also a great demand for large lens spectacles. These latter are being found to afford ample protection from the direct flow of dust, do not limit the angle of view as do many of the older gogle forms and furthermore permit a constant movement of air about the eye and so reduce eye strain in warm weather.

Fig. 6—Smart skeleton-lined overcoat in army cloth for the touring motorist. Price $30

Back view of army cloth coat showing half belt and center inverted pleat at the back

Fig. 7—Rubber apron that is absolutely waterproof. Snap buttons are used throughout

Showing method of fastening apron by neck bands. This storm protector is listed at $25

Not much change can be recorded in the design of uniforms for the chauffeur. What little there is in the direction of bringing the uniform more into the field of the ordinary garment.

In Fig. 1 is shown a Mackinaw jacket which is becoming exceedingly popular. These are supplied in a great variety of patterns, the one illustrated being a shepherd's plaid. They have a sporty appearance and are thick enough to afford ample protection against cold.

Fig. 2 shows a favorite type of duster in dark grey striped poplin. The collar is convertible and the garment looks smart either way. The sleeves are provided with elastic wind shields.

A cravenetted worsted double breasted duster with a high military collar is illustrated in Fig 3. This coat has a special neck tag to insure tight buttoning up of the collar, wrist shields and a pleated breast pocket, as well as the ordinary slot pockets at the sides.

The back view shows a distinctive dust coat in light poplin. A half belt of the same material extends from pocket to pocket and wrist shields in addition to outer wrist straps are fitted. The collar is high and fits the neck snugly.

Fig. 4 shows a light waterproof in dark grey with raglan shoulders. A velvet trimmed collar adds considerably to the appearance of the garment. The rubberized material is double around the shoulders. The arm holes are deep to allow freedom of movement and the arm pit is ventilated. A half belt trimmed with velvet in a similar manner to the collar is fitted behind. The side pockets are of the slot type.

Back and front views of an extremely smart overcoat for touring are shown in Fig. 6. This model, supplied in army cloth is light and is equally of use in or out of the car. The sleeves and shoulders are lined and looseness in the skirt is secured by means of an inverted center pleat extending from the waist at the back. A buttoned half belt is fitted.

Fig. 7 illustrates a storm proof apron as seen from back and front. The arrangement of the flaps at the opening for the neck are such that there is no possibility of rain entering. All buttons are of the snap pattern used in gloves. The outer collar formed in one with the breast flap is secured at the back by these buttons as shown in the back view. A strap at the wrist produces a tight fit and prevents the entry of water at that point.

An ingenious method of increasing the wearing qualities of gloves used by drivers is illustrated in Fig 8. Extra thicknesses of leather are sewn on the inner surfaces of the fingers and over the palm where the glove is in constant contact with the driving wheel. Another development in glove design is shown in Fig. 9. This is intended for summer wear when the ordinary glove is generally found to heat the hand too much. The back of the hand portion and the fingers are cut away and silk lisle of a color to match the glove inserted. By this means ventilation is secured.

The Automobile is indebted to Saks & Co., of New York, for the use of the garment shown in Fig. 1; to The Auto Supply Co., New York, for those illustrated in Figs. 5, 6, 7, 8 and 9, and to James McCreery & Co., New York, for the coats shown in Figs. 2, 3 and 4. Photographs by N. Lazarnick, New York.

Fig. 9—Summer glove with ventilating back of silk lisle

Ford To Add 500,000 Square Feet

Chalmers Adds 50,000 Square Feet — Schaefer is Abbott President

DETROIT, MICH., May 20—Although it has been common property for some time that the Ford Motor Co. was contemplating the further enlargement of its plant in Highland Park. According to a statement emanating from the general offices of the Ford company the additions will increase the total floor space from 1,270,062 square feet to 1,794,974 square feet, or about 500,000 square feet. Two new factory buildings, each six stories in height and measuring 60 feet in width by 900 feet in length, are to be erected, the plans being prepared under the supervision of the company's consulting engineers.

Craneways, which will be under a glass roof, will extend the length of the structures and will afford means of transfer of parts or other material from any point in the factory to any other. The additions will mean much to Detroit, as they will make necessary the employment of several thousand more men, which will probably swell the total number to around 16,000. There are at present about 14,500 employed by the concern.

In addition to the extensions of the plant proper, two stories are to be built onto the office and administration building in front of the plant, and material extensions to the Ford sales and service station, located at the corner of Woodward avenue and Grand Boulevard, are also planned. Five stories more are to be added to the latter, while its frontage on Woodward avenue is to be increased from 100 to 321 feet. The depth of this building is 97 feet.

Chalmers' Factory Addition Planned

DETROIT, MICH., May 19—The large Chalmers Motor Co. plant on Jefferson avenue is to be further enlarged by the addition of another wing measuring 220 feet in length and 60 feet wide. The added floor space will be about 50,000 square feet, the structure being four stories in height according to the plans. The new building will be made of concrete and steel, and the ceilings will be flush. That is, there will be no exposed beams. Inclosed bridges of steel will connect each floor with those of the adjoining building. With the completion of this latest addition the Chalmers company will have added some 200,000 square feet of floor space to its already large plant within the last year, and it will bring the total expenditures for additions and improvements to plant during that period to $400,000. Five other structures have been added, ranging from one to four stories in height as well as extensions to other departments.

Schaefer Elected Abbott President

DETROIT, MICH., May 21—*Special Telegram*—The creditors' committee of three, consisting of A. H. Zimmerman, Continental Motor Mfg. Co., A. W. Lewis, Timken-Detroit Axle Co., and H. J. Mallory, Weston Mott Co., has chosen A. E. Schaefer, formerly with the Ohio Motor Co. as president and general manager of the Abbott Motor Co., which recently went into the hands of the creditors' committee. Mr. Zimmerman has been made vice-president and treasurer and, while no secretary has yet been appointed, this office will be filled before the end of the week. The committee reports progress and its actions have met with the entire approval of the creditors. The directorate will consist of nine, most of the members of which will be chosen from the creditors. The committee expects to complete the list of directors by the end of the week.

France's Exports Gain $2,602,380

PARIS, FRANCE, May 12—Although rumors of war have caused a falling off in home business, the automobile export trade of France continues to be good. According to the official returns, the increase in exports for the first 3 months of the present year, compared with the corresponding period of 1912 is $2,602,380. Four countries show a falling off in their purchases with France: England, $281,940; Switzerland, $77,340; Turkey, $19,880; United States, $26,460. All other nations show an increase, the greatest jump being with the Argentine Republic. The official figures for exports during January, February and March, 1912 and 1913, are:

	1912	1913
England	$2,859,360	$2,577,420
Belgium	1,918,560	2,339,520
Argentine Republic	448,700	1,194,360
Brazil	449,640	729,420
Germany	600,900	680,460
Algeria	769,860	945,120
Italy	114,240	281,700
Spain	219,060	252,540
Russia	63,840	247,920
Switzerland	262,380	185,040
United States	168,780	142,320
Austria	61,920	76,320
Turkey	59,580	37,700
Other countries	929,280	1,844,040
	$8,926,500	$11,528,880

Imports of automobiles into France have increased, the figures for the first three months of 1912 being $476,160, compared with $838,560 for the present year, being an increase of $362,400, or 76 per cent. The greatest increases have been obtained by England, Germany, Belgium, Switzerland and the United States. England has increased her business with France 125 per cent. during these three months and Germany shows an increase of 128 per cent.

Houpt To Handle Lozier in Metropolis

NEW YORK CITY, May 20—Harry S. Houpt, Inc., will after June 1st handle the Lozier car for New York and the Metropolitan territory, succeeding the present branch arrangement. Mr. Houpt, who is president and general manager, was until recently head of the sales department of the American Locomotive Co. With him is L. A. Van Patten, vice-president and salesmanager, and who is at present advertising manager of the Alco company. J. V. Westervelt will be secretary and treasurer of the new concern.

Westinghouse Report Shows Gains

NEW YORK CITY, May 21.—The Westinghouse Electric & Mfg. Co. published its annual report yesterday, showing gross earnings for the year ending March 31, 1913, of $40,000,000, $3,164,032 being available for dividend payments. After paying 7 per cent. dividends on the preferred stock, 8.2 per cent. remained for the common stock, as compared with 6.12 per cent. for the previous year.

Automobile Securities Quotations

Changes in price were rather mixed during the past week, and the amount of trading also varied with the several issues dealt in on the Exchange.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	125	155	..
Ajax-Grieb Rubber Co., pfd	95	100	95	100
Aluminum Castings, pfd	100	..	98	100
American Locomotive Co., com	42½	43	32¼	32½
American Locomotive Co., pfd	107	109	102	103
Chalmers Motor Company, com	..	..	127	135
Chalmers Motor Company, pfd	..	..	98	102
Consolidated Rubber Tire Co., com	18	20	14	18
Consolidated Rubber Tire Co., pfd	58	..	60	75
Firestone Tire & Rubber Co., com	285	295	254	260
Firestone Tire & Rubber Co., pfd	106½	107½	105	107
Fisk Rubber Company, com	..	..	..	..
Fisk Rubber Company, pfd	..	..	..	100
Garford Company, preferred	100	..	..	97½
General Motors Company, com	35	37	25	30
General Motors Company, pfd	76	77	70	77
B. F. Goodrich Company, com (new)	86	86½	30	31
B. F. Goodrich Company, pfd (new)	108	108½	92	94
Goodyear Tire & Rubber Co., com	265	275	316	322
Goodyear Tire & Rubber Co., pfd	105	105½	98½	100
Hayes Manufacturing Company	..	104	..	90
International Motor Co., com	33	35	5	6
International Motor Co., pfd	93½	96	10	15
Lozier Motor Company	..	55	..	20
Maxwell Motor Co., com	..	..	2	5
Maxwell Motor Co., 1st pfd	..	..	40	50
Maxwell Motor Co., 2nd pfd	..	..	12	15
Miller Rubber Company	160	165	140	150
Packard Motor Car Company, pfd	104½	106	98	102
Peerless Motor Car Company, com	..	..	40	50
Peerless Motor Car Company, pfd	..	..	..	96
Pope Manufacturing Co., com	29	31	15	16
Pope Manufacturing Co., pfd	73	74¼	48	51
Portage Rubber Co., com	..	..	35	45
Portage Rubber Co., pfd	..	..	90	95
Reo Motor Truck Company	9	10½	10½	11½
Reo Motor Car Company	24½	25½	20	22
Rubber Goods Mfg. Co., pfd	104	108	105	111
Studebaker Company, com	39	40	27	29
Studebaker Company, pfd	96	98	88	92
Swinehart Tire Company	112	114	85	85
U. S. Rubber Co., com	..	..	62½	63
U. S. Rubber Co., 1st pfd	..	..	104½	105¼
White Company	107½	108½	107	110
Willys-Overland Co., com	..	..	63	66
Willys-Overland Co., pfd	..	..	90	95

Matheson Sale's First Day Brings $81,000

Bid $310,000 for Columbus Buggy —Bergdoll's Sale Brings $45,062

WILKES-BARRE, PA., May 21—*Special Telegram*—The sale of the receiver of the Matheson Automobile Co., of this city, opened yesterday, under the supervision of W. C. Shepherd, former president of the company and now receiver. The total realized on the first day of the sale was $81,000, which includes $30,000 realized on business good will, trademarks, etc., patterns and drawings. The sale will continue through today and tomorrow, when finished cars and shop equipment will be sold.

The Matheson company went into the hands of the receiver some time ago. On April 21, the condition of the company's liabilities was as follows: It owed $200,000 first mortgage, of which $183,200, the interest on which totaled $4,268.56. The second mortgage amounted to $105,000, including outstanding bonds to a total value of $68,500 and interest.

Columbus Buggy Co. Sale Confirmed

COLUMBUS, O., May 19—Judge J. E. Sater in the U. S. Court late Monday, May 19, confirmed the sale of the assets of the Columbus Buggy Co., to D. N. Postlewaite, representing the creditors' committee at the bid of $310,000. The objection of the McCue company, a creditor, on the ground that more money could be realized, was overruled. Steps are now being taken to reorganize the company and operate the plant.

Bergdoll Assets Bring $45,062.87

PHILADELPHIA, PA., May 19—The 2-day sale in bankruptcy of the Louis J. Bergdoll Motor Co., southwest corner of Sixteenth and Callowhill streets, realized known assets of $45,062.87, with unknown assets scheduled at about an equal amount, which is considerably less than the scheduled liabilities of approximately $160,000. Judge Thompson, in the United States District Court, today confirmed the sale of the company's assets.

Allen Company to Make Car

FOSTORIA, O., May 17—The organization of the Allen Motor Car Co., with an authorized capital of $500,000, has been completed and the announcement is made that a car will soon be manufactured in Fostoria and placed on the market which will sell for about $1,350. The organizers of the concern are E. W. Allen, W. O. Allen, J. E. Wright, M. A. Thomas, O. P. Bernhart, George E. Schroth, Grayton Baker, R. J. Christy and H. C. DeRan.

To Make More Gasoline in Kansas

TOPEKA, KAN., May 17—A big increase in the output of gasoline from the tar stills of the Standard Oil Co. of Kansas, located at Neodesha, Kan., will mean a considerable decrease in the price of gasoline in this territory, according to Earl W. Evans, attorney for the company. The concern has just secured permission to increase its capital stock from $1,000,000 to $2,000,000, and will make extensive improvements in its plant, expecting to make it the largest refinery in the world. The largely increased production of gasoline, if it reduces the price, will prove a boon to automobile owners, who have recently been compelled to pay more than formerly for their fuel.

Powerene—a New Automobile Fuel

FINDLAY, O., May 19—A new product made from the by-product of natural oil wells, which has hitherto been considered useless, has been discovered by Dr. J. W. Rae and Reece Lockwood, of Bowling Green, O. It is claimed by the discoverers that their new product will do away entirely with gasoline for motor power purposes. The new discovery will be called Powerene. It is said that it can be manufactured for half the cost of gasoline and that it will give more energy than a like amount of the latter liquid. Its explosive power is much higher and it does not leave as great a deposit of burnt carbon, on account of the new stuff being less carbonaceous than gasoline.

On a trial run from Bowling Green to Tiffin, 84 miles, the cost was 36 cents. The stuff can be easily manufactured for 13 cents per gallon.

MILWAUKEE, WIS., May 17—The Acetylite Gas Co., of which Percy C. Avery, well known in the automobile illuminating field of America and Europe, is president and general manager, has established a plant in Milwaukee, where it will carry on its work, which includes the manufacture and filling of gas tanks for pleasure cars and trucks. Experiments are being completed with a new form of acetylene gas which may be used as fuel in motor car engines, but Mr. Avery is not yet ready to make public the details of the product. By a secret process the Acetylite company has developed an acetylene gas which gives a flame of intense white or bluish light, similar to the light of electric lamps. The new fuel is a development of this gas process.

Court Holds Acetylite Does Not Infringe

MILWAUKEE, WIS., May 17—The United States Court for the Eastern District of Wisconsin, Milwaukee, has dissolved the injunction issued against Percy C. Avery and George F. Burnham of Milwaukee in 1910, on petition of the Prest-O-Lite Co., in consequence of the recent decision of the United States Court of Appeals that the patent had expired in 1910, and further, that the gas tank and process of the defendants did not infringe.

Smith-Haines Enjoined from Using "Yale"

NEW YORK CITY, May 20—Smith-Haines, who sold locks under the name Yale without being empowered to do so by the Yale & Towne Mfg. Co., of this city, were enjoined from continuing this practice by Justice Geo. C. Holt, of the U. S. District Court, Southern District of New York.

Market Changes of the Week

The metal markets this week experienced quite a few important changes. Tin slumped to $47.88 per 100 pounds at a loss of $1.12 in price for the week, while both coppers dropped in prices, electrolytic $.00 1-5 a pound and Lake $.00 1-20. Antimony on Wednesday dropped to $.07 1-2 per pound, a difference of $.00 1-8 from the preceding week. Bessemer steel dropped to $28.00 a ton, a lowering of $1.00, while open-hearth steel experienced a drop to $28.50, a reduction in price of $.50 per ton. Lead remained quiet but steady, calling at $4.35 per 100 pounds. Cottonseed oil at the close of the week held steady in price, and again reflected the tone of the lard market, which showed no material change in actual prices, but with an undercurrent of steadiness. A gradual rise from $6.89 on Wednesday to $7.06 on Tuesday showed at the closing an increase of $.17. Domestic scrap rubber remains in a steady position. A fair demand is being received from reclaimers and a somewhat larger export movement has been noted of late. Stocks seem to be comparatively small. On call at the New York market, automobile tire scrap was selling at $.10 a pound.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.	.07½	.07½	.07½	.07½	.07½	.07½	....
Beams & Channels, 100 lbs.	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	28.00	27.00	27.00	27.00	27.00	27.00	....
Copper, Elec., lb.	.15 7/10	.15⅝	.15⅝	.15 7/10	.15 7/10	.15 5/11	— .00⅕
Copper, Lake, lb.	.15¾	.15¾	.15¾	.15¾	.15¾	.15 7/10	— .00 1/20
Cottonseed Oil, lb.	6.89	6.95	6.95	6.95	7.00	7.06	+ .17
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil, Menhaden, Brown	.34	.34	.34	.34	.34	.34	....
Gasoline, Auto, 200 gals.	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime.	.95	.95	.95	.95	.95	.95	....
Lead, 100 lbs.	4.35	4.35	4.35	4.35	4.35	4.35	....
Linseed Oil.	.48	.48	.48	.48	.48	.48	....
Open-Hearth Steel, ton	28.50	28.50	28.50	28.50	28.50	28.50	....
Petroleum, bbl., Kansas crude	.88	.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa., crude.	2.50	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	....
Silk, raw Italy.	....	4.35	....	....	4.35	4.35	....
Silk raw Japan.	....	3.70	....	....	3.70	3.70	....
Sulphuric Acid, 60 Baumé.	.90	.90	.90	90	.90	.90	....
Tin, 100 lb.	49.00	48.05	48.00	48.88	48.00	47.88	—1.12
Tire Scrap.	.10	.10	.10	.10	.10	.10	....

Massachusetts Truck Bill Is Reported Back

Despite Opposition of Automobile and Business Men, Committee Brings $5 a Ton Bill Up Again

BOSTON, MASS., May 17—Despite all the arguments made against the truck bill by men of ability in different lines, and with no one representing the Highway Commission appearing in favor of it, the Committee on Roads and Bridges of the Massachusetts Legislature reported back the same bill calling for $5 a ton last Tuesday. It was evident from the questions asked by the members of the committee that they could not be convinced but what the motorists were wrong and the Highway Commission was right. But the fight will be kept up. If it passes the Senate a fight will be made in the House against it.

Massachusetts to Test Double Tax

BOSTON, MASS., May 19—Plans are now being formed in this city to test the constitutionality of the Massachusetts motor law instead of waiting for the outcome of the test case that the American Automobile Association is going to take to the United States Supreme Court. In the New York law all other taxes are exempted in lieu of motor fees, while here motorists pay personal property taxes as well as the registration tax, and the latter gives them no special privileges to go where horse-drawn vehicles are not allowed to go, but, on the contrary, they are restricted on many roads; while also other users of the highways pay no taxes except on property value.

Essenkay Products Change Hands

CHICAGO, ILL., May 19—*Special Telegram*—The Essenkay Products Co., 1125 West Thirty-seventh street, Chicago, has taken over all the business and the rights of the Essenkay company. The latter concern was the original promoter of Essenkay, a tire filler, which became fairly well known all through the country. Instead of using distributing agencies as before, the new company will introduce the plan of having supply houses and garages handle the filler.

NEW YORK CITY, May 17—The Manhattan Automobile Club, Inc., has opened its clubrooms at 222-224 West Fifty-ninth street to its members. A smoker is to bt given in the near future. The restaurant in the building has arranged to supply the members with meals a la carte.

Warner Announces New Clutch

MUNCIE, IND., May 17—The Warner Gear Co., of this city has added to its extensive line of automobile parts, a new enclosed clutch. The clutch, their model K-12, is of the dry-plate multiple-disk type, and is adaptable to the unit constructions of motors. The clutch housing does not run with the flywheel, but is stationary, being bolted to the motor housing.

The disks are of steel, faced with Raybestos. The drive is taken on hardened steel studs and hardened keys. All bearings are of the ball type.

Chicago's Municipal Underground Garage

CHICAGO, ILL., May 21—This city is planning a mammoth garage which will extend thirteen blocks along Michigan avenue, from Randolph street to Park Row, run under the surface of Grant Park and will house more than 2,000 automobiles. When completed it will be the largest garage in the world. The plans, drawn up by J. J. Reynolds, engineer of the harbor and subway commission, have been sent to the South Park Commissioners for their consideration. Whether they will be approved or rejected depends upon the action of the park board, which has sole jurisdiction over Grant Park. The estimated cost is $1,250,000. According to the present plans the garage will be constructed in sections, each section to accommodate 225 cars, with the cost of construction estimated at $125,000. Each section will be built between two east and west cross streets. The material specified in the plans is reinforced concrete, insuring permanence and proof against fire, and the roof will be covered with soil, so as to make a grass plot as at present. The cars will enter at one roadway and go out another, so that traffic will be in one direction except when a machine is backing out of its stall. The stalls, to be 16 feet long and 8 feet wide, will be arranged for the easiest entrance and exit.

Americans Lose by Slow Delivery

WASHINGTON, D. C., May 17—There are 2,000 automobiles in the republic of Uruguay, according to a recent official report. Of this number 1,300 are licensed in Montevideo and the remainder scattered throughout the country. Cars are entering the custom house at the rate of fifty a month. About half of the cars in use are of American manufacture. American cars are declared to be the more popular, but owing to the delay in delivery many orders are placed in Europe, where, it is claimed, shipment is made more promptly.

Vaughn Car Co. Working at Kingston

NEW YORK CITY, May 20—The Vaughn Car Co. has taken over the Kingston, N. Y., factory of Wyckoff, Church & Partridge, Inc., now bankrupt, and there will build a six-cylinder car, the Vaughn, which will retail at not more than $2,500. The officers of the company are: A. B. Cordner, president; Orlando Weber, vice-president; H. M. Johns, treasurer; Ernest S. Partridge, secretary and sales manager; Chester Griswold, consulting engineer.

Commercial Makers Plan Combination

NEW YORK CITY, May 20—The removal of the factory of the Lansden Co., of Newark, N. J., to Allentown, Pa., which has been announced here today, means not only that this company will considerably increase its capacity after having taken a one-story building having some 7,000 square feet, but it foreshadows a more important movement. The building which the Lansden Co. will use for the Allentown factory, belongs now to the Webb Fire Engine Co. This company, as well as the Maccarr Co., also of Allentown, are expected to combine with the Lansden Co. will use for the Allentown factory belongs now to the Webb manufacturer of self-propelling fire-fighting equipment and the Maccarr company makes a 1,500-pound wagon.

CHICAGO, ILL., May 17—W. T. Tennant, of Tennant Motors, Ltd., Chicago, agents for Simplex and Henderson, has been made vice-president of the Stewart Speedometer Corp.

NEW YORK CITY, May 20—On June 1 R. W. Hutchinson, advertising manager of the International Motor Co., will leave that company. So far he has not announced his future plans.

FINDLAY, O., May 19—R. K. Johnston has been retained to take the management of the manufacturing end of the Bowling Green Motor Car Co., Bowling Green.

Pedestrian Has Prime Right of Way

MEMPHIS, TENN., May 17—That a passenger leaving a trolley car has the right of way over an automobile has been decided in the U. S. Circuit Court of Appeals for the Sixth Circuit. Robert W. Parks, after leaving a street car and trying to gain the sidewalk, was struck by a cab of the Taxicab Company of this city. The latter, in its defense brought up in reply to the individual's damage action, argued that the accident was due to contributory negligence of the pedestrian, but the court ruled opposite and gave judgment for the plaintiff.

DETROIT, MICH., May 19—The Downing-Detroit Motor Co. is bringing out a racy-type design of cycle-car. The power plant consists of a 10-12-horsepower motor of long stroke. One chassis will be produced of standard tread and wire wheels, with a choice of either single or tandem seats. Arrangements are being completed to produce these cycle-cars in large numbers.

Practice for 500-Mile Race Is Under Way

Nearly All Drivers Are Tuning Up Their Racers at Speedway—Foreign Cars Turn Laps in 1:41

INDIANAPOLIS, IND., May 19—Those who have been watching the practice at the Indianapolis Motor Speedway are predicting that the average speed of the 500-mile race to be staged May 30 will be something less than 80 miles per hour, but over last year's mark. Among those who have made this prediction is Joe Dawson, who won last year's race at an average speed of 78.72 miles per hour. It is Dawson's opinion that, although some of the cars entered are capable of 100 miles an hour or better, they will be unable to maintain within 20 miles of that average on the local Speedway.

The Peugeots, driven by Goux and Zucarrelli, have turned several laps in 1:41, which has been the best mark since practice began in the present try-outs. The best lap last year during the race was 1:39 and many of the drivers are confident of equalling this before the race. Both Goux and Zucarrelli are delighted with the course. They say that, while they do not believe the course is capable of as great speed as Brooklands, they find driving less fatiguing here than on the English track.

The three Isottas will arrive tomorrow and will begin practice at once. Tetzlaff, one of the Isotta drivers, has been here several days, impatient to begin work. Grant and Trucco will be on hand when the Isottas arrive.

Gil Anderson and his Stutz are attracting a lot of attention during the practice. Anderson, a day or so ago, turned four laps, or 10 miles, in 6:57, which is said to be the best time for the distance that has ever been made on the course. Anderson has done several laps in 1:44 and his team mate, Herr and Merz, have also hit this figure repeatedly.

One of the criticisms of the Peugeot drivers has been that they have been trying to maintain approximately the same speed on the turns that they do on the straightaways.

Bob Burman in his Keeton is doing some steady and consistent work. Burman believes his car is ready for the race, although he expects to do some faster laps during practice than he has to date. His best lap has been 1:42 3-4, and he has turned other laps in 1:43 and 1:45.

The Mercer team, De Palma, Bragg and Wishart, have been at work several days. They have clipped off some laps at 90 miles an hour and their cars are working nicely.

Clark has practically overhauled his Tulsa and is now ready for some stiff practice. He found on arriving here that a number of changes in the car were advisable. Liesaw has been making some changes in his Anel, and Endicott has been making a few changes in his Case. No opportunity has been given thus far to show what the Case, Tulsa and Anel can do, but it is expected they will begin pretty active work by tomorrow.

The Fox Special, or Gray Fox, as it is being called by the railbirds, is being given a good work-out by Wilcox. Thus far Wilcox has been content to take the stiffness out of his motor, but by tomorrow or Wednesday he expects to begin showing some speed. Endicott and his Nyberg are not yet on the track. Reports have been received, however, that in practice work on country roads, Endicott has been able to get 92 miles an hour out of his car. The car will be on the track some time this week.

Harry Goetz has been selected as team manager for Billy Knipper, who is to drive the Henderson in the race.

Disbrow and Nikrent have been on the track several times with their Case cars, but have not tried to do much better than 1:50 for a lap. They have been trying to determine the size gear wheels they will need and, incidentally, to become thoroughly familiar with the track before attempting any fast work.

Johnny Jenkins has not done much actual practice with his Schacht, but has made a few trials and has made a few minor changes as a result. Mulford and his Mercedes will be here within the next day or two.

The Speedway management has announced the appointment of P. P. Willis as assistant director of contests at the Speedway. He will thus be first assistant to Charles Sedwick.

A new plan of signalling the drivers has been adopted. Heretofore the starter has had to flag the cars from the track. For this year a trolley arrangement has been built from the judge's pagoda to the paddock stand across the track and the flags will slide down to the center of the track. At the end of each driver's 199th lap a green flag will notify him that he has begun his last lap.

INDIANAPOLIS, IND., May 21—*Special Telegram*—F. L. Adams has withdrawn the Smada entry from the 500-mile race, being unable to get the car ready. Pennebaker and Nyberg have arrived. The unknown entry No. 32 is a Shambaugh, entered by Charles Shambaugh, of Lafayette, Ind., who entered a car last year but withdrew it before the race. The motor is a special four-cylinder type built by Shambaugh.

NEW YORK CITY, May 17—Albert Guyot arrived today on the steamer *La Provence* in company with H. L. C. Crossman, who will act as mechanician with him at Indianapolis on May 30. Guyot's Sunbeam racer has arrived and has been shipped to Indianapolis. Guyot has had much experience as a driver and is expected to give a good account of himself in the 500-mile race.

A. A. A Authorizes Pennebaker Entry

NEW YORK CITY, May 20—At a meeting of the Contest Board held at A. A. A. National Headquarters, Friday, May 16, the following action was taken:

The application for reinstatement to good standing of Theran S. Duby, of St. Louis, Mo., who was on December 14, 1911, disqualified and suspended until December 14, 1913, for participation in an unsanctioned track meeting at DeWitt, Iowa, on September 15, 1911, was considered and Mr. Duby was reinstated to good standing. Charles Shambaugh was also reinstated.

The ineligibility of Ernest J. Delaney, of Jackson, Mich., driver of the Cutting car in the 1910 500-mile race at Indianapolis, who took part in an unsanctioned track race at Milford, Iowa, August 14, 1912, was, upon his formal application, removed.

The application of R. H. Pennebaker, of Memphis, Tenn., who drove in the unsanctioned race meet held at the Tri-State Fair Ground's Track, Memphis, Tenn., July 4, 1912, was favorably considered and the acceptance by the Indianapolis Motor Speedway of his entry of a Pennebaker Special in the coming 500-mile race was authorized.

The request of C. V. Dunivan, of Memphis, the promoter of the meet in question, for removal of his ineligibility was considered, but his application was finally denied.

The application of E. V. Rickenbacher, of Des Moines, Iowa, for reinstatement to good standing was denied.

Upon satisfactory compliance with Rule 78, the board allowed and accepted the claim for record of Earl Cooper, driving a Stutz car, at the County Fair Grounds track, Fresno, Cal., February 10, 1913, as follows: 200 miles—3 hours 27 minutes 23 4-5 seconds.

The performance of Barney Oldfield, driving the front-drive Christie, in a 1-mile time trial at the new Bakersfield, Cal., 1-mile dirt track in 46 2-5 seconds, was not accepted as a new record pending the submission to the board of more complete data as to the construction and method of operation of the Pendleton automatic timing device, with which the trial was timed.

The sworn affidavits of E. H. Pendleton, chief timer; C. A. Colby, referee, and S. L. Mitchell, A. A. A. representative, to the correctness of the time was furnished, as well as the certificate of Civil Engineer J. L. Evans as to the distance, but the Contest Rules provide that no claim for record of 1 mile or under and up to 5 miles can be considered unless the timing is done by an automatic electrical or mechanical timing device *"approved by the board and the actual printed evidence taken by such device submitted to the board."* If these requirements are satisfactorily met the new mark will supersede the present record of 47 85-100 seconds made by Bob Burman in the Blitzen Benz II at Brighton Beach, N. Y., September 7, 1912.

The application of S. W. Gumpretz for sanction for automobile races in conjunction with auto polo games at Brighton Beach May 30 and 31 was denied.

The following summary of automobile contests for which official sanction has been issued in 1910, 1911 and 1912 was submitted by Chairman Schimpf:

	1910	1911	1912	Scheduled for 1913
Speed events (track and speedway)	88	60	97	12
Beach races	4	4	2	1
Road races	5	8	8	5
Hill climbs	20	14	6	3
Reliability	49	26	17	11
Non-stop tests and trials	..	3	2	..
Totals	166	117	132	32

The number of events scheduled at this time for the coming year shows the following increase over the number of events scheduled a year ago: Speed events, three; road races, two; reliability, four; hill-climbs remain the same and there is a loss of one in beach races, the Old Orchard, Me., meeting not being scheduled for 1913.

Winning National, which finished highest almost throughout

Paige-Detroit, which had the highest score in fuel economy

National Grand Winner in Catskill Run

Final Standing Catskill Tour

No.	Name	Price	Reliability	Hill-Climb	Economy
1	Mercer	$2,500	15	2:38.4	.260
3	National	2,600	0	3:46.8	.1628
5	Alco	6,000	0	3:23.5	.188
7	Ford	525	0	4:20.4	.206
11	Ford	600	0	5:16.2	.213
15	Mercer	2,500	0	Stalled	.196
17	Pathfinder	2,000	137	5:16.4	.180
20	American	2,750	0	3:42.6	.197
22	Oakland	1,215	0	5:02.8	.204
24	Paige-Detroit	1,275	0	3:52.2	.1627
34	Briggs-Detroit	900	148	No	.175

NEW YORK CITY, May 15—The combined Catskill reliability run, hill climb and economy test promoted by W. J. Morgan, the veteran promoter of contests, and conducted under the auspices of the newly-formed Motor Dealers' Contest Association, reached a successful conclusion this evening, all eleven of the competing cars which checked out yesterday noon having gone through the strenuous day and a half of competition in good shape.

The cars traveled 262.8 miles. The first afternoon's run to Newburgh was 64.7 miles, and in addition to testing reliability was also an economy contest, which was won by a Paige-Detroit with a percentage figure of .1627 obtained by dividing the weight of the vehicle with passengers into the ounces of gasoline used for the distance. The National was just beaten in the fourth place of decimals, its figure being .1628.

The second day's run was 198.1 miles, divided into forenoon and afternoon runs. The forenoon run was from Newburgh to Haines Falls in the Catskills, 63.2 miles. This occupied but a part of the time, the remainder being taken up with a hill-climb in which each vehicle had to compete, the driver alone riding. The hill was 1.1 miles long, very winding, with grades exceeding 20 per cent. and with a great many water breakers across the roadway. The winner of the climb was Mercer runabout No. 1 which made a remarkable climb in 2:38 2-5, or 44 seconds faster than the next competitor, which was the Alco touring car with a figure of 3:23.5.

The afternoon run of the second day was 135 miles, over good roads back to New York by way of Newburgh and Tuxedo.

When the eleven contestants checked in at the finish eight had perfect road scores. These were: No. 3 National, No. 5 Alco, No. 7 Ford, No. 11 Ford, No. 15 Mercer, No. 20 American, No. 22 Oakland and No. 24 Paige-Detroit. Each of these received a certificate of performance.

Besides a winner in the hill-climb, a winner in the fuel economy and winner or tied scores in the reliability, the rules called for a grand winner to be the contestant averaging best in all three contests. In deciding on the grand winner 600 points were allowed for a perfect score in reliability, 200 points to the winner of the hill-climb and 200 points to the winner of the fuel test. The other contestants were rated on a percentage basis proportional to their showing compared with the winner in each contest. In this grand classification No. 3 National was adjudged first with a rating of 938 points out of a possible 1,000. The Paige-Detroit was second with 936 points; the Alco third, 928, and American fourth with 907.

Under the rules each contestant carried an official observer throughout the contest, excepting in the hill climb when the driver rode alone. The reliability rules called for penalities for being late in checking in at controls, also for work done on the car when on the road such as repairing or replacing damaged parts. Motor stops were not penalized and there was not any technical inspection of the cars at the finish or any tests of brakes, clutches and gearboxes.

The economy contest proved one of the most interesting, in that the method of determining the winner gave the small car practically an equal chance with the largest machines. It would be difficult to select a better 65 miles for a fuel test. There is not a level mile in the entire stretch and just beyond West Point the contestants climbed Crow's Nest mountain, an ascent of 2 miles, with many hairpin turns so sharp that some of the larger cars had to reverse in order to get around the turn. In addition to sharp curves the road surface is soft dirt and there are water breakers every 50 feet, which compelled the cars to slow down. During the other part of the test there were many stiff climbs and much poor road, wornout macadam filled with pot holes 1 foot in diameter and often 6 inches deep. The speeds of travel were 12 miles per hour for cars under $800, 13.5 m.p.h. for those costing $800 to $2,000; and 15 m.p.h. for those costing above that amount. The cars were weighed previous to the start. The following are the results:

No.	Car	Weight	Gals.	Ounces	Percentage	Final standing	Miles per gallon
24	Paige-Detroit	3650	4	82	.1627	1	14.0
3	National	4200	5	44	.1628	2	12.1
34	Briggs-Detroit	3080	4	29	.175	3	15.3
17	Pathfinder	3690	5	27	.180	4	12.4
5	Alco	5780	8	65	.188	5	7.6
15	Mercer	3250	5	0	.196	6	13.0
20	American	4900	7	71	.197	7	8.6
22	Oakland	3350	5	44	.204	8	12.1
7	Ford	1880	3	3	.206	9	21.5
11	Ford	2400	4	0	.213	10	16.2
1	Mercer	3050	6	32	.260	11	10.4

These results show that the Ford runabout was the only contestant to exceed 20 miles to the gallon, making 21.5, a good showing for the roads. The method of determining the winner, namely dividing weight into gasoline used favors the heavier cars slightly in that the load carried is often better proportioned to the motor capacity than in light vehicles with fair-sized motors.

The winning Paige-Detroit has a four-cylinder motor 4 and 5 inches bore and stroke and uses a Stewart carbureter and Bosch magneto. No. 3 National, which finished so close a second, used a Schebler carbureter and Bosch magneto. Its cylinder sizes are 5 by 5 11-16. It has four cylinders.

The result of the hill-climb was practically a foregone conclusion from the start as Driver Ferguson has had much experience in handling a racing car. His roadster was stripped of fenders, but handicapped by a leaky radiator. He handled the machine well on the dangerous curves and over the water breaks. For timing purposes a telephone system connecting the starting line with the finishing line was used.

So far as the reliability run was concerned the eight perfect-score contestants had little trouble. The roads were dry from start to finish and not one of them had any difficulty in maintaining the schedule, which on the second day was 16 miles per hour for cars under $800; 18 miles per hour for cars costing up to $2,000 and 20 miles per hour for cars selling at over that price.

The three to receive road penalties were penalized not for defects in construction but for minor reasons. No. 1 Mercer developed a leaky radiator the first day and was penalized for taking on water outside of controls. No. 17 Pathfinder got all of its points but one for dirt in the gasoline line; and No. 34 Briggs-Detroiter discovered a piece of steel in the timing gears and also broke a torsion rod.

Revised and Corrected Score Grand Winner Catskill Tour

No.	Car	Reliability	Hill-Climb	Economy	Total
3	National	600	139	199	938
24	Paige-Detroit	600	136	200	936
5	Aleo	600	155	173	928
20	American	600	142	165	907
7	Ford	600	121	157	878
22	Oakland	600	104	159	863
11	Ford	600	100	152	852
1	Mercer	525	200	125	850
15	Mereer	600	000	160	760
17	Pathfinder	—85	100	180	95
34	Briggs-Detroiter	—140	000	186	46

In determining the grand winner a total of 1,000 points was allowed, of which 600 were given to the perfect score reliability, 200 to the winner of the hill-climb and 200 to the winner of the economy test. Each of the other contestants was awarded points in proportion.

In the reliability each point penalty against a contestant was equivalent to a deduction of 5 points from the 600 points allowed.

In the hill climb the points allotted each contestant after the winner were obtained on a percentage basis in which the winner was taken as standard. The fraction used had as its numerator the time of the winner and as its denominator the time of the other contestant, the time in each case being reduced to fifths of a second.

In the economy test the points allotted each contestant after the winner, were obtained on a percentage basis as in the hill climb. The fraction used had as its numerator the percentage given the winning car in the fuel test and as its denominator the percentage of the other contestants.

May Have 1913 Fairmont Park Race

PHILADELPHIA, PA., May 17—The preliminary move looking toward the restoration to the racing calendar of the Fairmount Park 200-mile road race was taken yesterday, when a resolution requesting the Fairmount Park Commissioners to act favorably upon the Quaker City Motor Club's petition for resumption of the event was introduced and unanimously passed by both branches of City Councils.

Whether there will be a 1913 race or not is now up to the commission, as that body, which last year abolished it, has the sole power of restoring it.

Expect 100 Glidden Tourists

MINNEAPOLIS, MINN., May 19—One hundred automobiles are expected to take part in the Twin City-Glacier National Park Tour for the Glidden trophy, which will start from this city on July 11 and will arrive at the park on July 19. The distance covered by the tourists will be 1,233 miles and they will pass through the states of Minnesota, North Dakota and Montana. A hotel train will travel shortly ahead of the tourists and will carry accommodations for sleeping and eating. With it a repair parts truck will travel, so that broken parts can be easily replaced in short order. Besides, a newspaper will be published, from day to day, with the assistance of the correspondents of papers participating in the tour.

The itinerary follows: July 11, leave Minneapolis; noon control at St. Cloud; night stop at Alexandria, Minn.; 144.4 miles. July 12, leave Alexandria; noon stop at Fergus Falls, Minn.; night stop at Fargo, N. D.; 123.8 miles. July 14, leave Fargo; noon stop at Grand Forks, N. D.; night stop at Devil's Lake; 194.6 miles. July 15, leave Devil's Lake; noon stop at Rugby, N. D.; night stop at Minot, N. D.; 135.6 miles. July 16, leave Minot; noon stop at Stanley; night stop at Williston, N. D.; 136.8 miles. July 17, leave Williston; noon stop at Poplar, Mont.; night stop at Glasgow, Mont.; 163.9 miles. July 18, leave Glasgow; noon stop at Malta. Mont.; night stop at Havre, Mont.; 156.1 miles. July 19, leave Havre; noon stop at Shelby, Mont.; night stop at Glacier National Park; 178.0 miles.

NEW OALEANS, LA., May 18—An offer of $5,000 as a prize for a 200-mile automobile race, which is to be the feature of the Galveston beach meet set for July 28, 29 and 30, is expected to draw enough of the stars in the game to make the event a great drawing card. In addition $9,000 in other prizes is arranged. Capt. J. W. Munn will have charge of the races. The meet will be a part of the Cotton Carnival.

DES MOINES, IA., May 17—The route of the fourth annual Little Glidden tour of the Iowa Automobile Association has already been tentatively agreed upon. The tour will leave Des Moines on June 23 and will make a day run over the state, covering in all a little over 1000 miles. Already more than thirty cars have been entered. This year a new departure will he attempted in that there will he two classes, one of factory ears, and another for owner-driven cars. The pathfinder for the tour will leave Des Moines this week.

On a beautiful mountain road in the Catskills

Contesting cars checked in at Newburgh on Hudson

The AUTOMOBILE

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Duration Motor Tests

WITH the completion of the 300-hour Packard motor test by the Automobile Club of America laboratory a movement has been instituted in this country which it is hoped will be carried forward and which, if properly directed, will do much to raise the efficiency of motors and also do valiant work in furnishing information concerning power plants which the American public, a good percentage of it at least, has been waiting for. Motor testing on the block for periods of long duration is new in America but it is bound to come in for increasing prominence because of the more general use of the dynamometer in factories and the wave of education on dynamometer testing that is being engendered at present. Only a year ago the Society of Automobile Engineers centered attention on the problem of motor testing in laboratories and at present a committee is active in this society in furthering this movement among the factories.

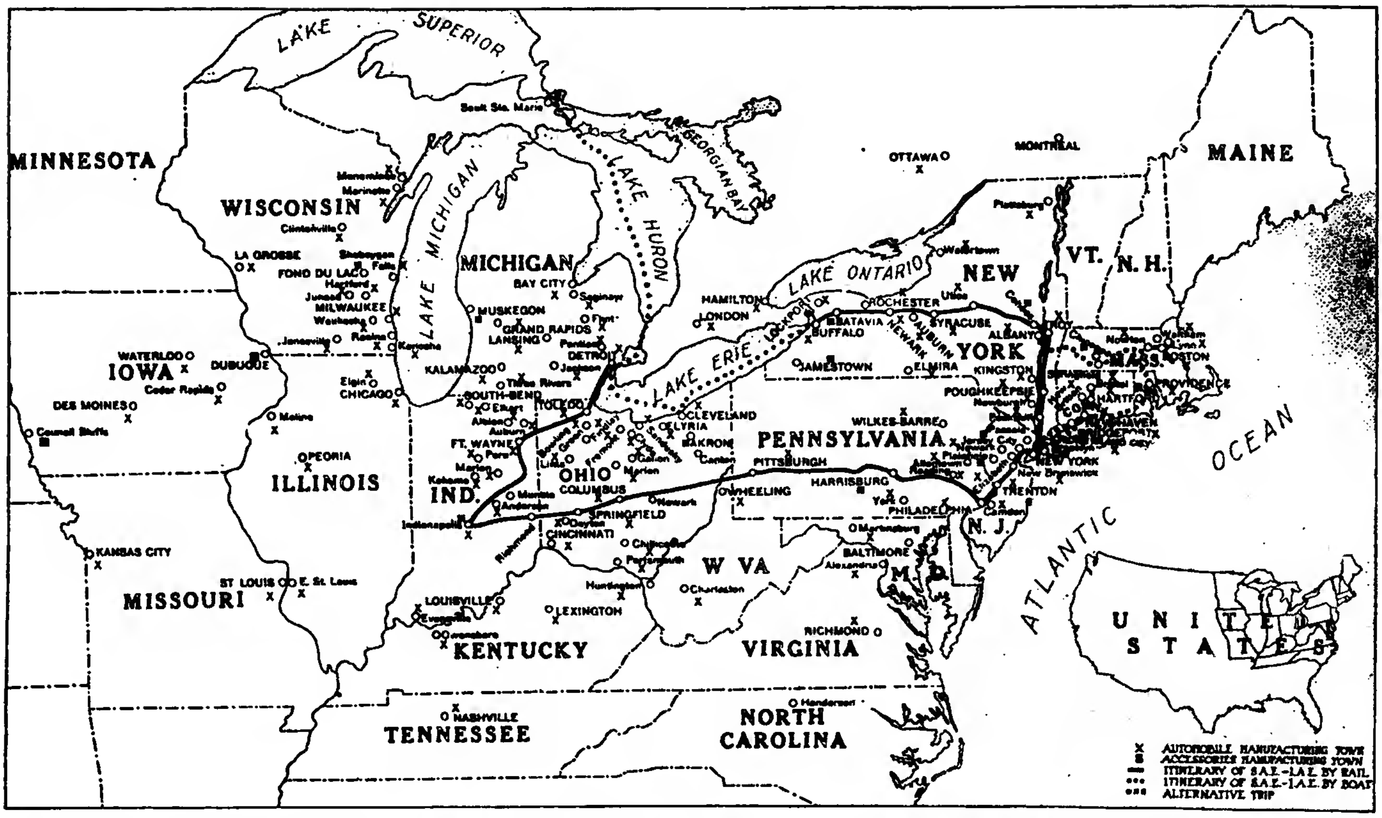
Duration motor tests made officially by laboratories not directly connected with any factory must be brought to some definite basis for comparison purposes otherwise these tests will be meaningless to the general public and the only purpose they will serve will be in enabling some factory to talk officially to the public in language that it desired to talk to such public before the start of the test. If there is not some basic regulation on such tests, each concern can hold a test according to is own whims, whims perhaps largely dictated by merchandising considerations. Permit such and you will effectually kill duration tests before they have grown out of their swaddling garments. Motor tests, made officially by apparently disinterested laboratories or technical schools, must aim at serving to elevate the general plane of engineering testing rather than being factors for other uses.

There is no reason why a few basic essentials might not be the same in standardized duration tests. Why should not the motor be required to show the official S. A. E. horsepower rating from start to finish. This is generally, in fact nearly always, the advertised rating, and because of this it is but logical that the motor under test should average this horsepower output from start to finish, at the piston speed at which such horsepower is supposed to be generated under the formula used in calculating. Making this one factor alone standard, it will give the public a basis of comparison which it must have if such tests are to continue. Let each factory set its own power rating and you will have at the end of the year a meaningless jumble of figures.

You cannot stop the public from comparing. It is one of the mental processes in the acquirement of knowledge. You cannot get a definite concept of anything without passing through the process of comparison.

Now that duration tests have been started it is to be hoped that efficiency and power tests will be started also. There should be a differentiation between them. In a duration test it is understood that the motor is not developing its maximum power, in power tests there should be a load much in excess of the official horsepower rating of the motor. Instead of a motor in a power or efficiency test pulling but its S. A. E. rating it should be compelled to pull 25 or 30 per cent. more than its rating for any period of hours that the maker might desire. Efficiency tests should also go further and show the frictional losses, the amount of power necessary to drive the rotating and reciprocating parts; the volumetric efficiency at various speeds and many other facts. In such a power or efficiency report every detail should show, whereas in a pure duration test made with a much lower horsepower load the horsepower generated, crankshaft speeds and fuel and oil consumption are practically all that should be given in addition to the general story of any alterations, adjustments, etc., which might be permitted under the rules.

The Automobile Club of America is to be congratulated on starting such a series of tests and the Packard company is also to be congratulated for setting the ball rolling. It is to be hoped that others will soon follow. In future tests greater care should be taken in conducting the test. The present testing laboratory of the club is too small to admit the visiting public. The testing room should be three times as large. The motor under test should also be better protected from visitors. There is no reason why a motor being tested should not be screened off, making it absolutely impossible for anyone but the officials connected with the test to get within 6 or 8 feet of it. Whenever the public is permitted to close in and lay hands on a motor undergoing such a test there is sure to be a storm of criticism. Many details will be misinterpreted and misunderstandings will arise. In such a test it is desirable to have duplicate sets of record keepers; and there should at all hours be some leading test official in charge.



The above map, which is similar to the one presented to the Society of Automobile Engineers and their English visitors, the Institute of Automobile Engineers, for use on their trip by THE AUTOMOBILE, shows the section of the United States and Canada in which are located practically all of the automobile and accessories factories. The itinerary of the engineers is clearly shown, the journey by rail in black and that by boat by the dotted lines, while the square dots indicate the alternative trip through New England. The cities marked "X" are automobile or motor truck manufacturing towns, while those marked with a square are accessory towns. The relative size of this section of the country is shown in the smaller map of the United States

Twenty-five English Engineers Sail for America

NEW YORK CITY, May 19—At a meeting of the entertainment committee of the Metropolitan Section of the Society of Automobile Engineers held here last night, the final details of the local program for the entertainment of the English engineers were closed. A cable has announced that twenty-five of the Englishmen were aboard the *Minnewaska* when she sailed last Saturday. The boat is expected to arrive in New York at about 10 a. m. Monday, May 26. In addition to the program which has been announced the committee has prepared a list of places which can be visited in the event of a rainy day or an interruption in the regular program. The places included in the list are as follows:

Brewster's body factory in Long Island City; Thomas A. Edison's plant in East Orange; New York Telephone Co.; Peter Doelger's brewery garage; Jacob Ruppert's brewery garage; Ward's bread factory; the New Grand Central Terminal; New York Edison Co.; General Vehicle Co.; American Express Co.

About a dozen starter manufacturers have consented to read 10-minute papers before the meeting on Tuesday night in the ballroom of the Hotel McAlpin and the discussion on these papers will be carried through after all the papers have been read.

The party includes four ladies. Those sailing are: T. B. Browne, president of the Institute of Automobile Engineers; T. C. Pullinger, Paisley, Scotland, and Charles Wheelers, London, members of the council of the Institute; Basil H. Joy, secretary of the Institution; and members, associate members and guests include: F. S. Bennett, London; C. A. Branston, Cambridge; H. Massac Buist, London; E. G. Davison, Cleveland; J. B. Ferguson, Belfast; J. Inglis Ker, Glasgow; E. C. Paskell, Birmingham; J. A. Prestwich, Tottenham; E. B. Wood, Bristol; Lucien Bollack, Coventry; E. Wooler, Bristol; Carl F. Benson, Coventry; J. B. Dunlop, Dublin; F. E. Filer, London; G. Gilbert Moore, Twickenham; Tom Norton, Llandrindod Wells; R. W. Smith, Redditch; T. Clarkson, Chelmsford; and Mesdames Pullinger, Wood, Browne, Clarkson and Mr. Smith, Jr.

Alexander Craig is managing director of the Maudslay Motor Co., Coventry, and has been connected with the industry since its inception. T. V. Pullinger is manager of the Arrol-Johnston Co. and has been long connected with the industry in France and England. F. S. Bennett is responsible for the Cadillac business in England. H. Massac Buist is a well-known journalist. Carl F. Benson is manager of the Humber works at Coventry. J. B. Dunlop is inventor of the pneumatic tire. T. B. Clarkson is designer of the Clarkson steam omnibus now being operated in London. R. W. Smith is managing director of the Enfield Cycle Co. J. A. Prestwich is constructor of the well-known J. A. P. motorcycle engines.

New England Electric Car Convention

BOSTON, MASS., May 21—The first New England convention of men identified with the electric field, comprising representative of central stations, makers of motor vehicles and allied interests, opened here at 1 o'clock yesterday afternoon at the Engineers' Club. It was attended by men prominent in all the lines from different parts of the country. W. H. Blood, Jr., former president of the Electric Vehicle Association of America, called the meeting to order and there were more than 100 on hand.

There were three sessions on the program, one yesterday afternoon, another last evening and a third this morning. The first session was given over to addresses and discussions under the heading "Electric Vehicle Progress." H. H. Rice, of the Waverley Co., Indianapolis, Ind., spoke on "The Growing Popularity of Electrics." Fred H. Kimball, of the General Electric Co., Boston, Mass., delivered an address on "New England as An Electric Vehicle Field," and President W. C. Anderson of the Anderson Electric Car Co., Detroit, Mich., spoke about "How a Control Station Can Develop Its Electric Vehicle Load." There were discussions after each paper.

The second session last night had "Salesmanship and Service" as the topics. E. R. Davenport, of the Narragansett Electric Light Co., Providence, R. I., spoke on "Constructive Criticism"; Louis Burr, of the Woods Electric Co., Chicago, Ill., had for a topic "Proper Selling of Electric Cars," and L. B. Wallis, of the Edison Electric Illuminating Co. of Boston, talked on "What Service Should the Central Station Furnish Owners of Electric Cars."

This morning the session was devoted to "Advertising." F. Nelson Carle, of the General Vehicle Co., Long Island City, N. Y., spoke on "Advertising the Electric Vehicle from the Manufacturer's Standpoint," and E. W. J. Proffitt of Providence, R. I., talked on "The Electric Vehicle as an Advertising Proposition from the Central Station Standpoint."

The Engineering Digest

A Digest of Technical Information from the Engineering Journals

GASOLINE Motor with Plane Slide Valves.—When the progressive engineer studies specimens among the multitude of valveless motors—meaning all non-poppet valve motors with the exception of the standard types of two-cycle motors—he frequently finds it difficult to perceive that any other object than that of finding an acceptable substitute for the poppet valve has been kept consistently in view by the designer. He realizes that the fashion element has been unduly influential in his field of work and that the great majority of new-type motors are therefore destined to perish in the struggle for survival, but also that an imitative or a fashion movement of this kind, with its 95 per cent. of waste, so far as applicable and practicable results are concerned, was necessary not only for the improvement of poppet valve motors, whose makers were getting satisfied to rest on their laurels, but particularly in order to bring to the surface the very small percentage of really promising construction which after all in the long run pays for the waste and much more. In some few instances a definite technical object has actually inspired the designer before his creation took form, although more frequently a merely possible design took form first and its technical objects were discovered afterwards, or were worked into it by successive modifications.

These reflections are suggested by a description of the Neute motor presented by Henri Petit. It is not clear whether this motor exists on paper only or has been made and tested, nor whether its weight can be kept within the limits considered ruling for automobile motors. An estimate on the basis of the accompanying drawings must satisfy the reader on these points.

The object aimed at by Mr. Neute has been to incorporate in one type of motor the greatest possible number of the desirable qualities now found represented individually in all the different types and makes of automobile motors and, above all, to secure unfailing reliability. In the largest sense of this word it involves that every working part of the motor can be inspected, cleaned and dismounted, on the road as well as in the garage, as often as the man in charge of it may desire, in the shortest possible time, with the simplest tools and without possible disturbance of its adjustments—those of the valve timing especially.

It is a four-cycle motor. The piston works in an ordinary water-jacketed cylinder. The cylinders are cast in pairs, and each cylinder A has a port *a*, serving for the passage of both fresh and exhaust gases, and a lateral casing *b* in which the whole valve mechanism is contained. The inner wall *c* of this casing, adjacently to the water-jacket, is ground perfectly plane and smooth. A piece B called the distributer-box has on one side a large ground surface in contact with *c*, a recessed middle portion in which the plane plate C is slidably inserted, and it faces outwardly against two slide valves D and E which are plane and can slide one upon the other. The conduits *d*, for the fresh gas, and *e*, for the exhaust, are cast in this box B and merge into one in line with the port *a* leading into the cylinder. The position of B is determined vertically by flanges *f*, forming part of the cylinder casting, and laterally by a spline *g* located between the two cylinders of a pair. The box B does not touch the casing *b* at its lateral and upper edges, which are left rough, expansion being facilitated by this provision. Contact between B and the plane-ground outer cylinder wall *c* is secured by the coverplate F which also regulates the necessary play between slide-valves D and E. The intake and exhaust manifolds G and H are mounted upon F, and the latter is secured to casing *b* by eight bolts b^1. The carbureter I is hung from the intake manifold.

It follows from this arrangement that the valve mechanism can be examined by merely removing the coverplate, together with the parts secured to it after separating the exhaust tube from the exhaust manifold and the carbureter from the gasoline inlet pipe and the throttle control.

Plate C, which is termed the stopper-plate, has a vertical displacement of 10 to 15 millimeters, and only a single orifice. It is controlled from cam *h* through a tappet rod J with a roller. A spring K takes it back to its lower position. The slide valves D and E have each two ports to determine the flow of gases and are controlled by the rods L and M, which for the sake of clearness are merely indicated by their positions in Fig. 1, these rods being in turn governed by two eccentrics e^1 and e^2 which are keyed upon shaft N, 70 degrees apart. Shaft N is a two-to-one shaft run by silent chain from the motor shaft. The cam *h* for the control of the stopper-plate is formed (see Fig. 8) upon the cheek separating two of a pair of the eccentrics e^1 and e^2.

The function of the stopper-plate is to be interposed between the cylinder and the slide-valves, so as to isolate the latter completely from the explosion chamber at the proper periods and protect them from pressure and heat. The cam *h* is so shaped (see graphic schedule of the cycle of cam actions in Fig. 2) that the port *a* in the cylinder is always uncovered a little more by the stopper-plate, for induction or exhaust, than by the respective slide-valve plates, and as to hold the stopper-plate at rest in its highest position at the end of compression and during the working stroke.

The movements of slide-valves and stopper-plate are indicated in the diagrams composing Figs. 2 and 3. At the end of the period for gas admission (diagram 1), which takes place when ports *i* and *j* register, cam *h* begins to raise the stopper-plate, and the lower edge of its port is displaced across port *a* at the same rate of speed at which the slide H valve D is moved which regulates the closure of gas admission; only the port in the stopper-plate is slightly behind in this movement.

At period 2, while port *a* is completely closed, the plate C still has 2 to 3 millimeters left of its upstroke. At periods 3 to 5 (including the position shown in diagram 4), the latter just preceding the opening of the exhaust, the stopper-plate remains stationary, the acting portion of the cam being circular and concentric with the shaft N. When 5 is reached the plate is dropped by the cam and is taken to its lowest position by spring K. The expansion of the gas is at that moment almost completed.

With regard to the pressures acting against the movements of the stopper plate, it is noticed that from 1 to 2—during the admission—the plate has its largest displacement, equal to 4/5 of its total stroke, and that this is effected without any resistance; that from 2 to 3, during the compression, the displacement is small, amounting to 1/5 of the stroke and taking a relatively long time, while the resistance is small, being determined by a maximum pressure of ½ kilogram per square centimeter of the stopper-plate edge; that from 3 to 5 there is no movement and, finally, that at 5 the spring action takes place under a resistance of about 4/10 kilogram per square centimeter.

The gas-tightness of the compression chamber is assured by the fact that, from the moment when the admission is closed and until the gas pressure ceases, the plate is pressed against the bottom of the distributer-box, where, moreover, as will appear later, the lubricating oil also contributes to the obviating of all leakage.

The mechanical conditions of this valve system are also particularly favorable. The frictions are of cast iron upon cast iron. The different pieces and walls engaged in the frictions are approximately of the same thckness and shape and undergo similar expansions and contractions by variations of temperature, so that the play once provided between the parts remains constant. The stopper-plate and the slide-valve plates are light of weight and perfectly guided, and the lightness of the slide-valve plates—weighing from 3/10 to 4/10 kilogram—admits of using control rods of corresponding lightness for operating them. These rods also work in an almost vertical position and exert no appreciable oblique pressures on the valve plates, so that it seems that they should last as long as the motor. With regard to accessibilty and easy dismounting, it is noticed that the stopper-plate is not jointed to its control but simply rests on it, like the valves in poppet-valve motors, the exact nature of the connection being shown in Figs. 5 and 6; also that the distributer is simply held between the outer cylinder wall and the coverplate without use of screws or bolts. and that the two manifolds are secured to the coverplate. No other tool than a single spanner or wrench is thus required for taking the whole valve mechanism apart or for mounting it. The only parts to be disconnected first are the carbureter from its control, the exhaust manifold from the exhaust pipe and the 8 bolts holding the coverplate F. The whole operation requires only a very short time—a few minutes for one familiar with the mechanism—as the details have been thought out with special reference to this high degree of accessibility. Even the guide of the tappet-rod for controllng the stopper-plate can be removed by first loosenng the bolt O (see Fig. 6) where after the whole rod can be lifted out and a single pin *t* holds the upper part of the control rod (Fig. 5) to the lower part J (Fig. 6). If it is desired to remove the slide-valve plates, it is not even found necessary to use a split-pin chaser to separate them from the control rods, as the relative movements of the two plates during operation of the mechanism is such that the spindles of the rod-knuckles cannot come out, one barring the way for the other, while each of them can be pushed out when the plates are separated. The working relations of these parts are shown in Fig. 7.

It is particularly worth noting that the valve adjustment cannot be changed by dismounting and remounting the parts and that it is unnecessary to drain the water from the jackets, to disconnect the gasoline manifolds, the carbureter or the cylinders.

A water circulation by thermo-syphon system is provided and ignition by magneto operated by silent chain in front of the motor.

The nature of the valve-mechanism in this motor further admits of instituting a motor-brake system by lodging an additional plate between the slide-valve plate E and coverplate F,

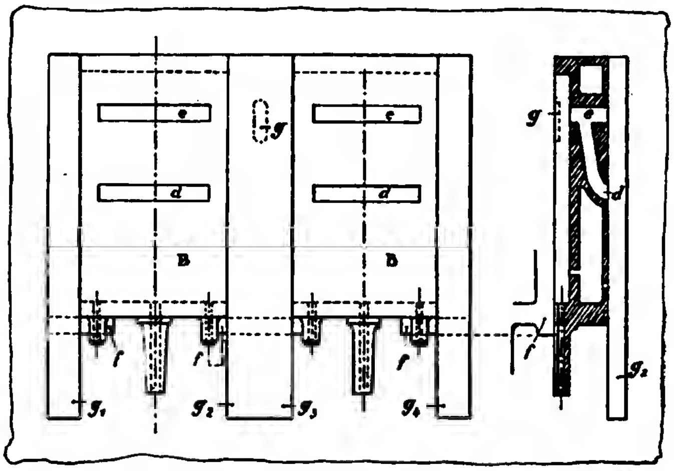


Fig. 4—Face view and section of distributor-box B for a pair of cylinders—g_1-g_4 are spurs for additional guiding of valve plates

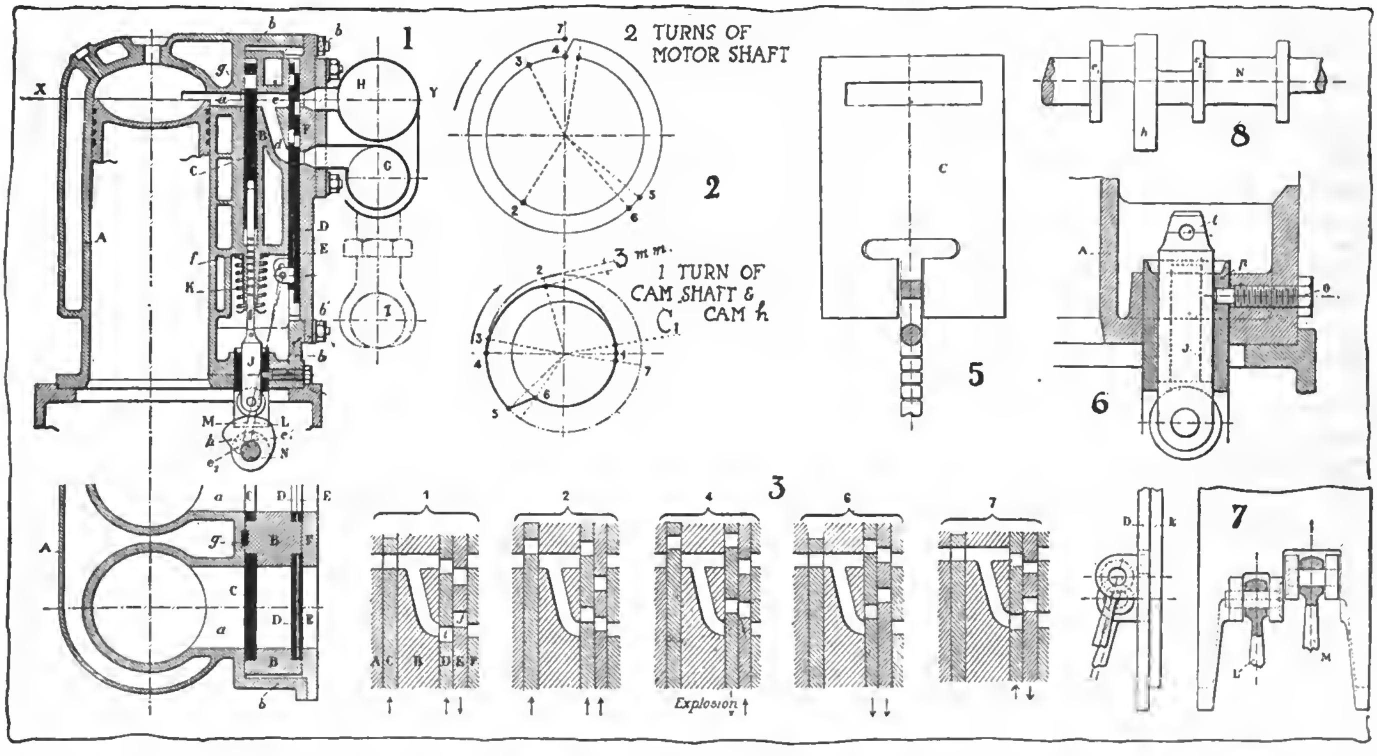


Fig. 1—Section of Neute motor; lower portion is section on line XY of upper portion. Fig. 2—Graphic schedule of cycle, divided into 6 periods. Fig. 3—Successive positions of stopper and valve plates. Fig. 5—Stopper-plate with upper part of control rod. Fig. 6—Lower part of same control rod. Fig. 7—Mounting of control rod knuckles on slide-valve plates. Fig. 8—Camshaft with cam h for stopper-plate control and eccentrics for slide-valve control

a lever for moving this plate up and down being apparently extended through the coverplate and connected with a pedal under the driver's foot.—From *La Vie Automobile*, May 3. [Illustration of brake action is accidentally omitted in original.—Ed.]

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THE Wittig Rotary Steam Engine.—In a recent issue reference was made to the Wittig steam turbine or rotary machine as one whose simplicity might suggest possible applications for transportation work, especially if the thermic efficiency of the steam generation is brought down to a new basis on the system of the Bonecourt flameless surface-combustion or one equally advanced. A subscriber requests more information about the Wittig construction, and it should be said first that the Wittig motor is not a turbine except in the sense of being rotary. On the other hand it is not only a steam engine but works equally well as a water pump, an air compressor, a blower or a gas compressor or as a hydraulic motor. It can also function as a compressed-air engine. The only difference between its mode of operation as a motor and as a transmitter of power lies in the direction of its rotation and the direction of the fluid, steam or gas circulating in it. Fig. 11 shows it as a motor. This illustration and the following reference to its peculiarities are taken from *Le Génie Civil* of August 17, 1912.

The practical utility of rotary machines, other than turbines proper, is usually impaired by a certain defect. It is almost impossible to secure tightness between the vanes and the fixed cylinder without reducing the play between these organs to such a point that the frictions become excessive. This inconvenience seems to have been overcome in the rotary machine which has now been turned out for several years at the Karl Wittig works at Zell, near Wiesental, Baden. This machine is composed essentially of a fixed cylinder *b*, in the interior of which there turns an eccentrically mounted cylinder *a* formed with a series of deep radial slots in which are lodged the vanes *c* which function as pistons. As the number of chambers formed between the two cylinders by means of the vanes is considerable, the variation in the pressures existing in two adjacent chambers is reduced. The vanes assume their varying positions in the slots solely by the action of centrifugal force. As, however, this force, which grows with the speed of rotation, might press the vanes too energetically against the walls of cylinder *b*, such an effect has been obviated very largely by surrounding all the vanes by a metal ring *d* which is rotated with a certain amount of play in a recess turned in the wall of cylinder *b*. In this manner excessive wear of the vanes is avoided, at the same time as continuous contact with the interior of cylinder *b* is assured, owing to the eccentricity of the vanes and the ring as a whole.

A tight joint along the line of contact between cylinders *a* and *b* is also assured without it being necessary to reduce the play between them.

The admission and discharge of the steam, gas or fluid used in the machine are effected without intervention of movable organs, simply by means of circumferential slits giving access to a larger or smaller number of the compartments between the vanes. If the medium used is incompressible, these two slits, one for admission and the other for discharge, extend over the larger portion of the circumference of the exterior fixed cylinder, but the length of the slits is reduced if the medium is compressible and it is made smaller in proportion as the tension of the medium must be more fully utilized.

When this machine functions as a steam motor, its efficiency is said to be comparable to that of reciprocating engines of similar power.

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COTTIN-DESGOUTTES Wheel Drive.—Unless great facility for removing and perhaps replacing a wheel shaft is considered a matter of great importance, the Cottin-Desgouttes system for combining the advantages of the floating shaft with those of the older types, in which the centering of the shaft in the wheel cannot be questioned, may present points of interest though mainly where ball-bearings for the wheels are still preferred to roller bearings. The characteristic feature, as shown in Fig. 9, is the enlargement of the axle-end constituted by a steel box bolted to the flared end of the axle proper, this box containing a double ball-bearing which is almost in alignment with the wheel tread and also prevents the wheel from coming off, and serving as base for the brake action in a very substantial manner, while keeping surplus lubricating oil from flowing to the brakes by providing a trough for it in the lower portion of the box.—From *La Vie Automobile*, May 3.

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BALLET'S Shock Absorber.—The idea of making the shock absorber help in supporting an increased load is finding expression in the type designed by Ballet which is shown in part in Fig. 10. Two coil springs D placed in pistons C with rollers *c* are compressed with a minimum of friction when the cam A is turned by a crank and rod which are automatically operated in the customary manner when the vehicle axle is raised or lowered in relation to the vehicle frame. The shape of the cam seems to indicate that the desired effect is a progressive spring resistance and assistance in carrying an overload rather than the retarding of the recoil after a severe shock. The recoil or spring-extension is in fact accelerated at first. But the moment the recoil would carry the vehicle spring beyond its best position, the cam provides an energetic resistance. The overload capacity is necessarily small so as not to interfere too much with the mobility of the spring under normal conditions.—Illustration from *Omnia*, May 3.

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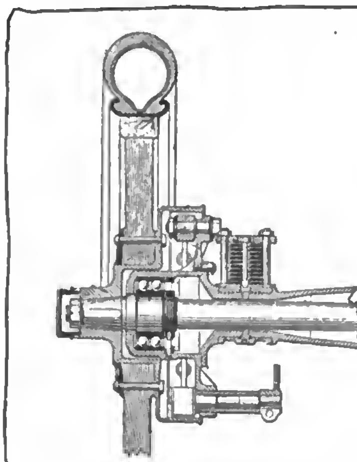
Troubles with Omnibuses.—Complaint has been made to the municipal council of Paris that the seating offered each passenger in the motor omnibuses of that city is far too scant and that the shakings which are received when the rubber tires are worn down to one-half of their original thickness are positively dangerous; finally that the wheels are too small and thereby aggravate all shocks.—From *Le Poids Lourd*, March 21.



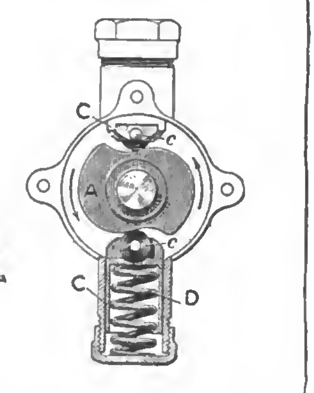


Fig. 9—French wheel drive. Fig. 10—Ballet's spring device

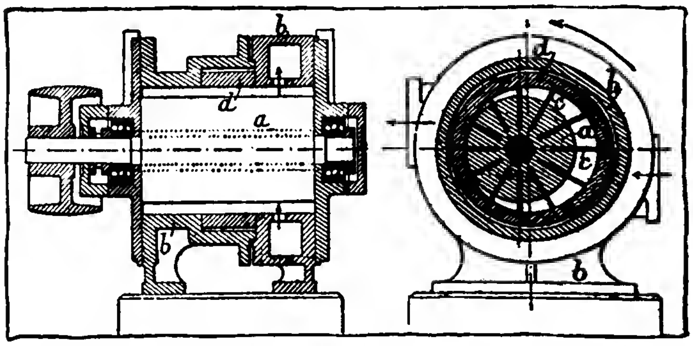
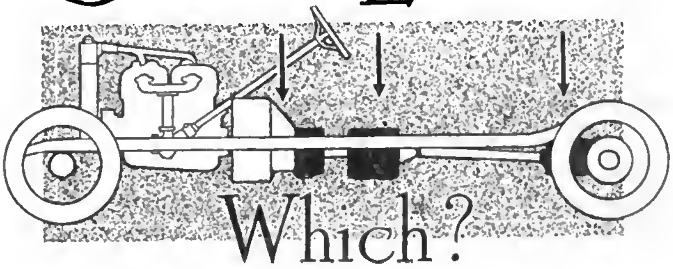


Fig. 11—Wittig rotary steam engine and universal motor

The Engineers' Forum

Gearbox Location



Part IV

Skidding Danger Is Minimized by Proper Location of the Gearbox

COMMUNICATIONS are still coming in from engineers and automobilists interested in questions of design regarding the best location of the gearbox. The preceding articles showed the remarkable diversity of opinion in engineering circles on this important particular of automobile construction. Herewith are given some arguments in favor of placing the gearbox on the rear axle:

Rear Axle Type Simplifies Chassis—Robertson

BUFFALO, N. Y.—Editor THE AUTOMOBILE:—In view of the present very marked tendency on the part of automobile engineers in general to simplify the chassis as much as good mechanics will permit, it is not surprising that there should be such a strongly-shown inclination to place the gearbox in combination with one of the two units that it connects. By so doing, one eliminates one piece of shafting, two universal joints, and, in some constructions, two oil retainers and one or more expensive bearings. The parts eliminated are particularly objectionable, as in the usual arrangement their exposure to dust and dirt and their commonly inadequate lubrication makes them particularly prone to wear and become noisy and their up-keep as a consequence somewhat of an item.

Either of the two unit constructions has the advantage of greater cleanliness, owing to the fact that there are two less points at which oil can escape.

As to the effect on the car's operation, of the location, of the weight of the gearbox, one has but to consider how much effort would result from a person of less than ordinary weight moving forward or backward a few feet in the car while it was in motion. Compared with the importance of the change in weight distribution in putting on a heavy limousine body the importance of the location, of the weight of the gearbox would almost seem negligible. The location of an electric lighting and starting battery would be of more importance. The rear axle gearbox unit has in its favor the greater silence resulting from the failure of the gear noises to reach the larger masses of the chassis and body which act as sounding boards for all the sounds that reach them. The rather elaborate gear control linkage is against the rear axle unit, however, and in many instances the oscillation of the car springs is communicated to the sliding gears resulting in indefinite gear location. The fatal defect of the rear axle gearbox unit, however, lies in the tremendously reduced ability of the car to perform on rough or uneven road surfaces. Some years ago the writer tried to drive a certain very high class car whose superb motor is the envy and despair of its competitors, but whose gearbox is located on the rear axle, over a very steep and roughly-paved hill on high gear. Not only was the feat well-nigh impossible, but so great was the abuse which the car sustained due to the excessive bouncing and pounding of the rear axle system, that the feat was not again attempted until it occurred to the writer to let considerable air out of the rear tires. Not only was the feat accomplished easily after that, but with the added handicap of starting at the bottom of the hill on high gear. At other times the writer has noticed how much at a disadvantage the cars, whose gearboxes were in the rear, were on the road. Once, on a short 2 days' trip through the mountains of Pennsylvania in company with a chain-driven car of German make, the writer, who was driving a car with a particularly heavy rear axle gearbox unit, had a splendid opportunity for studying under extreme conditions the comparative effect of the lightest and the heaviest types of axles. Suffice it to say that the chain-driven car was at all times master of the situation even on roads so rough as to compel the other to resort to gear work continually. Summing up, it would seem that advantage would all be with the motor gearbox unit up to such powers as would make the use of shaft as final drive of doubtful advisability.—PHILIP ROBERTSON, Y. M. C. A.

Put the Weight on the Driving Wheels—Duryea

SAGINAW, MICH.—Editor THE AUTOMOBILE:—I have read with interest a number of expressions on gearbox location, and I see that one writer favors distributing the weight because this lessens skidding. It has been nearly a score of years since visions of expensive, broken plate-glass flashed in front of me when my motor vehicle suddenly skidded and I have given continual attention to the matter since. I am certain that my product for the last dozen years demonstrates daily that the best prevention of skidding consists in placing the greatest part of the weight on the driving wheels, and that on this account the vehicle will be less likely to skid if the gearbox is placed on the rear axle; and further, that the rear tires will last longer. I have made motor vehicles with almost every possible proportion of weight on the front and rear axles. From the delivery rig, having the motor, tank and driver on the front wheels, with practically nothing at the back when not loaded, to a convertible four-passenger car carrying the rear passengers well behind the axle, and carrying the motor slightly in front with water tank directly over the rear axle. This proportion of rear weight was so great that on a steep hill there was some question as to whether or not the front wheels would remain on the ground. This experience repeated many times, has demonstrated that the best results are obtained with probably three-quarters of the weight on the driving wheels, and that when thus loaded they seldom skid. So certain has this freedom from skidding been that I have never owned or carried regularly a pair of tire chains, and have seldom found a road condition that my vehicle would not negotiate successfully without chains.

You can easily test this for yourself by attempting to push something on a slippery floor. Your feet not being heavily loaded slip badly, but take the load on your shoulders and you walk with certainty over the same slippery surface. The vehicle with the heavily loaded rear does not skid. Its tires are not ground away by its skidding wheels. Its front end is much easier to propel because it is not forced deeply into soft roads. The rear location for as much weight as possible is undoubtedly the best one.—CHAS. E. DURYEA, president, Duryea Motor Co.

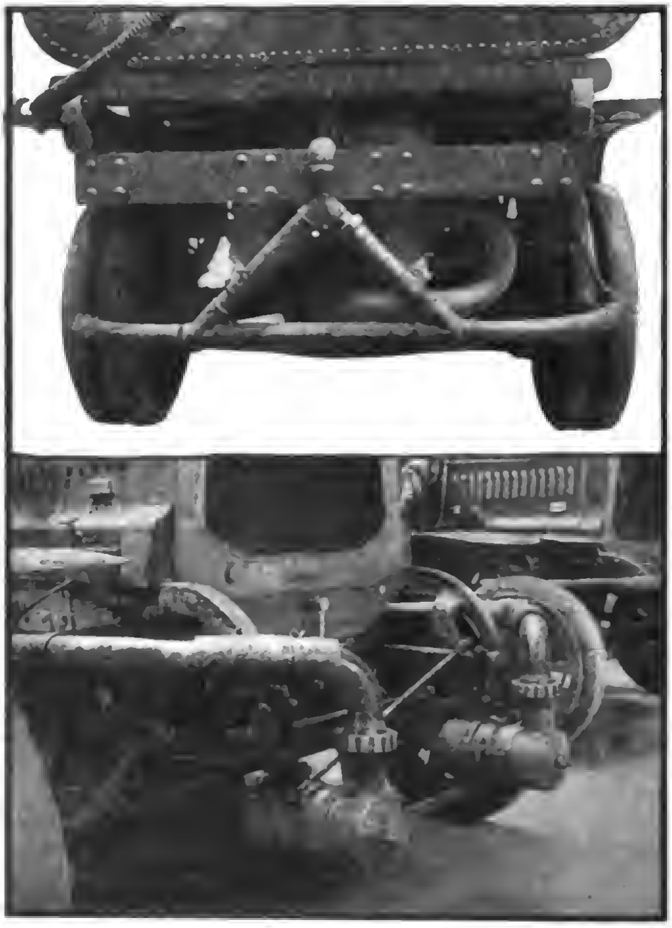
Motor Sweepers Save 12 to 60 Per Cent.

Use of Modern Street Cleaning Devices in Paris and Versailles Reveals Marked Economy as Compared with Old Methods

PARIS, France—It is part of the world's economy that the horse should disappear from the work of cleaning, sweeping and watering the streets and avenues of great cities. This is quite natural, for the horse itself is responsible for at least three-quarters of the dirt to be found on paved streets. Paris has proved it with the Champs Elysees, the automobile section of which never has to be washed and rarely has to be swept, while the adjoining alleys have to receive a daily toilette. Paris is the first city to make use of motor vehicles for street cleaning to the entire abandonment of the horse. The change is not yet complete, but in five of the twenty wards into which the city is divided the horse has gone entirely from the street cleaning department. The other districts have either made a partial change or have decided to convert as soon as present contracts have expired.

The determination of the correct type of machine for street cleaning necessitated a considerable amount of experiment. It was not merely a question of connecting up a motor to a four-wheel chassis driving a rotary brush. This was attempted at first, the city purchasing light, low-power rotary sweepers to replace the one-horse rigs in use for so long; and big motor-driven water-wagons for street sprinkling. It was found that the former raised as much dust as they swept, and that the latter could only be used to advantage in specially wide avenues a few days a year. This experimental work resulted in the adoption of a combination type of sweeper and sprinkler, capable of service throughout the year, wet or fine, rain or snow. The eighth ward, which is the most fashionable district of Paris, comprising the Champs Elysees and the Place de l'Etoile, was the first to make a complete conversion. The work in this ward is accomplished by seven De Dion Bouton machines, replacing from fifteen to twenty-five horses. Under the old system the number of horses was a very variable quantity, owing to the inelasticity of this method. During spring and fall fifteen horses could do the work; in summer and winter twenty-five horses were not always sufficient.

Taking the eighth district as typical of the entire city, the day's work comprises 10 hours, the machines going out at 4 a. m., stopping for 2 hours in the middle of the day, and entering the depot at 4 p. m. The same man is kept in charge of each machine and only skilled drivers are employed, the men having had experience with gasoline trucks being preferred. Drivers of the old horse rigs are not trained to handle the motor sweepers. The nature of the work varies largely according to the weather, the task given to each driver being chosen at the discretion of the overseer.

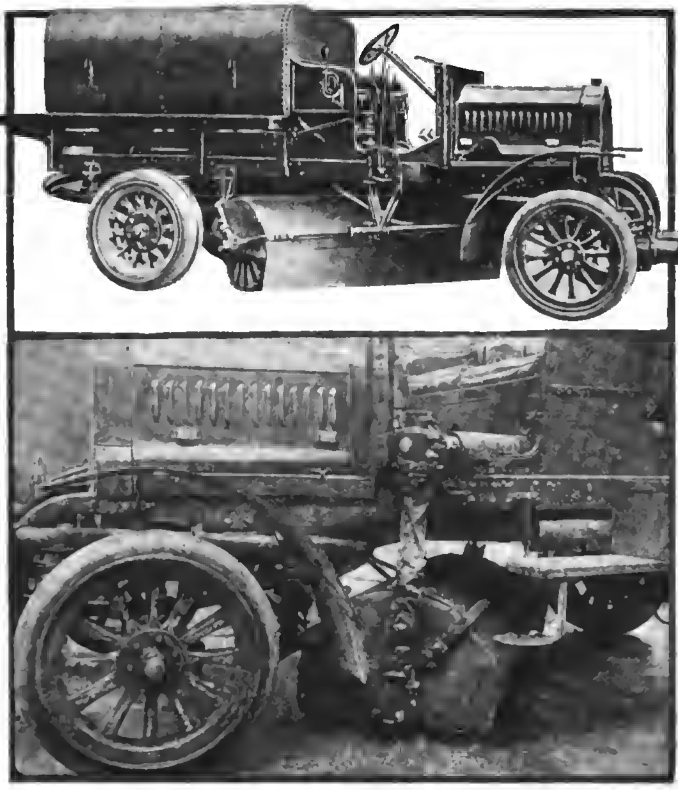


Upper—Rear view of motor street sweeper. Flow to transverse sprinkler is direct from tank by gravity. Lower—Detail of forward sprinkler on Paris street sweeper

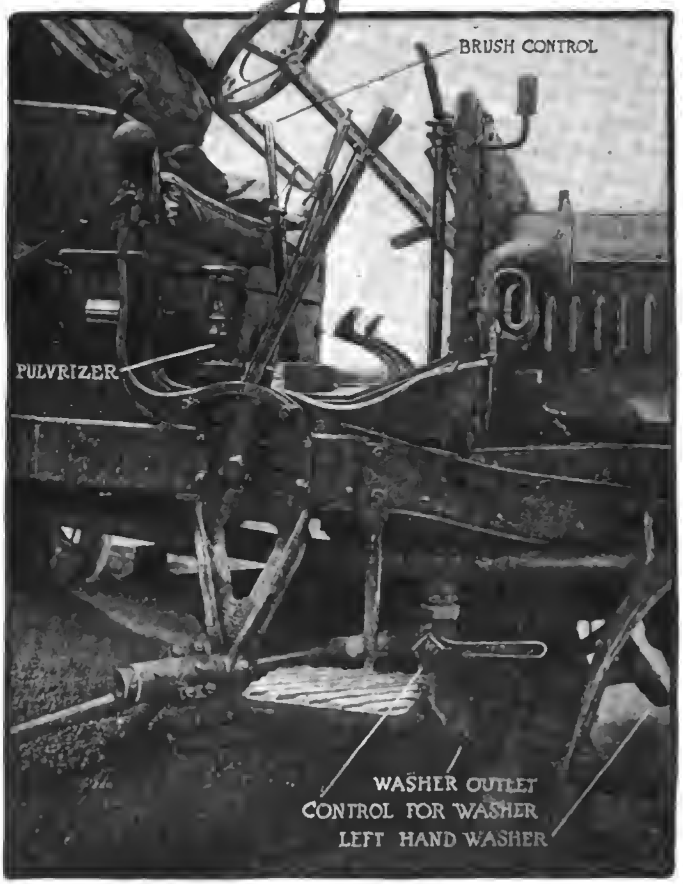
Street washing is generally undertaken during the early morning. The tank is filled from the street mains and the 570 gallons of water pumped out; with the pump working at full force the tank is emptied in about 10 minutes, during which time the machine is run at a speed of 7.5 miles an hour. After swilling with water it is customary to leave the street about an hour to allow the mud to soften before attempting to sweep. Another method is to flood the streets direct from the mains, then send the machines over later for sweeping only. This thorough washing only takes place from once to three times a week, according to weather conditions. It gives an absolutely clean surface with a single passage of the brush. Watering with the front sprinklers at full capacity, the tank is emptied in about 15 minutes, the machine during this time running at a speed of 7.5 miles an hour. This means that the machines will water over a width of 50 feet for a length of nearly 2 miles on one tank load of water.

The majority of the work, however, consists of street sweeping. This is done on a width of 67 inches, at a speed varying from 5 to 8 miles an hour, according to the condition of the road surface. Experience has shown that with a brush traveling at this speed a large amount of dust is raised in dry weather. To prevent this, each machine is fitted with a central sprinkler just ahead of the brush, thus slightly damping the street surface and effectively preventing the raising of dust. With only the pulverizer working, one filling of the tank is sufficient for 4 or 5 hours. During the 10 hours on the street, each machine covers a distance of 38 to 45 miles. This average is based on the work of the seven machines employed in the eighth ward.

One of the most important advantages of the motor sweeper over the horse variety is that owing to its increased speed it does not interrupt the normal flow of traffic. With an average of 3.8 to 4.5 miles an hour for a full day, including stoppages for filling tanks, etc., it is evident that the normal running speed must approximate 7 miles an hour. The maximum width of roadway watered at one operation is 50 feet. As



Upper—One of the rotary street sweepers in use in Paris. This is of the De Dion Bouton type. Lower—Partial side view of one of the motor-driven street sweepers, showing the driving mechanism of the rotary brush



Control features of one of the motor-driven street sweepers now in use on the streets of Paris and Versailles. The driver can operate all the important control levers from his seat and the minor adjustments sometimes necessary are all readily accessible

the ordinary Paris streets vary in width from 23 to 40 feet, they can all be covered at one operation. The boulevards and specially wide avenues, such as the Champs Elysees, require several operations.

For reasons of economy benzol is used exclusively in place of gasoline. Except in the matter of price, it has no advantages over gasoline; indeed, it is found to foul the motor a little and to necessitate pulling down at more frequent intervals. The average amount of fuel used is 46 gallons per machine per day; this works out at an average of 10.7 miles per gallon. These figures are taken on actual working conditions extending over several weeks, and not on a short experimental run under favorable conditions. Each brush lasts on an average 3 days, or a distance of 120 to 130 miles. At the end of this time it is so far worn down as to be of little use, and is then sent to the city brush factory for the bristles to be replaced.

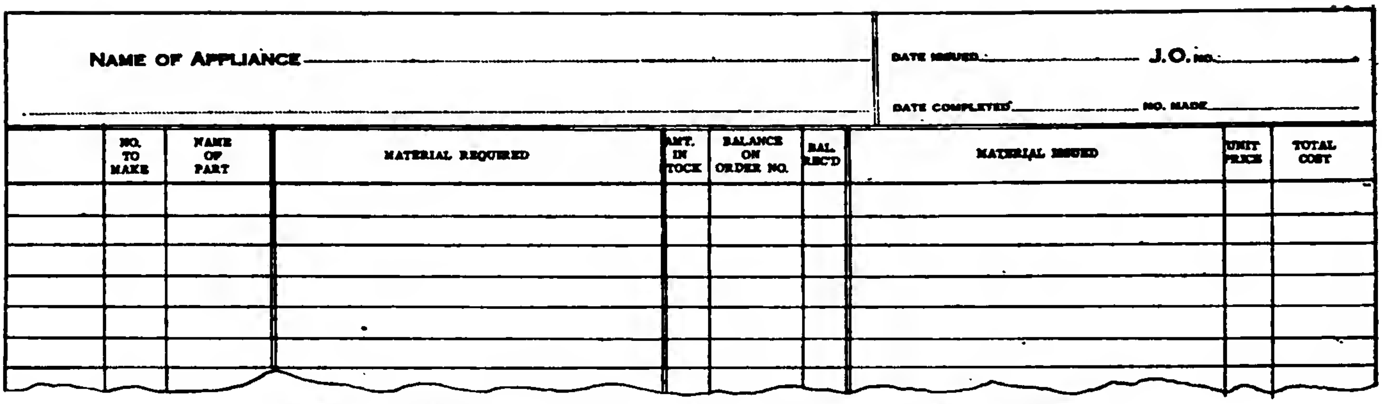
According to the Paris municipal authorities, the economy by the use of motor street sweepers is from 12 to 14 per cent. over the same work done with horses. The authorities of the city of Versailles declare that an economy of 50 to 60 per cent. is obtained. Versailles has the advantage over Paris, however, of possessing exceptionally wide, straight avenues with very little traffic, thus allowing the machines to work constantly at their maximum efficiency. Paris is one of the most crowded cities in Europe, and except in the early morning the sweepers cannot work to their full capacity.

The De Dion Bouton sweeper and waterer is a machine with motor under a bonnet, the driver behind, and water tank on the rear platform. The brush is placed diagonally across the machine, between the two axles. The motor is an ordinary type of four-cylinder cast in pairs, the bore and stroke being 3.5 and 4.7 inches, and the nominal horsepower 18. Control is reduced to the operation of a throttle. So far as the drive is concerned, the machines follow the general De Dion Bouton design. There is a plate clutch, three-speed gearbox and transverse cardan shafts to the rear wheels. These latter are fitted with twin rubber tires, the front wheels having single rubber tires.

There are four main water outlets to be used according to the different classes of work to be undertaken. At the rear is a transverse sprayer through which the water flows by gravity on the opening of a cock. This is only made use of in narrow streets having insufficient width for the front sprayers to work to advantage. From the pump, at the extreme rear of the chassis, there is a left and right hand main feed pipe passing under the chassis and going to the circular section sprayers projecting beyond the front of the frame. On each feed pipe is a by-pass for the washers, these being branches from the main pipes with their extremity near the ground, just ahead of the brush, and fitted with a valve which can only be opened by the driver getting down from his seat. Also on one of the main feed pipes is a by-pass to the pulverizer, this being a fine spray nozzle near the ground.

The whole of the mechanism is carried on a sub-frame the full length of the main frame, and it is at the end of this sub-frame that the centrifugal water pump is mounted. The pump is driven by a propeller shaft having a sliding pinion on its forward end brought into engagement, by the use of a lever, with one of the gearset pinions. The operation is practically the same as changing gears. With the pump working, the operator withdraws either one or both of the piston valves at the inlet end of the two main delivery pipes. This delivers water to either left or right-hand pipes, or both. If street watering has to be done, the piston valves in the front sprinklers are withdrawn, either together or separately, admitting the flow to the sprayers. These sprayers are cylindrical housings having a series of fine holes on one-half of their circumference. On the outside of the cylindrical casing is a semi-circular guard which can be rapidly made to completely or partially cover the outlet holes. The two guards have separate

(*Continued on page* 1078)



NAME OF APPLIANCE

DATE ISSUED J.O. NO.

DATE COMPLETED NO. MADE

	NO. TO MAKE	NAME OF PART	MATERIAL REQUIRED	AMT. IN STOCK	BALANCE ON ORDER NO.	BAL. REC'D	MATERIAL ISSUED	UNIT PRICE	TOTAL COST

Fig. 1—Job order, the master form of the system. Every department has a copy

Klaxon Factory System Seen in Detail

Material and Labor Expense Recorded on Nine Forms—Standardization of Nomenclature and Labor Expenditure

AFTER having explained and described repeatedly in the past various systems used for recording materials and labor expended in the automobile service plants of diverse large firms, THE AUTOMOBILE proposes to describe below a simple yet efficient recording system of an up-to-date accessory manufacturing plant. Assuming that a plant of this nature has a yearly output retailing at a total of $1,000,000, it is obvious that every operation must be under the positive control of the management so as to make maximum economy possible. To illustrate this, suppose that by proper methods 25 cents may be saved on each article made by the company and that the output of the company is 20,000 pieces a year. The saving in this case would amount to $5,000. On the other hand, if the saving is possible, but is not realized, due to circumstances unavoidable or avoidable, the company may justly calculate that it loses $5,000 yearly which otherwise would go to pay dividends on its capital stock.

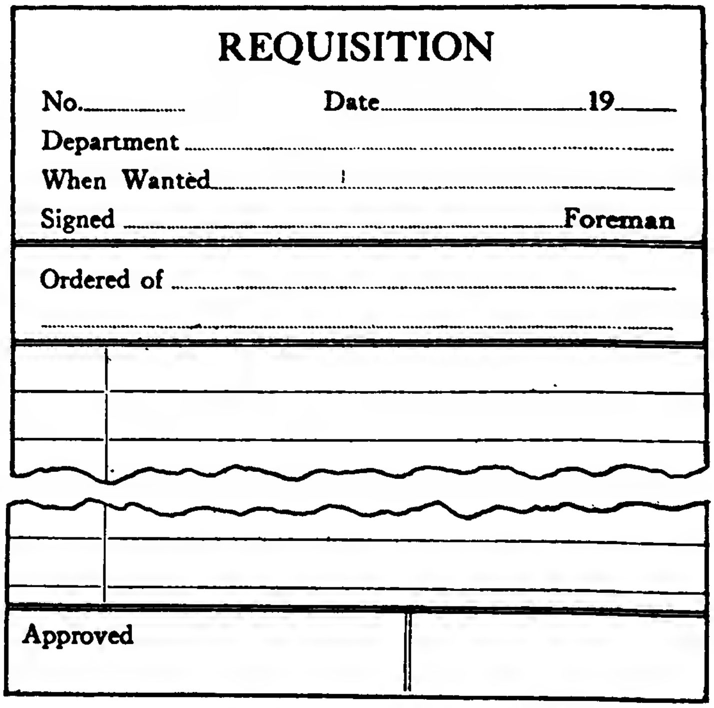
The system which will be taken up below is that of the Lovell-McConnell Mfg. Co., Newark, N. J., manufacturer of Klaxon, Klaxonet and Klaxet horns. Roughly speaking, the system and its various record forms may be divided into two parts, the recording of material and that of labor. There are five blanks for the handling of materials and for the recording of the cost of labor. It may be said in this connection that only productive material and labor are recorded by this system.

Use of the Job Order Blank

Suppose that a lot of 6,000 Klaxon horns is to be made within a specified time. The principal order for this purpose is issued from the main office over which the manager presides. For this principal order or job order, as it is called, the form, Fig. 1, is used. This is a wide sheet, 11.25 by 9 inches, printed black on white paper and punched along the left edge so as to fit into a binder. The office, when filling out this order, prepares one original and such carbon copies as are needed, one going to each factory department affected. The office fills out the form as follows: On the first line, marked Name of Appliance, is written: 6,000 Klaxons. The date on which the order was given, the order number, the names of the various parts and the quantity required of each, are also filled in. The Date Completed space allows for recording the date of the day on which the order is returned to the office complete. The office also names the materials for motor casings, armature laminations and windings, etc. This having been done, the job order and all its copies are sent to the stockroom. The Date Completed space allows for recording the date the order is returned to the office complete.

The stockroom foreman goes over the list, and in the space marked Amount in Stock he states the quantity of each kind of material stored at the plant. This information is entered on the original and on the copies of the job order; at the same time the materials which are in stock and usable for the job are tagged with a job number and put on a special rack, styled the reserve rack. Then all the sheets are sent back to the manager's office, and purchase orders are made out for the materials which are not in stock. At this time the carbon copies are distributed to the various departments, informing their foremen in advance of the work which they will have to have carried out during the next few weeks or months, as the case may be.

The purchase order which is sent out from the purchasing department to the dealer furnishing the company with a certain class of material or parts, is shown in Fig. 4. The blank



REQUISITION

No. Date 19

Department

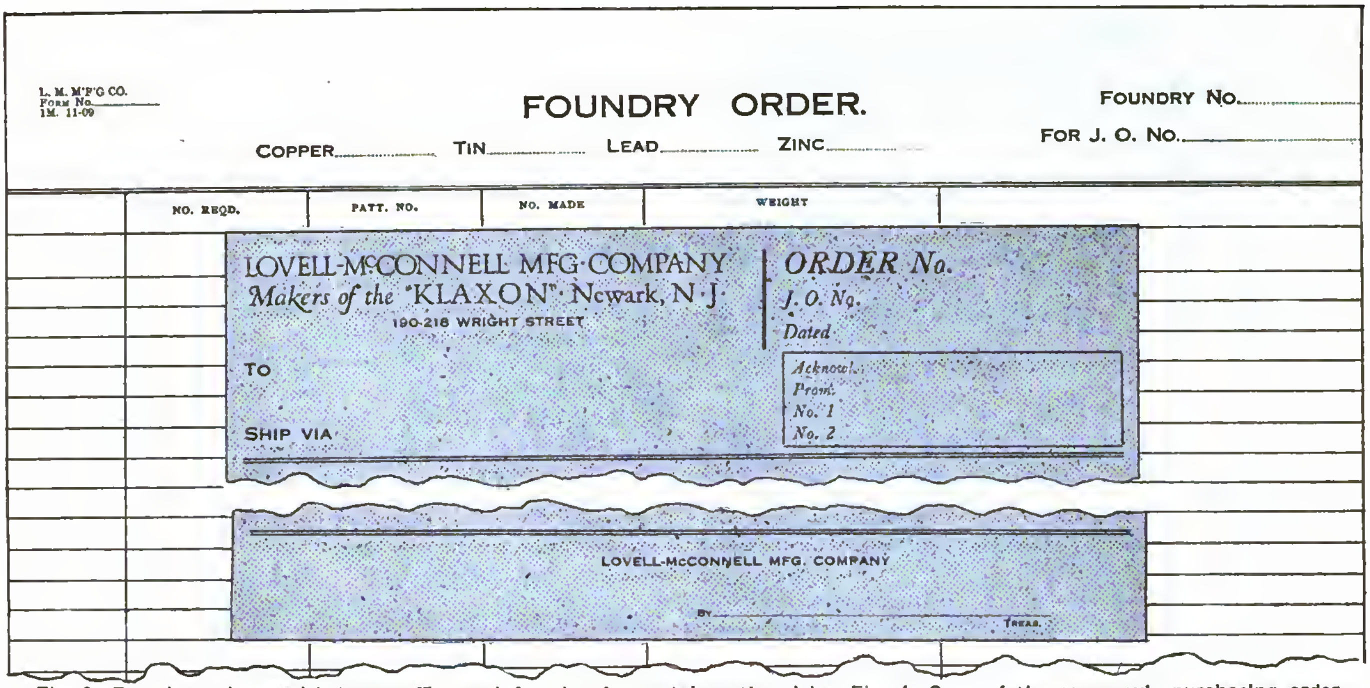
When Wanted

Signed Foreman

Ordered of

Approved

Fig. 2—Requisition form to purchase department



L. M. M'F'G CO.
Form No.
1M. 11-09

FOUNDRY ORDER.

FOUNDRY No.
FOR J. O. No.

COPPER TIN LEAD ZINC

	NO. REQD.	PATT. NO.	NO. MADE	WEIGHT	

LOVELL-McCONNELL MFG-COMPANY
Makers of the "KLAXON" Newark, N.J.
190-218 WRIGHT STREET

ORDER No.
J. O. No.
Dated

TO

SHIP VIA

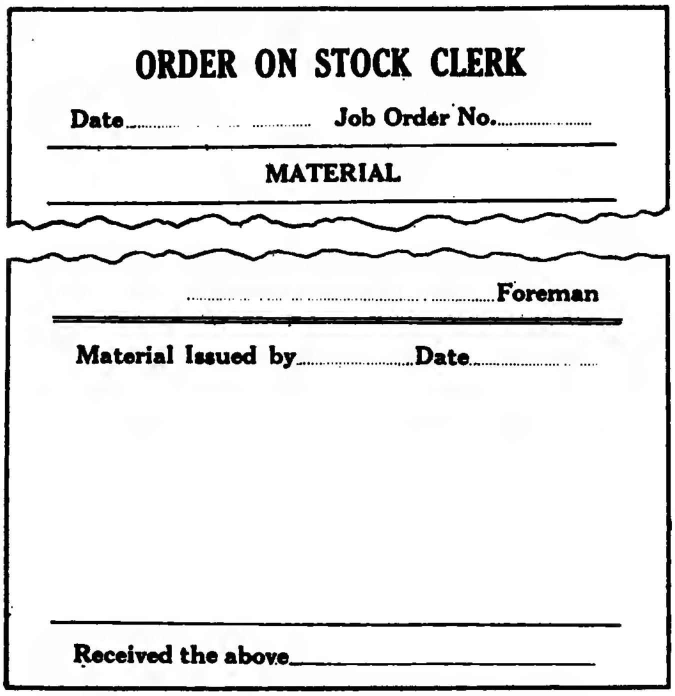
Acknowl.
Prom.
No. 1
No. 2

LOVELL-McCONNELL MFG. COMPANY

BY TREAS.

Fig. 3—Foundry order used between office and foundry for metal casting jobs Fig. 4—Copy of the company's purchasing order

is 7.75 by 6 inches, and there are three copies of this blank filled out, each being printed on paper of a different color. One copy goes to the dealer, the other to the stockroom and the last to the office. In making out this order the purchasing department enters on it the name of the dealer who is to furnish the material, his address and how the goods are to be shipped. All the orders issued by the purchase department are numbered consecutively, the copies bearing, of course, the same number as their original. The number of the job for which the material is required and the date of desired delivery are also stated on this form. In a space between the two double rules the material is specified, and the treasurer of the company signs the order. When the latter has been acknowledged by the addressee, this is marked on the office copy and the same applies to a possible promise of delivery on the part of the dealer as well as the first and second follow-up letter.



ORDER ON STOCK CLERK

Date Job Order No.

MATERIAL

Foreman

Material Issued by Date

Received the above

Fig. 5—Material order from department to stockroom

When the material is delivered to the company it is checked by the stock clerk against the order and the invoice, and is tagged with the number of the job for which it is reserved; the invoice is sent to the office. Now, as the various departments require the materials they need to carry out their shares of the job, they call on the stockroom to issue the materials to them. For this purpose the foreman of each department fills out the order to the stock clerk, Fig. 5. This form is 8.5 by 5.5 inches and comes in pads being printed black on colored paper, a copy of different color paper being used for each department. The foreman of the department keeps a carbon copy of the blank as his own record. When the material has been delivered to the department employee by the stock clerk, the former signs the order as a receipt.

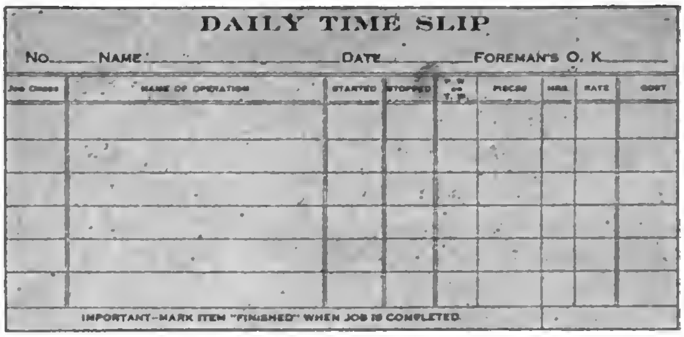
The requisition, Fig. 2, is used by the various department heads for miscellaneous materials required, such as specified drills, tools, etc. The blank used for this purpose and here shown is 7.75 by 4.5 inches. Upon the receipt of the requisition, the purchasing department either makes out a purchasing order for the material, or if it has been ordered already, sends out a follow-up letter.

In case the stockroom receives more material than was ordered this material is kept by the company and stored in the stockroom on the so-called free rack, which is opened for the use of any department. The clerk, however, who is in charge of the stock, uses wherever possible the material on the free rack for the job orders, as they come up, so that the free stock is kept down to as small as possible a quantity of materials.

Foundry Jobs on Special Order

When foundry work is required, the manager's office fills out the foundry order, Fig. 3, which is designed along similar lines as the form, Fig. 1. The sheet is 11.25 by 9 inches. The metal to be used is checked and the pattern number, number of pieces required, job number and foundry order number are entered on this sheet. The foundry foreman after having done his work records on the order the number of pieces made and their total weight after which the form is sent to the office and the material to the stockroom.

Coming to the labor recording system, the clock card and the daily time slip are the fundamental forms used. The former is a weekly record, and is illustrated in Fig. 9. The blank is 3.5 by 5.5 inches and besides spaces for the number and name of

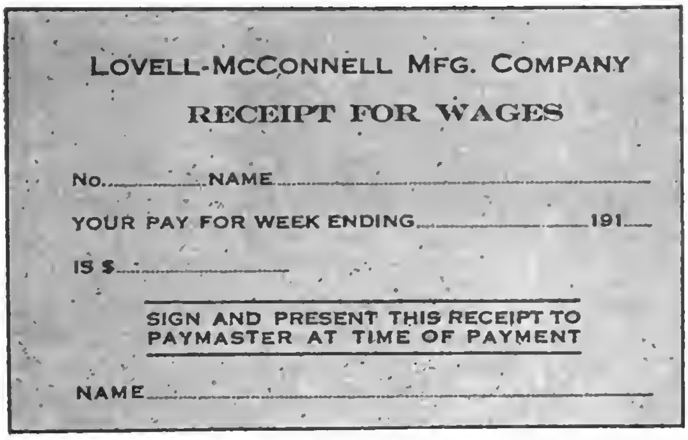

DAILY TIME SLIP

No.____ NAME ____ DATE ____ FOREMAN'S O. K. ____

JOB ORDER	NAME OF OPERATION	STARTED	STOPPED	P. W. or T. W.	PIECES	HRS.	RATE	COST

IMPORTANT—MARK ITEM "FINISHED" WHEN JOB IS COMPLETED

Fig. 6—Workers' daily time slip


LOVELL-MCCONNELL MFG. COMPANY

RECEIPT FOR WAGES

No.____ NAME ____

YOUR PAY FOR WEEK ENDING ____ 191__

IS $____

SIGN AND PRESENT THIS RECEIPT TO PAYMASTER AT TIME OF PAYMENT

NAME ____

Fig. 7—Wage receipt form blank

¶ The daily time slip, used to account for the portions of the total working time of each man, as given by his clock card, is designed to give every point of information relating to this phase of factory work, making an exact account thereof possible.

¶ By the use of the two forms shown above, the question of an exact payroll is being solved to mutual satisfaction of both the company and the force. These two forms, together with the weekly clock card, constitute an efficient time-checking system.

¶ The receipt for wages paid out to the worker is a fit example of how small trouble, which often is the cause of large nuisances, can be avoided. No worker having signed a slip such as this will come back and claim that he did not receive his pay.

the employee is marked for an entry of his total wages earned during the week and the deductions made for the sick benefit and the Klaxon Savings and Aid Association, a body organized for mutual assistance among the men. The clock card provides spaces for stamping three starting and stopping times a day on it.

As to the distribution of a man's working time, this information is obtained by means of the daily time slip, Fig. 6. This form comes in pads of 7.38 by 3.75 inches, being printed black on colored paper, a different color being used for each department for simplicity. Exact information including whether a man works on a time or piece basis is thus obtained and the slips of all the men are turned into the office at evening.

In this connection it should be mentioned that the company is making earnest and well-directed efforts toward a standardization of nomenclature of the various working operations carried on in the shop. The management recognizes that as long as different men style one operation as boring, drilling and whatever other names are used in the different shops, there is no way of getting away from misunderstandings in the company's office where the cost sheets are figured and made up.

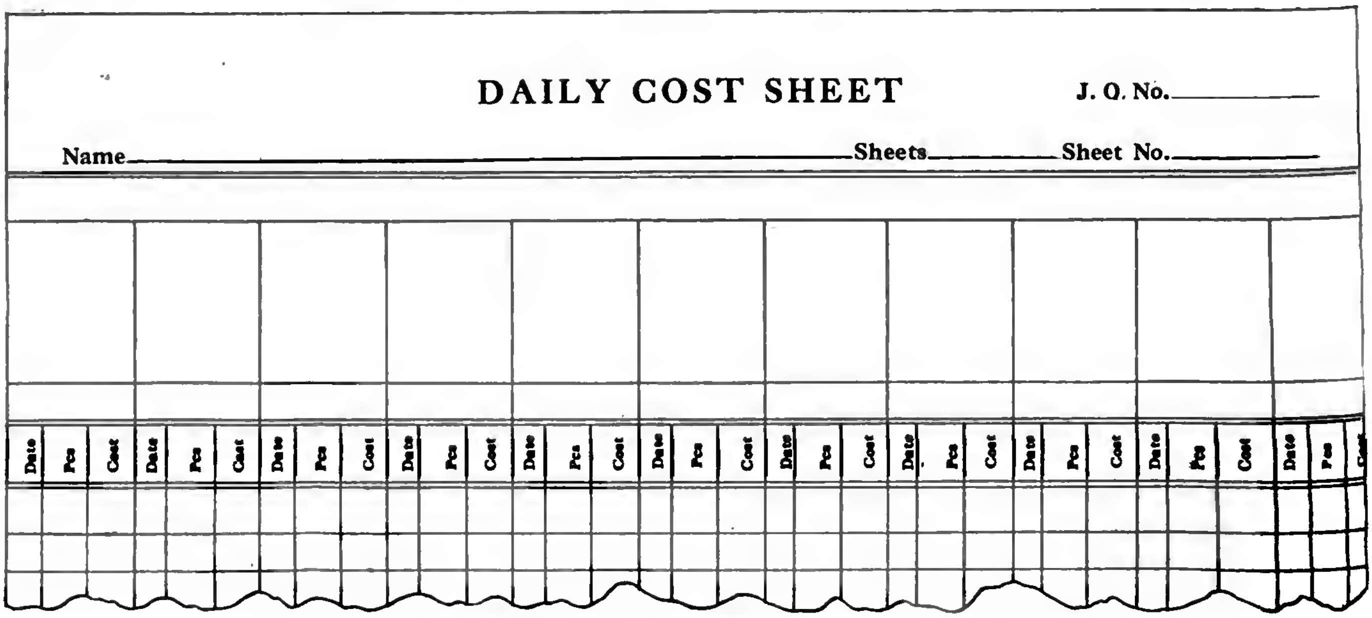
Making Up The Daily Cost

In the office the information is transferred from the daily time slips to the daily cost sheet, Fig. 8, which is kept in a binder. This sheet is 8.75 by 11.5 inches, printed black with red and blue rules on white ledger paper. Of course as many cost sheets as necessary are used every day. Under Name, the exact part name is entered, and the job number is also written on the form. The lower portion of the latter is divided into eleven columns, each of which has three small divisions marked Date, Pieces and Cost. In filling out the daily cost sheet, the office clerk doing this work writes into the square space on top of a column the standardized name of the operation, for instance:

Casing, Drill and Tap.

Under this heading all the time spent by any worker of the factory in carrying out this operation on a job order during the day before is recorded, together with the number of pieces produced in that time and with the wage paid for that work. In this manner the full amount of any kind of part made in the shop is ascertained and this number must be identical with that of the pieces paid for on the previous operation. Any discrepancy arising causes an immediate examination of the situation to clear the problem. Likewise, this cost sheet makes possible the establishment of standards of cost for the production of any part or parts of the devices made by the company.

The day before pay-day each man receives a wage-receipt blank,


DAILY COST SHEET J. O. No.____

Name ____ Sheets ____ Sheet No. ____

Date	Pcs	Cost	Date	Pcs	Cost	Date	Pcs	Cost	Date	Pcs	Cost	Date	Pcs	Cost	Date	Pcs	Cost	Date	Pcs	Cost	Date	Pcs	Cost	Date	Pcs	Cost	Date	Pcs	Cost	Date	Pcs	Cost

Fig. 8—Daily cost sheet giving the working operations of all men and their cost

Fig. 7, a yellow slip with black print, 4.5 by 2.5 inches. Before receiving his money, he signs the slip and exchanges it for his pay envelope.

In order to keep up a general discipline in the factory, the company has prepared a leaflet giving rules and regulations for its workers, Fig. 10. The same is 9.75 by 6 inches and gives complete instructions with regard to the work, payments and various points of order which must be rigidly adhered to. Each man receives a copy of this leaflet when starting in his position, and if he needs another copy, he may, of course, obtain the same from the office of the company.

Forms Adapted To Their Purpose

Close inspection of the various forms brings out their adaptability. For instance, the job order blank is so designed that the manager in his office, getting reports from the stockroom and the various factory departments, is able to have this information put on the job order original; the result is that this information is always at hand and it is not necessary to send for various department heads or clerks in order to find out things which, by proper communication, could have been forwarded to the manager's office days or weeks earlier. Likewise, it is possible at any moment to figure up the full cost of the whole job or part of it.

The daily cost sheet likewise opens up new perspectives. First of all it makes possible the standardization of cost of even the smallest of shop operations. Here is a practical and useful example of shop records. Cost standards having been arrived at, the time needed for the making of one unit part at average cost may be analyzed according to the rules of motion study and waste motions on the part of the workers may be eliminated. It goes without saying that once the nomenclature has been standardized this will also influence the design of the daily cost sheet. It will, of course, prove a saving of time if the various working operations are printed on cost sheets instead of being written.

Finally, the idea of the reserved stock rack and the free rack will commend itself to more than one factory manager.

LOVELL-McCONNELL MFG. CO.

Form No. 5023

TIME CARD.

No.......... NAME

TOTAL WAGES.........

S. B........No........K. S. A.........

NET AMOUNT..........

DAY	Started	Stopped	Re-Started	Stopped	Re-Started	Stopped	Total

FOR WEEK ENDING..........

NOTE—Pay is made up only for time shown hereon.

Fig. 9—Workers' weekly clock card

¶ *This clock card for shop workers as used at the Klaxon plant contains a number of details comparing favorably with cards used in various other works and well worth consideration.*

THE following rules and regulations will govern employment in this factory.

TIME CARDS

Each individual is to ring his own time card when starting or stopping work. The payroll will be made up on the basis of the time as shown on the time cards. Deductions will be made on the basis of quarter hours. One minute's tardiness is sufficient to cause the loss of one quarter hour's time.

WORKING TIME

Hours of employment are from 7.00 A. M. to 12.00 M., and 12.30 P. M. to 5.30 P. M. on week days, except Saturdays. On Saturdays from 7.00 A. M. to 1.00 P. M. On Saturdays the power will shut down at 12.45 P. M. to give machine operators an opportunity to clean their machines. Employees who do not run machines are to continue working till 1.00 P. M.

DAILY TIME SLIPS

Daily time slips are to be made out the first thing each morning for the previous day's work. They must be on the foreman's desk not later than eight o'clock.

PAY DAY

Pay day is Wednesday, and payment will be made for the week ending on the previous Saturday. If Wednesday is a holiday, payment will be made on the previous day.

OVERTIME

For overtime till midnight payment will be made at the rate of time and a quarter. After midnight and for Sunday and holiday work at the rate of time and a half.

SMOKING

Smoking is positively prohibited in the factory at all times. It is permitted during noon hour in the foundry, boiler house or yard.

WASH-ROOM PRIVILEGES

Employees must keep all clothing in the wash-room. The wash-room will be kept locked and entrance to the same during working hours can only be gained by presenting a permit duly signed by your foreman.

OILY WASTE

Oily waste must not be left laying around, but is to be put in the receptacles provided for it.

GENERAL CLEANLINESS

This company makes a special effort to provide its employees with comfortable surroundings and the coöperation of our employees is requested, in order that the best results may be obtained.

You are particularly requested to throw refuse of all kinds into the dirt barrels and not on the floors or grounds.

You are also cautioned not to leave towels, hats, shoes, etc., laying around the wash-room. It is understood by the cleaners that material left laying around is worthless and can be removed when found.

TOOLS

Tools will be issued from tool room only on a check. In the event of an employee leaving, all tools must be returned before an employee will be paid off.

Failure to obey any of the above will be considered sufficient cause for summary discharge.

Lovell-McConnell Mfg Company
Newark, N. J.

Fig. 10—Copy of company's rules-and-regulation leaflet distributed to workers

Choosing a Color Scheme

Lighter Shade Should Be Used on the Chassis Than on the Body in a One-Color Scheme

IN choosing a one-color scheme for the car, it is always in order to use a lighter shade for the chassis than is employed upon the body. A better-balanced appearance will invariably result. When, for example, a deep ultramarine blue is selected for the panels of the car, with the upper parts of the body black, the chassis should carry the light shade of ultramarine blue. Stripe the chassis with a 1-4-inch line of black and at each edge of this stripe run a fine line of gold. Stripe the dark blue panels with two 1-8-inch lines of the light shade of ultramarine blue and run a fine line of gold between the two. This yields a charming color effect.

Another method of using blues on the car consists of deep blue for the door and main side panels, and a medium deep shade of the same blue for the chassis and upper panels of the car. Paint the moldings black and stripe the chassis with a broad black line split at the center with a single line of gold.

In greens, Brunswick green, deep, for the main body panels, with black upper panels, and black moldings, with double fine lines of black run around the green panels makes an ideal combination. The chassis should be painted the light shade of Brunswick green with striping lines of black.

Silk Green Is Very Popular

Silk green is probably the most popular green for this season among owners attracted by smart coloring. Use for example, medium silk green for the body panels, dark shade of same color for the narrow upper panels, and light shade for the chassis.

Stripe the body panels with double lines, 1-8-inch wide, of black, with a fine line of gold running between the two. Stripe chassis with fine lines of black 1-2 inch apart and in this center space cast two fine lines of gold 1-16 inch apart. Have the upholstery to match the body panels, and the effect will prove admirable.

Napier and thistle green are soft toned, magnificent greens, and upon the heavier type of car they offer splendid effects. Paint the main body panels in either of these two greens and for unique effects run vertical 1-inch stripes 1-5 inch apart, of darker green, or if so preferred, of lighter green, directly across the panels. Paint the upper panels either black or a very deep shade of the main panel green. Paint all moldings black. Give the chassis a light shade of the same green, and stripe with the deep panel green.

The main scheme of coloring for the automobile at the present time consists of colors in the main dark and fine without any sharply contrasting color such as the reds or maroons or lakes might afford.

Dark warm browns for touring cars and runabouts are much in evidence this season, and they really do produce fetching effects when artistically placed upon the surface. Place the dark shade of tan brown on the upper or narrow body panels, the medium shade of same color on the main body panels, and light shade for the chassis. Thus you have a graduated color scheme which brings the shades into proper relation to each other. Paint all body moldings black and use for the panels and for the chassis .375-inch lines of black, edged with very fine lines of gold. Quite the same scheme may be effectively employed in using Manila or Oriental browns, two exceedingly popular browns.

For a particularly high-colored blue withal strikingly bold and beautiful, adapted for the light runabout and a light class of touring cars, cobalt blue, light, for the main body panels, with moldings black, and cobalt blue, extra light, for the chassis, with gold or aluminum striping, done principally in fine lines, yields something in the way of colors quite out of the ordinary.

A new comer in the field of lake pigments is the lovely Japanese crimson lake over which the ladies in autodom linger in genuine feminine adoration. This is a wonderfully deep, luminous pigment suitable for big touring car decoration. A very effective way of painting the car in this color is to use the deep shade for the main body panels, the light shade for the upper panels and the chassis, and to paint the moldings black, and employ black lines for the striping. Fine lines of gold look attractive upon this color.

The fact that the lake pigments are rapidly increasing in favor for use upon the automobile, and especially for touring cars, serves to interest the car owner in these colors as never before.

To develop striking, yet harmonious combinations with the lakes, paint the main panels of the car English scarlet lake, deep, upper panels English purple lake, chassis English crimson lake. All moldings to be painted black. Again, paint the upper panels black, large panels Munich lake, medium shade, and chassis French carmine, moldings to be painted black, with black lines of striping.

Another way consists of painting the main panels English scarlet lake, upper panels French carmine with chassis same color. Moldings to be painted English purple lake. Striping lines on both body and chassis to be in black and gold lines.

Another very popular combination is made by painting the large body panels English purple lake, upper panels and chassis English crimson lake, moldings black. Lines of striping to be in aluminum.

Returning to the green pigments, one of the superb greens of the season is olive green, a shade instantly attractive. This is a soft, warm, brilliantly toned green. Give upper panels plain black, large panels deep shade of the green, and chassis a light shade of same color. Moldings to be in black, and striping lines to be French carmine.

English rose lake of deepest shade for the upper panels, medium shade for the large central and back panels, and the lightest shade for the chassis, the lines of striping to be in French black; moldings painted in same color.

All these lakes are very largely transparent, and to be effective, they must be used over ground colors brought up with great care and enriched to an extent only surpassed by the actual lake coat itself. Over such grounds it is good practice to apply a single coat of the selected lake mixed to dry and flatten out without any gloss. Then for the final coat thin some of the lake with turpentine in which condition add sufficient rubbing varnish to give the mass a good, substantial gloss. Handled in this manner there is developed a color display which for elegance and luxurious effects cannot be surpassed.

All colors will appear richer and finer if they are used in connection with varnish, as varnish colors, for the final color developing coat. If the surface is brought up clean and smooth, with the feel of velvet, and given one or two coats of the color diluted with turpentine to dry flat without luster, the final color coat will need to carry only sufficient pigment to stain the varnish.

Color Combinations for Big Cars

Dark and medium cobalt blue, dark shade for the body and medium share for the chassis, both being striped with double fine lines of white or gold, also give a rich and durable effect.

In brown, the tan color, dark shade for the body and light shade for the chassis, striped with a .375-inch line of black edged with fine lines of gold form an excellent combination.

In the gray, battleship and monitor gray are perhaps the most widely liked. If brought up carefully to a finish they are among the exceedingly durable colors. They make exceptionally pleasing colors for big cars.

For a seven-passenger touring car, French gray, deep shade for body and medium shade for chassis, striped with a .25-inch line of light French gray and this line edged with fine lines of gold, gives great service and a very attractive appearance.

Among the New Books

Numerous Works Treating of the Automobile and Kindred Subjects of Interest Are Spring Offerings

ALTHOUGH some of the books reviewed herewith would seem at first glance to be foreign in subject matter to the automobile and consequently to many of our readers, a further inspection brings out the fact that all of the works considered are in some way related to either the car itself, its accessories or to some phase of the wonderful industry which has been built up around it.

List of Automobiles Showing Model Type of Body and List Price with Horsepower and Collision Insurance Ratings, published by the Commercial Union Assurance Co., Ltd., of London. 55 John street, New York. Issued to interested parties by the Commercial Union Assurance Co., Ltd.

This little handbook contains the names, models, horsepower and collision classification of practically every motor-driven vehicle. This book used in connection with the rate sheet will immediately tell anyone the amount of insurance required on any given vehicle.

The Gas, Petrol and Oil Engine, Vol. II by Dugald Clerk and G. A. Burls, members of council of the Institution of Automobile Engineers, published by John Wiley & Sons, New York City. 838, 5.5 by 8.75-inch pages, with 478 illustrations. Cloth, $7.50.

Three years have been spent in the preparation of this volume, and this length of time has elapsed since the first volume was published. In the present book there are twelve chapters. Chapters 1, 2, 5 and 12 are by Dugald Clerk, chapters 7, 8, 9 and 11 are by G. A. Burls. The remaining chapters were written in collaboration. The work has been arranged in such a manner that it represents the views of both authors in combination, each subject touched upon having been dwelt upon in a joint discussion.

Chapters 1 and 2 treat of the development of two- and four-cycle motors and describe the problems which have come up in design and how they have been solved or unsolved as the case may be. Chapter 3 deals with the development of the ignition system; chapter 4 describes governors; chapter 5 touches upon gaseous fuels; chapter 6 deals with the volatile fuels; chapters 7 and 8 take up the design of former and existing types of gasoline engines; chapter 9 is devoted to carburetion; chapters 10 and 11 discuss oil engines and chapter 12 is devoted to the future of internal combustion motors.

The chapters are all exhaustive on the particular subject to which they are devoted and the entire work is of value as a reference book.

Automobiltechnisches Handbuch, 7th edition, illustrated; by Dr. Ernst Valentin, with assistance of ten other engineers; 952 pages. Published by M. Krayn, Berlin W 57. Price, 4.50 Mark.

This work, in its edition for 1913, enters upon nearly all those questions related to automobile construction and engineering—including motorboats and motorcycles—which are omitted, for being too specific, from the general engineering handbooks. It contains opinions as well as data; in most cases well separated, however. A table of logarithms and a recapitulation of mathematics and physics, sufficient for those who are only rusty but not for learners, add to its practical value. The illustrations are drawn from textbooks and from material furnished by the German industry. Current topics, such as valveless motors, silent chains and gears, worm drive, are included in the treatment. The print and the illustrations are too small for comfort and clearness, and for this the low price can compensate only in part. For engineers and mechanics in this country, the book may in many instances have a special value as a means for keeping abreast of German technical nomenclature, as in most instances it is handier and more definite and conclusive in this respect than a dictionary, though of course not so complete. The chapters on traffic and legislation should be of interest to all touring in Germany.

The Autocar Imperial Year Book, 1913, for circulation in the colonies over seas and abroad, published annually by Iliffe & Sons, Ltd., London, Eng., 112, 12 by 8-inch pages, illustrated. Boards, 2 shillings, 6 pence.

This work is a review of the automobile situation of the world in general and England in particular as it stood at the beginning of the year. The trend of modern development is studied by taking up particular parts of the car and pointing out what has been done during the year of 1912. Not only the engine, but the details of coach work are touched upon and the development pointed out. A complete data table covering 20 pages is given in which are included all the important details of the best-known cars in the world which are on the British market. An interesting department of the issue is the history and the records of Brookline track. A study of the lighting systems and starters now on the market is also of special interest. This work can be read to advantage by any member of the trade or anyone else who wishes to keep in touch with the British industry.

The A. B. C. Fiscal Handbook, published by Free Trade Union, 25 Victoria street, London, S. W. 262 pages 5.5 by 8.5 inches. Paper, 1 shilling.

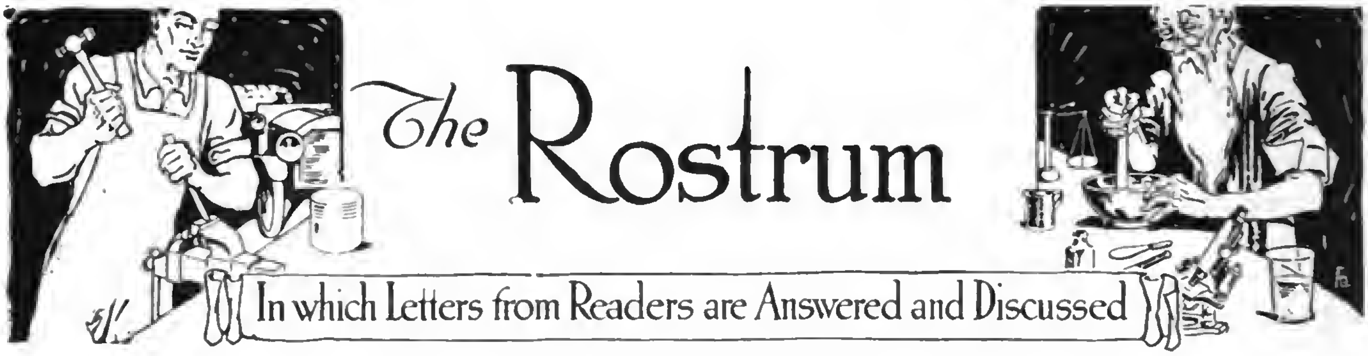
The Fiscal Handbook, 1913, contains complete statistics of British foreign trade over a period of years. These statistics are based on the declarations of importers and exporters of the goods under their respective classifications as verified by the customs officials at the various British ports. The figures on exports are automatically checked because the exporter must declare specifically whether the goods imported are of foreign or British manufacture and in case of a mis-statement is liable to penalization. As for imports, the value of all goods arriving in England and declared as mentioned are included in the import figures under their various classifications, except personal luggage, ships and military stores, packing cases and a large portion of the jewelry imported. Many interesting facts may be learned from the Handbook. Of particular interest to the automobile world, however, are the figures on automobiles, parts and chassis given on pages 150 and 151.

Trade Mark Laws of the World and Unfair Trade. By B. Singer, published by the author, 30 Church street, New York, or National Life Bldg., Chicago. 700, 6 by 9-inch pages, bound in buckram, $5.

This work gives a digest of the trade mark laws of every country of the world. The registration of trade marks of popular and standard classes of merchandise has become tremendously important of late years, owing to the keen rivalry among the nations of the world. A registered mark protects the manufacturer as well as the owner against those who seek to imitate the production of a certain article. Trade mark laws of different countries vary to such an extent that it is necessary to anyone engaged in international commerce or who markets an article which he desires to protect against foreign imitators.

An Expensive Experiment. By Reginald Pelham Bolton, author of *Building for Profit, Motive Powers*, etc., published by the Baker & Taylor Co., New York City. 281, 5 by 8-inch pages. Cloth, $1.25.

This is the story of a wasteful method of securing power which was adopted by a Canadian province, in utilizing the Canadian Niagara. "In 1897," states the author, "the city council of Toronto applied to the legislature of Ontario for permission to enter upon municipal ownership and operation for electrical service." The result of this was what the author calls the Great Experiment. How this experiment worked out and its result in the loss to the public is interestingly told by the author in a clear, concise manner.



Ignition Used on the 1911 Ohio—Detecting Acetylene Leaks—Securing Proper Valve Timing—New Jersey Law in Effect—Ford Lights Do No Damage—Proper Adjustment of Ford Vibrator—Trouble Caused by Dirt in Gasoline

Splitdorf Ignition on Ohio 1911

EDITOR THE AUTOMOBILE:—Will you kindly explain the Splitdorf ignition system as used on the 1911 Ohio 40?

St. Louis, Mo. E. H. K.

—On the 1911 Ohio cars the model B and model D Splitdorf magnetos were used. These magnetos are absolutely the same except that the model B has three permanent magnets and the model D has two. These are low-tension magnetos. That is to say, the armature of the magneto has but one winding and the current is raised to a high voltage by passing it through a transformer having a low and high-tension winding similar to that of an induction coil for batteries. This brings the current to a point at which the tension is sufficient to cause the spark to jump across the gaps in the plugs against the resistance of the gas compressed in the cylinders.

In addition to using the current from the magneto the transformer also acts as a spark coil by using the breaker mechanism of the magneto as a circuit breaker to interrupt the battery current. The battery current is used for starting purposes or for an emergency. The distributor is used to bring the current thus used to the spark-plugs. This gives a dual system with one set of plugs and both systems are controlled by a switch on the dash.

In Fig. 2 a full wiring diagram is given for the models B and D magnetos. By arranging the wiring in the manner shown in this diagram the system above described is operated.

With a system of this kind you have always a reserve in case the magneto should ever get out of order. The batteries would not be disabled through any disarrangement that could possibly occur under ordinary circumstances.

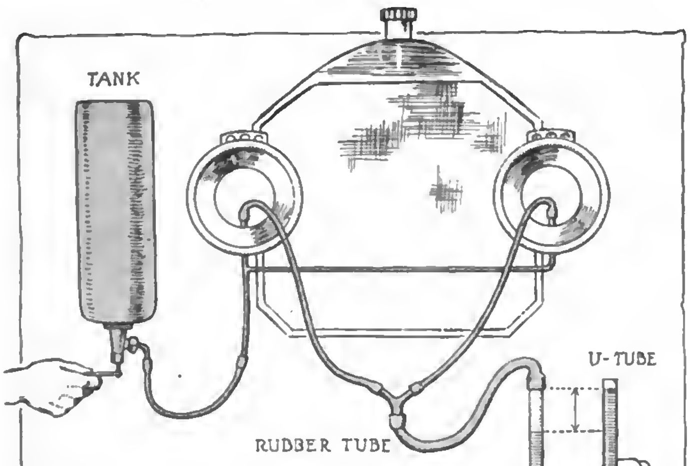


Fig. 1—Apparatus used for detecting the existence of a leak in the acetylene line

Locating Acetylene Gas Leak

Editor THE AUTOMOBILE:—I have been troubled by the gas tank on my car running down without using the lamps. I think there is a leak somewhere in the line but I have been unable to find it. I would like to find out two things, first if there is a leak and second how to locate it. I am not positive about there being a leak as it might be that I have used the lamps more than I think and that I am mistaken in my calculation as to how long I have had them lit, but if there is a leak I want to find it. I know acetylene is traceable by an odor but I have not been able to smell any escaping gas along the pipes. What method do they use in garages for determining whether or not there is a leak?

German Valley, N. J. GAS-LINE.

—You can readily determine whether or not there is a leak by using the simple apparatus shown in Fig. 1. This consists of three pieces of rubber tubing, a three-way pipe connection, and a glass U-tube. The burners of the acetylene lights are removed and the ends of the rubber tube placed over the projecting pipe as shown in the illustration. The valve on the gas tank should be closed while this is done. Some water is now placed in the U-tube but not enough to completely fill it. The needle valve on the gas tank is slowly opened until the water in the U-tube is lifted to the position shown in Fig. 1. The valve is then closed and the U-tube watched. If water drops to the same level in both branches there is a leak. The leak can be found by mixing up a thick soapsud solution and covering sections of the pipes and tubing especially at the joints. The leak will be detected by the bubbles.

Timing Intake and Exhaust Valves

Editor THE AUTOMOBILE:—In timing the exhaust valves and intake valves by means of a rod put in priming cups, where should the exhaust close and intake open; giving it in inches or part of an inch of the stroke? Also the difference in a 4-inch stroke, 4.5-inch stroke and 5-inch stroke; or, are they timed alike? Are the firing points the same on the battery as magneto in setting? What is the correct firing position for the piston on a 4-inch stroke, 5-inch stroke and 5.5-inch stroke?

Newark, N. J. JOHN WILLS.

—It is impossible to do a good job in timing the valves of a car by measuring with a rod in the way you suggest because the measurements are so small at the beginning and end of the stroke as compared to a number of degrees of revolution of the crankshaft. The timing should be done by measuring the degrees on the flywheel. It is easy to divide the circumference of the flywheel into 360 equal parts and to lay out the timing as accurately as desired instead of relying on micrometer measurements in thousandths of an inch when measuring by means of a rod. For instance, 5 degrees past upper dead center on a

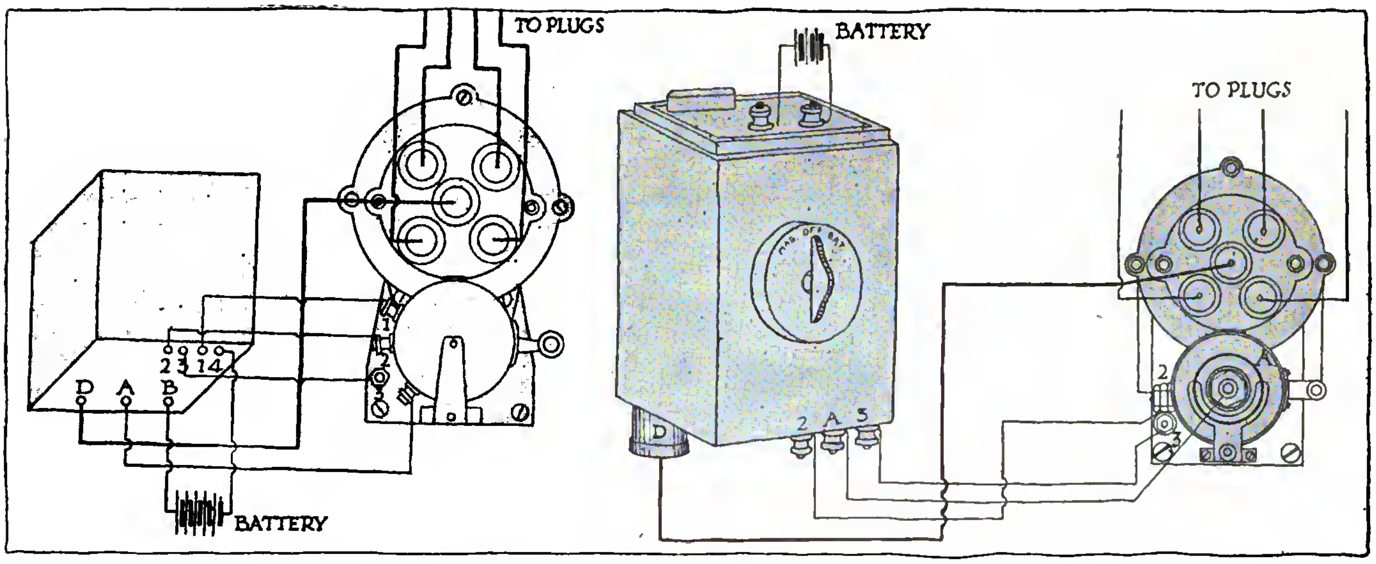


Fig. 2—Method of wiring model B Splitdorf magneto and model D Splitdorf as used on the Ohio 1911

12-inch flywheel would mean that the piston had gone down on its stroke a distance of .0457 inch. This would be rather hard to measure correctly. This same distance measured around the circumference of the flywheel would be .5236 inch. This is more than ten times what you would have to measure on the rod through the cylinder and therefore gives you about ten times the chance of being accurate. It is much easier to measure .52 inch than it is .04 inch in the first place and a difference of .01 inch in the case of the .52 would not be serious while with the .04 inch it would be a 25 per cent. error and would be serious. The idea of measuring timing in the way you suggest should be abandoned.

Open the compression cocks on the motor and turn it over until cylinder No. 1 is on the exhaust stroke. Revolve the motor slowly, then until the piston in this cylinder reaches upper dead center. This you can tell by means of the rod in the compression cup hole. Mark the rod at the point where the piston is at upper dead center or, in other words, when the rod is lifted as high as possible. When you have got this point located exactly and you are sure that you are right, center-punch the flywheel and some mark on a part of the stationary part of the engine near it so that you will know that when these two marks are directly opposite each other the piston in the No. 1 cylinder is on upper dead center. After you are sure the marks are in line correctly and that the piston is really on upper dead center, center punch on the flywheel alongside the mark you have made, 1-U-C. This will signify that cylinder No. 1 is on upper dead center.

You have now made a definite point from which you can start your timing operations. Before you can do anything else you will have to know what part of the circumference corresponds to 1 degree, because in this kind of measuring work dimensions are given in degrees and not inches. A degree is 1-360 of the distance around the flywheel. If you have a 12-inch flywheel each degree is .1047 inch; on a 14-inch wheel each degree is .12508 inch. This is practically 1-8 inch.

The cams being made for your car you will have to arrange the opening and allow the closing of the valves to fall as it will. Turn the motor over slowly until the flywheel has turned 10 degrees. This will be 1.047 or 1 3-64 inches on a 12-inch wheel or 1.2508 or 1 1-4 inches on a 14-inch wheel. At this point the inlet valve on No. 1 cylinder should start to open. At this point put another mark on the flywheel opposite the mark which was opposite the 1-U-C mark that will now be 10 degrees around to the right as you face the motor. This mark shows where the inlet valve on cylinder No. 1 starts to open and should be marked I-O-1.

The next point to locate is the opening of the exhaust valve on the No. 1 cylinder. Turn the crank slowly around to the right on the suction stroke, while the inlet valve will remain open and then around on the compression stroke and down on the firing stroke until you reach a point 40 degrees in advance of lower dead center. At this point the exhaust valve should start to open. If you have an L-head motor the cams will be on one shaft and when you have set the first one you will have no control over the others, but will have to let them fall as they come. With a T-head motor, however, you can set the exhaust valve in the No. 1 cylinder. On a 12-inch wheel 40 degrees will be 4.188 inches, or 4 3-16 inches, and on a 14-inch wheel it will be 5.032, or 5 1-32, inches. This distance is measured around the circumference as described. The point on the flywheel that falls opposite the mark on the fixed part of the motor should be labeled E-C-1.

The inlet valve should close 30 degrees after lower center and the exhaust valve should close 5 degrees after upper dead center. These points should be marked on the flywheel the same as the others and also the timing of the other cylinder. For instance, where the exhaust valve of No. 3 cylinder closes the mark used would be E-C-3.

The timing on the different motors you mention will all be the same when referred to the degree system and you will not have to bother with the differences in stroke as these are automatically taken care of. In each case the maximum firing point advance should be 37.75 degrees before dead center, or 6 7-32 inches on the flywheel.

Jersey Law Requires License

Editor THE AUTOMOBILE:—1—Could a boy of fifteen under any circumstances in New York and New Jersey procure a driver's, owner's or chauffeur's license? I can pass any examination that could be put to me. Another question as to whether a boy can drive if accompanied by his father (the owner)?

2—I would also like to know what compression is generally used on special racing cars; also the piston clearance and the amount of clearance at top and bottom of stroke, *i. e.*, amount of taper in cylinder.

New York, N. Y. FRED H. WELLS.

—1—The law in New Jersey as now in force on this subject is as follows:

The Commissioner of Motor Vehicles shall be authorized, and full power and authority are hereby given to him to license at his discretion and upon payment of the lawful fee, any proper person of the age of 18 years or over to be a motor vehicle driver, said commissioner or his agent having first examined said person and being satisfied of his ability as an operator, which examination shall include a test of the knowledge on

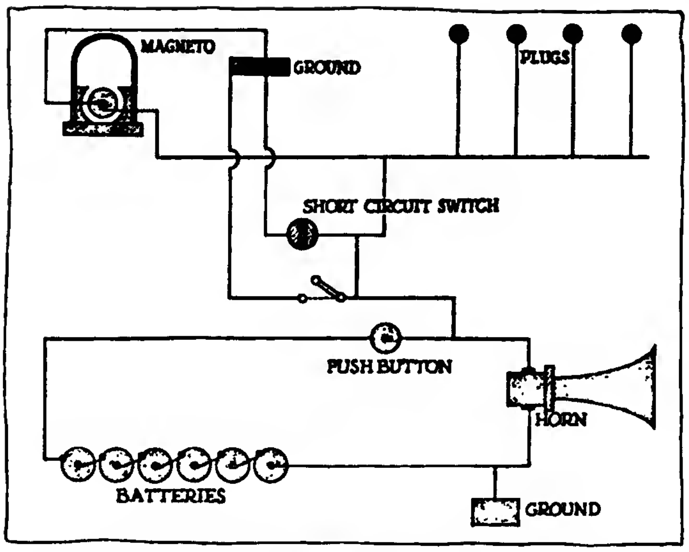


Fig. 3—Incorrect methods suggested by reader for throwing horn and magneto out of circuit

the part of the said person of such portions of the mechanism of motor vehicles as is necessary in order to insure the safe operation of a vehicle of the kind or kinds indicated by the applicant, and the said applicant having demonstrated his ability to operate a vehicle of the class designated; provided, that it shall be lawful for the Commissioner of Motor Vehicles to grant licenses to persons between the ages of 16 and 18 years who, by reason of their exceptional ability, the Commissioner deems proper to be licensed, such persons to be licensed only by the Commissioner after a personal examination held under his immediate supervision; and the said Commissioner of Motor Vehicles may, in his discretion, refuse to grant a license to drive motor vehicles to any person who shall, in the estimation of said Commissioner, be an improper person to be granted such a license; and the said Commissioner shall have power to grant a registration certificate to the owner of any motor vehicle, application for registration having properly been made and the fee therefor paid, and the vehicle being of a type that complies with the requirements of this act. But it shall be lawful for the Commissioner of Motor Vehicles to refuse registration to any vehicle that, in his estimation, is not a proper vehicle to be used upon public roads and highways of this State.

2—The compression pressure on racing cars averages about 80 pounds to the square inch. The piston clearance on these cars varies with the bore of the car but is very close to .010 inch at the top, about .005 inch at the bottom and .008 inch at the rings for a 4.5-inch engine.

Ford Vibrator Not Adjusted Right

Editor The Automobile:—I have a Ford touring car model T 1910. It has not been run over 5000 miles and has just been taken down to see what caused a knock. We found the magneto was touching thirteen of the fields, due to slight endwise motion in the main bearings. I had new bearings put in at the garage, but the motor will not run on the magneto, except for a little while running idle. It then stops and will not start on magneto. The magneto will light a 6-volt lamp. In fact, it will make the carbon glow slightly when spinning by hand. Is there anything the matter with this magneto? Have the repair men assembled the motor with too much clearance between magneto and fields? What is the proper distance of this clearance? Why does the magneto light up a lamp and the motor will not start or run on it? The garage man says magneto is no good; if so, why does it generate from 4 to 6 volts.

Athol, Mass. George T. Brills.

—The fact that the magneto will light a 6-volt lamp shows that it is in good condition. The trouble is not in the magneto at all but in the vibrators. These are not adjusted correctly and should be attended to. The correct clearance is 1-54 or .018 inch.

Lights Detract from Power

Editor The Automobile:—I am the owner of a Ford T 1912 Roadster which I am equipping with electric lights to be run from the magneto. What voltage and candle power lamps would you advise me to use? Will lights of this kind injure the magneto in any way? Does the 1913 magneto produce any more current than the 1912 or is it just about the same?

Modesto, Ill. K. L. Nifong.

—The lamps to be used in connection with a system for the Ford car should be of the 6-volt type and develop about 10 candlepower. The use of these lamps will not injure the car or the magneto in any way but will have the effect of reducing the power while the lamps are in use, because the spark given by the magneto will be weaker. When the lamps are taken out of the circuit the power will be just as good as before. It is merely a matter of whether or not you desire to sacrifice a small amount of power for the use of the lamps. The 1913 magneto does not produce any more current than did the 1912. They are the same.

Dirty Gas Line Causes Trouble

Editor The Automobile:—1—What might be the trouble with a motor of the four-cycle type which runs nicely when at a moderate speed idle, but which stalls as soon as the throttle is opened and the load put on it? Sometimes opening the throttle has the same effect as cutting the ignition. Then as the throttle is closed to its former adjustment the engine resumes its smooth even running. But if the throttle is very slowly opened up it will attain to a high speed and if kept racing by slipping the clutch the car may be hauled for quite a distance. At other times it pulls very nicely. I have been unable to find any trace of this trouble.

2—What is the advantage of wrapping leaf springs with tape? I have frequently noticed the springs of racing and test cars so bound. Would it be any material help on a car in ordinary service?

3—Have sleeve valve motors of the Knight type been used to any extent in racing? Will this motor not heat more readily than the poppet valve type on account of two additional walls between the combustion gases and the water?

Bridgeville, Pa. L. J. Bowman.

—1—Dirt in the carbureter or in the gasoline can be the cause of trouble which is of a particularly mystifying nature.

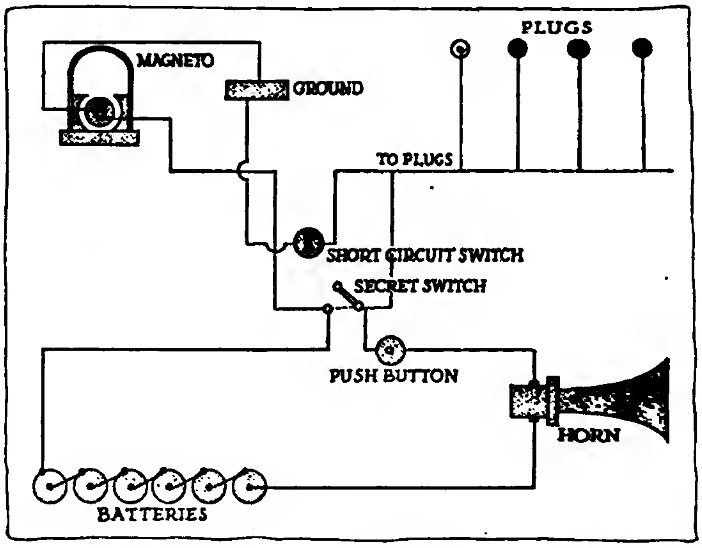


Fig. 4—This method of wiring would cause magneto to deliver current through batteries and horn. It is incorrect

The gas enters the float chamber of the carbureter very slowly and the result is that if there is a sudden demand for an extra supply of fuel such as would be the case where the throttle is opened quickly or the motor is called upon to pull against a stiff grade, the result is that there is not enough fuel to meet the demand and the motor dies. You have no doubt noticed that if you close the throttle for a short time while the car is running along and then open it again the motor will start all right and run for a short time before it stops again. The best way to remedy the trouble would be to take off the carbureter and clean it out. This can be done very nicely by compressed air if you are anywhere near a garage where they maintain pressure. The gasoline should be drained from the tank and the air shot through the gasoline feed pipe. To save future trouble in this respect always strain the gasoline through chamois. The garage man often protests against this, stating that there is a strainer in his line, but to be on the safe side it is better to use the chamois.

2—Springs are wrapped with tape to render them stiffer. On racing cars and on cars that are run over the roads at high speed on test work it is not desirable to have the more delicate spring action that is required in a car used for pleasure. In fact, such a suspension would be detrimental, as may readily be seen, because where the car is not slowing down for any bumps in the road, with a sensitive suspension the car would be jumping all over the road. Where shock absorbers of the friction type are used the friction member is drawn up much stiffer. It would not be of any use to a car in ordinary service unless you desire to go at high speed over country roads.

3—The Knight-equipped cars have figured prominently in many of the races held in Europe. In the last Belgium Grand Prix race a Knight car scored a victory. The results of that race were as follows:

Car	Bore and Stroke	Cyl. area		Speed imposed	
Minerva (Knight motor)......	3.1 x 4.8	3	liters	40	m.p.h.
Hermes	2.8 x 4.7	2	"	35	"
Mercedes (Knight motor)	3.9 x 5.5	4.4	"	44.4	"
Opal	2.7 x 5.1	2.1	"	35.3	"
Lion-Peugeot	3' x 6.1	3	"	40	"
Schneider	3.2 x 5.5	3	"	40	"
German (valvelesa)	3.6 x 5.9	4	"	43	"
Sava	3.2 x 5.5	3	"	40	"
F. A. B.	2.9 x 4.7	2.2	"	35.5	"
Miesse	3.5 x 5.5	3.6	"	42	"
Ford	3.7 x 4	2.9	"	39.9	"

Knight motors do not show any tendency to heat up if the lubrication is properly attended to.

Installing Secret Control Switch

Editor THE AUTOMOBILE:—As I have been perpetually bothered by small boys who take a fiendish delight in hearing my electric horn and who are not adverse to running down the horn batteries, I intend installing a small switch that will throw the horn out of circuit when I leave the car.

I live in New York City and often use the car in a business way, leaving the car outside my office building for perhaps 2 or 3 hours at a time. During this time I am generally undergoing quite a strain on my nerves because I worry for fear some one with a love of automobiling and a small conscience may make off with the car. I worry, in fact, so much over whether the car will or will not disappear that I cannot keep my mind on my work while the car is standing outside. I intend to fit a small switch that will take care of this also.

It struck me that it would be a good scheme to combine the two switches into one so that I will merely have to throw the secret switch when leaving the car and the horn will be out of circuit and the magneto short-circuited at the same time. To do this requires a little fancy wiring and I have thought out two schemes, Figs. 3 and 4, which I submit for your consideration. Are both of these correct or if only one of them which is correct and why?

New York City. GOTHAMITE.

—Both the methods that you suggest are wrong as may be seen if you will trace through the wiring diagrams. Taking first, that shown in Fig. 3, you will notice that the magneto is per-

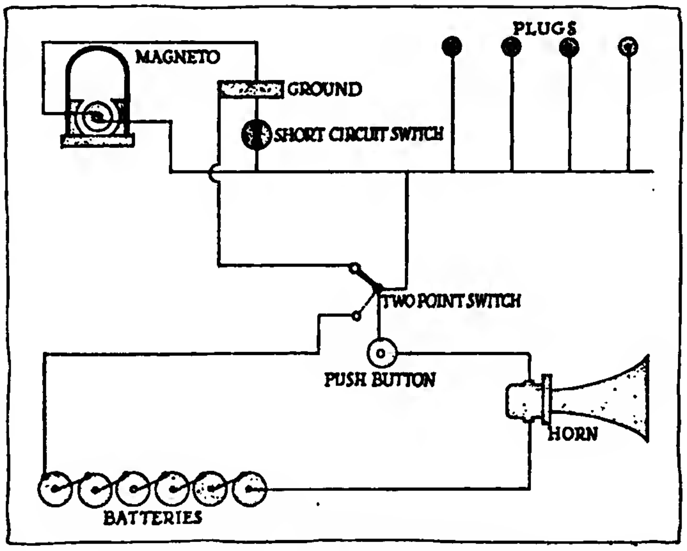


Fig. 5—Correct method for installing secret switch of two-point type to throw horn and magneto out

petually short-circuited through the horn. The current would run from the magneto through the horn and then back to the magneto through the ground. As long as the magneto is grounded you should not ground any other circuit that can in any way communicate with the magneto because if you do the magneto will surely be short-circuited and you would not be able to get a spark at the plugs. In fact the magneto would probably blow out the windings of the horn if you should spin the motor while connected up in this manner.

The plan that you outline in Fig. 4 is also bad. You will notice that the horn batteries and the horn close the circuit which you intend to break by means of the switch. The high-tension current would pass through the batteries and the horn and then to the plugs, closing the circuit. If the car was running on the magneto and you intended to stop by opening the switch which breaks the magneto circuit, or rather which is supposed to, the magneto would be forced to send the current through the batteries and the horn. This would probably burn out the horn.

The correct plan is that shown in Fig. 5. As you may see a two-point switch is used. This is no more complicated than a one-point as it can be of the type that is either in one circuit or the other. When one circuit is closed the horn is in circuit and so is the magneto. When the switch is thrown over the magneto is short-circuited and the horn circuit is broken.

Lamp Dimensions and Candle Power

Editor THE AUTOMOBILE:—Would you please give me the voltage, amperes required and candlepower of a set of standard Edison base passenger-car lamps? I would also like to know the diameters.

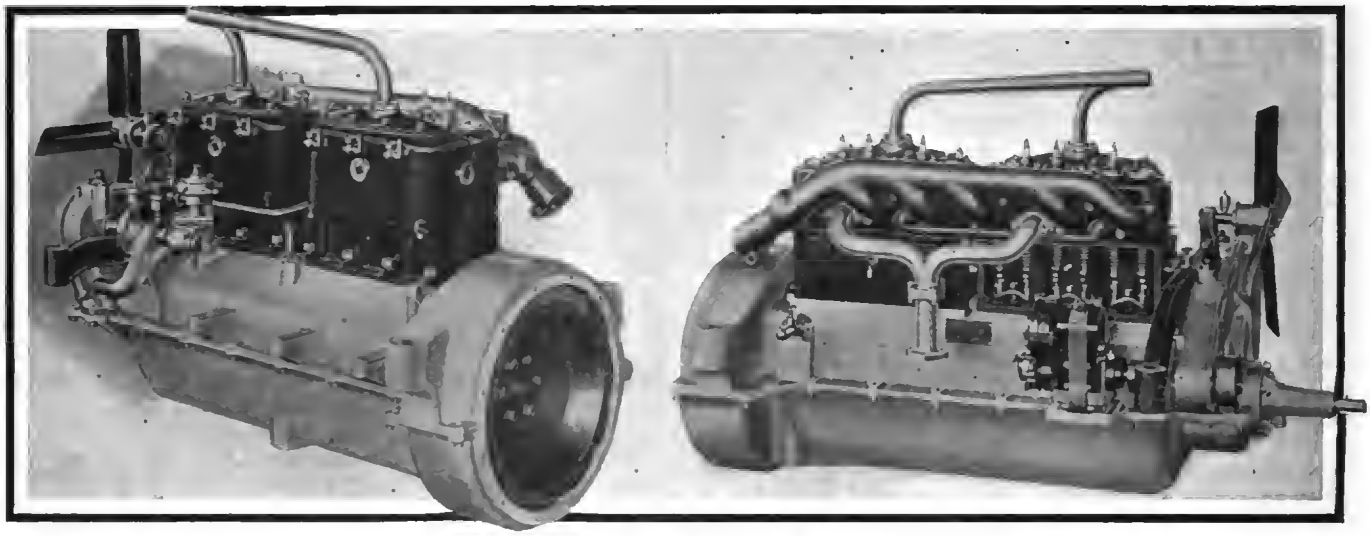
Altoona, Pa. READER.

—The following table will give you the data you require on standard Edison base lamps. By adding up the amperage of the lamps you intend using you will be able to tell what your battery requirements are.

DATA ON STANDARD EDISON BASE LAMPS

Style	Location	Diameter	Voltage	Candle Power	Amperes Required	Efficiency Watts Per Candle Power
1.	Head	2 1/16"	6	15	2.5	1.00
				18	3.0	
				21	3.5	
				24	4.0	
2.	Head	1½"	6	9	1.5	1.00
				12	2.0	
				15	2.5	
				18	3.0	
3.	Rear or side	1"	6	1.5	0.31	1.25
4.	Rear or side	¾"	6	1.5	0.31	1.25
				2.0	0.42	
				3.0	0.63	
5.	Rear or dash	¾"	3	1.0	0.42	1.25

Continental Meets Demand for Light Six



Two views of the Continental motor, showing design of magneto drive manifolds and valve covering

BELIEVING that the 1914 season will be featured by a demand for light sixes, the Continental Motor Mfg. Co. has brought out a motor especially designed to take care of that class of car. This motor is to be known as the 6P, and the company has provided itself with jigs and fixtures to meet the demand for this type of engine.

According to Continental practice the motor has been designed to be used independently or in the form of a complete power plant of unit construction with a multiple-disk clutch and three or four-speed selected gearset.

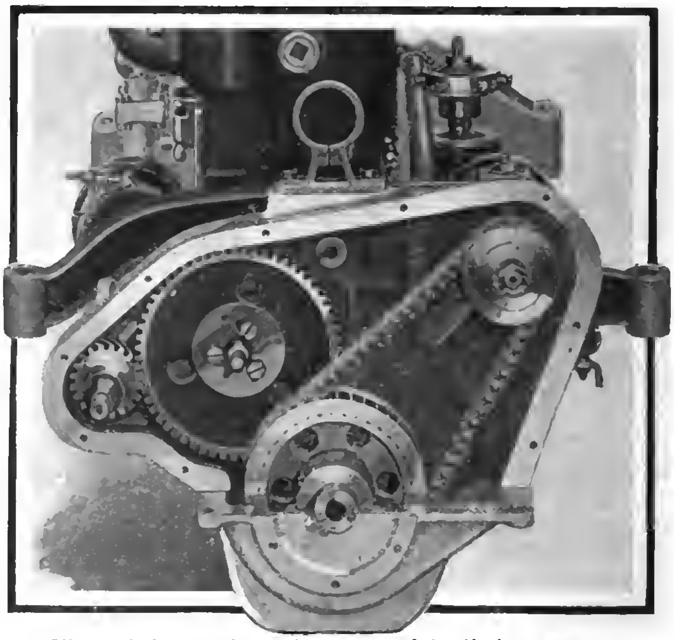
The motor has a bore of 3.75 inches and a stroke of 5.25 inches, giving a rating of 34 horsepower under the S. A. E rating. The cylinders are of the L-type cast in two blocks of three, giving a motor which is very short for a six-cylinder type. It will go under a 40-inch hood without crowding and the total weight, inclusive of flywheel and regular equipment, is but 600 pounds.

Three-point suspension is used with this power plant, thus avoiding any twisting strains on the crankcase. The pivot support is located at the front of the motor and is supplied with a bronze bushing and a lubricator so that there will be no chance of wear and noise at this point. The intake gas passage is cored inside each block cylinder and allows the use of a simple Y-shaped intake manifold.

To further carry out the idea of the designers in having a simple exterior, the valve action has been completely inclosed by two metal covers, each of which is held in place by a single wing nut. The covers can be quickly removed and act as a silence feature besides protecting the action from dirt and dust and permitting the stems and tappet rods to operate with plenty of lubrication.

Considerable latitude is allowed the car manufacturer in that any of the standard forms of equipment may be fitted. The motor can accommodate any type of magneto, dynamo or ignition and lighting device. It is also designed for either right or left drive and center control. The crankcase is built to accommodate any type of cranking motor mounting.

The oil is circulated by means of a gear pump, with positive multiple feeds, which forces the oil directly to the three main bearings, whence it is returned to the reservoir in the crankcase. The overflow from the front main bearings falls into a pocket in the timing gearcase, in which the large sprocket on the crankshaft and the silent chain is partly submerged. This carries oil up to the timing gears and lubricates all the bearings on the front end of the motor. In order that all the wells under the different connecting-rods be supplied with oil constantly and in equal amounts, the lubrication is forced by the gear pumps to each one of the wells in which the connecting-rods dip, so that an absolutely constant level is retained at any motor speed and under any condition of road travel.



Silent chain starting drive mounted in timing gearcase

Another noteworthy point is the silent-chain drive for starting purposes which runs in the timing gearcase. The chain runs in a constant bath of oil and is noiseless. It also drives the pump and commutator shaft and possibly an electric generator when not doing duty as an engine starter. The timing gears are helically cut.

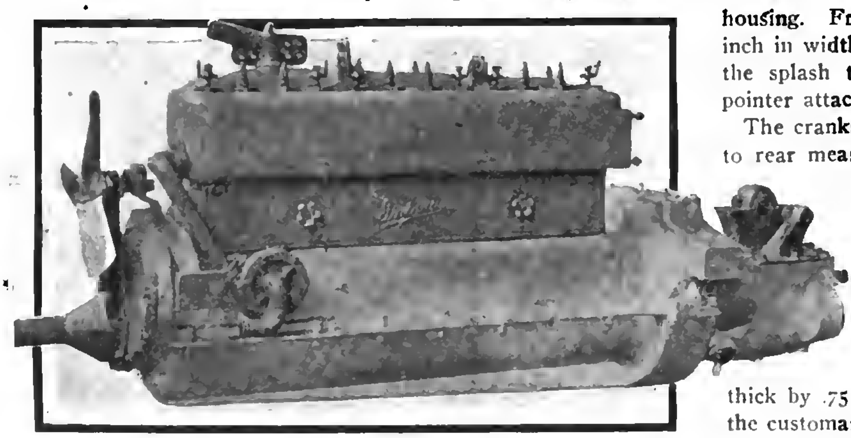
The water circulation is well cared for by a powerful centrifugal pump, which pumps the cooled water directly under the valves to the hottest point.

Milwaukee Casts Exhaust with Cylinders

THE Milwaukee Motor Co. has brought out something new in the way of a block motor. This motor is made in either the six or four-cylinder type, and has several new features of prominence. Important among these is the fact that the exhaust manifold is cast integral with the cylinders. This gives the motor an exceptionally clean appearance and great neatness, the only exterior moving parts being the fan and the pump and magneto shaft.

The motor has a bore of 4.125 inches and a stroke of 5.5 inches. The cylinders are cast in one block and are of the L-head type. The valves are all on the left side of the motor. The opposite sides of the motor are shown at the bottom of this page, and it will be noted that the intake manifold enters the cylinder casting on the side opposite the valves. The exhaust manifold is contained in the cylinder casting along the valve side of the motor, as may be seen in the smaller of the two accompanying illustrations. The manifold terminates in a flat flange at the rear end of the block casting and is at this point connected to the regular exhaust pipe. The terminating flange is rectangular in shape and a bolt is located at each of the four corners for the purpose of attaching the exhaust pipe.

The valve action is fully inclosed by a single cover plate which extends the entire length of the motor just below the exhaust manifold. It can be removed by turning two wing nuts, thus exposing the entire valve mechanism. On the same side as the valve cover plate and located just below it in the crankcase of the motor is the centrifugal water pump. The water enters the block casting at the forward end and is carried through by the pump action to the manifold, which is bolted on the top of the cylinder casting, as shown in the illustration.



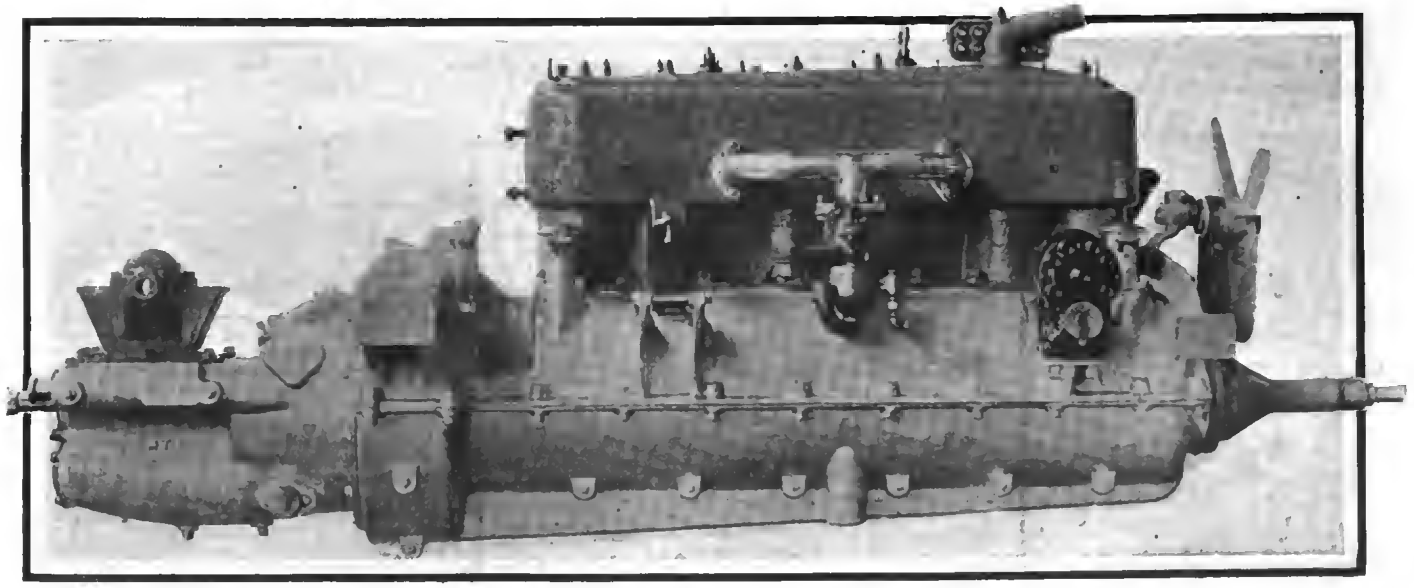
Left side of Milwaukee motor, showing pump

Three-point suspension is used on this motor, two supporting points being at the rear at either side of the crankcase and the third, a universal trunnion is located at the front of the motor behind the timing gearcase. This effectually protects the crankcase against racking strains due to the twisting of the frame. The pistons are 5.125 inches in length. Each carry three piston rings .25 inch wide. These are beveled at the end and are ground on the side to make a good joint with the piston. The piston pins are driven into the piston and oscillate in a bushing at the end of the rod. Above each boss is a small pocket to catch the oil that drips from the piston head.

The lubrication is by constant-level splash. When the motor is not running the oil in the crankcase is all in the bottom of the oil pan and the flywheel housing, except what remains in the four splash troughs under the lower ends of the connecting-rods. When the motor is running the oil in the flywheel housing is picked up by the wheel and carried to its top, where it is thrown off by centrifugal force into a pocket on the side of the housing. From this point it runs along a square channel .375 inch in width, which is cast in the crankcase and is deposited in the splash troughs. The oil level may be determined by a pointer attached to a float operating in a guide.

The crankshaft bearings are three in number, and from front to rear measure 2.75, 3.125 and 4.5 inches in length. They are all 2 inches in diameter. The rear bearing cap is held in place by four through bolts. The center and front bearings are held in place by two through bolts each.

The gearset and clutch are contained in a bell-shaped casting which is a unit with the aluminum crankcase. The clutch is made up of twenty-five large and twenty-four small steel rings .0625 inch thick by .75 inch wide, bent at an angle of 20 degrees. It is of the customary disk clutch design. The gearset is carried on ball bearings and has three forward speeds.



Right or intake side of Milwaukee block six motor, illustrating simple manifold, magneto drive and unit construction

Quadruplex Carbureter Has Four Jets

THE Quadruplex carbureter, as its name implies, has four means of mixing the gasoline with air. Carbureters of the multiple-jet type and each of the four points of mixture has a separate jet. The carbureter, in fact, might be called a multiple-venturi type because there is a venturi-shaped passage around each jet. Fig. 2 gives the sectional view of the carbureter and also a view through each of the four jets.

The carbureter has an eccentric-float feed. The float is not circular as is customary but only extends part of the way around the hemispherical bowl which forms the float chamber. Another unusual point is that the gasoline enters directly through the bottom of the float bowl at its central point. The needle valve controlling the flow of the gasoline is located on the axis of the hemisphere forming the float chamber and is controlled by the customary lever arrangement which keeps the gasoline at its proper level. This part of the mechanism is clearly illustrated in Fig. 2. In the main section of the carbureter is shown the number 1 jet, A. This is the primary point of mixture and constitutes the fuel feed at low speed. The gasoline passes from the float chamber up the vertical passage to the jet which is shown located in the venturi. This jet corresponds directly to the needle valve in the ordinary type of carbureter and is directly adjustable by means of the slotted-screw head at the top of the needle. The primary mixture is drawn directly through the cored passage to the intake manifold and is unobstructed, save by a web in the carbureter casting through which the priming rod passes.

At very low speeds or when running idle the primary jet takes care of the carburetion. When the throttle is entirely closed the gasoline passes through a bypass D just above the primary venturi. This leads directly to the intake and is designed to be sufficient to run the motor when the butterfly throttle is entirely closed.

After the motor reaches a low intermediate speed, the second jet B comes into play. This jet is regulated by gravity. The valve is lifted off its seat by the suction induced in the inlet passage when the throttle is opened. The weight of this valve is fixed and should not be changed except at the factory. The adjustment, however, of the spray nozzle at the number 2 jet may be regulated in the same manner as that of first jet. As will be seen by close study of the illustration, the needle valve governs the supply of gasoline coming up through a central cored passage. The gasoline, after flowing past the needle, goes through small holes pierced in the needle-valve retaining tube. These holes lead directly into the narrowest part of the venturi opening. In this manner gasoline is taken from several points in the venturi opening and an atomizing effect is secured. The other needle valves in the other three jets are arranged in the same manner. When the gravity-seated valves are lifted the suction falls on the small holes in the venturi and the gasoline spray is drawn from them and rushes through the intake passage and mixes with the fuel taken from the primary jet.

The supplementary jet B and the primary jet A are the only ones requiring adjustment when the installation of the carbureter is made. Auxiliary jets C and D are set at the factory and require no change. It will be noted that the weighted valves B, C and D each operate under a different suction on account of their different weights. The mixtures furnished by each of the jets vary in richness and the jets are so designed that the proper mixture will be formed for any given speed. The three gravity valves are of different weights and when giving

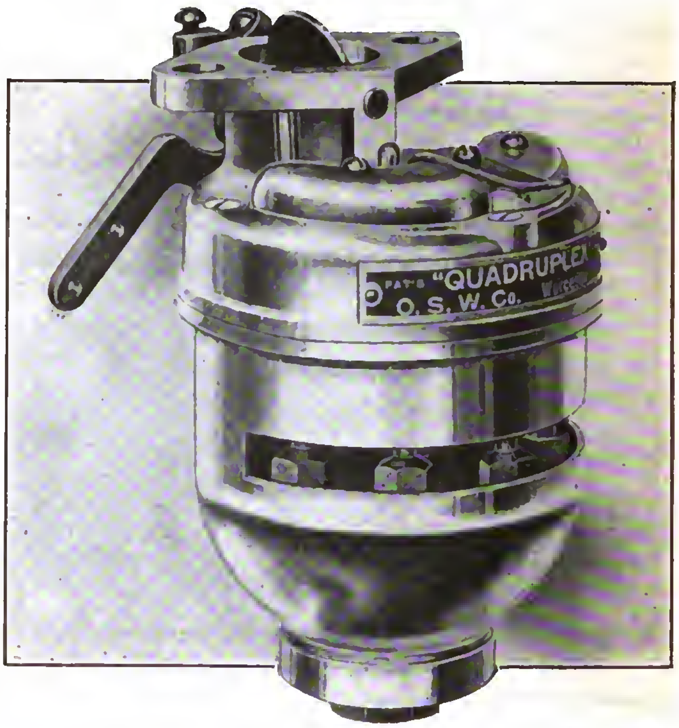


Fig. 1—Exterior of the quadruplex carbureter, showing hemispherical bowl

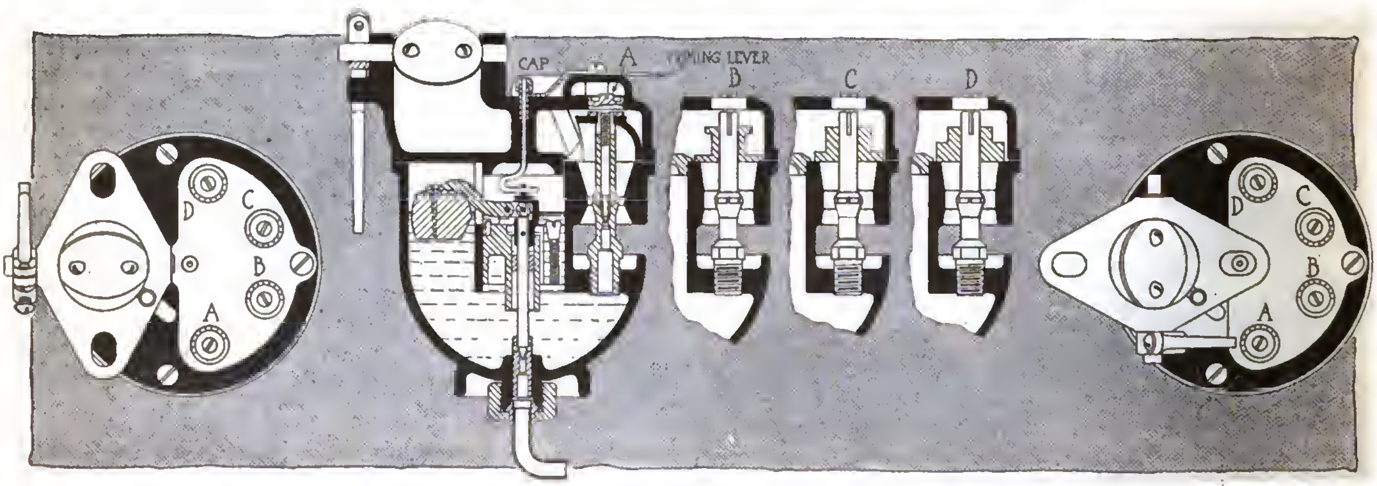


Fig. 2—Section through the Quadruplex carbureter illustrating the four venturi passages and jets

Side view of the Motokart, showing its size as compared to its driver

the maximum power of the engine all of them will be lifted.

The carbureter has no springs or cams and the only adjustment is for gasoline. Each of the four needle valves has numbered micrometer graduations operated from above by a screwdriver, and when once set the same adjustment can always be again reached by noting the numbers and recording them. The micrometer adjustments are shown in the plan views above the sections. The carbureter is furnished with a hot air intake mouthpiece clamped around the exterior of the carbureter and provided with a priming butterfly valve in the outlet to assist in starting in cold weather. The outlet is also arranged for the attachment of a flexible metal hose which can be led in almost any direction to the exhaust manifold upon which a hot air box is installed.

Paris Sweepers Save 12 to 60 Per Cent.

(*Continued from page 1065*)

control and very rapid action, so that it is possible for the operator to instantly cut off the flow of water to avoid splashing pedestrians.

The water pump is engaged by means of a short lever on the right-hand side of the driver's seat. Pivoted at the base of the dashboard are four levers. Two of these operate the piston valves at the inlet end of the main feed pipes, and the two others a similar pair of valves at the sprinkler end. These four being opened to the required degree, the operator confines his control to the guards.

The rotary brush is placed diagonally under the chassis. Diagonally across the frame from the differential housing to a point immediately to the rear of the dashboard, is a horizontal shaft driven by worm gearing from the differential, and having a bevel pinion at its forward end. The worm and worm wheel within the differential housing are constantly in mesh, but the horizontal shaft carries a dog clutch by which the movement can be interrupted through the operation of a side lever. This lever, which is placed immediately to the left of the driver, serves both to engage and disengage the clutch and at the same time to raise and lower the brush. The bevel pinion at the forward end of the diagonal shaft engages with another pinion having the same number of teeth on a vertical shaft just outside the frame member. At the base of this shaft is a second pair of bevel gears having respectively twelve and eighteen teeth, the driven pinion being mounted on the brush shaft. The relation of the sets of gears is such that the brush revolves at one-ninth the speed of the road wheels. As the brush has to be raised and lowered at frequent intervals, and has also to be regulated for height as the bristles become worn, the vertical shaft is telescoping and is also incased by a couple of telescopic tubes. As a final protection, a leather boot is placed around the entire shaft.

New Light Delivery Car

The Motokart Is the First Four-Wheeled Vehicle of This Type To Appear on the Market—It Is Designed for Use in Cities

ALTHOUGH there are a number of light, three-wheeled delivery motor vehicles on the market, it remained for the Tarrytown Motor Car Co., Inc., to bring out the first four-wheel light car especially designed for urban parcel delivery service. This car is adapted to the delivery requirements of butchers, grocers, dairymen, bakers, laundrymen, florists, milliners, etc. An idea of the size of the machine may be gained from the accompanying illustration, which also indicates the light but durable construction used. Seeking for a trade name for the vehicle which would be distinctive, the company adopted the original word "Motokart."

The power unit of the car consists of a two-cylinder motor with cylinders 3.625 by 4 inches which delivers 10.53 A. L. A. M. horsepower. Cooling is effected by the thermo-syphon system. The transmission of the power is by means of a friction drive which provides a wide range of speeds and at the same time precludes the possibility of stripping gears, one of the greatest troubles when inexperienced drivers are given charge of delivery cars using the gear type of transmission.

In appearance the car somewhat resembles the motorcycle or cyclecar types of motor delivery vehicles, the main difference from the motorcycle consisting in the use of four wheels instead of three. As may be seen in the illustration, the driver is seated at the rear of the parcel box directly over the rear axle.

The operation of the car is extremely simple and all actuating levers may be seen in the illustration, comprising the pedal for the clutch, the steering column and wheel and the lever for changing the speed on the friction disk mounted underneath the steering wheel.

Large Parcel Box

The machine has a pressed steel frame, the wheelbase being 65 inches while the tread is 44, the designers having given considerable attention to keeping the car as small as is logically possible in order to facilitate handling in crowded streets. However, the dimensions of the parcel box have been made as large as the size of the vehicle permits, being 48 inches long, 34 inches high and 32 inches wide, the cubical area of the box being 30 square feet. The load capacity of the vehicle is 400 to 500 pounds.

The body used is of metal and the spring suspension is designed to protect fragile merchandise, the springs themselves being of the semi-elliptic type 26 by 2.5 inches. The easy riding qualities of the car are enhanced by the use of wire wheels and pneumatic tires, the lightness of the vehicle insuring low tire and maintenance cost.

As may be seen from the illustration, the car is fitted with mud-guards over each wheel and with a step at the side for the entrance of the driver. The gasoline tank is carried under the seat, while the cooling water tank is contained in the upper part of the rear portion of the parcel delivery box. Access to the parcel box is through doors at the front, the interior of the box permitting of various shelf arrangements to suit the convenience of demands of various trades.

The company has established a factory at Tarrytown, N. Y., its New York office being at 1790 Broadway. It is expected that deliveries will be begun not later than June 15. The price of the machine is $400.

An interested gathering of engineers watched the conclusion of the 300-hour run of the Packard motor

Full Report of Packard Motor Test

Details of the Motor Performance During 300-Hour Run Given Out by A.C.A.

NEW YORK, May 20—The complete report of the 300-hour test of a Packard motor by the testing laboratory of the Automobile Club of America was given out this evening by Herbert Chase, laboratory engineer, and is printed in full herewith. This report shows that the motor made a non-stop run for 300 hours, the only stop that actually occurred during the test being one of 45 seconds caused by air in the gasoline feed pipe, but as this stop was not due to the motor the run must be considered a non-stop one.

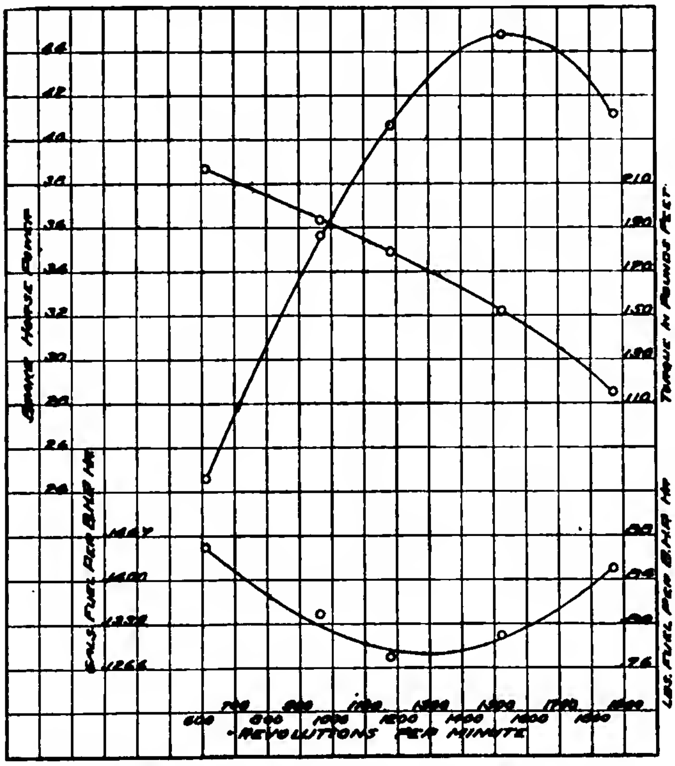


Chart of the brake horsepower run to determine maximum

During the test the motor showed an average horsepower of 35.7, the crankshaft speed averaging 1,208 revolutions per minute.

Fourteen hundred and thirty eight gallons of gasoline were consumed, or an average of 4.79 gallons per hour, this being equivalent to .134 gallon per horsepower-hour. In weight the gasoline consumed amounted to 8,671.4 pounds. It was of 63 Baumé gravity, or a specific gravity of .727.

During the 300 hours 321.9 gallons of lubricating oil were used, or 1.07 gallons per hour of test. By weight the oil amounted to 2,319.5 pounds. During the first part of the test Invader crystal medium oil was used and during the last part Polarine.

The average temperature of the water entering the cylinder jackets was 125 degrees Fahrenheit; the average temperature of the water leaving the jackets was 140 degrees. Instead of using the car radiator a water tank, as customary in all motor tests, was employed.

The report shows that two adjustments of the exhaust valve tappet on No. 1 cylinder, one at the 147th hour and the other at the 152nd hour. Two spark-plugs were replaced, one at 106th hour, the other at the 128th hour. The screw covers above certain of the valves were tightened. The screws which fasten the air valve cage of the carbureter were tightened once during the run.

The report shows that during the test the throttle was wired wide open from start to finish and the spark at the full-advanced position.

The motor was a Packard 1914 38-six, familiarly known as the Packard small six. Its bore and stroke are 4 by 5.5 inches, and has an S. A. E. rating of 38.4 horsepower.

According to the rules governing the test, printed in full in THE AUTOMOBILE May 1, page 926, a preliminary series of short tests of 3 minutes each was made to determine the maximum horsepower of the motor, which showed 44.9 horsepower at 1,533 crankshaft revolutions per minute. During the duration test of 300 hours the rules called for an average horsepower of more than 70 per cent. of this, in other words, the average horsepower for the 300 hours was to be somewhere above 31.43 horsepower.

The horsepower chart reproduced herewith shows the power curve for the entire 300 hours, the vertical lines marking the time off into 5-hour intervals. According to this chart the lowest horsepower mark appears at the 106th hour at which time the first spark-plug was changed. The changing of the second plug at the 128th hour does not show any drop in power on the chart. Slight downward projections on the power curve are shown at the 147th and also at the 152nd hour, when the tappet was being adjusted.

The official record of the tests shows that it began at 10:43 Saturday night, May 3, and was completed at 10:43 Friday afternoon, May 16, exactly 12.5 days. Running a motor at an average crankshaft speed of 1,208 crankshaft revolutions per minute gives a total of 21,744,000 revolutions. Were the motor running in the car at this speed and with the gear ratio used it would be averaging slightly in excess of 37 miles per hour and during the 300 hours would cover a mileage of 11,100. Roughly calculating it is 4,000 miles from New York to San Francisco, so that this test in mileage is equivalent to twice across the continent and from New York to beyond Salt Lake City on the third trip.

The complete report follows:

"This is to certify that the Technical Committee of the Automobile Club of America has tested the Packard motor, manufactured by the Packard Motor Car Co., with the following results:

"Endurance Run—The motor ran continuously with wide-open throttle and fully-advanced spark for a period of 300 hours at an average speed of 1,208 revolutions per minute. During this interval the average brake load at 1 foot radius was 155.1 pounds, giving a resultant average brake-horsepower of 35.7. The lowest horsepower reading for any 15-minute interval during the entire 300 hours was 28.7.

"The total fuel consumed during the run was 8,671.4 pounds, equivalent to 1,438 gallons, an average consumption of 0.81 pound (0.134 gallon) per brake-horsepower-hour.

"The total oil consumed was 2,319.5 pounds, equivalent to 321.9 gallons, an average of 1.07 gallons per hour. (See chart No. 1 and Table No. 1 for record of power variation.)

"Runs at Various Speeds—Prior to the endurance run a series of short runs, each of 3 minutes' duration, with throttle wide open and spark set for maximum power, was made to determine the maximum power of the motor.

"The maximum power developed was 44 horsepower at 1,533 crankshaft revolutions per minute. (See Table No. 2 and Chart No. 2 for record of torque and power at various speeds.)

"Particulars Regarding Motor—The motor, which is designated by the manufacturers as model 13-38, is of the four-cycle type having six cylinders of 4-inch bore. The stroke is 5.5 inches. The valves, which are of the poppet type, are all located on the same side of the motor and are actuated from a single camshaft.

"The weight of the motor, including flywheel, pump, fan, carbureter, all manifolds, magneto and complete ignition system, self-starter, motor, clutch and its casing, brake starter and clutch, pedal levers and half of universal joint, was 973 pounds.

"Lubrication—The motor was not taken down for examination, but the owners state the lubrication is accomplished as follows: A gear pump draws oil from the sump and delivers it to the main bearings under pressure. From these it flows through the hollow crankshaft to the big-end bearings and thence to the wristpins through pipes attached to the connecting-rods. The oil is also delivered to the cylinder walls for lubrication of the pistons passing through a valve which in the normal operation of the car is opened and close by the accelerator pedal. During this test the valve was wired wide open.

"The exhaust from the motor was smoky and considerable carbon deposits were observed on the exhaust valves after the test.

"Two different brands of oil were used during the test, namely, Invader crystal medium and Polarine.

"Fuel—The fuel used during the test was gasoline having an average specific gravity of 63 degrees Baumé, equivalent to .727 specific gravity.

"Carburetion and Ignition—The Packard carbureter was

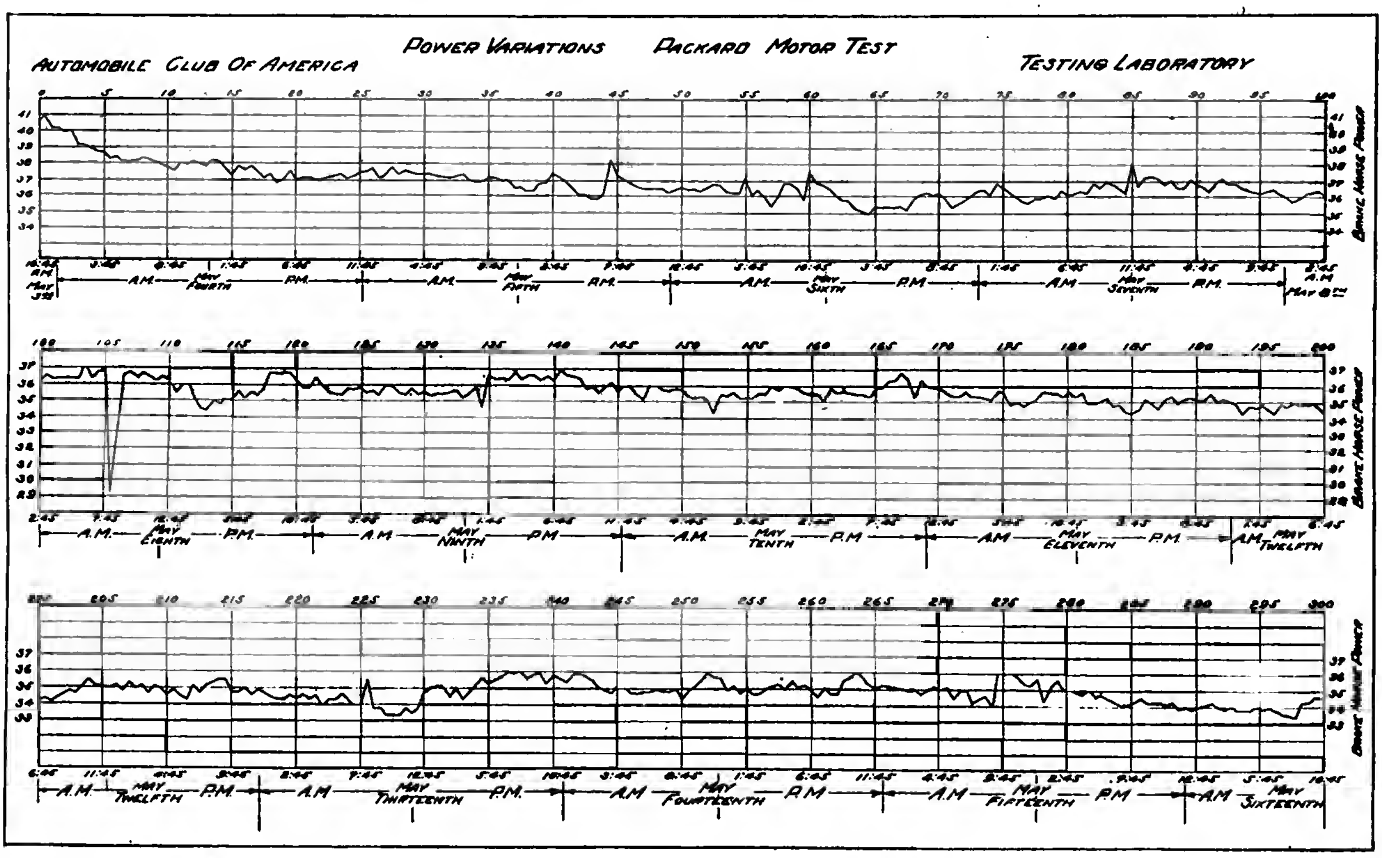


Chart showing the performance of the motor during the 300 hours, plotted on average horsepowers at each half hour during entire run

used, while the ignition was furnished by a Bosch model 5 DU 6 magneto.

"COOLING AND EXHAUST—The motor was cooled during the test by water circulated by a centrifugal pump. The average temperature of the water entering and leaving the motor was 125 degrees Fahrenheit and 140 degrees, respectively.

"The motor exhausted through a 30-inch length of 2-inch pipe into an expansion chamber having a 3-inch standard pipe outlet.

"During the endurance test a blower was used to direct upon the motor a blast of air having a velocity of about 30 miles per hour. The fan, which is regularly used with the motor, was also kept in operation.

"The average temperature of the air during the test was 68 degrees Fahrenheit; and the average barometer readings 29.19 inches of mercury.

"ADJUSTMENTS.—The following adjustments were made during the 300-hour run.*

"During the 147th hour the lock nut on the exhaust valve tappet of No. 1 cylinder was found to be loose and the tappet in such position that the valve did not seat properly. The tappet was screwed down and locked. It was later found that this tappet had been set for more clearance than it had at the start of the test. It was consequently reset at 152d hour, to its original position, where it remained to the end of the test. While this adjustment was being obtained the power fell momentarily, but aside from this the adjustments did not result in any greater variation in the power developed than were recorded during periods when no adjustments were made.

"Two spark plugs were replaced without stopping the motor. One during the 106th and one during the 128th hour.

"The screw covers above certain of the valves were tightened.

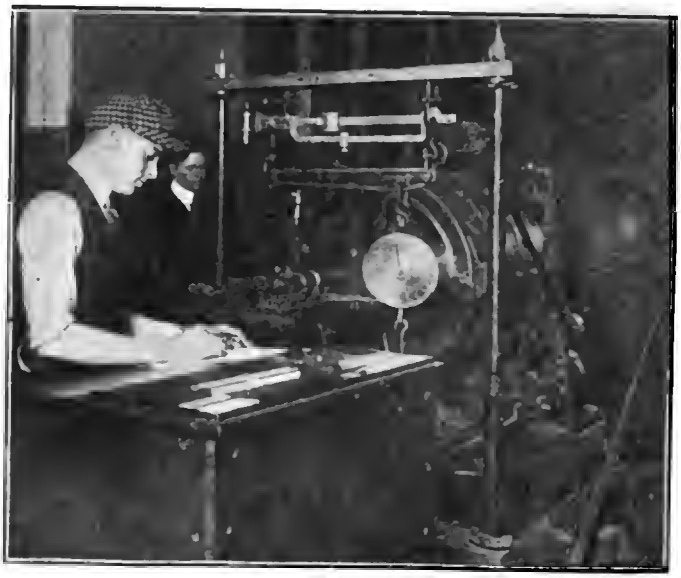
"The screws which fasten the cage containing the carbureter air valve in place were also tightened once during the run.

"A slight leak around the gland on the water pump was present during the greater part of the test, but no adjustment thereof was made."

F. R. HUTTON,
Chairman Technical Committee.
HERBERT CHASE,
Laboratory Engineer.

The table below shows the story of the endurance test and the preliminary power test. Pressure on the fuel was often required even while the strainer was absolutely clean. The pressure on the fuel varied between atmospheric and 2 inches of mercury during the 300 hours.

*Interruption of the gasoline supply due to air in the feed pipe during the 60th hour caused the motor to stop for approximately 45 seconds. Since this stop was not due to any fault of the motor the run is considered continuous under the rules.



Operation desk at A. C. A. testing laboratory

Time, H., M., S.	Fuel Consumed, Lbs.	Total Fuel Consumed, Lbs.	Hours Run	Time, H., M., S.	Fuel Consumed, Lbs.	Total Fuel Consumed, Lbs.	Hours Run
10:43:00	157.2	159.2	5	9:45:35	147.9	4774.3	155
8:50:15	156.3	315.5	10	2:48:00	146.6	4920.9	160
1:54:30	155.0	470.0	15	7:46:20	145.4	5068.2	165
6:45:25	148.9	618.9	20	12:45:05	149.0	5217.2	170
11:59:05	158.7	767.3	25	5:45:15	147.1	5364.3	175
4:46:20	147.1	914.4	30	10:45:15	143.1	5516.4	180
9:50:45	155.1	1045.7	35	3:45:05	144.5	5660.9	185
2:46:15	149.3	1194.8	40	8:46:20	149.0	5810.9	190
7:48:25	147.5	1332.3	45	1:45:10	145.7	5955.9	195
12:46:30	149.4	1482.9	50	6:45:20	142.6	6098.5	200
5:46:10	138.1	1621.0	55	11:45:35	135.4	6235.0	205
10:47:00	139.5	2062.5	60	4:46:40	146.2	6368.7	210
3:46:15	150.3	2212.8	65	9:53:00	133.2	6508.1	215
8:47:40	140.2	2352.3	70	2:45:10	140.4	6660.9	220
1:46:20	138.4	2491.7	75	7:47:00	144.6	6805.4	225
6:45:30	142.3	2630.0	80	12:45:20	145.5	6950.9	230
11:46:20	142.6	2772.6	85	5:49:45	144.9	7114.7	235
4:46:20	149.9	2922.5	90	10:46:10	133.7	7248.4	240
9:47:20	142.5	3065.0	95	3:47:30	139.0	7393.4	245
2:45:20	143.2	3208.2	100	8:51:20	147.4	7556.1	250
7:45:00	147.3	3355.5	105	1:45:00	144.4	7710.5	255
12:48:15	151.0	3506.5	110	6:47:00	140.8	7851.1	260
5:45:40	133.5	3640.0	115	11:46:05	128.6	7979.6	265
10:47:45	148.3	3800.9	120	4:45:45	146.4	8126.0	270
3:45:35	146.5	3947.4	125	9:46:05	146.9	8272.5	275
8:45:30	149.9	4097.3	130	2:45:30	143.3	8415.8	280
1:45:50	142.8	4240.9	135	7:46:00	146.0	8555.9	285
6:46:50	118.2	4358.1	140	12:45:30	146.6	8702.5	290
11:46:25	134.5	4489.3	145	5:46:25	146.7	8849.6	295
4:45:30	142.5	4626.8	150	10:46:00	144.5	8994.1	300

Hour		Average		Gasoline per B.H.P.-Hr.		Hour		Average		Gasoline per B.H.P.-Hr.		Hour		Average		Gasoline per B.H.P.-Hr.	
From	To	R.P.M.	B.H.P.	Lbs.	Gals.	From	To	R.P.M.	B.H.P.	Lbs.	Gals.	From	To	R.P.M.	B.H.P.	Lbs.	Gals.
0	5	1213	38.7	.81	.134	101	105	1209	36.7	.80	.133	201	205	1207	34.6	.78	.129
6	10	1195	38.1	.82	.136	106	110	1215	35.5	.85	.142	206	210	1220	34.4	.85	.142
11	15	1179	37.8	.82	.136	111	115	1203	35.0	.76	.127	211	215	1211	35.0	.76	.126
16	20	1207	37.3	.80	.133	116	120	1208	36.0	.82	.131	216	220	1205	34.8	.81	.133
21	25	1199	37.2	.85	.142	121	125	1208	35.7	.82	.136	221	225	1202	34.3	.84	.139
26	30	1202	37.4	.79	.131	126	130	1200	35.5	.84	.140	226	230	1219	33.9	.86	.141
31	35	1207	37.1	.84	.138	131	135	1213	35.5	.80	.133	231	235	1219	34.8	.83	.137
36	40	1212	36.7	.81	.133	136	140	1213	36.4	.65	.108	236	240	1217	35.8	.75	.123
41	45	1210	36.4	.81	.134	141	145	1201	36.1	.75	.123	241	245	1206	35.4	.79	.130
46	50	1200	36.5	.82	.136	146	150	1208	35.7	.80	.132	246	250	1215	35.0	.84	.139
51	55	1211	36.4	.78	.130	151	155	1204	35.1	.84	.139	251	255	1221	35.3	.82	.136
56	60	1219	36.2	.79	.131	156	160	1211	35.3	.83	.138	256	260	1215	35.1	.80	.132
61	65	1221	35.8	.84	.141	161	165	1210	35.4	.82	.137	261	265	1212	35.2	.73	.120
66	70	1209	35.6	.79	.131	166	170	1224	36.3	.82	.135	266	270	1211	35.0	.84	.132
71	75	1208	36.1	.77	.128	171	175	1209	35.4	.83	.139	271	275	1207	34.9	.84	.138
76	80	1202	35.9	.79	.132	176	180	1207	35.2	.81	.135	276	280	1209	35.3	.81	.133
81	85	1208	36.9	.77	.128	181	185	1211	34.9	.83	.136	281	285	1205	34.5	.85	.137
86	90	1211	36.9	.81	.134	186	190	1208	35.0	.85	.140	286	290	1210	34.4	.85	.141
91	95	1192	36.5	.78	.130	191	195	1200	34.8	.84	.138	291	295	1216	34.0	.86	.142
96	100	1190	36.5	.78	.129	196	200	1198	34.6	.82	.136	296	300	1211	34.1	.85	.144

Duration, Mins.	Rev. per Min.	Torque Lbs. Ft.	Brake H.P.
3	612	210.8	24.3
3	970	193.2	35.7
3	1191	179.6	40.7
3	1533	153.5	41.9
3	1870	115.5	41.1

Gasoline Consumption per B.H.P.-Hr.		Temperature F° Jacket Water		
Lbs.	Gals.	In	Out	Range
0.87	.128	125	152	27
0.81	.135	124	145	21
0.77	.128	121	140	19
0.79	.131	122	138	16
0.85	.141	123	137	14

Lbs. Water, Min.	B.T.U. per Min. to Jackets	B.T.U. per Min. to Useful Work
.....	....	1043
84	1764	1513
141	2679	1728
179	2864	1905
....	....	1745

Accessories for the Automobilist

Fig. 2—Use of Flexilyte lamp on the road

FLEXILYTE—A clever and useful accessory has been devised by the L. A. Williamson Co., 1790 Broadway, New York City. The device is known as the Flexilyte, Figs. 1 and 2, and is constructed to serve as a trouble-hunting and general search light for automobilists, both on the road and in the garage. Fig. 1 shows the appearance of the Flexilyte very well, it being composed of a gun-metal casing to which the holder H, formed like a steering wheel, is attached by means of a pin. The rim of the drum-shaped casing is cut at C so as to permit the wire-cord to pass through it which leads from the battery terminals to the hub-formed lamp socket arranged centrally in the drum-shaped casing of the device. On the back side of the casing there is a small pawl P engaging flat serrations in the rear wall of the socket-hub, so that if the latter is turned in one direction, the reversal of the movement is prevented by P. The piece Q, pivoted around a pin secured to and above the surface of the socket wall, is turnable around this pin; it is ordinarily held in engagement with a hole in the socket wall, its end carrying a ball which fits into the hole. If this end is free, the piece Q may be thrown over toward the casing periphery and the socket-hub may be so turned that the pawl prevents its return. By freeing the pawl from the serrations, the hub is permitted to turn by pulling the cord, so that any desired length of wound wire may be pulled out of the casing and rewound by turning the piece Q. The ends of the cord are fitted with spring-clip terminals which may be secured to any type of battery poles. Fig. 2 shows an obviously very useful application of the Flexilyte device, one of the many cases where the powerful tungsten bulb can be worked to advantage.

Packard Valve Cap Tool—Asch & Co., 1777 Broadway, New York City, handle the valve cap tool shown in Fig. 3, which is specially designed to fit Packard motors. The tool consists of a hexagonal steel prism into the side of which a steel rod is fitted to form a handle. The hexagon is so proportioned as to exactly fit the depression in Packard valve caps, so that it is extremely easy to remove the latter by inserting the tool and giving it a turn or two. Such a device is, of course, a great time saver in a repair shop. Tools to fit the valve caps of many other prominent makes will be brought out soon.

GO Motor-Speeder—Fig. 4 illustrates the GO Motor-Speeder, made by the Fudge Bros. Mfg. Co., Marion, Ind. This device has the purpose of supplying warm auxiliary air for preheating and completely breaking up the mixture, and supplying it in the correct amount, no matter what the throttle opening of the motor might be. To attain this end, the Fudge concern has combined the device proper, D in Fig. 4, which is a cup all closed with the exception of a screened air intake, with a valve contained in D and connected by C to the throttle rod R of the carbureter, so that any movement of the latter produces a corresponding adjustment of the speeder valve. The air taken in through the hole of D passed through the compressing coupling at the lower end of the device and through a tube C coiled around the exhaust pipe to the intake manifold, which it enters through a nozzle N formed with a number of small holes. To regulate the capacity of the auxiliary air lead, primarily, a cock is placed just ahead of the nozzle N. This device has the great advantage that when its capacity has once been adjusted by properly positioning the cock, it remains in the right adjustment and requires no further attention. It may be mounted in a very short time, being attached to the motor frame by means of the bracket seen in Fig. 4 and after this it serves for any length of time without demanding any attention.

Rust-No Graphite—The same company also handles the Rust-No graphite stick for preventing the tires rusting onto rims, Fig. 7. This article is composed of graphite powder held together by an oily binder and being formed in the shape here illustrated. The compound is dry and hardly blackens the hands; at any rate, one end is covered with paper which is printed with instructions for the use of it. It is used for rubbing the contacting faces of rims and tires before mounting the latter on the former. The graphite then forms a thin layer between rubber and metal and prevents the adhesion of the two materials. The stick may also be used for the lubrication of such parts as spring leaves by rubbing the latter with it, or shaving some of the graphite and squeezing it between the leaves.

Taylor Noil Tire Pump—The Taylor Mfg. Co., P. O. Box 485, Chicago, Ill., is the maker of a new engine-driven tire pump, which is permanently installed on the motor or chassis frame and is operated by a sliding gear which may be brought into engagement with a half-time or other pinion, the engagement and disengagement of the gears being controlled by means handled by the driver. The pump is of the reciprocating piston type. The piston is of mushroom design, somewhat similar in shape to a valve.

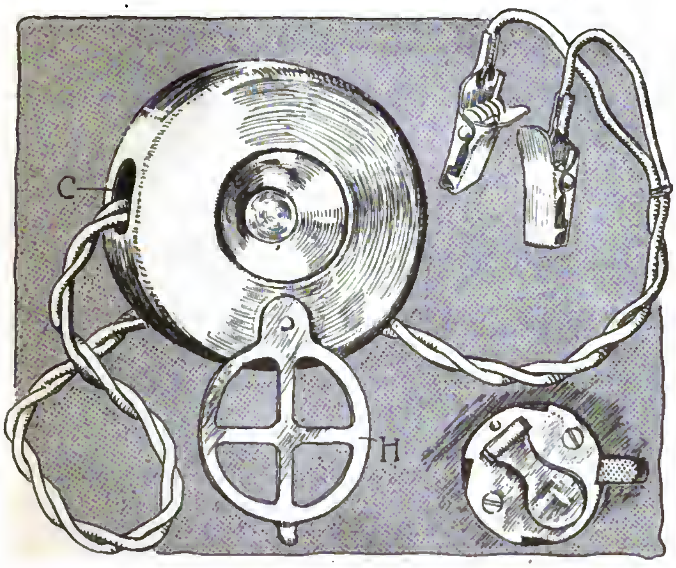


Fig. 1—Flexilyte trouble-hunting lamp

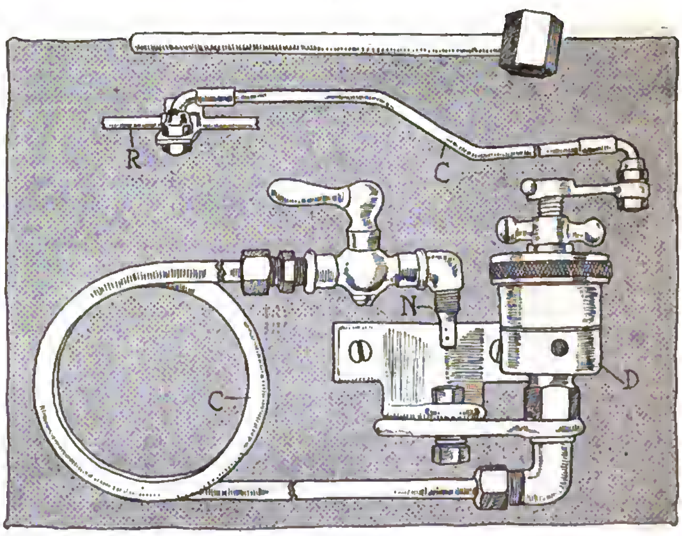
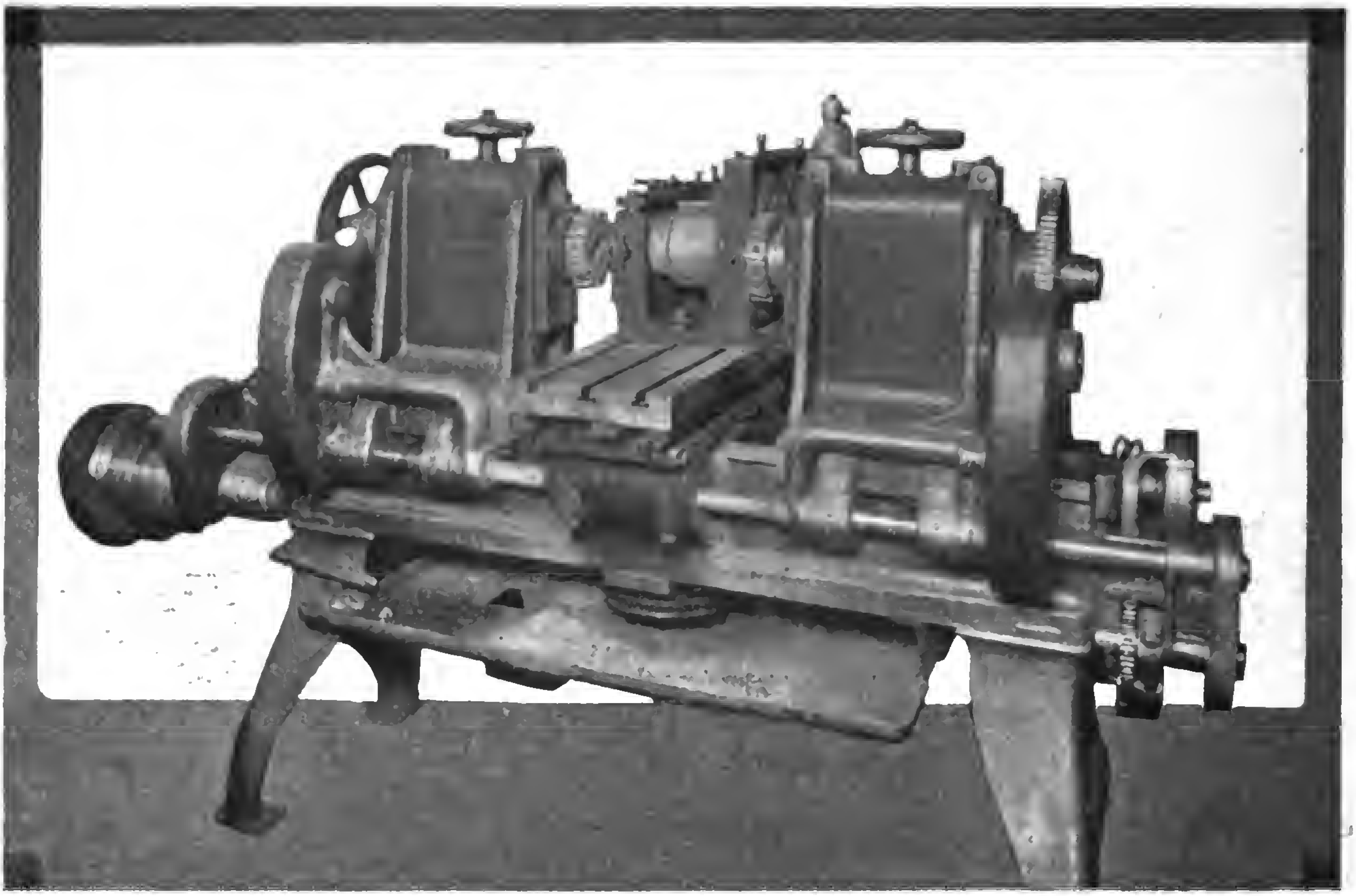


Fig. 3—Valve cap tool, Fig. 4—Motor-speeder

Factory Miscellany



Milling machine for finishing Moon cylinders employed in the factory of the company at St. Louis, Mo.

IN comparing the advantages of the T-head and L-head types of cylinders laymen frequently omit the consideration of machining. It is evident that it will cost more to do machine work on two sides of a casting than on one because there will be double the number of set-up jobs. Where a moderate-priced car uses the T-head type of cylinder it is evident that machines will have to be employed to keep the cost of labor on the cylinders down to the lowest possible point. The machine shown in the above illustration does this in the Moon factory at St. Louis. This machine is capable of handling eight cylinders at one time and all of the outside milling work on these cylinders is performed in two operations and by one man. The first operation consists in the milling of the tops and bottoms of the cylinders at the same time. After these are completed, the cylinders are turned upright and both sides are milled. This includes the milling of the intake and exhaust manifold bosses, the water connections and the valve covering plates. One man handles all the set-up work and no time is lost in this respect as he sets up one pair of cylinders while another pair is being milled. One man can turn out forty cylinder castings in a day. Naturally, this machine is an important economic factor.

NEW DUFF PLANT—The Duff Mfg. Co., recently moved into its new factory, located on Preble avenue, N. S., Pittsburgh, Pa. The main factory building is 550 feet long by 125 feet wide, affording an area of over 68,000 square feet. The entire factory building and office building is built fireproof, of steel, brick and concrete construction. The width of the building, 125 feet, is divided into four bays, 30 feet, 35 feet and then two 30-foot bays. The crane bay and side bays are designed to provide for a telpherage system and all roof trusses are so designed as to permit the operation of the crane and telpher hoist in connection therewith in practically every square foot of the building. Another feature is the central oil distributing system which comprehends all of the machine shop and which provides that all of the machines are fed from a central point by gravity, the returned oil being passed through a series of strainers into a large tank, from which it is electrically pumped to the gravity tank and again passed through the entire system. The floors of the main machine shop are constructed of asphalt block, which is mainly a limestone block of great durability. The floors of the heat-treating department and forge room arela id with a hard paving block, and floors of the warehouse, lavatories, tool supply departments, boiler and fan rooms are concrete. There are no solid partitions in the entire factory building, as heavy wire screening, 10 feet in height is used exclusively to separate the stock rooms, etc.

Hewitt Plans Factory—The Hewitt Rubber Co., Buffalo, N. Y., has filed plans for a new three-story brick factory at 240 Kensington avenue, to cost $175,000.

Gibson Will Build—The Gibson Motor Car Co., Pittsburgh, Pa., will build an automobile plant as soon as a site can be decided upon. The company will manufacture commercial trucks.

Automobile Plant for Louisville—The Crown Motor Car Co. is being organized in Louisville, Ky., with a capital of $500,000. It will make a cheap automobile, the intention being to market a two-passenger runabout to sell at $350.

Ausman Truck Factory Planned—A factory for manufacture of the Ausman motor trucks is to be established at Chattanooga, Tenn., with capital supplied by the Manufacturers' Assn. of that city. The plant will cost $100,000.

Big U. S. Tire Output—The April output of the Hartford, Conn., plant of the United States Tire Co. comprised 70,000 bicycle, 35,000 automobile and 150 tons of vehicle tires. The new power house, 108 by 68 feet, is nearly completed. The factory now employs about 1,700 hands.

Mansfield Tire Increases Output—The Mansfield Tire & Rubber Co., Mansfield, O., is increasing its tire output to 500 automobile tires a day.

Fourteen Plants Now—The home of the Detroit, Mich., Curling Club has been secured by the Studebaker Corp., and is now plant 14 in that company's system.

Detroit Top Company Builds—Meyers & Blackstock, Detroit, Mich., will soon open a factory at St. Louis, Mich., for the manufacture of automobile and buggy tops and similar articles.

Studebaker's $60,000 Assembling Plant—Plans were completed recently for a new two-story $60,000 building in St. Louis, Mo., for the Studebaker Corp. of America. This building will be an assembling plant. It will be of brick, concrete and terra cotta.

Buffalo Spring Company's Factory—The Buffalo, N. Y., Automobile Spring Co., recently incorporated, has leased for manufacturing purposes the two-story brick factory building at 146 Virginia street.

Painesville Citizens Want Factory—The citizens of Painesville, O., are agitating the question of securing an automobile factory for that town. The Vulcan Mfg. Co., recently incorporated to manufacture automobiles, is the concern which may locate in that city.

Heinz Electric Needs Men—Two hundred more men will be required for the factory of the Heinz Electric Co., Walkerville, Ont., this Lowell, Mass., concern having located there for the purpose of manufacturing spark coils and electric appliances for the Canadian and export trade.

Goodrich Purchases Land—The B. F. Goodrich Co. has secured some land on Chippewa Creek, Ont., 1 mile from Niagara River, on which it proposes to construct a large factory. The site was purchased from the Ontario Power Co. and that concern will supply the plant with electric power. The new rubber concern will manufacture rubber tires for automobiles as well as other rubber goods. Within a year 1,800 workmen will be employed in the plant.

Work on New Tire Plant—Owing to the fact that the ground on which they had planned to place their new building was wanted by the Pennsylvania Railroad, the members of the DeLion Tire and Rubber Co., Trenton, N. J., have changed their plans and will build their new factory about 300 yards from the original site. The building will be of the three-story type of brick and steel construction, which will render it practically fireproof. Cement floors will be used entirely.

Automobile Manufacturing in Canada—The manufacture of motor cars and trucks has made rapid strides in Canada. Windsor and Walkerville have already become the automobile center of that country. This is accounted for by the fact that it is extremely convenient for the Detroit, Mich., manufacturing firms to establish branches so close to the head offices. Among the latest to establish itself there is the Tudhope Motor Co., a branch of the Everett Motor Co., Detroit, Mich., which has purchased 10 acres in Windsor's factory district and has contracted to erect a $75,000 factory. The Tate Electrics, Ltd., financed by Canadian and American interests, has purchased a site in Ford City and is erecting a large automobile plant there.

General view of the main shop of the Duff Mfg. Co., Pittsburgh, Pa., taken prior to occupancy

The Automobile Calendar

Shows, Conventions, Etc.

May 20-23 .... Baltimore, Md., Spring Meeting, American Society of Mechanical Engineers.
June 2-7 .... Racine, Wis., "Made in Racine Exposition," J. I. Case Co.'s foundry.
June 5, 6, 7....... Detroit, Mich., Midsummer Meeting of Society of Automobile Engineers.
October 13......... Philadelphia, Pa., National Fire Prevention Conference, Philadelphia Fire Prevention Commission.

Race Meets, Runs, Hill Climbs, Etc.

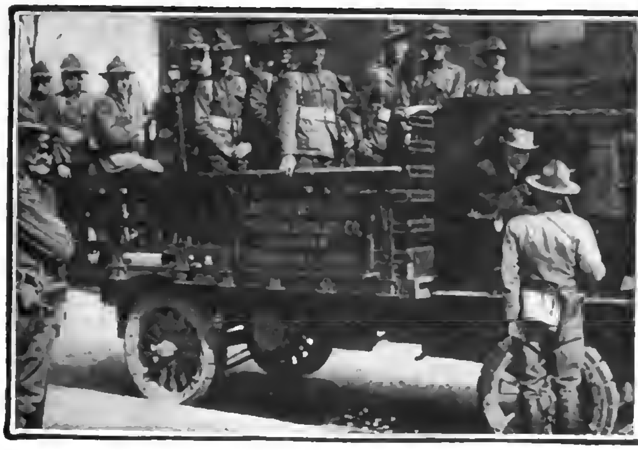
May 27-28......... Chambersburg, Pa., Reliability Rnn, Chambersburg Motor Club.
May 29-30 .... Chicago, Ill., Inter-Club Reliability to Indianapolis, Ind., Chicago Motor Club vs. Illinois Athletic Club.
May 30............ Indianapolis, Ind., 500-Mile Race, Speedway.
Jnne 5............ New York City, Orpbans' Day Picnic at Glen Island, Orpbans' Automobile Day Assn.
June 7 .... Pbiladelpbia, Pa., Inter-Club Reliability, Quaker City Motor Club, Automobile Clubs of Delaware County, Philadelpbia and Germantown.
June 10........... Columbus, O., Reliability Run, Columbus Automobile Club.
June 14 .... Cincinnati, O., Hill Climb, Cincinnati Auto Dealers.
June 14-15........ San Francisco, Cal., Track Races, E. A. Moross.
June 16, 17, 18 .... Columbus, O., Reliability Contest, *Ohio State Journal.*
June 19 .... Chicago, Ill., Algonquin Hill Climb, Chicago Motor Club.
June 21 .... Cincinnati, O., Hill Climb, Cincinnati, O., Automobile Dealers.
June 21........... Pbiladelpbia, Pa., Fletcber Cup Run, Automobile Clnb of Philadelphia.
June 21-22......... San Francisco, Cal., Track Races, E. A. Moross.
June 23........... Des Moines, Ia., Little Glidden Tour, Iowa Automobile Assn.
June 25-28 .... Cbicago, Ill., Non-Motor-Stop Reliability, Chieago to Boston, Cbicago Antomobile Clnb.
July 1 .... Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Assn. to the Pacific Coast.
July 1-16 .... Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.
July 4 .... Columbus, O., 200-Mile Track Race, Columbus, O., Automobile Club.
July 4 .... Taylor, Tex., Track Meeting, Taylor Auto Clnb.
July 4............ Wasbington, D. C., Track Races, National Capital Motorcycle Club.
July 4-5 .... Sioux City, S. Dak., Track Meetings, Sioux City Automobile Club and Speedway Assn.
July 5-6 .... Tacoma, Wasb., Road Raee, Montemara Festa Automobile Committee.
July 8-16 .... Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager.
July 11 .... Twin City, Minn., National Reliability Tour, A. A. A.
July 20........... Seattle, Wasb., Track Races, E. A. Moross.
July 27 .... Grand Rapids, Micb., Tour, Grand Rapids Auto Club.
July 27-28 .... Tacoma, Wash., Tacoma Road Races.
July 28-29-30...... Galveston, Tex., Beacb Races, Galveston Automobile Club.
Aug. 5............ Kansas City, Mo., Sociability and Endurance Run from Kansas City to Colorado Springs, Col., Kansas State Automobile Assn.
Aug. 12 .... Kansas City, Mo., Reliability Tour, Kansas State Auto Assn.
Aug. 29-30 .... Elgin, Ill., Elgin Road Races, Elgin Road Race Assn.
Aug. 30-Sept. 6 ... Chicago, Ill., Reliability Rnn, Chicago Motor Clnb.
Sept. 1 .... Columbus, O., 200-Mile Track Race, Columbus Auto Club.
Sept. 9 .... Corona, Cal., Track Race, Corona Anto Assn.
Oct. 4-11 .... Cbicago, Ill., Around Lake Michigan Run, Chicago Motor Co.
Nov. 24 .... Savannab, Ga., Vanderbilt Cnp Race, Motor Cups Holding Company.
Nov. 27 .... Savannab, Ga., Grand Prize Race, Automobile Club of America.

Foreign.

May .... St. Petersburg, Russia, International Automobile Exposition, Building of Michael Maneze, Imperial Automobile Club of Russia.
June 3-7 .... London, Eng., Tbird International Road Congress, Rees Jeffrey, General Honorary Secretary.
June 23-28 .... London, England, International Road Congress.
July 12 .... Amiens, France, Grand Prix Race.
July 13 .... Paris, France, French Grand Prix Cyclecar Race.
July 18-26 .... London, Eng., Imperial Motor Transport Conference.
Aug. 28-30......... Ghent, Belgium, Institute of Metals, Annual Autumn Meeting, Ghent International Exhibition.
Sept. 21.......... Boulogne, France, 3-Litre Race.
Sept. 25 .... Isle of Man, International Stock Car Race.
October .... Paris, France, Paris Automobile Sbow.
October .... Paris, France, Automobile Sbow, Grand Palais, 10 days.
November .... London, Eng., Annual Automobile Exhibition, Olympia.

The Week in the Industry

Engineer — Dealer — Repairman — Garage



Men of Company C, N. Y. N. G., responding to hurry call for protection from rioting strikers and to guard a manufacturing plant in Syracuse, N. Y.

Scene at the recent car strike in Cincinnati, O., where the motor truck replaced the street car. The motormen and conductors were on strike for more pay; as a result all the lines were tied up and the motor truck proved a handy conveyance

TRUCKS IN LABOR STRIKE—Three companies of the New York National Guard were called out to subdue strike riots in Syracuse, N. Y., recently. For the first time in the history of such events in that city, motor vehicles, pleasure cars and trucks played an important part in the arrangements to preserve order. Several large motor trucks and half a dozen touring cars were kept at the Armory and when calls came from any part of the city asking for protection for non-union laborers, the soldiers were hurried to the spot in the trucks.

PROMOTION FOR MAXWELL—R. D. Maxwell has been appointed manager of the Studebaker branch retail store in Los Angeles, Cal.

WELDING FIRM IN VANCOUVER—Among the new industries established in Vancouver, B. C., is the new firm Oxo Welding & Machine Co.

NORMAN HEADS FORD BRANCH—F. B. Norman has been placed in charge of the branch of the Ford Motor Co., Detroit, Mich., in Portland, Ore.

DUNHAM DIAMOND TIRE MANAGER—C. A. Dunham has been appointed Pittsburgh, Pa., manager of the Diamond-Goodrich branch in that city.

PACKARD ADOPTS HARTFORD ABSORBERS—The Packard Motor Car Co., Detroit, Mich., will again adopt the Hartford shock absorber equipment.

LOZIER'S FRISCO BRANCH CHANGED—The San Francisco, Cal., branch of the Lozier Motor Co., Detroit, Mich., will move into larger quarters in the near future.

MCMARTIN PROMOTED—E. J. McMartin, of the Fisk Rubber Co., Chicopee Falls, Mass., branch, has been promoted to manager of the subsidiary branch at Butte, Mont.

TAKES MINNESOTA AIREASE RIGHTS—H. S. Waite, 1334 Nicollet avenue, Minneapolis, Minn., has taken the Minnesota rights for the sale of Airease. He will create agencies.

SHILAND RESIGNS FROM HAVERS—H. E. Shiland, sales manager of the Havers Motor Car Co., Port Huron, Mich., has resigned from that company, same to take effect June 1.

BUGBEE ASSISTANT GENERAL MANAGER—C. S. Bugbee, of Detroit, Mich., has received the appointment of assistant general manager of the Great Western Automobile Co., Peru, Ind.

ROCHESTER CLUB MOVES—The Rochester, N. Y. Automobile Club is moving its headquarters from the Hotel Seneca to Powers Hotel. The new clubroom will be 30 by 35 feet in size.

WALLACE FRANKLIN'S FRISCO MANAGER—W. D. Wallace, formerly of Seattle, Wash., has recently been appointed sales manager of the Franklin Automobile Co., in San Francisco, Cal.

HAYNES PUBLISHES HOUSE ORGAN—The Haynes Automobile Co., Kokomo, Ind., will publish a house organ. The initial number will be published on July 1. It will be a monthly publication.

DAWSON SUCCEEDS KEIP—A. R. Dawson has been made branch manager of the San Francisco, Cal., branch of the Lozier Motor Co., Detroit, Mich. He succeeds F. B. Keip, who recently resigned.

BUS LINE IN SCHENECTADY—An automobile bus line was started recently from Schenectady, N. Y., to Pittsfield, Mass., by Messrs. Welcome and Jordon. Two Packard cars constitute the service.

BULLOCK RESIGNS FROM HERRESHOFF—J. H. Bullock, assistant secretary and treasurer of the Herreshoff Motor Co., Detroit, Mich., has resigned and is in Houston, Tex., at present, having located there temporarily.

NEW INVADER OIL AGENTS—The Beck Corbitt Iron Co., St. Louis, Mo., and the Boyer-Campbell Co., Detroit, Mich., have taken on the full line of the products manufactured by the Invader Oil Co., New York City.

KEROSENE CARBURETOR ON HENDERSONS—The Henderson Motor Car Co., Indianapolis, Ind., announces that it will furnish a Harroun carburetor, using kerosene, at a slight additional charge on any of its second series models.

INDIANAPOLIS SHOW GIVES DIVIDEND—A dividend of 25 per cent. to those who exhibited at the automobile show held in Indianapolis, Ind., during the latter part of March, has been declared by the Indianapolis Automobile Trade Assn.

KELLY-SPRINGFIELD'S NEW QUARTERS—The Kelly-Springfield Tire Co., New York City, has moved into new quarters at Broadway and 57th street. The solid and block tire department will, for the present, remain at 243 West 47th street.

STERNSFELS ADVERTISING MANAGER—C. D. Sternsfels has been appointed advertising manager of the Abendroth & Root Mfg. Co., Newburgh, N. Y., with headquarters at 50 Church street, New York City. This company manufactures motor trucks.

AUTOMOBILE APPAREL FIRM BANKRUPT—A petition in bankruptcy has been filed against C. E. Hottum, a manufacturer of automobile and livery apparel at 12 West 33d street, New York City. The liabilities are alleged to be $7,000 and assets $1,500.

LARGE $40,000 GARAGE FIRE—Fire which broke out in the Lafayette Garage, Lafayette, La., recently, consumed the entire building, together with the contents, consisting of twenty-three automobiles. Estimates of the losses sustained range from $35,000 to $40,000.

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

BOSTON, MASS.—Britton-Stevens Motors Corp.; capital, $50,000. Incorporators: William H. Britton, Geo. D. Stevens, Chas. F. Pinkham.

BROOKLYN, N. Y.—Lil's Motors Co., Inc.; capital, $4,000; to do a general automobile and taxicab business. Incorporators: Thos. J. Qualey, Ethel McDonald, Geo. H. Wendling.

BUFFALO, N. Y.—Buffalo Automobile Spring Co., Inc.; capital, $10,000. Incorporators: Earl Plants, W. Edward Slater, Harvey Etlinger.

CHICAGO, ILL.—Knight & Kilbourne Patents Co.; capital, $1,000,000; to manufacture automobiles, engines and motors.

CINCINNATI, O.—Queen City Motor Delivery Co.; capital, $50,000; to deal in automobiles. Incorporators: M. C. Heintz, Harry G. Hehman, Albert F. Hehman, Louis Hehman, William F. Ray.

CONNERSVILLE, IND.—Van Auken Electric Car Co.; capital, $10,000; to do a general automobile business. Incorporators: G. C. Babcock, A. K. Babcock, C. L. Millard, B. D. Millard, H. M. Wylie.

DETROIT, MICH.—Monarch Motor Car Co.; capital, $30,000; to manufacture automobiles. Incorporator: August J. Bloom.

GALENA, O.—Galena Auto & Machine Co.; capital, $2,500. Incorporators: C. C. Wilmerton, Kenneth V. Johnston, Roy W. Wilmerton.

HAMILTON, ONT.—Hamilton Cadillac Motor Co.; capital, $40,000; to manufacture motor cars and other vehicles. Incorporators: James Nixon, Frank R. Newberry, James A. Sauriol.

INDIANAPOLIS, IND.—Fisher Automobile Co.; capital, $25,000. Incorporators: Carl G. Fisher, Harry L. Hammond, F. Ellis Hunter.

JACKSONVILLE, FLA.—S. & B. Motor Co.; capital, $10,000. Incorporators: B. D. Spinney, Jos. Lockwood, J. Stewart, Bertram.

JACKSONVILLE, FLA.—White Sales Co.; capital, $100,000; to engage in an automobile business. Incorporators: James R. Collins, P. D. Oakley, N. A. Collins.

JERSEY CITY, N. J.—Model Garage Co.; capital, $25,000; to do a general automobile business. Incorporators: J. F. Autenrieth, H. Finke.

LOUISVILLE, KY.—Automobile Clearing House Co.; capital, $2,500. Incorporators: C. L. Holden, W. J. Welch, Chas. H. Welch.

NEOSHO, MO.—Neosho Automobile Co.; capital, $3,500. Incorporators: J. F. Wills, F. S. Biggs, E. R. Rudy.

NEWCASTLE, IND.—Maxwell-Newcastle Mfg. Co.; capital, $50,000. Incorporators: Russel Willson, Romney L. Willson, Frank C. Olive, Harry Wilder, James W. Wellington.

NEW YORK, N. Y.—Tarrytown Motor Car Co.; capital, $250,000; to deal in automobiles. Incorporators: W. Odell, B. J. Knerr, A. M. Levy.

NEW YORK, N. Y.—Gerleit Auto Spring Wheel Co.; capital, $200,000; to deal in wheels, parts, etc. Incorporators: A. Gerleit, M. Vath, H. Heil.

NEW YORK, N. Y.—Fulton-Post Co., Inc.; capital, $1,000; to deal in motor and motor vehicles. Incorporators: Regis H. Post, William H. Fulton, L. M. Dietrich.

NEW YORK, N. Y.—The Motor-Compressor Co., Inc.; capital, $10,000; to manufacture motors. Incorporators: G. J. Spohrer, Chas. E. Van Vleck, Robert L. Redfield.

SHELBYVILLE, IND.—Meteor Motor Car Co.; capital, $150,000; to do a general automobile business. Incorporators: M. S. Wolfe, F. P. Wolfe, M. E. Hester.

ST. LOUIS, MO.—Admiral Motor Co.; capital, $60,000; to manufacture a new one-thousand pound truck and a light farm tractor.

SYRACUSE, N. Y.—Stowell Motor Car Co.; capital, $30,000; to deal in automobiles and motorcycles. Incorporators: Harry E. Stowell, R. Burns Avery, Fred H. Mabey.

WILMINGTON, DEL.—Victor Motor Car Co.; capital, $100,000; to deal in automobiles.

WYANDANCH, N. Y.—Consolidated Gas & Gasoline Engine Co.; capital, $15,000. Incorporators: Geo. H. Scanlan, F. B. Knowlton, E. J. Forhan.

GARAGES AND ACCESSORIES

BOSTON, MASS.—Massachusetts Garage Association; capital, $5,000. Incorporators: Josiah Hathaway, Chester I. Campbell, Frederick W. Boynton, John E. Savell.

BUFFALO, N. Y.—Frontier Transportation Co.; capital, $200,000; to operate a motor bus line. Incorporators: Giles G. Meindell, Irving F. Cragin, Francis L. Hoff.

BUFFALO, N. Y.—Couch-Georger Tire Agency; capital, $20,000; to handle tires and accessories. Incorporators: C. A. Couch, E. E. Howell, Frank P. Georger.

CHICAGO, ILL.—Vincennes Garage; capital, $2,500. Incorporators: Albert E. Lucius, Edward B. Lucius, J. Scott Matthews.

CHICAGO, ILL.—Ferns Motor Livery; capital, $50,000. Incorporators: M. M. Franey, Asher J. Goldfine, Harry P. Munns.

CLEVELAND, O.—Cleveland Automobile Country Club; capital, $7,500. Incorporator: T. P. Cogwin.

DALLAS, TEX.—American Tire & Rubber Co.; capital, $25,000; to deal in automobile accessories.

DALLAS, TEX.—The Original Punturelfix Co.; capital, $5,000. Incorporators: A. Marks, Vincent L. Hughes, A. F. Weisberg.

DAVENPORT, IA.—Positive Tire Vulcanizer Co.; capital, $10,000; to sell tire vulcanizers. Incorporators: W. G. Sanford, Chas. Huber, J. Reed Lane, P. A. Bendixen.

EAST ST. LOUIS, ILL.—Southern Illinois Traction Co.; capital increased from $1,500,000 to $7,500,000.

HAMILTON, O.—Star Taxicab Co.; capital, $5,000. Incorporators: Geo. C. Skinner, A. M. Skinner, William Miller, Merle Flenner, Millikin Shotts.

INDIANAPOLIS, IND.—Shinauto Mfg. Co.; capital, $10,000; to manufacture motor car polishes and soaps. Incorporators: W. L. Bedford, J. C. Sharp, M. A. Seligman.

MILWAUKEE, WIS.—Economy Motor Fuel Adjusting Co.; to manufacture a new type of carbureter. Incorporators: John McFarland, Max Grass, John J. Handley.

NEW YORK, N. Y.—Multiple Jet Carbureter Co., Inc.; capital, $1,000. Incorporators: Chas. A. Singer, Austin B. Palmer, Chester U. Palmer.

NEW YORK, N. Y.—Auto Polo Corp.; capital, $10,000; to promote auto polo. Incorporators: Hicks A. Weatherbee, Richard R. Sinclair, Philip Huetwohl.

NEW YORK, N. Y.—Troy Auto Bus Corp.; capital, $20,000; to operate an auto bus line. Incorporators: John Burdick, Ernest L. Snyder, John McGlynn.

NEW YORK CITY.—Globe Rubber Tire Mfg. Co.; capital, $1,500,000; to manufacture rubber tires and all accessories for automobiles. Incorporators: Harry D. James, Joseph P. Hell, Spencer Weart.

NEW YORK CITY.—Gallagher Carbureter Co.; capital, $300,000; to manufacture carbureters. Incorporators: Richard W. Gallagher, William M. Ford, Howard A. Johnston.

NEW YORK, N. Y.—Allenhust Auto Van & Express Co.; capital, $1,000. Incorporators: Charles Drewes, William Bohn, Johanne Bohn.

NEW YORK, N. Y.—Interboro Delivery Co., Inc.; capital, $1,000; auto vehicle delivery. Incorporators: Max Altschuler, Isidore Levine, Martin Radican.

NEW YORK, N. Y.—H. H. H. Tire & Mfg. Co.; capital, $50,000; to manufacture and deal in automobile tires. Incorporators: J. H. Dravle, Wm. C. Burroughs, John J. Coyle.

SAN ANTONIO, TEX.—International Automobile School; capital, $4,000; to instruct pupils to handle automobiles. Incorporators: Thomas P. Price, Gus Leroy, John A. Kerr.

WILMINGTON, DEL.—Pneumatic Rim & Tire Co.; capital, $200,000. Incorporator: Harry W. Davis.

CHANGES OF NAME AND CAPITAL

MILWAUKEE, WIS.—Milwaukee Motor Co.; capital increased from $250,000 to $800,000.

SANDUSKY, O.—Suspension Roller Bearing Co.; capital increased from $250,000 to $800,000.

SPLITDORF BRANCH OPENED—The Splitdorf Electrical Co., New York City, has opened an Atlanta, Ga., branch, situated at 8 Harris street. O. J. Rohde, who opened the Atlanta, Ga., branch, will shortly open a Newark, N. J. branch. Toronto, Ont., will shortly have a branch.

SMALL RESIGNS—A. H. Small has resigned from the Oakland-Wisconsin Motor Co., Milwaukee, Wis., to become Wisconsin field representative for the Marion Motor Car Co., with headquarters in the E. F. Sanger Co. garage, Milwaukee, representative of the Marion and Stearns.

METALLURGIQUE AGENTS BANKRUPT—W. C. and H. N. Allen, doing business as the Metallurgique Motor Co., selling agents for automobiles at 1876 Broadway, New York City, have filed a petition in bankruptcy with liabilities of $67,928 and assets $8,070, consisting of accounts $7,556, stock $150 and cash in bank $364.

TIMKEN ENLARGES N. Y. BRANCH—Increase of eastern business has made it necessary for the Timken Roller Bearing Co., and the Timken Detroit Axle Co., Detroit, Mich., to double the size of their New York City branch at Broadway and 68th street. They have leased the store next to their former place, throwing the whole into one large room.

FORD'S HAMILTON GARAGE OPENED—The new three-story garage of the Ford Motor Co., recently completed at 74 John street, north, Hamilton, Ont., was recently opened. The ground floor is used as a showroom, office and garage, while the two upper floors are devoted to repair work, and stock room. The garage is one of the largest in the province of Ontario.

NEW BOSCH SUPPLY STATIONS—The following Bosch supply stations have been selected by the Bosch Magneto Co., New York City, in their respective territories: Reed Motor Supply Co., St. Paul, Minn.; W. D. MacMillan, Jr., Wilmington, N. C.; Kinston Garage, Kinston, N. C.; Cuskaden Auto Supply Co., Atlantic City, N. J.; J. T. Cox, Penn Yan, N. Y.; Wichita Garage Co., Wichita, Kans.; The Auto Supply Co., Hutchinson, Kans.; and the Severin-Lumbard Tire & Supply Co., Oklahoma City, Okla.

Government officers watching truck climb mountain near Columbia, Pa., during Government truck trials

Washington Post Commercial Truck Test. White 1,500-pound truck climbing hill between Frederick and Hagerstown, Md.

United States Government officials in the Washington Post Reliability Run. They are, from right to left, Messrs. Edgarston, Austin, Boyd and Ayars

Great interest was shown at each stop during the recent Washington Post Reliability Run. This shows the cars parked in the city square at Hanover, Pa.

WARREN COMPANY'S BUSINESS CONTINUED—The Detroit, Mich., Trust Co., receiver of the Warren Motor Car Co., has notified the creditors that the business of the company will be continued under the management of the Trust Company and that the policy ot the receiver will be to purchase material and merchandise as much as possible from the creditors of the company.

FOREIGN TRADE OPPORTUNITIES—A firm of automobile dealers in the United Kingdom informs an American consulate that it wished to get in touch with manufacturers who specialize in the production of the various component parts of automobiles suitable for erecting a complete chassis of not over 80 millimeters bore. File No. 10,871, Bureau of Foreign and Domestic Commerce, Washington, D. C. A business man who has already placed a number of American articles on the British market informs an American consulate that he would like to correspond with manufacturers of a two-seated runabout automobile, retailing for about $500. File No. 10,800. A South American business firm informs an American consular officer that it desires to be put in touch with manufacturers of tires for automobiles. Correspondence should be in Spanish. File No. 10,819.

New Agencies Established During the Week

PLEASURE VEHICLES

Place	Car	Agent
Asbury Park, N. J.	Regal	Mark Guy.
Belle Mead, N. J.	Regal	R. I. Cruser.
Birmingham, Ala.	Cole	Cole Motor Car Co.
Birmingham, Ala.	Oakland	Judge Dan A. Greene.
Bloomfield, N. J.	Regal	Central Motor Car Co.
Boston, Mass.	Chandler	Chandler Motor Car Co.
Boston, Mass.	G. J. G.	Cole Motor Co.
Boston, Mass.	Ohio	Cole Motor Co.
Brooklyn, N. Y.	Chandler	Tanner Motor Car Co.
Brooklyn, N. Y.	Regal	O. S. Tata.
Catskill, N. Y.	Regal	Peerless Garage Co.
Closter, N. J.	Regal	W. H. Roberts.
Cold Spring, N. Y.	Regal	Phyfe's Garage.
Dunnellen, N. J.	Regal	Dunnellen Garage.
Elizabeth, N. J.	Regal	Elizabeth Automobile Co., Inc.
Evansville, Wis.	Studebaker	F. P. Carrier.
Glen Cove., L. I.	Regal	L. T. Simonson.
Hackensack, N. J.	Regal	W. R. Schoonmaker & Son.
Hartford, Conn.	Regal	A. J. Cassky.
Hempstead, L. I., N. Y.	Regal	Hutcheson Bros.
Hoquiam, Wash.	Franklin	Hoquiam Auto Co.
Islip, L. I.	Regal	Frank Gates.
Jersey City, N. J.	Regal	B. Rickard.
Joplin, Mo.	Kissel	Lyscio & Walker.
Kingston, N. Y.	Regal	Wall Street Garage.
Lomira, Wis.	Imperial	Lomira Auto Co.
Massillon, O.	Franklin	Jacob Von Gunten.
Middletown, N. Y.	Regal	Brown's Garage.
Milwaukee, Wis.	Case	William Diemann.
Milwaukee, Wis.	King	Creek Motor Sales Co.
Monroe, Wis.	Hupmobile	Genger & Feaser.
Nawark, N. J.	Franklin	Carlough & Malion.
Newark, N. J.	Regal	Oldsmobile Co. of Newark.
New Brunswick, N. J.	Regal	S. A. M. Garage.
New Canaan, Conn.	Regal	Regal Motor Car Sales Co.
New Haven, Conn.	Regal	C. A. Bunnell.
New London, Conn.	Regal	Lathrop & Smith.
Naw York, N. Y.	Regal	Regal Auto Sales Co.
Oakes, N. D.	Kissel	J. E. Bush.
Paterson, N. J.	Regal	T. H. Muth.
Plymouth, Pa.	Regal	S. Reese Machine Tool Co.
Putnam, Conn.	Regal	G. A. Vaughan.
Raleigh, N. C.	Franklin	Byrum & Hillyer.
Red Bank, N. J.	Regal	F. H. Van Dorn.
Sayville, L. I.	Regal	Stenger & Rohm.
Scranton, Pa.	Regal	Eureka Motor Car Co.
St. Cloud, Minn.	Kissel	Menec & Bisenina.
Staten Island, N. Y.	Regal	E. T. Shortt.
St. Louis, Mo.	Case	H. B. Daniels.
St. Louis, Mo.	King	Heinrich Automobile Co.
St. Louis, Mo.	Velie	Velie Motor Co. of Missouri.
Stoughton, Wis.	Overland	Roe Automobile Co.
Syracuse, N. Y.	Maxwell	E. P. Young.
Syracuse, N. Y.	Regal	E. P. Young.
Torrington, Conn.	Regal	O. C. Haight.
Trenton, N. J.	Regal	Carl Endebrock.
Waukesha, Wis.	Crown	Davies Bros.
Weyauwega	Oakland	Weyauwega Garage.
West Pittston, Pa.	Regal	Stroh Auto Co.
Yonkers, N. Y.	Regal	R. B. Timm.
Butler, Pa.	Dart	A. O. Hileman.
Camden, N. J.	Indiana	N. J. Auto & Supply Co.
Clarksburg, W. Va.	Indiana	D. Scott Thompson.
Cleveland, O.	Mercury	Mercury Mfg. Co.
Colchester, Ill.	Dart	Colchester Auto Co.
Edmonton, Alberta, Can.	Indiana	Freeman & Co., Ltd.
Fort Dodge, Ia.	Dart	Tremaine & Rankin.
Fort Plain, N. Y.	Stewart	H. B. Gray Co.
Fort Worth, Tex.	Dart	Mayer & Strickland.
Glenns Falls, N. Y.	Sanford	Miller Price.
Green Bay, Wis.	Best	DuBois, Haevers & Co.
Harrisburg, Pa.	Dart	Ensminger Garage.
Harkimer, N. Y.	Stewart	G. E. Clark.
Hudson, N. Y.	Stewart	Wm. Petry Garage.
Indianapolis, Ind.	Vulcan	John W. Hogan.
Ithaca, N. Y.	Indiana	Cornell Transfer.
Johnstown, N. Y.	Stewart	Johnstown Motor Car Co.
Lorain, O.	Sandusky	Hagaman & Nichols.
Los Angeles, Cal.	Sanford	Hawley King & Co.
Luxemburg, Mo.	Palmer	Louis Schnellman.
Manistique, Mich.	Dart	W. J. Bebean.
Mansfield, O.	Sandusky	Herring Buggy Co.
Mattese, Mo.	Palmer	H. J. Jenneman.
Maxwell, Mo.	Palmer	O. J. Siedler.
Milwaukee, Wis.	Dart	H. F. Wiesenthal.
Newark, N. J.	Chase	Chase Motor Truck Co.
Newark, N. J.	Indiana	D. E. Morris.
New York City	Indiana	Indiana Motor Truck Co.
New York City	Sanford	F. T. Sanford Auto Co.
Newburg, N. Y.	Dart	C. H. Bellinger.
Newport, R. I.	Dart	G. A. Smith.
Northampton, Mass.	Stewart	Draper Garage.
Norwich, Conn.	Sanford	F. O. Cunningham.
Oakland, Cal.	B. A. Gramm's	Miller & Dryer.
Quincy, Ill.	Dart	Quincy Garage.
Red Bank, N. J.	Stewart	F. H. Van Dorn.
Reading, Pa.	Sanford	Deysher Furniture Co.
Reno, Nev.	Dart	J. C. Dunham.
Rochester, N. Y.	Sanford	Mandery Motor Car Co.
Sacramento, Cal.	B. A. Gramm's	King & Son.
Salt Lake City, Utah	Dart	Inter-Mountain Transportation Co.
Saratoga, N. Y.	Sanford	Ross Ketcham Garage.
San Antonio, Tex.	Indiana	Guarantee Motor Car Co.
San Diego, Cal.	Sanford	P. M. Price.
San Francisco, Cal.	Indiana	Auburn Sales Co.
San Jose, Cal.	B. A. Gramm's	San Jose Implement Co.
Sidney, Australia	Sanford	Hippsley & Waddell.
Sistersville, W. Va.	Indiana	Reno Oil Co.
Somerville, Mass.	Sanford	Orr J. Palmer.
South Seattle, Wash.	Indiana	G. W. Hoffman.
St. Louis, Mo.	Adams	Lewis Automobile Co.
Stockton, Cal.	B. A. Gramm's	Hansel & Ortman.
Syracuse, N. Y.	Standard	A. J. Jackson.
Tama, Ia.	Dart	Harlan & Cory.
Toledo, O.	B. A. Gramm's	Grasser Motor Co.
Utica, N. Y.	Sanford	A. A. Lederman.
Vancouver, B. C.	Indiana	Hall & Wallace.
Worcester, Mass.	Sanford	R. E. Northridge.
Yokohoma, Japan	Sanford	Melchior, Armstrong & Dessau.
Youngstown, O.	Indiana	A. E. Hallden.

COMMERCIAL VEHICLES

Place	Car	Agent
Akron, O.	Sandusky	H. E. Kepler Auto Co.
Alliance, O.	Sandusky	Al. Shem.
Arcata, Cal.	B. A. Gramm's	W. A. Preston.
Baltimore, Md.	Dart	G. A. Wehr.
Berea, O.	Sandusky	Hathaway Motor Co.
Boston, Mass.	Maccarr	Britton-Stevens Co.
Boston, Mass.	Smith-Milwaukee	Britton-Stevens Co.

ELECTRIC VEHICLES

Place	Car	Agent
Boston, Mass.	Lansden	Britton-Stevens Co.
Hartford, Conn.	Rauch & Lang	R. D. & C. O. Britton Co.
Indianapolis, Ind.	Chicago	J. F. Wild Auto Co.
Meriden, Conn.	Rauch & Lang	R. D. & C. O. Britton Co.
Middletown, Conn.	Rauch & Lang	R. D. & C. O. Britton Co.
Springfield, Mass.	Rauch & Lang	R. D. & C. O. Britton Co.
Superior, Wis.	Detroit	Superior Water, Light & Power Co.

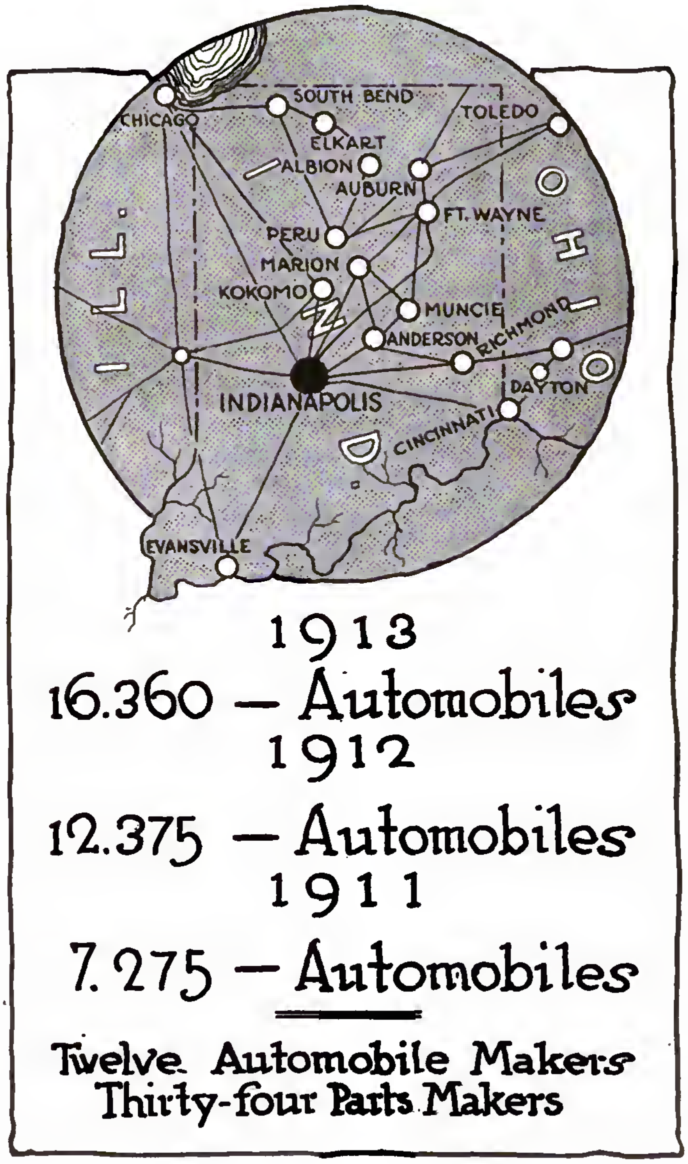
Vo. XXVIII NEW YORK—THURSDAY, MAY 29, 1913—CHICAGO No. 22

The AUTOMOBILE

Indianapolis

A City Where Pulling Together Has Brought Results

By L. V. Spencer



INDIANAPOLIS, first city of Indiana, enjoys the distinction of having within its boundaries more 18-karat boosters for the automobile than any one community in the United States. Its citizens have done more to make the whole subject of motoring and its allied topics widely discussed than have any other. They have promoted one automobile event after another until today, though not the largest city in the production of cars and their parts, the city is exceedingly well known by the automobile public as a manufacturing center.

Among cities of the United States, Indianapolis ranks third in the number of finished automobiles and their parts to be given to the world each year. Realizing that the Michigan city had several years the start of them in the matter of production, the Hoosiers set out to make their city equally prominent in the world of gasoline, sagaciously choosing other lines of endeavor which have netted big returns.

Just now the eyes of the motoring world are centered on Indiana's capital, for this week the cream of the world's speed creations will be piloted around the 2.5-mile Speedway in what bids fair to be the greatest 500-mile automobile race yet staged. Speed kings of this country and of Europe will vie for the rich prizes which the enterprise of a wide-awake city has posted as bait for the world's best. Fifty thousand dollars, which is to be split in ten pieces—the winner to get $20,000—has been offered and the Hoosiers feel that it is cheap, when the great amount of publicity which the city will reap and the thousands of spectators and motoring converts who will be drawn there for the race, are considered.

The Indianapolis Speedway project was announced in January, 1909, its plans originating with Carl G. Fisher, of Transcontinental Highway fame. An association was formed and the Speedway built at a cost of over $350,000 on the outskirts of the city, though being easy of access by two automobile roads, one traction line and two railroads. Its exact location is 4.5 miles northwest of the city.

The plot of ground on which the Speedway is located covers 328 acres and has on it forty-one buildings, including garages, aerodomes, hangars and the like. While the grand—

Panoramic view of part of the great Indianapolis Speedway, where the most daring and skilful racing drivers of Europe and America will strive

stands and boxes afford accommodations for 60,000 persons, the entire grounds will afford room for nearly 200,000 people. In addition, there is a parking space for 10,000 automobiles.

Since the holding of the International Sweepstakes races, the city has been the Mecca for motor car touring parties. One has to but examine the licenses carried by a part of the great collection of motor vehicles parked at one of these races to realize that nearly every state in the Union now has its motoring enthusiasts.

A word as to the actual construction of the track itself may be of interest. It has a surface of vitrified brick, 3,500,000 of these being required to cover the 2.5 miles. The turns, with a radius of 1,500 feet, are banked 16 feet, and a cement wall, 3 feet high and 11 inches thick, extends around the outer edge of these turns. Heavy wire mesh protects all stands from the track. Telephone lines connect all score-boards on the back stretch direct with timers' and judges' stands so that persons on any part of the track are told the standing of all participants in the events at any time. Thirty sets of telegraph instruments tell the outside world the progress of the speeding cars.

Yet the Speedway has not been the only agent Indianapolis has used to get into the automobile limelight. Through its Four-States tours, Coast-to-Coast runs, the activities of the Hoosier Motor Club, and the doings of an energetic Automobile Trade Association, the city has been placed upon the motoring map in big letters.

The idea of touring through four neighboring states each year was original with the city. The first tour of this sort was announced in April, 1911, and started July 16, covering a distance of 1,431.9 miles through the four states of Illinois, Iowa, Missouri and Indiana. The run was restricted to car manufacturers in Indiana and the object was purely a social and boosting affair. So much importance was attached to the affair that the then governor of Indiana, Thomas R. Marshall, pushed the button to start it. In this initial affair there were twenty-seven machines. The event is particularly notable from the fact that it was the first time in the history of the automobile industry that the automobile manufacturers of one state had banded together in such a movement.

The second of these tours, held last July, was made through the four states of Ohio, Kentucky, West Virginia and Indiana. Its mileage was 1,423. Thirty-three cars participated.

The 1913 tour, scheduled for July 1 to 25, will be replaced by a run to the Pacific Coast exclusively for Indiana manufacturers.

The Premier Coast-to-Coast run of 2 years ago attracted a great deal of attention. The participants were owners of these cars who started from Atlantic City on July 26, 1911, by dipping the wheels of their cars in the waves of the Atlantic. Twelve cars finished by dipping the wheels in the Pacific at Los Angeles on August 10, 1911.

It is just such events as these which are continually being originated and staged by a group of men who are pulling together to advance their city and to bring fame to their product.

There is a spirit of fellowship running through the long list of makers of cars and parts gathered together in the Hoosier city which is very evident to the outsider. There is a get-together-and-push atmosphere which is bound to work to the advantage of all concerned.

Another instance of the progressiveness of Indianapolis was the establishment last June of Speedway, the horseless city, a municipality unique in its ideas for thorough modernity both from the standpoint of the buildings, which it is planned to erect, and from the fact that it is to be horseless in every sense of the word. No horses will be permitted within the new town, the brain-child of Carl G. Fisher and James A. Allison. These men have long wanted to see a city built devoted entirely to the automobile industry which would be ideal in every respect. All dwellings must be of concrete. Factories are also required to be of concrete construction reinforced with steel and up to the latest architectural dictates. Cars and trucks only may traverse the streets.

The start of the second annual Four-States Tour, July 9, 1912, of the Indiana automobile manufacturers. It is

to lower the world's record in the great 500-mile race, May 30. The Speedway has done much to bring Indianapolis before the automobile world

During the early part of 1912 the two promoters of the project bought 1,000 acres of land, and after they had become thoroughly convinced of the feasibility of the plan of establishing a strictly motor car city it was made public to the world, attracting much attention.

The idea was not entirely a money-making proposition, but one which would further draw attention to Indianapolis and bring more power to it in a manufacturing way. Others have responded to the project and it has fast gained ground. The new plant of the Prest-O-Lite Co., consisting of twelve buildings, is located in Speedway, while half a dozen parts concerns and several motor car factories are to locate within its gates.

Industrially, Indianapolis may well be proud of its automobile and allied interests. There is a full dozen of the well-known motor car makers who have chosen the city for its many advantages. Situated at practically the center of population of the United States, it has an inexhaustible supply of cheap fuel, has competing steam and electric railroads in all directions, has plenty of labor of diversified character and plenty of room for this labor to live. In short, it has been characterized as the natural base from which to draw upon nearly all sources of raw materials. Its position is strategic as regards shipping to nearly all parts of the country.

Besides the twelve factories making motor vehicles there are thirty-four accessory and parts-making concerns identified with the city. This latter figure represents only those plants which are directly in the automobile class and devote either all or the greater part of their energies to the making of supplies and parts. It does not include such plants as those doing a more general business, such as the manufacture of bolts, nuts, screws and a hundred and one other articles which were just as necessary before the time of the motor vehicle as they are today when the making of such vehicles has grown to be one of the world's greatest industries. Were all of these added, the total would be swelled several fold.

The combined output of the dozen Indianapolis makers of all classes of motor vehicles for 1913 is approximately 16,400. This includes the electric output of the Waverley company—Indianapolis' only representative in the electric vehicle field—and the concerns making motor trucks. The total does not include the outputs of any concerns in the vicinity of the city, but exclusively those which may properly be regarded as belonging to Indianapolis.

During 1912 approximately 12,275 machines of all classes were produced by these same companies and for the year previous to this, 1911, about 11,000 machines were given to the world with the Indianapolis stamp on them.

It is difficult to estimate the outputs for the years previous to 1911 as no statistics of this nature were kept; however, an idea of the increase in production which has taken place since the early days of the industry in Indianapolis results from a search through old files.

These show that the 1906 output of the five factories then operating was approximately 2,100 machines, having an aggregate value of $4,105,000. This estimated production for that year did not include the then recently established American Motor Car Co. It included the number to be made by the Pope Motor Car Co., Waverley department; the National Motor Vehicle Co., the Premier Motor Mfg. Co., the Marion Motor Car Co. and Nordyke & Marmon, several of the city's leading firms.

Thus, in the making of motor cars the city has kept pace with the growth of the industry as a whole, having in 7 years increased its output of motor vehicles by 680 per cent.

Comparison of the total value of the motor vehicles produced by the Indianapolis concerns from year to year is rather difficult inasmuch as complete data along this line are not obtainable. However, from statistics received from five of the leading motor car concerns in Indianapolis it is shown that $9,461,500 worth of cars were made by them in 1912. All told the city's factories probably turned out machines to the value of $30,000,000 for this period. On the same basis, this year's output

largely to the energetic promotion of such affairs as this that Indianapolis owes her rapid rise as an automobile center should reach a market value close to $41,000,000, assuming that the price of the Indianapolis-made car averages $2,500.

It is apparent from these statistics that the Indianapolis motor car maker has not gone in for quantity production to any great extent. Nevertheless, the factories are large in size. The twelve have an aggregate floor space of approximately 1,714,000 square feet; add to this the floor space of the parts factories mentioned and the total reaches 5,000,000 square feet, 4,582,200 square feet, to be exact, according to the records at hand.

The working population of Indianapolis is well represented in the city's factories in the automobile industry. At the present time, 13,990 wage-earners are thus employed. Of this number, 6,650 earn their livelihood from the makers of cars, while the balance of 7,340 are paid by the producers of parts and accessories. There seems to be little opportunity for comparison with the motor car industry working population of previous years, since no such records are obtainable. However, the present population of Indianapolis is 267,000, while in 1900 it was 169,000, an increase of 98,000, or 58 per cent. It seems reasonable to assume that the number of automobile and parts factory wage-earners has increased about twice as fast, and we may, therefore, say that in a dozen years the industry has been responsible for the bringing to the city of at least 10,000 more men of the wage class, or one-tenth of the population gain. If every other industry could have done as well, the city's growth would have been unprecedented.

On the basis of the present population, the wage-earning class chargeable to the motor vehicle industry composes 5.2 per cent of the total persons in Indianapolis, the number in the car-making factories alone, 2.5 per cent., and in the parts and accessory plants, 2.8 per cent., as shown in the table:

1900 population	169,000	Percentage of present population	5.2
1913 population	267,000	Percentage of present population in car-making factories alone	2.5
Increase	98,000	Percentage of present population in parts and accessory factories alone	2.8
Increase—per cent.	58		
Total wage earners—automobile industry	13,990		

The automobile business in Indianapolis dates back to about the year 1900, although much experimenting had taken place before that year. Records show that an electric vehicle—the first built by the Waverley company, then known as the Indiana Bicycle Co.—was delivered to Charles Finlay Smith in January, 1907. In May, 1898, the Waverley was one of the four makes of electric vehicles exhibited at an electrical show held at the Madison Square Garden, New York. In 1903 the Waverley company built the first coupé body ever placed upon an electric vehicle chassis. Those prior to this had all been of the Stanhope design.

Among the gasoline car makers, Nordyke & Marmon are perhaps the oldest Indianapolis manufacturing concern, as it was established in 1851 as a machinery manufacturing business. In 1901 the company built its first motor car. In 1904 several more machines were made. A year later the Marmon was placed regularly upon the market.

The first of the Nationals came along about this time. The Premier Motor Mfg. Co. may also be numbered among the pioneers, it having been formed in 1902, when its first car was constructed. The American Motors Co., the originator of the underslung type of construction, began experimental work on its first underslung model in the summer of 1906.

The Marion Motor Car Co. was established in 1903. The present holding company took over the Marion interests on the first of last August. Later came the Cole Motor Car Co., which began making cars in June, 1909. The Empire Automobile Co., formerly the Empire Motor Car Co., was formed in 1909. The Motor Car Mfg. Co., maker of the Pathfinder, started business in 1911. The Ideal Motor Car Co., the name of which has recently been changed to the Stutz Motor Car Co., was established in 1911 also, and it was about this time that the Mais Motor Truck Co. came into being to manufacture a motor truck designed by a German engineer of that name. The Henderson Motor Car Co. was formed last year. Thus we have the following chronological table:

Waverley Co.	1897	Cole Motor Car Co.	1909
Nordyke & Marmon	1901	Empire Automobile Co.	1909
Premier Motor Mfg. Co.	1902	Motor Car Mfg. Co.	1911
Marion Motor Car Co.	1903	Stutz Motor Car Co.	1911
National Motor Vehicle Co.	1904	Mais Motor Truck Co.	1911
American Motors Co.	1906	Henderson Motor Car Co.	1912

In the parts and accessories making clan there are many names well known to every motorist. There is the Wheeler & Schebler concern which is the world's largest maker of carbureters, and which started in business in 1901. It employs from 500 to 800 men, has a floor space of 300,000 square feet and last year turned out 300,000 carbureters. The daily capacity of this plant is 4,000 carbureters.

The Prest-O-Lite Co. started in business in September, 1904, and has a floor area of 250,000 square feet, employing over 400 men.

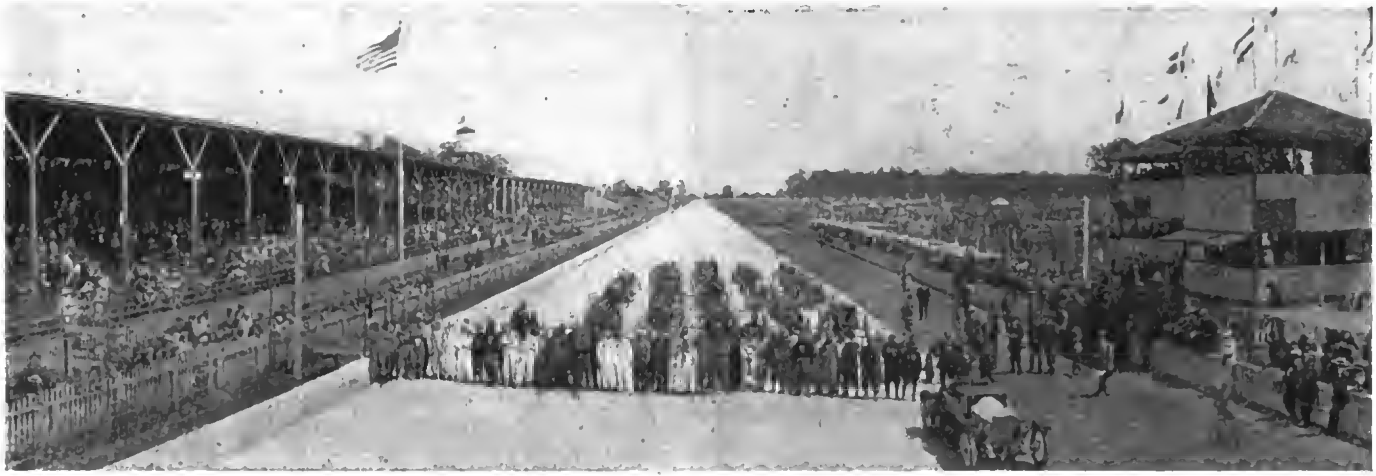
In the axle and transmission making field we find the Stutz Auto Parts Co. also claiming Indianapolis as its home. Maker of automobile machine parts is the Spacke Machine Co., formed in 1903 and now employing from 350 to 400 workmen on the average day.

High-speed chain makers are the Link-Belt Co., the Diamond Chain & Mfg. Co. and the American High Speed Chain Co., which furnish their product for automobile use as well as for other machinery constructions. The Keyless Lock Co., which recently moved into one of the most modern of bronze and aluminum foundries, is another of the many thriving concerns making specialties for the industry.

And so it goes on down the line. There is no end to the variety of motor car parts which bear the stamp of the Indianapolis-made.

These concerns and many others directly or indirectly connected with the automobile industry are operating on an enormous scale. Many others are not so large, but they are all thriving, each filling its niche in the great cycle of production.

A graphic representation of some of the most important factors which enabled Indianapolis to turn out 16,360 automobiles during 1912



Cars, drivers and mechanicians lined up before the start of the 500-mile race on the Indianapolis Speedway, May 30, 1912

Twenty-Nine Cars Ready for Big Race

ON Memorial Day, Friday, May 30, the third annual international Sweepstakes race will be staged at the Indianapolis Speedway. The entry list, which is limited to thirty cars, contains twenty-nine, and includes some of the fastest cars in the world driven by drivers of world-wide reputation. This classic speed event is indeed international in its scope, for no less than five nations are represented, including England, France, Germany, Italy and the United States.

In addition to the international flavor of this great speed event, this race will prove particularly strong for several of the following reasons: Among the eight foreign entries are the English Sunbeam and the French Peugeot which have been making such remarkable performances in Europe during the last 2 years. Another feature is that of the introduction of the Knight engine to American racing competition. Last, but not least, whereas in previous races cash prizes amounting to not more than $20,000 proved most attractive, the winner of this race, taking the value of trophies into consideration, has a good chance to win $35,000.

The qualifications for the race are that cars must not exceed 450 cubic inches piston displacement, must have a minimum weight of 1,600 pounds and shall be able to do 75 miles an hour. In last year's time trials all of the cars but one succeeded in making this speed and, barring accidents, in practice it is reasonable to expect that all of the twenty-nine cars entered this year will line up at the starting point.

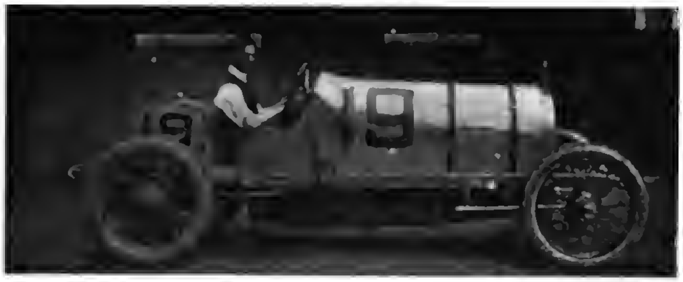
Considerable interest is being taken this year in the Sunbeam and Peugeot cars. The Sunbeam six-cylinder car now holds the world's records for 600 miles, 700 miles and 800 miles, all of which were made in 1911 on the Brooklands track at an average speed of a little more than 75 miles an hour. This car also holds the 7, 8, 9, 10 and 11-hour records, also established in 1911 on the Brooklands track. This car will have to increase its speed considerably, however, in order to win the Speedway race this year, for it is predicted that even greater speed than that of 78 miles per hour made in last year's race will be required to win this race of 1913.

SUMMARY OF CARS ENTERED IN 500-MILE RACE

No.	Car	Driver	Cylinders	Horsepower
1	Nyberg	H. Endicott	6	38.40
2	Stutz	Charles Merz	4	38.25
3	Stutz	G. Anderson	4	38.25
4	Keeton	Burman	4	42.20
5	Mason	Evans	4	30.65
6	Mason	Tower	4	30.65
7	Deltal	E. H. Delting	4	44.20
8	Stutz	Herr	4	38.25
9	Sunbeam	Guyot	6	29.45
10	Henderson	Knipper	4	29.00
12	Fox	Wilcox	4	36.15
15	Peugeot	Zuccarelli	4	29.00
16	Peugeot	Goux	4	29.00
17	Anel	Liesaw	4	32.40
18	Schacht	Jenkins	4	38.25
19	Mercer	Bragg	4	38.25
21	Mercer	De Palma	4	38.25
22	Mercer	Wishart	4	30.65
23	Mercedes-Knight	Pillette	4	16.92
24	Pennebaker	Pennebaker	4	42.20
25	Tulsa	Clark	4	36.15
26	Isotta-Fraschini	Grant	4	36.15
27	Isotta-Fraschini	Tetzlaff	4	36.15
28	Isotta-Fraschini	Trucco	4	36.15
29	Mercedes	Mulford	4	32.40
31	Case	Disbrow	4	42.20
32	Case	Nikrent	6	46.00
33	Case	Endicott	4	27.20
35	Mason	Will Haupt	4	29.00

As for the Peugeots, they have indeed everything in the way of prestige as a result of the world's records established by the Peugeot car driven by Boillot and Goux at Brooklands during the last few months. In April of this year several interesting records were established by Goux in a Peugeot car. The Talbot record for 50 miles in 29 minutes 2.5 seconds, which is equivalent to 103.3 miles per hour, was beaten by Goux's Peugeot which negotiated the 50 miles in 28 minutes 18.65 seconds, which is equivalent to 105.97 miles per hour. On the same day the Talbot records for 100 miles and the hour also were beaten. The Talbot's record of 100 miles in 57 minutes 49.38 seconds, or 103.76 miles per hour, was lowered by the Peugeot, which made the distance in 56 minutes 29.93 seconds, or 106.20 miles per hour.

These are indeed remarkable records, but it must be borne in mind that these records are only for 100 miles and were established on a track which is much easier on tires than the Indianapolis Speedway. Soon after these results were achieved at Brooklands these cars were forced to stop to make tire changes; and it is a well-known fact that numerous tire changes in the



Ralph De Palma in the special racing Mercer in which he will endeavor to overcome his frequent hard luck at Indianapolis this year by hard and consistent driving

George H. Clark mounted on his Tulsa racer, as he will appear in the annual 500-mile race on Memorial Day. The Tulsa is an Oklahoma car and is named after its native city

Spencer Wishart in his special Mercer ready for the 500-mile grind. Wishart's car differs from the other two Mercers in that the exhaust line is carried outside of the hood on the right side

Ralph Mulford in his big Mercedes all ready for the 500-mile contest, smiling his famous smile, which is unassuming in victory and undaunted in defeat

Don Herr and his Stutz, one of the team of three cars of this make which will strive to capture first place and as many other places as possible in the big Indianapolis classic

Indianapolis Speedway race of 500 miles are apt to prove fatal to almost any car as far as the grand prize is concerned.

This race will provide the first opportunity that the American public has had for judging the capabilities of the Knight engine when pitted against well-known exponents of the poppet-valve engine in a speed event, and it is needless to say that its performance will be watched with great interest. To add to the interest in this respect one of these cars, the Mercedes-Knight, has a four-cylinder engine, while the other is an exponent of the six-cylinder idea.

A substantial increase in the cash prizes offered for the first ten most successful cars in this event, has resulted in bringing together most of the best drivers in the world, and considering, both drivers and cars, it is very reasonable to believe that Joe Dawson's record of 78.7 miles per hour will be lowered and a speed of 79 or 80 miles per hour attained.

To the first man to cross the finishing line will be given the grand prize of $20,000, while the second man to cross the line will receive $10,000. For the next eight to follow him prizes of $5,000, $3,500, $3,000, $2,200, $1,800, $1,600, $1,500 and $1,400, respectively, will be given. In addition to these, the Motsinger company offers $1,000 to every driver who finishes within the first ten having a motor equipped with Motsinger carbureter. Findeisen & Kropf offer $1,000 in gold to the winner if his car is fitted with the Rayfield carbureter, and also the Rayfield cup, which is valued at $2,000; the Wheeler & Schebler Co. also offers $1,000 to the winner providing he uses the Schebler carbureter. As in previous years, the Bosch Magneto Co. will give three prizes of $500, $300 and $200 to the winners of first, second and third places, respectively, providing the cars are equipped with the Bosch magneto. Emil Grossman & Co. offer $500 to the winner, providing he uses Red-Head spark-plugs and the Hartford Suspension Co. will give prizes of $250, $150 and $100 to the winners of first, second and third places, respectively, providing Truffault-Hartford shock-absorbers are used on their cars. In addition to these cash prizes, the great Wheeler & Schebler cup, which is valued at more than $10,000, is offered for the first car to finish 400 miles. The Prest-O-Lite solid silver brick will be given to the first to finish 300 miles, and for the first to finish 200 miles the Remy Brassard will be given with a salary of $50 a week for 6 weeks. Altogether, it is possible for the winner of the race to come away with cash and trophies valued at more than $35,000.

Five Three-Car Teams

In this race there will be five teams of three cars each, which include the Stutz, Mason, Mercer, Isotta and Case, while the Peugeot has two entries. The Stutz team will be represented by a veteran Stutz driver in Gil Anderson and two excellent drivers in Merz and Herr, who have been recruited from the ranks of National pilots. Anderson has been handling racing cars since 1909, when he participated in the Crown Point and other races, but it was in the 500-mile race of 1911 that he earned a reputation for himself and the Stutz when he finished the 500 miles in the eleventh place. He also was a starter in the 500-mile race of 1912 in a Stutz car, so he should really know his car and the peculiarities of the track better than any other driver, for there are no others who have driven the same car in the two previous races.

Burman, who came into prominence in 1909 as a driver of the Buick cars and as winner of the Prest-O-Lite trophy at Indianapolis, afterwards became one of the best-known racing drivers in America as a result of his many remarkable performances with the Blitzen Benz. With this car he established and still holds all the A. A. A. records from the quarter mile, half mile kilometer and mile straightaways and speedways and the 1-mile for the dirt track.

Evans, who has never had an opportunity of driving a really fast car, nevertheless has a good record for consistency as a pilot for small cars and has won quite a number of competitions among the small car events.

Tower is another driven in Evans' class who has driven small cars for some time and came into prominence during the Beach races at Jacksonville in 1911, when he succeeded in winning three events.

Merz is well known on the Indianapolis Speedway, for it might be said that he was practically born and raised with it. He came into prominence in 1911 as a driver of the National car when he won a class event and was second in the free-for-all of the Panama-Pacific Race and Carnival at Oakland, Cal. Since then he has added to his laurels by coming in second in the Illinois Trophy race of 1911 and in winning the same race at Elgin in 1912. His team-mate, Herr, is also driving a Stutz in this year's event. He became famous as a racing driver in 1911 when he succeeded in piloting the victorious National in the Illinois Trophy event of the Elgin National Stock Chassis Road Race.

The Mercer team comprises three of the best racing drivers in America. De Palma is the most famous of this trio, having been the champion all-around-race driver of 1912 and being the holder of the 50-mile record for 1-mile circular dirt tracks and the 20-mile Class B Speedway record. He is one of the most sensational drivers in the world and perhaps the most capable in getting the maximum speed out of a car and holding it on the road at terrific speeds. In last year's 500-mile race, after leading up to the second from the last lap, he was forced to drop out of the competition as a result of engine trouble and he should be a very strong contender in this year's event.

Bragg, as winner of the Grand Prix in 1912, also occupies a prominent place among the most reputable drivers. He also has to his credit all of the American speedway records of from 2 to 5 miles, which were made in a Fiat at Los Angeles in 1910 and 1912.

Wishart, whose principal victory was at Fairmount Park, Philadelphia, in 1911, has won considerable prestige as a driver of Mercedes cars, having made most consistent performances with this machine in previous Speedway events and many other events throughout the country during the last 4 or 5 years. He also has to his credit the 75, 100 and 150-mile records for the 1-mile circular dirt track in a Mercer.

Isotta Has Formidable Team

The Isotta team also has two of the greatest drivers in America in Grant and Tetzlaff. Grant, who has twice driven the Alco car to victory in the Vanderbilt Cup Race, and who in the same car was second in the big race at Elgin in 1911, is recognized as one of the most competent drivers in the world and his performance in this year's 500-mile race will be watched with considerable interest.

Tetzlaff has never had anything but hard luck in his Middle West and Eastern competitions, but in the Far West he reigns supreme. He was winner of the most important event at Santa Monica in 1910 and also at Tacoma in 1912, while three events went to his credit at the Motordrome in Los Angeles in 1911. Tetzlaff also holds the 25, 50, 75, 100, 150, 200 and 250-mile American speedway records, regardless of class, the first three of these having been made in the Lozier and the last four in the Fiat.

The Case is well represented. Disbrow has been a most consistent driver for several years, having won many small events, the most important of which was at Philadelphia in 1911. Disbrow has many records to his credit. Among these are the straightway free-for-all records, regardless of class, for 150, 200, 250 and 300 miles and the 1-hour race which were made in a special car at Jacksonville in 1911, and the 3, 4 and 5-mile records for the 1-mile circular dirt track, which were made in a Simplex at Cleveland. Disbrow also won four events at Jacksonville, Fla., and four more at Old Orchard, Me., in 1911.

"Bill" Endicott has been a consistent small car pilot for a number of years. His principal victories include one event at the Los Angeles Motordrome in 1911 and the Wisconsin Trophy, which he captured in Milwaukee in 1912.

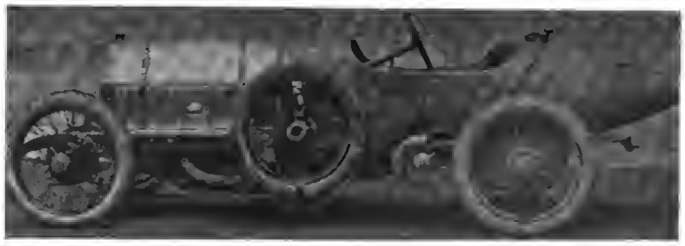
Nikrent also has won several prominent victories at Bakers-

Louis Disbrow and mechanician on his chain-driven Case as they will appear in the big race at Indianapolis on Memorial Day. Note how closely the chassis is stripped to reduce weight

The Henderson contingent. Left to right, they are Harry Goetz, the team manager; Frank Jones, mechanician and relief driver; Billy Knipper, driver, and R. P. Henderson, vice-president of the Henderson Motor Car Co.

Pilette in the Mercedes-Knight car which he will drive in the coming 500-mile race at the Indianapolis Speedway. Note the V-shaped radiator and sloping hood

Harry Endicott in the Nyberg special racer which will be his mount in the big Indianapolis race. This is one of the three sixes entered in the contest



One of the three Isottas entered in the race. The drivers nominated for these cars are Harry Grant, Teddy Tetzlaff and Trucco, the latter from the factory in Italy

The three cars comprising the Case team are somewhat different in mechanical details. They are stripped very closely

field, Cal., Santa Monica, Los Angeles and at the Los Angeles Motordrome in 1911.

Aside from the American team drivers, Mulford is perhaps the most prominent among the single entries. Mulford became famous in 1910 when he won the Elgin National and Fairmount Park races and was second in an important event at Philadelphia. He added considerably to his laurels in 1911 when he won the Vanderbilt and was second in the Elgin National. His chief performance in 1912, however, was the second place which he won in the Elgin National Road Race.

Billy Knipper came into prominence when he won the Cobe trophy race at Crownpoint, Ind., in 1909 in a Chalmers car and again when he won the small-car race at Savannah in 1910.

Wilcox became prominent as pilot of a National car and has had considerable experience on the Indianapolis Speedway, particularly in the 500-mile race as he competed in both of the previous ones. In 1911 Wilcox added considerably to his laurels at the Beach Races in Jacksonville, Fla., in which he won five events, and at the Los Angeles Motordrome, where he carried off the first prize for four events. Wilcox also holds the 1 and 5-mile record in the 301 to 450 cubic inch class.

Jenkins is a well-known driver of small cars, having made consistent performances in many of the country's important events during the last 4 years. He has driven in both of the previous 500-mile races at Indianapolis and is credited with the first place in one event at Fernbank Dam, Cincinnati, O., in 1911.

If car quality is any criterion of a race meet, the Memorial Day 500-mile international race will be the most closely-fought battle of speed kings America has witnessed. In spite of the fact motors are smaller this year than formerly has been the rule at the Speedway on account of the piston displacement limitation of 450 cubic inches, it is a safe prediction that a faster pace will be set than ever before. Not alone are the cars lighter, which to an extent makes up for the difference in cylinder dimensions, but, judging from construction and design, the engines will develop more power in proportion to their cylinder volume, and more of that power will be used in turning the rear wheels. Unless indications are at fault there are going to be fewer stops for tire changes and the cars are going to run longer without halting for fresh supplies of fuel and oil.

High engine speeds are the rule; such speeds as 2,800 and 2,900 revolutions per minute are common talk among the railbirds and in the racing camps. Greater attention is being paid to lessening the wind resistance; streamline bodies and small head-on area seem to be as much the ideal as great motor power. More attention has been paid to distributing the weight of the various parts of the car in such a way that skidding and bouncing over the brick track will be reduced to a minimum and thus tire wear reduced.

So far as the motors themselves are concerned, the American public will have an opportunity to see a greater variety of engine designs than ever has been offered. Not only will there be a

Specifications and Mechanical Details of Racing Cars Which Are to Compete in the

No.	Car	Driver	Mechanician	Number Cylinders	Bore, Inches	Stroke, Inches	Displacement	Cylinders Cast	Valve Location	Valve Inlet	Diameter Exhaust	Valve Inlet	Lift Exhaust
1	Nyberg	H. Endicott	James B. McNamara	6	4	5	389.0	Pairs	Left	1 7/8	1 7/8	[illegible]	[illegible]
2	Stutz	Charles Merz	Harry Martin	4	4.813	5.5	399.97	Pairs	Opposite	....	....	[illegible]	[illegible]
3	Stutz	G. Anderson	F. Agan	4	4.813	5.5	399.97	Pairs	Opposite	....	....	[illegible]	[illegible]
4	Keeton	Burman	Tony Jeanette	4	5 3/16	5.5	387.0	Pairs	Opposite	3 1/8	3 1/8	[illegible]	[illegible]
5	Mason	Evans	....	4	5 5/16	6	350.5	Block	....	....	....	....	....
6	Mason	Tower	....	4	4 5/16	6	350.5	Block	....	....	....	....	....
7	Deltal	E. H. Delting	....	4	5 5/16	5 5/16	299.0	....	....	....	....	....	....
8½	Stutz	Don Herr	Roy Vernon	4	4.814	5.5	399.97	Pairs	Opposite	....	....	1/2	3/8
9	Sunbeam	A. Guyot	R. F. L. Crossman	6	3.54	6.29	380.8	3's	Left	2 1/8	2 1/8	.512	.512
10	Henderson	Billy Knipper	Frank Jones	4	4 5/16	6	350.5	Block	Side	....	....	....	....
12	Fox	Wilcox	Frank Farber	4	4 3/4	5.5	389	Pairs	Head	2 1/4	2 1/4	5/16	5/16
15	Peugeot	Zuccarelli	Fanelli	4	4.252	7.2	448.0	Block	*Head	1.77**	1.77**	.315	.315
16	Peugeot	Goux	Begin	4	4.256	7.2	448.0	Block	*Head	1.77**	1.77**	.315	.315
17	Anel	R. C. Liesaw	W. Farr-R.C. Liesaw	4	4.5	5	318.1	Pairs	Head	1 7/8	1 7/8	5/16	7/16
18	Schacht	J. Jenkins	G. Sweetman	4	4 7/8	5.5	410.6	....	....	....	2.5	....	3/8
19	Mercer	Caleb Bragg	Roy Thatcher	4	4.80	6 5/16	424.36	Pairs	Opposite	2 3/8	2 3/8	5/16	5/16
21	Mercer	De Palma	Andy Vulman	4	4.80	6 5/16	424.36	Pairs	Opposite	2 3/8	2 3/8	5/16	5/16
22	Mercer	Wishart	J. Jenter	4	4.37	5	299.7	Pairs	Opposite	2 1/8	2 1/8	5/16	5/16
23	Mercedes-Knight	Pillette	B. Bruyere	4	3.937	5.118	251.33	Pairs	Ports	4 1/4x1/2	....	....	....
24	Pennebaker	R. H. Pennebaker	....	4	5.126	5.375	443.5	Pairs	Ports	....	....	....	....
25	Tulsa	Clark	Bob Moore	4	4 3/4	5.5	340.1	Pairs	Opposite	2 3/8	2 3/8	1/2	1/2
26	Isotta	Harry Grant	....	4	4.6	6	443.86	Pairs	Head	1.97**	1.97**	....	....
27	Isotta	Teddy Tetzlaff	Dave Lewis	4	4.6	6	443.86	....	....	....	....	....	....
28	Isotta	Trucco	....	4	4.6	6	443.86	....	....	....	....	....	....
29	Mercedes	Ralph Mulford	Paul Stevens	4	4.489	7.087	440.8	Pairs	Head	2 1/4	1 3/4**	....	....
31	Case	Louis Disbrow	Jess Callahan	4	5.1	5.5	449	Pairs	Opposite	3	3	3/8	3/8
32	Case	Nikrent	Fred Horey	6	4 11/32	5	448	Pairs	*Head	3	2 1/16	5/16	7/16
33	Case	Bill Endicott	C. R. Newhouse	4	5.11	5.5	449	Pairs	Opposite	3 1/8	3 1/8	5/16	5/16
35	Mason	Will Haupt	....	4	4 5/16	6	350.5	Block	Side & H'd	....	....	....	....

*Nos. 15 and 16 have valves in head at angle each side. No. 35 has L head. **Double valves.

The three Stutz cars form a strong team. They are stripped as cleanly as possible to minimize weight and wind resistance

competition between the poppet-valve and the sleeve-valve designs, but among the poppet-valve designs there will be a great variety. In addition to the familiar L and T-head and the still-older valve-in-the-head constructions, there appear two valve arrangements new to the Speedway, Dusenberg's combination of horizontal valves in the side and in the head, which made its début at Elgin last year, and the diagonal arrangement of the valves in the cylinder head of the two Peugeots, which are to make their initial American appearance.

Knight-type motors appear in Pilette's Mercedes-Knight and in the Pennebaker Special. The Belgian's mount is the smallest car in the race, having a displacement of only 250 cubic inches. The sleeve valves have two inlet and two exhaust ports, each 2.125 by .5 inches. The car weighs 2,380 pounds with driver and mechanic and full tanks. Pilette relies on continuous running rather than high speed to make a showing in the race. He believes that he will be able to run the entire distance without a stop except for tires. This is on account of his exceptionally low consumption of fuel. He finds that at the speed he will endeavor to average he gets 21 miles per gallon of gasoline and the 40 gallons he carries will take him 720 miles. He believes his 10 gallons of oil will carry him the full distance. He does not attempt to account for this economy. His combination of light weight and wire wheels, together with the fact that the weight is evenly distributed over the wheels he believes will reduce tire wear to a minimum. The car has a special oil tank on the dash, feeding to the rear end. A novel feature is the use of a V-shaped wooden shield on the front axle to cut the wind. Other features are a sharp nose and a V-radiator.

A combination of old favorites appears in No. 20, Ralph Mulford driving the Mercedes. This is a chain-drive car with 108-inch wheelbase. It weighs about 2,850 pounds, the motor has valves in the head. The brake connections are cables.

Pennebaker's motor is much larger than the others, having within 7 inches of the limit in displacement. It weighs about 2,500 pounds empty and carries the same quantity of supplies as does the other. The motor weighs 812 pounds.

The three Isottas to be piloted by Tetzlaff, Grant and the Italian Trucco, are alike so far as motor construction is concerned. They are unique in that there are two exhaust and two inlet valves in each cylinder operated by a camshaft which is above the cylinder heads. Pistons are of pressed steel and are very light. Knipper's Henderson and the three Mason cars have the Dusenberg design of motor which did so well at Elgin and Milwaukee last year. In this the valves extend horizontally into the side of the cylinder, the push rods and rocker arms working in and out instead of up and down. These cars have both pump and thermal cooling, water being taken from the bottom of the radiator in two separate pipes, one to the radiator and the other for the thermal system. The gasoline tank used by the Masons is part of the frame to prevent the breaking of connections from vibration. The Masons have turtle backs.

Great Annual 500-Mile Sweepstakes at the Indianapolis Speedway on Memorial Day

Magneto	Number Plug	Number Distributor	Carbureter Make	Size	CONTROL		TANK CAPACITY, GALS.		Wheelbase	Final Drive	Gear Drive	TIRE SIZES		Wire Wheels	Shock Absorber
					Steer	Shift	Gas	Oil				Front	Rear		
Splitdorf	8	2	Schebler	1	Left	Center	20	6	112	Shaft	2.25	34x4	34x4	Frayer	Hartford
Bosch	8	2	Schebler	....	Right	Right	25	14	....	Shaft	2.25	34x4.5	34x4.5	No	Hartford
Bosch	8	2	Schebler	....	Right	Right	25	14	......	Shaft	2.25	34x4.5	34x4.5	No	Hartford
Remy	8	2	Rayfield	2½	Left	Center	32	15	108	Shaft	2	33x4.5	34x4.5	McCue	Hartford
Splitdorf	......	......	Schebler	....	......	......	30	12	106.5	Shaft	2.25	32x4	34x4.5	....	Hartford
Splitdorf	......	......	Schebler	....	......	......	30	12	106.5	Shaft	2.25	32x4	34x4.5	....	Hartford
....	......	......	....	....	......	......	......	......	......	....	....	....	....	....	....
Bosch	8	2	Schebler	....	Right	Right	25	14	......	Shaft	2.25	34x4.5	34x4.5	No	Hartford
Bosch	4	1	Claudel	....	Right	Right	33	4	127	Shaft	....	34x4.5	32x4.5	....	Triou.
Bosch	8	2	Harroun	....	Left	Center	26	12	110	Shaft	....	34x4.5	34x4.5	McCue	Hartford
Bosch	8	2	Miller	2	Right	Right	26	12	104.5	Shaft	2 or 2.17	33x4.5	36x5	No	Hartford
Bosch	4	1	Claudel	1.7	Right	Right	36	8	108	Shaft	2	35x4	34x4.5	Yes	....
Bosch	4	1	Claudel	1.7	Right	Right	36	8	108	Shaft	2	35x4	34x4.5	Yes	....
Remy	4	1	Unknown	1½	Right	Right	30	15	112	Shaft	2.25	32x4	32x4	No	Hartford
Mea	4	1	Miller	....	Right	Right	30	10	110	Shaft	1.78	32x4.25	32x4.25	....	Hartford
Bosch	8	2	Unknown	2½	Right	Right	35	18	108	Shaft	2.5	32x4	32x4	No	Hartford
Bosch	8	2	Unknown	2	Right	Right	35	18	112	Shaft	2.5	34x4.5	35x5	Rud.-Whit.	Hartford
Bosch	8	2	Rayfield	2½	Right	Right	35	18	112	Shaft	Undecided	33x4.5	34x5	Rud.-Whit.	Hartford
Bosch	8	......	Mercedes	....	Right	Right	40	10	......	Shaft	....	32x4	34x4.5	Rud.-Whit.	Maybach
Bosch	4	1	Stearns	2	Right	Right	40	10	106	Chain	1.75 or 2	34x4	35x5	No	Hartford
Bosch	8	2	Rayfield	....	Right	Right	27	8	100	Shaft	2.3	34x4.5	34x4.5	McCue	Hartford
Unknown	8	2	Unknown	2¼	Right	Right	30	10	105	Chain	....	34x4.5	34x4.5	Riley	Hartford
Bosch	8	2	Master	2¼	Right	Right	30	10	105	Chain	....	34x4.5	34x4.5	Riley	....
Unknown	8	2	Unknown	2¼	Right	Right	30	10	105	Chain	....	34x4.5	34x4.5	Riley	....
Bosch	8	2	Rayfield	2½	Right	Right	42	10	108	Chain	1.25	34x4.5	37x5	....	Mercedes
Unknown	8	2	Rayfield	....	Left	Center	28	12	108	Chain	2½	....	....	McCue	Hartford
Unknown	12	2	Unknown	....	Right	Center	32	16	106	Shaft	2¼	32x4	35x5	....	Hartford
Unknown	8	2	Rayfield	2½	......	......	28	12	104	Chain	2½	32x4	34x4.5	....	Hartford
Splitdorf	......	......	Unknown	....	......	......	30	12	106.5	Shaft	2.25	32x4	34x4.5	....	Hartford

NOTE—The equipments given are probable but may be changed.

Jules Goux on the record-making Peugeot

Bob Burman at the wheel of the Keeton entry

Showing the wind cutting lines of the speedy Sunbeam

Exhaust side of the engine on Burman's Keeton

Massive exhaust manifold of De Palma's Mercedes

The Peugeots have two camshafts on top of the cylinders driven by vertical shaft and worm from the crankshaft. The valves are in the head, but are set into the cylinder diagonally. Valves are in duplicate throughout and the seats are on the under side of the cylinder casting, so that the valves are closed when they are pushed up. Oil is forced into the cylinders at a pressure of 30 pounds per square inch. The pressure employed in most of the American racers is in the neighborhood of 2 pounds. Pistons are cut from solid blocks of steel.

The car having the most features of interest to American eyes is the English Sunbeam. The motor is one of the three sixes in the race and is of the L-head type cast in blocks of three. Though all the valves are on the left side of the cylinder, the carbureter is on the right, the inlet manifold passing between the two cylinder castings. One of the novel features is the method of cooling the oil through a series of 1.5-inch copper tubes arranged outside of the body and running from the motor to the tail. The oiling system is a circulating one under a pressure of 25 pounds per square inch. After the oil has been used in the motor it is sent through these cooling tubes before it is returned. Another evidence of thoughtfulness is the way the waste of water from a steaming radiator is prevented. Instead of allowing the steam to shoot out the overflow pipe, the latter is attached to a coil of small copper tubing in the form of a spiral which acts as a condenser, returning the evaporation in the form of water to the radiator. Pistons are bored from a solid steel block and are very light.

The three Mercedes to be driven by De Palma, Bragg and Wishart have very much the same features that characterized this car last year. The motor is of the T-head type cast in pairs. The transverse shaft in front of the motor and carrying the pump and magneto is a feature still, but the chain timing-gear drive is supplanted by a spur gear with skewed teeth. The pistons are cast steel.

Disbrow and Nikrent's two four-cylinder Cases are similar in size and make-up. This involves a T-head motor cast in pairs and a double chain drive. There is a difference in wheelbase, Nikrent's being 4 inches longer than Disbrow's. The six-cylinder Case which Endicott is to pilot is an L-head motor with valves in the head. Two sets of exhaust valves are used. This car has shaft drive. Both Nikrent and Endicott have their balance well worked out so far as weight distribution between front and rear wheels is concerned. The four weighs only 150 pounds more in the rear than in the front, while there is only 40 pounds difference between front and rear on the six. Steel forged pistons are used on all three Cases.

Nyberg One of the Sixes

Harry Endicott's Nyberg is the other of the three six-cylinder cars entered in the race. The car has an L-head motor cast in pairs. The valves are comparatively small, being 1.875 inches in diameter and .375-inch lift. Endicott has gone in for reducing wind resistance, giving the body a streamline effect by a sharp nose and tail and a flaring shield in front of the steering wheel. The nose has fins in front of the radiator to direct the air upon it.

Burman's Keeton is one of the spectacular cars in looks as well as speed. The oddity in looks is due to the radiator location back of the motor. The motor is covered with the sloping European type of hood, which is simply a screen. The engine has T-head cylinders cast in pairs. Burman has a special brace for the steering column, illustrated in one of the sketches on this page. A vertical rod is bolted to the side frame member and attached to the column by a T. Another brace of strap steel runs from that point to the transmission. It is curved and carries the shaft of the speedometer.

The three Stutzes driven by Merz, Anderson and Herr are alike in every respect so far as can be told from the outside appearance. The motors at least are the same size, 4.814 by 5.5 inches. The Stutz company does not care to have all the details published at this time. It may be stated, however, that the motors are T-head, cast in pairs. The cars can carry 25 gallons of gasoline and 14 gallons of oil. The gear ratio is 2.25-1. There has been little attention paid to getting streamline body effects.

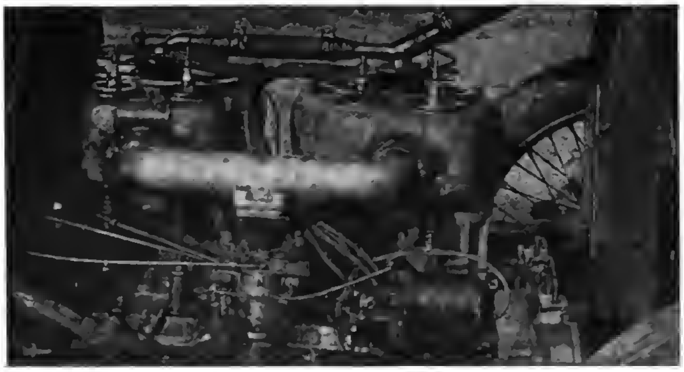
Novel Features in Fox

Wilcox's mount, the Fox Special, was built by Frank Fox, of Indianapolis, and has some novel features. The motor is a valve-in-the-head design made with 2.25-inch valves made of chrome vanadium steel lifting 9-16 inch. Empty there is 16 pounds more weight over the front wheels than over the rear, but with load the rear wheels carry 240 pounds more than the front. The wheelbase is 104.5 inches. Special pains have been taken in the balance, but Fox relies more on his own special spring suspension to prevent tire wear.

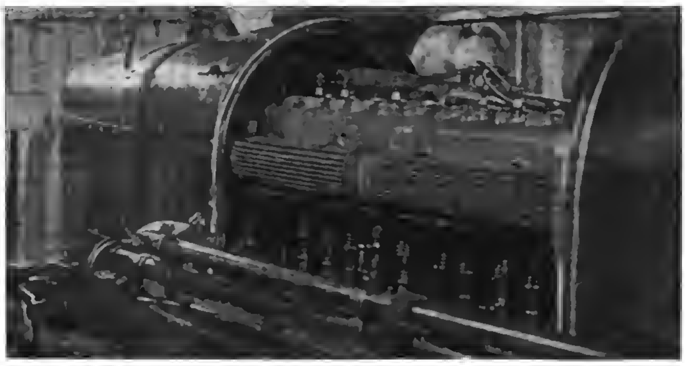
Liesaw's Anel gets its cognomen from the name Lena spelled backwards. It has a familiar type of valve-in-the-head motor with the spark-plugs stuck in the side. This car is unique in two respects. So far as known at this time it is the only one that will attempt the race without differential action and the only one not having an aluminum crankcase. Liesaw finds the bronze crankcase holds up better. There is no exhaust manifold, the exhaust being led from each cylinder directly through the hood to the air. The steering column is supported in a manner similar to Burman's, and illustrated herewith.

The Schacht which Jenkins is to pilot is the only car which has appeared so far with the sheet metal guards on the wheels which were so common last year during the tryouts.

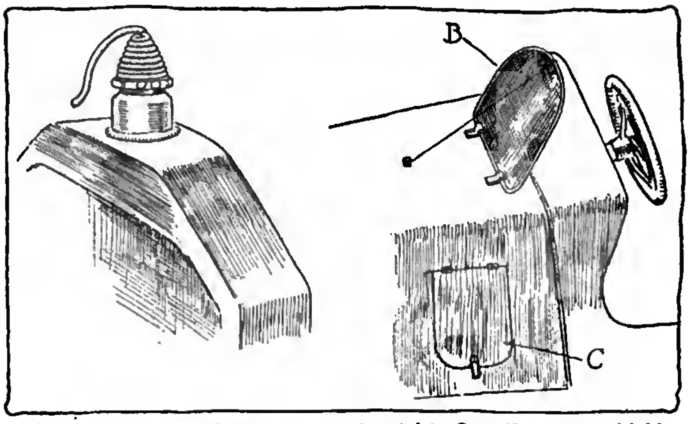
Clark's Tulsa is an Oklahoma entry and takes the name of its home city. It has a T-head motor with the cylinders cast in pairs. The car weighs 2150 empty and has wire wheels.



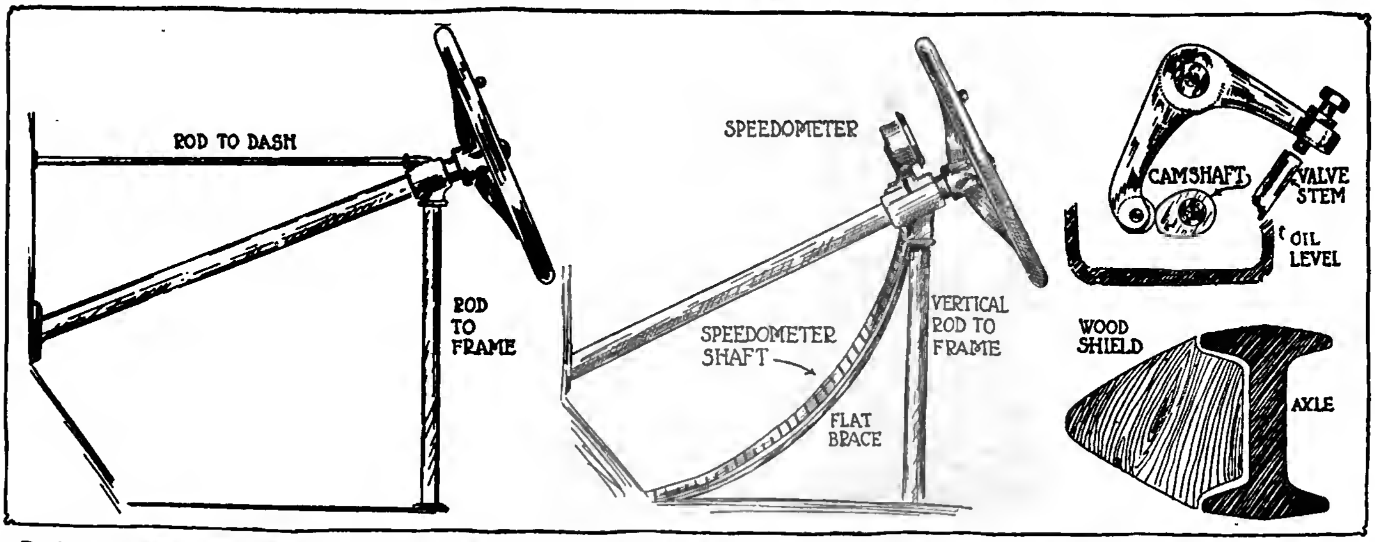
Intake side of the Tulsa motor. Note the absence of fan



View of the Sunbeam motor, showing condenser on radiator



Condenser on Sunbeam racer. At right, Guyot's gauze shield



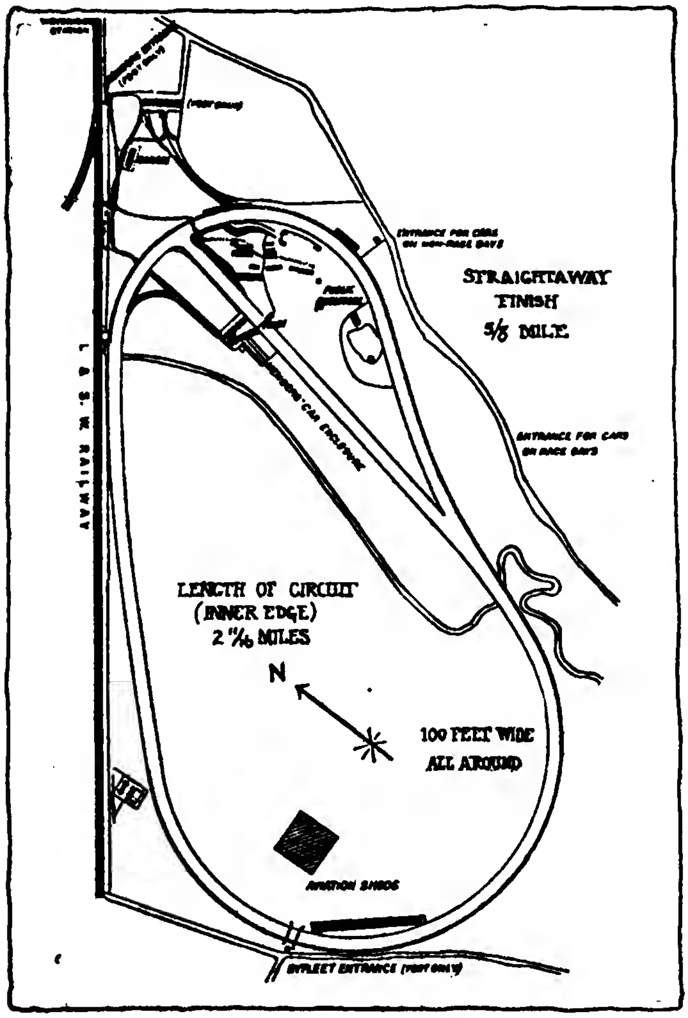
Device for supporting steering column on Liesaw's Anel. Center, Similar arrangement on Burman's Keeton, with special speedometer mounting. At right, upper sketch is valve mechanism on the Isottas, while lower shows wooden shield on front axle of Pilette's Mercedes to cut down wind resistance

Brooklands Is World's Fastest Speedway

THE Brooklands motor course, which is situated at the Weybridge Station of the London & Southwestern Railway, in England, is the fastest speedway in the world, its superiority over the Indianapolis Speedway from a speed-producing standpoint being obtained by means of the design and construction of the course as regards the greater radius of its curves and its more efficient banking. The track surface is of concrete laid to a depth of from 6 to 8 inches.

The Brooklands Speedway was constructed during 1906 and the spring of 1907 by H. F. Locke King, the owner both of the track and of the property on which it stands. It is the first of the really great speedways designed particularly for automobile competition, and the aim for constructing the track was not only to give English manufacturers an opportunity of competing in motor races on equal terms with their rivals on the Continent, but also to provide a testing ground whereon the efficiency as well as the speed of cars could be improved.

Until the Brooklands track was opened Continental European manufacturers had an enormous advantage over their English rivals, owing to the fact that important road races were held yearly on the Continent and nothing of a similar nature was possible in England. Now all this is changed. Brooklands track is always available, whereas Continental motor races can only be held once, or at most, twice a year. The advantages which English manufacturers have gained thereby have been so marked that projects for the construction of similar tracks are on foot both in France and Germany.



Plan view of the grounds at Brooklands track

The Brooklands track is somewhat of the shape of a pear; the complete circuit is 2 miles 1,350 yards. Across one corner is an internal portion of the course known as the straight which leads from the circuit of the track to the finishing lines and official buildings, the latter being situated on a space known as the paddock. Between the straight and the northeastern corner of the track are the inclosures, which, being on a natural hill, enable the spectators to obtain a magnificent view of the track. In these inclosures are erected covered stands for viewing the races, in addition to lunch rooms, refreshment rooms, cloak rooms, etc., all of which are capable of accommodating a very large number of spectators.

As for the curves of the Brooklands track, there are only two when the Straight is avoided, both of which are of a greater radius than those of the Indianapolis Speedway. The sharpest curve on the northern end being struck at a radius of 1,000 feet, while the mean radius of the longer curve is 1,550 feet. This is one of the chief reasons why the Brooklands track is faster than the Indianapolis Speedway, which really has four curves having a radius of 840 feet. The curves of this track have been scientifically banked so that even at speeds of 100 miles an hour a car driven at the proper height on the banking has all four wheels pressing equally on the track and there is no tendency to skid. One circuit of the track on the center line gives a distance of 2 miles 1,350 yards. One circuit at 10 feet from the inner edge gives a distance of 2 miles 1,263 yards. The width of the track is 100 feet. The length of the level Finishing Straight is 991 yards and the maximum height of banking on shorter curve is 28 feet 8 inches.

Track Measured for Testing Work

To enable manufacturers to carry out careful tests of their cars the track has been most accurately measured and various points marked thereon, so that with the assistance of any of the staff manufacturers can, if they wish, take accurate note of the distance traversed and for their own purposes ascertain the speeds of their cars, fuel consumption and any other details they wish to observe. A special test hill has also been constructed on accurate gradient; and with the combination of the track and the hill practically every detail of a motor car can be carefully worked out. The average gradient of the test hill is nearly 1 in 5 whilst the maximum gradient is 1 in 4.

In addition to the scientific work which goes on at Brooklands and the regular testing, the sporting side is by no means overlooked and regular race meetings held at the track are now a feature in the sporting calendar. During 1913 five large race meetings will be held in addition to numerous small ones inaugurated by county motor and cycle clubs.

Specifications of the Brooklands Speedway Construction

Length of circuit once round with finishing straight, 3.25 miles.
Length of circuit once round with finishing straight, 3.25 miles.
Mean radius of shorter curve, 1,000 feet.
Mean radius of longer curve, 1,550 feet.
Length of level finishing straight, .625 mile.
Length of level in one circuit, 2 miles.
Up gradient of the approach to shorter curve, 1 in 30.
Down gradient from shorter curve, 1 in 25.
Width of course, 100 feet.
Maximum height of bank on shorter curve, 28 feet 8 inches.
Maximum height of bank on longer curve, 2 feet 10 inches.
Number of bays or stopping places for cars, seven.

Brooklands was officially opened in June, 1907, and until near the end of 1909 it was devoted almost exclusively to motor car and motorcycle tests and competitions.

Indianapolis Speedway as 500-Mile Course

THE Indianapolis Speedway was constructed in the spring of 1909 by the Indianapolis Speedway Co., headed by C. G. Fisher, A. C. Newby, F. H. Wheeler and J. A. Allison and with P. J. Andrews of New York as construction engineer. The first races upon it were run in August of that year, while the track was still in a rather incomplete condition. As a result of the premature opening, however, several regrettable accidents occurred and fault was found with the surface of the track. Immediately after the races, therefore, the original taroid macadam surface was covered with vitrified brick, and these improvements were completed for a meet held in the fall of the same year.

The course of the Indianapolis Speedway is 2.5 miles long, 50 feet wide on the straight stretches, 60 feet wide on the curves, and is located on a plot of ground 1.5 miles long, .5 mile wide, containing 320 acres. The straight stretches are 3,301 feet long, while the ends are 660 feet long. The curves are each a quarter of a circle of 840 feet radius on the course line or 90 degrees of a 6 degree 49 foot 30-inch curve, no easement curves or spirals being used. The curves are banked to an angle of 16 degrees, 40 inches in cross-section for 50 feet of their width, the remaining 10 feet of width being banked to an angle of 36 degrees, 40 inches.

The approaches and releases to and from the bank curves are limited to a 2 per cent. grade in sections parallel with the measured course line and the maximum variation from a level plane at the course line is a 2 per cent. grade. The straight stretches are given a pitch of .8 inch in 50 feet toward the infield for drainage, thus presenting a fine flat track. In constructing this speedway, after being properly graded the whole course was resurfaced and rolled with a 15-ton three-wheel steam roller until the surface presented a smooth, firm and uniform plane. Two inches of thick gravel was then spread uniformly over the entire surface and rolled with a 15-ton roller. This was followed by a 2-inch layer of crushed limestone rolled with an 8-ton tandem roller, over which was poured 2 gallons of taroid to the square yard. This surface was then overcast with ½-inch crushed stone chips filling the voids between the larger size stone and given another coat of taroid of a lower melting point than the first part. Over this was spread a thick layer of crushed stone from .5 inch to dust in size and given a final rolling with a 3-ton tandem steam roller.

3,200,000 Paving Bricks Required

This surface, which presented the original idea, did not prove to be satisfactory, and the idea of paving over this surface with brick was evolved and carried out. In preceding with the brick paving it was decided to accept the specifications of the National Paving Brick Manufacturers' Association, and 3,200,000 pressed paving bricks were ordered for the purpose.

Two reinforced concrete bridges were built to support the track over a stream running diagonally across the southwest corner of the grounds. These bridges are 30 feet wide and 90 feet long and of a permanent character.

The main grandstand, a commodious covered structure, seats approximately 10,000. Ranging around the south turn are thirteen miniature grandstands intended for private parties, each of which will hold twenty-eight people. Then in about the middle of the south turn is another big stand, the bleachers, which will hold 4,200 more. The main grandstand is 82 feet wide and 500 feet long and there are two bleachers, one 500 by 60 feet and the other one 350 by 65 feet.

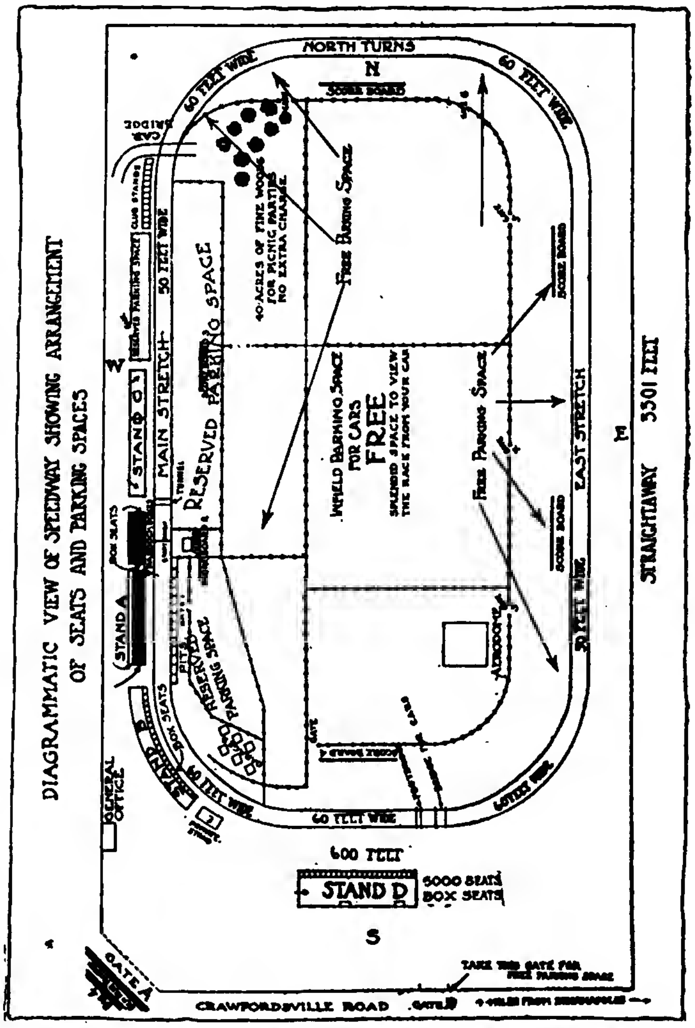
Three miles of tight board fence 8 feet high, surmounted with barb wire surrounds the grounds, the posts being set in concrete. There are 7 miles of wire fence in the infield and around the track and 1.5 miles of 8-foot picket fence, two suspension bridges for foot traffic cross the track, giving egress from the infield during the races. A truss bridge for vehicles also is provided which affords entrance and exit to and from the infield.

Piston Displacement and Speed of First Ten Cars in 500-Mile Race for 1911

Car.	1911	No. Cyl.	Bore	Stroke	Piston Distance	Time h.m.s.	Time m.p.h.
Marmon	Harroun	6	4½	5	477	6.42.08	74.8
Lozier	Mulford	4	5⅜	6	544	6.43.51	74.28
Fiat	Brown	4	5	7½	589	6.52.29	72.7
Mercedes	Wishart	4	5.1	7.1	583	6.52.57	72.6
Marmon	Dawson	4	4¾	7	495	6.54.34	72.3
Simplex	DePalma	4	5¾	5¾	597	7.02.02	71.0
National	Merz	4	5	5 11/16	477	7.06.20	70.3
Amplex	Turner	4	5 5/16	5	443	7.15.56	68.9
Knox	Belcher	6	5	4¾	559	7.19.09	68.3
Jackson	Cobe	6	5	5½	432	7.21.50	67.9

Piston Displacement and Speed of First Ten Cars in 500-Mile Race for 1912

Car	1912	No. Cyl.	Bore	Stroke	Piston Distance	Time h.m.s.	Time m.p.h.
National	Dawson	4	5	6¼	490.8	6.21.06	78.7
Fiat	Tetzlaff	4	5	7½	589	6.31.29	76.6
Mercer	Hughes	4	4⅜	5	300	6.33.09	76.3
Stutz	Merz	4	4¾	5½	389.9	6.34.40	76.0
Schacht	Endicott	4	4¾	5½	389.9	6.46.28	73.3
Stutz	Zengel	4	4¾	5½	389.9	6.50.28	73.0
White	Jenkins	6	4¼	5¾	489	6.52.38	72.7
Lozier	Horan	4	5⅜	6	549	6.59.38	71.4
National	Wilcox	4	5	7½	589	7.11.30	69.6
Knox	Mulford	6	4.8	5½	597	8.53.00	56.2



Plan view of the Indianapolis course and grandstands

Boillot, in Peugeot, Star at Le Mans

Covers 5 Kilometers in 1 Minute 56 2/5 Seconds—Average Speed 96 Miles per Hour—Two Americans Entered in Meet

PARIS, May 14—Georges Boillot, piloting the racing Peugeot with which Goux set up world's records at Brooklands recently, was the star performer at the Le Mans Whitsuntide meeting. The 5 kilometers straightaway was covered in 1 minute 56 2/5 seconds, being at the rate of 96 miles an hour. No other car came anywhere near the Peugeot's time. In the kilometer hill climb, with a flying start, over an average gradient of 5 per cent, Boillot's time was 35 2/5 seconds, being at the rate of 62.8 miles an hour. America was represented in this meeting by two Buicks, one running as a racer, the other as a touring car. In the racing section the Buick was fastest in its class, putting up 2:58 2/5 for the 5 kilometers (3.1 miles) and 48 seconds for the kilometer hill climb. The touring Buick, driven by Repusseau, showed 3:26 for the 5 kilometers and 56 seconds for the kilometer hill climb. The best time made in the touring sections, irrespective of size, was 2:36 1/5 for the 5 kilometers and 44 4/5 for the hill climb. These times were made by a new model Rolland-Pilain carrying six passengers. For the kilometer an Isotta-Fraschini tied with the Rolland.

5 kilometers—3.1 miles—Racers

Car	Driver	Time
Peugeot	Boillot	1:56 2/5
Anasagasti	Brown	3:21
Crespelle	Crespelle	2:29
Buick	Pouget	2:58 2/5
Vermorel	Gaste	3:26 2/5
Bugatti	Dillon-Kavanagh	3:23
Bugatti	Frederich	2:58

5 kilometers—3.1 miles—Touring Cars Driven by Amateurs

Car	Driver	Time
Isotta-Fraschini	Comte de Toulouse-Lautrec	2:43
Pilain	Comte de Peyronnet	3:40 3/5
Th. Schneider	Louvet	3:31
Panhard-Knight	Mitsche	5:29 4/5
Rolland-Pilain	Pouzet	4:05 3/5
Pilain	Colliere	4:36
Buchet	Durand	5:27
Bugatti	Desrochers	4:26
Baby Peugeot	Grillet	4:29 4/5

Touring Cars Driven by Professionals

Car	Driver	Time
Rolland-Pilain	Pierron	2:36 1/5
Vauxhall	Roper	3:22 4/5
Hispano-Suiza	Gsras	3:07 1/5
Pierron	D'Avary	2:23 2/5
Buick	Repusseau	3:26
F.A.B.	Lafon	4:28 1/5
Scap	Launay	3:52 1/5
Bugatti	Dillon-Kavanagh	3:38
Bugatti	Frederich	3:17

1-Kilometer Hill-Climb, Racers

Car	Driver	Time
Peugeot	Boillot	0:35 2/5
Anasagasti	Brown	0:55 2/5
Alcyon	Barriaux	0:41 4/5
Buick	Pouget	0:48
Scap	Mollet	0:56 4/5
Bugatti	Dillon-Kavanagh	0:56 3/5
Bugatti	Frederich	0:47 2/5

1-Kilometer Hill-Climb, Touring Cars, Amateurs

Car	Driver	Time
Isotta-Fraschini	Comte Toulouse-Lautrec	0:44 4/5
Pilain	Comte de Peyronnet	1:00 4/5
Scar	Lambert	1:02 1/5
Th. Schneider	Louvet	0:59 3/5
Panhard-Knight	Mitsche	1:43 3/5
Rolland-Pilain	Pouzet	1:10 4/5
La Ponette	Gilles	1:08
Bugatti	Desrochers	1:04
Baby Peugeot	Grilliat	1:23 4/5

1-Kilometer Hill-Climb, Touring Cars, Professionals

Car	Driver	Time
Rolland-Pilain		0:44 4/5
Aries		1:00 2/5
Hispano-Suiza	Gsras	0:51 4/5
Pierron	D'Avary	0:52
Buick	Repusseau	0:56
F.A.B.	Lafon	1:17
Scap	Launay	1:07 1/5
Bugatti	Dillon-Kavanagh	0:53 3/5
Bugatti	Frederich	0:52 3/5

Grand Rapids Run Sanctioned

GRAND RAPIDS, MICH., May 24—Official sanction No. 577 has been allotted by the contest board of the A. A. A. for the second annual reliability run for Grand Rapids automobile dealers and private owners, promoted by The Grand Rapids *Herald* and given under the auspices of the Grand Rapids Automobile Club.

The tour will occupy the dates of July 21 to July 25, inclusive. The route will be the central highway to Mackinaw, returning via the Lake Michigan coast semi-boulevard trail. Each day's drive will be a hammering run, early into night controls, each of which will be in some one of Michigan's famous resort cities, with a whole afternoon and evening at historic Mackinaw. The only portion of the route to be twice traversed will be the main street in Petoskey.

Wolseley Wins Canadian Climb

HAMILTON, ONT., May 24—*Special Telegram*—The first hill-climbing contest ever held in Canada took place on Saturday, Dominion Day. It was won by A. Sharp, of Toronto, in a Wolseley car in 2 minutes and 42 seconds. Other cars of 35 horsepower and over scoring victories included the Hudson, Stearns, Overland and Russell.

Plan 6 Day Tour into Virginia

PHILADELPHIA, PA., May 24—Starting next Thursday morning, the Automobile Club of Delaware County will conduct a 6-day tour of Virginia. The start will be made from Newtown Square and participants will be picked up *en route* through Paoli and

Pierron, in Rolland-Pilain, made fastest touring car time

Georges Boillot making 96 miles an hour in his Peugeot

Baby Peugeot car which took part in Le Mans meet

Buick car on a straightaway in the Le Mans meeting

Downingtown, with a noon stop at Lancaster, Gettysburg being the objective point for the first day. Various points of interest in Virginia will be visited on the second, third and fourth days, the return trip being scheduled to start on Monday.

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Sixteen Cars for Indiana-Pacific

INDIANAPOLIS, IND., May 24—The participants of the Indiana-Pacific tour which will last 33 days and cover 3,549.1 miles, will travel through eight states, following the route shown on the map herewith. Starting from Indianapolis on July 1, they will pass through St. Louis, Kansas City, Colorado Springs, Denver, Salt Lake City, Goldfield, Sacramento and San Francisco, to arrive in Los Angeles on August 2. There will be no path-finding tour, but an official pilot will travel in advance of the tourists, marking the trail. So far sixteen entries have been received.

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INDIANAPOLIS, IND., May 26—The Indiana Automobile Manufacturers' Association has received two entries from Apperson Brothers, Kokomo, for the Indiana-to-the-Pacific tour, which starts from Indianapolis on July 1. Elmer and Edgar Apperson have announced they will alternate driving one of the Apperson entries. The total number of entries for the tour is now eighteen. The route of the tour has been announced and is shown on the accompanying map.

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NEW YORK CITY, May 26—The L. I. A. C. will hold, on May 30, a run from its home in Brooklyn to the Edgewood Inn, Greenwich, Conn., which must be done in a specified time. Penalization will be for lateness, and the least penalty in combination with a secret mileage over which the trip is to be made will decide the winner of the Frank H. Newcomb trophy. Every contestant will have a chance of deciding whether he will make the trip over a short road slowly, or quickly over a long one.

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WASHINGTON, D. C., May 26—The newly organized Washington Motorists' Association will give its first run Memorial Day, to Hagerstown, Md. The event is to be a free-for-all affair, with no rules or restrictions, and it is expected at least 100 members of the association will take part.

—

$2,500,000 Cement for Transcontinental

INDIANAPOLIS, IND., May 26—The Ocean-to-Ocean Highway movement, projected by Carl G. Fisher and James A. Allison, has received a material boost by the offer of the Association of American Portland Cement Manufacturers to furnish cement valued at approximately $2,500,000 for the road. The offer is conditioned on the road being of concrete construction.

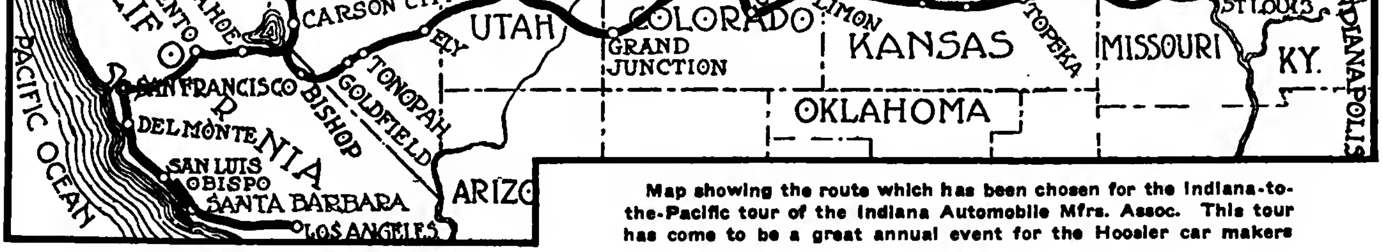
This brings the total subscriptions to the movement up to about $5,000,000, or approximately half of the $10,000,000 the promoters have undertaken to raise for the purchase of material. It is believed the offer will bring renewed interest in the project.

—

France to Allow $6,800,000 for Roads

PARIS, FRANCE, May 14.—Probably a credit of $6,800,000 will be allowed this year for the upkeep of the 38,337 kilometers of national highway existing in France. This will represent an increase of $400,000, compared with a year ago, and will be an allowance of $243.6 per mile per annum for maintenance only. For 1914 it is proposed to grant the sum of $7,200,000 for the national highways, this being at the rate of $302.25 per mile per annum. These figures deal only with the national highways of France, which have a total length of 23,831 miles, and are entirely under the control of the central government. The three other classes of roads, which are more or less under local control, have a mileage of 339,867, giving a total for all classes of made roads in France of 363,698 miles.

Recent events have shown that the credit for the upkeep of French national highways is insufficient, not having kept pace with the increase of traffic and particularly automobile traffic. Even the progressive increases made since 1910 are hardly sufficient to cover the increasing wear and tear. A proposal is now before Parliament to make a special allowance of $1,600,000 for the reconstruction of roads in most urgent need of repair. With a grant of this proportion and the projected increase for maintenance expenses the roads can be got back to their original perfect condition.



Map showing the route which has been chosen for the Indiana-to-the-Pacific tour of the Indiana Automobile Mfrs. Assoc. This tour has come to be a great annual event for the Hoosier car makers

Members of the American Society of Automobile Engineers and of the English Institute of Automobile Engineers just before setting out from the steamship pier for the Hotel McAlpin

S. A. E. Enthusiastically Greets English Engineers

Members of American Automobile Engineering Society at Pier To Meet British Delegation—Many Social Activities

NEW YORK CITY, May 27—The party of twenty-five English automobile engineers arrived here yesterday at 6:30 p. m. and were met by a large gathering of members of the Society of Automobile Engineers who had gathered in this city to greet their British guests. Three rousing cheers hailed the party as they made their way down the gangplank and the waiting automobiles whirled them to their quarters at the McAlpin Hotel.

After a rest of about an hour the male members of the party were conducted to Healy's restaurant, where a beefsteak dinner awaited them in the Jungle Room. Here the members of the party were initiated into the intricacies of the American beefsteak dinner which had been discussed frequently during the voyage. It is even stated that the members of the party persuaded the captain to closely approach the record day's passage of the Minnewaska in order to get the party to New York in time for the affair. At the conclusion of the dinner speeches of welcome were made by Toastmaster Anglada, President Marmon, P. D. Wagner, H. M. Lloyd and C. W. Spicer, the members of the New York committee and the general committee to which Messrs. Brown, Joy, Clarkson and Wheeler responded with an expression of appreciation for their hearty welcome.

The party assembled again at the McAlpin Hotel at 8:30 this morning and in spite of a drizzling rain and raw wind enjoyed an automobile trip around the city. During the forenoon the Woolworth Building was visited as well as the Battery, Brooklyn, the East River bridges, the Aquarium and the service plants in Long Island City. At the conclusion of the morning's run the party assembled at the Automobile Club of America where a buffet luncheon was served. Owing to the bad weather the baseball game had to be omitted from the program and trips to local points of interest were made instead. The New York City Fire Department has promised a drill to exhibit the working of the Metropolitan apparatus.

The program calls for a stay in New York until 9:25 tomorrow morning when the party will board the train for Pittsburgh. Two special cars have been set aside for their use and these will be sidetracked during the stay at Pittsburgh and Indianapolis.

Tire Makers Oppose Tariff

NEW YORK CITY, May 24—The tire manufacturers have filed a brief with the Senate committee under whose consideration is the Underwood tariff objecting to the proposed reduction of duty on guttapercha or india rubber, from 35 to 10 per cent. ad valorem. The makers state that the duty should be at least 25 per cent. The reasons given for the objection are the high labor cost in this country and the unconditional competition among the tire makers. It is also stated that if the reduction goes through the Goodrich company, having a factory in France, would be able to produce enormous quantities of tires for the American market, paying for cheaper labor in France; so that it would be possible for this company by the use of its French factory to "beat the Akron manufacturers off the face of the earth," according to the language of the protest.

Electric Men Object to Truck Fee Raise

BOSTON, MASS., May 24—The New England section of the Electric Vehicle Association of America, the Electric Motor Car Club of Boston and the Electric Light Companies of Massachusetts held a joint meeting here on May 20 and 21 at which the general and local problems facing the electric-car maker, dealer and user were taken up. The attendance was large, and besides listening to a series of papers, the visitors held an outing at Relay House, Bass Point, Nahant, situated on the north shore of Massachusetts Bay. The plant of the General Electric Co., West Lynn, was visited.

The following resolution was passed by the members of the three bodies present at the meeting:

RESOLVED: That the passage of any bill arbitrarily increasing the registration fees on motor trucks would be injurious to the industry as a whole, would tend to retard the industrial development of natural resources and the manufacturing growth of this state, and would seriously restrict commercial progress. Such action would be contrary to the traditional spirit of progress which has always distinguished this commonwealth and its great and general court;

RESOLVED: That such a discriminating tax would be an unfair burden upon a growing industry which is assisting to promote commerce and improve fundamental conditions in the commonwealth's industrial life;

RESOLVED: Should it be found necessary to secure additional funds for building and preserving the state highways, that a scientific investigation of actual traffic conditions should be made, which we believe would show that horse-drawn wagons and trucks tend to destroy the highways by reason of the sharp steel shoes of the horses and the narrow steel tires to a much greater degree than the broad yielding tires of the motor truck and that fees should be proportionately charged on all vehicles using the highways.

Truck Club Members Discuss Docks

NEW YORK CITY, May 26—The Motor Truck Club of this city held its monthly meeting here on May 21, when the questions of trucks and the New York docks were discussed. Steps were proposed to influence the construction of new docks, now under way, which are to be erected between Forty-second and Fifty-ninth streets, so that there be better provisions for trucks than there are at the old docks now in use.

Majority Vote To Settle Accessory Show

M. & A. M. May Hold Separate Exhibition

NEW YORK CITY, May 27—The question whether the interest of the members of the Motor and Accessory Manufacturers would be best preserved by participating in the 1914 show at Grand Central Palace or by conducting a distinct and separate show at the Madison Square Garden—an option for which has been taken by the M. and A. M.—busied the members present at today's meeting of the board of directors. If the majority of members, among whom a vote is now being arranged, are in favor of a separate show in the Garden, the latter will be held at the same time with the Palace show of the Automobile Chamber of Commerce. In case of a separate show manufacturers of motorcycles and parts of the same will be offered a chance to share in the Garden show. However, no matter what may be the vote of the majority of the members, and the consequent decision upon the course to be taken, the situation in Chicago will remain as before, so far as can be seen now, the M. and A. M. expecting to participate in the show to be held in the Coliseum, Annex and Third Regiment Armory.

This is by far the most important question now faced by the members of the M. and A. M. The body includes now a number of new members who became such since the 1913 show, after which William S. Sweet, general manager, made a trip to the West.

Light and Heating Strike Over

NIAGARA FALLS, N. Y., May 27—The strike in the plant here of the United States Light & Heating Co., which started on March 2, was settled last Friday afternoon, and yesterday mornthe 1,700 strikers returned to their places in the North End concern. The settlement was reached when Superintendent Engel of the plant agreed to reinstate all men who had been discharged because they were affiliated with labor organizations and those who voluntarily went on strike three weeks ago. Before the strike the company offered its employees a 9-hour day with 10 hours pay or a 10 per cent. increase in wages for a 10-hour work day. The men decided to return to work with a 9-hour day with the same wages they formerly received for 10 hours. No new men will be employed until all the strikers have been reinstated.

Germans Buy 300 Cars in 8 Months

BERLIN, May 16—During the 8 months ending with May 1, 1913, there were 300 American cars, worth $280,000, sold in Germany. During the corresponding period a year ago only eighty-nine cars which, however, aggregated a considerably higher value were disposed of in the empire. Similar advances of the American trade are reported from other Continental countries and Great Britain, which during the year ended with April imported 2,000 cars more than during the preceding 12 months.

Bennett General Manager for Willys

TOLEDO, O., May 24—John North Willys, president of the Willys-Overland Co., the Garford Co., the Gramm Motor Truck Co. and a number of other concerns, has announced the appointment of George W. Bennett, vice-president of the concerns named, as their general manager.

This step of John N. Willys shows the great confidence he has in Mr. Bennett as well as the appreciation of the latter's work in the past. Indications are that Mr. Bennett will now have a larger hand in the affairs of the company than ever before.

Before affiliating with the Overland interests, Mr. Bennett had been on the sales organizations of the White and Rambler concerns.

Treasury's Drawback Allowances to Makers

WASHINGTON, D. C., May 25—The customs division of the treasury department has been busy during the past week issuing drawback regulations to motor car companies. One prescribes that drawback of duties shall be allowed under section 25 of the tariff act of August 5, 1909, on motor cars designated as model T, manufactured by the Ford Motor Co., of Detroit, with the use of imported aluminum and Scandinavian brake lining. The drawback allowance is not to exceed the quantities of imported materials appearing in the exported cars, as shown by the maker's sworn statement, filed with the collector of customs at Detroit.

A similar regulation has been issued allowing drawbacks to the Abbott Motor Car Co., of Detroit, on motor cars and motor car real axles manufactured by that company with the use of imported ball bearings. The regulations stipulate that the allowance shall not exceed the number of imported ball bearings appearing in the exported cars or axles as shown by the manufacturers' sworn statement, also filed with the collector of customs at Detroit.

Drawback allowances will also be given the Stegeman Motor Car Co., of Milwaukee, on exportations of motor trucks manufactured by that company with the use of imported magnetos and ball bearings.

The American Ever Ready Co. is to receive drawback allowances on exportations of Ever Ready ignition batteries.

Chicago Subway Garage Held Up

CHICAGO, ILL., May 27—*Special Telegram*—At the meeting of the Chicago South Park Board held last week the commissioners rejected the plans for the proposed subway garage under Grant Park, on the ground that such a structure was not feasible. What action Mayor Harrison, who is sponsor for the underground garage plan, will now take is not known, although it is reported that he will request a reconsideration. Unless the park commissioners adopt the plan, it will have to be abandoned, as they alone have jurisdiction over Grant Park, which is the property of the state and not of the municipality.

A group of S. A. E. and I. A. E. members leaving the pier

Beefsteak Dinner at Healy's, where S. A. E. and I. A. E. made merry Monday evening

Nearly four-score representatives of the electric-vehicle industry and trade met at Boston last week to discuss the

Cannot Fix Retail Price

Federal Supreme Court Deems the Payment of Maker's Price Enough Protection

WASHINGTON, D. C., May 26—*Special Telegram*—One of the most important patent decisions handed down by the United States Supreme Court in many years was rendered today in the case of Bauer Chemical Co. and others against James O'Donnell, a druggist of this city. While the case primarily relates to a proprietary medical preparation, it affects many patent owners, including those in the motor-car-supply trade. Justice Day delivered the court's decision, which was decided by a five to four vote.

"Is this an attempt to restrict prices within the statutory patent right to vend?" the court said was the principal question. "To vend means to sell, of course. The difference between the copyright and patent right is that the latter gives the right to use patented articles. The thing really gives the right to use patented articles. The thing really done here is to sell, not to use, this article. When an article is sold to a jobber, the manufacturer receives his price and all the protection and immunity of the patent law to which he is entitled. He cannot further restrict the retail price at which it is to be sold to the public.

"The case is brought within that line of cases in which this court from the beginning has held that a patentee has parted with a patented machine by passing title to a purchaser."

Oldfield Patent Bill to Come Up

WASHINGTON, D. C., May 25—Insisting upon a reform in the patent laws, Congressman Oldfield, of Arkansas, is scheduled to remain at the head of the house committee on patents and when organized the committee will begin immediate consideration of the Oldfield patent bill. The bill will provide a complete revision of the existing laws relating to patents and will seek to prevent the monopolistic control of patents.

One of the objects of the measure will be to circumvent the recent supreme court decision in the Dick mimeograph case, which gives the patentee of the article control over its use and selling price. As the bill will be radical in its nature it is expected the committee will give exhaustive hearings.

Grant a New Detroit Cycle Car

DETROIT, MICH., May 24—The Grant Motor Co. has been incorporated in this city for $100,000 to manufacture a small type of car of the cyclecar class. The officers of the company are George D. Grant, president; C. A. Grant, vice-president and sales manager; David Shaw, secretary and treasurer; G. F. Salzman, factory manager, and J. M. Howe, engineer.

The car, the first model of which may be seen on the streets of Detroit now, is to be known as the Grant. It is really a miniature motor car, having seating accommodations for two people side by side. It has a 20-horsepower, four-cycle motor and a cone clutch, left drive and center control. Wire wheels are used. The tread is 56 inches and the wheelbase 90 inches. The total weight of the machine is 930 pounds and it is designed to sell at $495.

As yet no factory location has been decided upon, but the new company is very active in getting started, and will be in a position to manufacture before long.

SEATTLE, WASH., May 23.—A plant for the manufacture and distribution of the Schram car, a Seattle-made automobile, is to be established within a few miles of the city in the near future. F. A. Mitchell is secretary of the company, the other officers of which are: F. J. Carver, Seattle, president; A. J. Schram, vice-president of the California Motor Car Co., maker of the Sunset car, designing engineer, and W. R. McClelland, treasurer. The concern is incorporated at Olympia with a capital of $500,000.

The Schram will be built in four and six-cylinder models. The six, which will sell on the Coast for $2,200, will have a wheelbase of 135 to 140 inches. The four-cylinder, in touring car and roadster models, will have a wheelbase of 129 inches and will sell at $1,500.

Automobile Securities Quotations

QUOTATIONS of automobile securities on the New York Stock Exchange were subject to irregular changes this week, but due to a strong undercurrent the majority of changes was of an upward nature. However, all changes were very small, being caused by the varying relation of supply and demand.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	125	155	..
Ajax-Grieb Rubber Co., pfd	..	100	95	100
Aluminum Castings, pfd	100	..	98	100
American Locomotive Co., com	42¼	42¾	33¼	34
American Locomotive, pfd	108	108¾	102	103
Chalmers Motor Company, com	..	..	129	138
Chalmers Motor Company, pfd	..	..	98	102
Consolidated Rubber Tire Co., com	17	19	14	18
Consolidated Rubber Tire Co., pfd	55	60	60	75
Firestone Tire & Rubber Co., com	278	282	254	258
Firestone Tire & Rubber Co., pfd	106½	107½	105	107
Fisk Rubber Company, com	..	..	..	..
Fisk Rubber Company, pfd	..	..	..	100
Garford Company, preferred	99	101	..	97½
General Motors Company, com	35	36	27	30
General Motors Company, pfd	75	76	72	76
B. F. Goodrich Company, com. new	86	86½	31½	32½
B. F. Goodrich Company, pfd	108	108½	91	94
Goodyear Tire & Rubber Co., com	275	285	315	325
Goodyear Tire & Rubber Co., pfd	105	105½	98	99¾
Hayes Manufacturing Company	..	104	..	90
International Motor Co., com	28	39	5	6
International Motor Co., pfd	90	94	10	15
Lozier Motor Company, com	45	55	15	20
Lozier Motor Company, pfd	..	..	..	92
Maxwell Motor Co., com	..	..	2½	4
Maxwell Motor Co., 1st pfd	..	..	30	40
Maxwell Motor Co., 2nd pfd	..	..	11	15
Miller Rubber Company	163	165	140	150
Packard Motor Company	104½	106	98	102
Peerless Motor Company, com	..	..	45	50
Peerless Motor Company, pfd	..	..	..	96
Pope Manufacturing Company, com	29	31	15	16
Pope Manufacturing Company, pfd	73	75	47	49
Portage Rubber Co., com	..	..	35	45
Portage Rubber Co., pfd	..	..	90	95
Reo Motor Truck Company	9½	10	10½	11½
Reo Motor Car Company	25¾	26¼	20	21
Rubber Goods Mfg. Co	..	..	105	110
Studebaker Company, com	38	40	26½	27
Studebaker Company, pfd	96	98	90	91
Swinehart Tire Company	108	110	85	88
U. S. Rubber Co., com	..	..	62½	63
U. S. Rubber Co., 1st pfd	..	..	104¾	105¾
White Company	107½	108½	107	110
Willys-Overland Co., com	..	..	60	65
Willys-Overland Co., pfd	..	..	86	92

problems now faced by the companies they stand for, as well as by the users of electric passenger and commercial cars

Motz Tire Is Infringement

Cadwell Patent Anticipates It—Searchlight Cannot Refill Prest-O-Lite Tanks

NEW YORK CITY, May 26—Motz clincher rubber tires, made by the Motz Clincher Tire & Rubber Co., which is owned by the Goodyear Tire & Rubber Co., are an infringement upon the patent rights of Edwin B. Cadwell, the number of the patent being 887,997. This decision was rendered by Justice J. M. Mayer of the U. S. District Court, Southern District of New York, in a suit of Edwin E. Cadwell, Frank P. Johnston, Frank M. Ashley and the Swinehart Clincher Tire & Rubber Co., against the Rapid Safety Filter Co., of New York.

The most important passages of the decision read as follows:

Ordered, adjudged and decreed as follows:

That the letters patent of the United States dated May 19th, 1908, numbered 887,997, issued to Edwin B. Cadwell, of Detroit, Michigan, assignor of one-third to Frank M. Ashley and one-third to Frank P. Johnston (the said Edwin B. Cadwell, Frank P. Johnston and Frank M. Ashley being complainants herein), being the letters patent mentioned and described in the bill of complaint, are good and valid in law as respects claims numbers 7, 9, 10, 13, 14 and 15 thereof.

That the defendant, The Rapid Safety Filter Co., of New York, is a corporation organized and existing under the laws of the State of New York, having its principal place of business in the Southern District of New York.

That the defendant, The Rapid Safety Filter Co., of New York, subsequent to the date of issue of said letters patent numbered 887,997 and prior to the commencement of this action infringed upon claims numbered 7, 9, 10, 13, 14 and 15 of said letters patent numbered 887,997, and upon the exclusive rights of the complainants under the same, by the use, without right or license, of four rubber tires, and which said tires were substantially as described in said letters patent and the claims thereof above enumerated.

That the defendant, The Rapid Safety Filter Co., of New York, in transporting its filters used an automobile equipped with the said four rubber tires; and which said four rubber tires were manufactured by The Motz Clincher Tire & Rubber Co., of Akron, Ohio, and known as the Motz tires.

That a perpetual injunction issue out of and under the seal of this court, enjoining and restraining the defendant, The Rapid Safety Filter Co., of New York, its officers, directors, associates, attorneys, agents, salesmen, clerks, servants and workmen, and each of them, from in any manner, either directly or indirectly, using or causing to be used the said four rubber tires or any of them on any automobile or otherwise or any other similar tires containing and embodying the invention described in the aforesaid claims numbers 7, 9, 10, 13, 14 and 15 of letters patent numbered 887,997.

Motions Denied in Hartford Suit

NEW YORK CITY, May 26—The motion of the Hartford Suspension Co., in U. S. District Court, Southern District of New York, praying for an injunction against the Concrete Bumper Co., has been denied by Justice Lacombe, as was the motion of the defendant to dismiss the bill of complaint. The latter refers to the making of bumpers, the bars of which are filled with concrete. The answers will be filed in the near future.

Abbott Reorganization Completed

DETROIT, MICH., May 27—*Special Telegram*—The complete reorganization of the Abbott Motor Co. by which the control of the business virtually comes into the hands of its creditors has now been effected. Nearly all of the concern's indebtedness is represented in the new directorate which provides a long extension of time on outstanding indebtedness and gives additional money for the proper carrying out of the business.

In addition to the officers announced in THE AUTOMOBILE for last week, A. E. Shaefer, formerly of the Ohio Motor Car Co., vice-president and treasurer, Wade Millis has been made secretary, completing the management. The Board of Directors consists of nine, all except two of the members of which have been named. In addition to the officers, A. W. Lewis, of the Timken company; H. I. Mallory, Weston Mott company; G. W. Rogers, of the Goodyear company, and H. M. Preston, who was heavily interested in the Olds company, have been chosen.

Not to Refill Presto-O-Lite Tanks

INDIANAPOLIS, IND., May 26—In the United States court here last week, Judge Albert B. Anderson handed down a decision in the suit brought by the Prest-O-Lite Co. against the Searchlight Gas Co., in which an injunction to prevent the refilling of Prest-O-Lite Co. by the Searchlight company, together with an accounting and damages, was asked.

Judge Anderson issued a permanent injunction, enjoining the Searchlight company from refilling the Prest-O-Lite tanks before the Prest-O-Lite name plate has been removed. He denied the accounting and damages that were asked.

Market Changes of the Week

SHARP breaks accompanying sluggish markets occurred this week in Bessemer and open-hearth steels, the former dropping $2 per ton and the latter $2.50. Lead was more active and firmer, rising $0.05 per hundred pounds. Tin experienced a rise of $0.18 per hundred pounds, in anticipation of higher rates after the Banca sale in Holland, when 2,500 tons will be offered there. The principal development of interest in the petroleum markets was the announcement of further chartering for exports of petroleum to Norway and Sweden. About 15,000 barrels will be shipped. Both petroleums from the Pennsylvania and Kansas wells remained constant holding their former prices of $2.50 and $0.88 per barrel, respectively. The cotton-seed oil market again promptly responded to the strength in lard with a slight gain of $0.07 per barrel in price. A moderate demand is reported from the dealers in automobile scrap rubber, the market is steadily holding its own and future trading has a promising outlook.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.		.07½	.07½	.07½	.07½	.07½	....
Beams & Channels, 100 lbs.		1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton		27.00	27.00	25.00	25.00	25.00	—2.00
Copper, Elec., lb.		.15⅜	.15⅜	.15⅜	.15⅜	.15⅜	....
Copper, Lake, lb.		.15¼	.15¼	.15¼	.15¼	.15¼	....
Cottonseed Oil, lb.		7.08	7.11	7.10	7.13	7.15	+ .07
Cyanide Potash, lb.		.19	.19	.19	.19	.19	....
Fish Oil, Menhaden, Brown		.34	.34	.34	.34	.34	....
Gasoline, Auto, 200 gals.		.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime		.95	.95	.95	.95	.95	....
Lead, 100 lbs.		4.30	4.30	4.30	4.30	4.35	+ .05
Linseed Oil		.48	.48	.48	.48	.48	....
Open-Hearth Steel, ton		28.50	28.50	26.00	26.00	26.00	—2.50
Petroleum, bbl., Kansas crude		.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa. crude		2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined		.68	.68	.68	.68	.68	....
Silk, raw Italy		....	4.35	....	....	4.35	....
Silk, raw Japan		....	3.70	....	....	3.70	....
Sulphuric Acid, 60 Baume		.90	.90	.90	.90	.90	....
Tin, 100 lb.		48.20	48.80	48.40	48.40	48.38	+ .18
Tire, Scrap		.10	.10	.10	.10	.10	....

California Has Model Law

Raises Speed Limit from 20 to 30 Miles Per Hour and Overrules All Local Ordinances

SAN FRANCISCO, CAL., May 23.—The new motor bill passed by the California legislature is the most advanced and comprehensive automobile statute that has been enacted. The bill in general follows the draft of the measure prepared by the Automobile Club of Southern California and except for the amendment providing for the collection of an annual license fee based upon horsepower, it is in all essentials the one fathered by the club.

It also raises the speed limit on country roads from 20 to 30 miles per hour and unifies the speed laws of the various towns and cities within the State by establishing minimum speed limits which cannot be abrogated by local ordinances.

The state has also decided that the annual license fees will be as follows:

For cars of less than 20 horsepower	$5
Between 20 and 30 horsepower	10
Between 30 and 40 horsepower	15
Between 40 and 50 horsepower	20
Between 50 and 60 horsepower	25

Annual Licensing Proposed for D. C.

WASHINGTON, D. C., May 26—*Special Telegram*—Annual registration of all motor vehicles, the payment of an annual license fee and the repeal of the wheel tax on automobiles are provided for in a bill framed to regulate the licensing, registration and operation of motor vehicles in the District of Columbia, forwarded by the commissioners to Congress today with a request for its early enactment.

The object of this bill is to vest in the commissioners complete authority to regulate automobile traffic in the district. Section 5 provides for the repeal of all existing laws and regulations on the subject and authorizes the commissioners to make all the necessary regulation anew, to impose all necessary license fees and penalties for violations of the regulations, and to prosecute such violations. It is further provided that all existing motor licenses shall be made to expire December 31, 1913. On and after January 1, 1914, owners of motor vehicles shall be required to obtain new licenses based upon regulations to be adopted by the commissioners. The existing rules governing the operation of motor vehicles in the district are included in special acts of Congress regulations promulgated by the commissioners under special authority delegated to them by Congress and regulations made under their general police authority. The commissioners' views regarding the proposed legislation are set forth in the following letter addressed to Senator Smith, chairman of the Senate Committee on the District of Columbia:

"The commissioners believe that the present speed limits fixed by an act of Congress should be amended and the matter of speed should be left to them to adjust by regulation as the necessities of the case may require. They believe that there should be an annual registration or license fee for motor vehicles and that the existing act of Congress which has been construed as requiring the fee to be paid but once should be repealed. They believe that the imposition of an annual wheel tax against motor vehicles should be repealed. There is no necessity for such a wheel tax, if the proper annual registration of license tax is imposed. At present the owner of a motor vehicle has to pay a registration or license fee, an annual wheel tax and an annual personal tax on a motor vehicle as personal property. The whole matter of the proper annual license fee to be paid should, in the commissioners' judgment, be under their control.

"The commissioners believe it more advisable for Congress to delegate to them the authority of handling the question of automobile traffic than that it should be handled directly by Congress. Conditions change, especially as to the matter of speed and traffic regulations, and if conditions should arise which would warrant changes, the commissioners are not free to bring about the change without the delay incident to a modification in the law by Congress.

"If the commissioners handled the matter, such changes could readily be made by a change in a regulation. The matter is one coming within the general police power, such as has been delegated to the commissioners by Congress and there seems to be no reason why motor vehicles should be exempt from the general police power of the commissioners as is now the case.

"It would be the intention of the commissioners in exercising the authority proposed to be conferred upon them by the bill, to prepare and adopt usual and reasonable regulations such as are in force in other jurisdictions governing the matter of automobile registration and traffic. Under such general authority they would have the power to enter into reciprocal relations with other jurisdictions."

HARRISBURG, PA., May 26—The Grabe Pennsylvania state tax bill, providing for a special fund for the improvement of streets and roads in boroughs and townships, was passed by the house this week. The bill directs the state authorities to collect a one-mill tax for the street and road improvement on personal property, capital stock, bonds of corporations, gross earnings of corporations, bankers, brokers and foreign insurance companies and also on capital stock of brewing companies.

The money thus raised, estimated between $5,000,000 and $6,000,000, is to be kept by the state as a separate fund and to be expended by the state highway commissioner, the distribution of money to be made on a mileage basis of the streets and roads of each borough and township. The bill provides that its provisions become effective December 1, this year, and the distributions are to start April 1, 1915.

Idiotic Tire Bill in Illinois House

NEW YORK CITY, May 27.—A bill is now before the two houses of the Illinois legislature which compares even with such measures as the New York tire-dating bill like a criminal of many years' experience does with a new-born orphan boy.

This product of human genius (?) reads as follows:

Be it enacted by the People of the State of Illinois, represented in General Assembly: That it shall be unlawful, within this state, for any person, firm or corporation to sell, resell or otherwise dispose of any tire to be used on any motor vehicle, unless the same shall have been properly stamped, clearly and legibly, and in the English language, with a die, and in such manner, designate thereon, the date when such tire was originally manufactured or made (or when, if such be the condition, such tire was repaired, with the date of such repair, and whether the same is a new or second-hand tire, and whether or not the same has previously been used) and such tire (when new) shall have a tag pasted thereon, showing the ingredient, composite and component parts thereof.

Violation is to be punished with a penalty of from $50 to $200 for each offense. The bill in this form is No. 217 of the Senate, introduced by Mr. Manny. With the passages in parentheses obliterated, it was introduced by Assemblyman Sullivan as House Bill No. 673.

In this bill, tires are looked upon with as much spirit of national economy as pure food, although it were undoubtedly more to the point, if such measures would be proposed with reference to shoes, hats, toothbrushes, etc., etc.—even though the matter would remain just as ridiculous. So much for the repair history. As to the tag showing the composition of the tire, this is most absurd, as no sane man would seriously expect a manufacturer to proffer his experience, which is a principal part of his business capital, to anyone buying a tire for a few dollars. But, however foolish a measure the bill, it will not escape the eyes of motorists and doubtless will be nipped in the bud.

Night Lights in Connecticut

HARTFORD, CONN., May 26—A bill calling for lights on all light spring vehicles after sunset was called up this week by House Chairman Macdonald in the state legislature. He moved concurrence with the senate amendment which changed the time of lighting from one-half hour after sunset to one hour after sunrise, which was adopted. The Macdonald amendment excepted highways lighted all night by municipalities. This was passed and Mr. Macdonald moved the adoption of the bill. The bill was carried 125 to 54.

Pennsylvania Fights Light Bill

HARRISBURG, PA., May 26—The Pennsylvania Motor Federation is fighting for the senate bill which requires all vehicles to display a light at night. The bill has passed the senate, but is being held up by the public roads committee of the house. This would mean that all carriages, wagons, carts, etc., on the roads at night would have to be equipped at night with lamps. With this law in effect collisions would probably cease.

Nutmeg State Wants No Bridges

HARTFORD, CONN., May 26.—A bill has been introduced in the Connecticut legislature passage of which would put the entire cost of highway bridges on the state. It was pointed out that such a measure once it became effective would let the trolley companies out of their share of cost. An amendment to the act calling upon the state to build and maintain all highway bridges up to 40 foot span was denounced as revolutionary. The state could not stand the expense, it was pointed out.

Makes 87 m.p.h. on Benzol

English Driver Proves Practicability of New Fuel for High Speeds at Brooklands

LONDON, ENG., May 23—One of the most convincing tests on benzol for high speed work was carried out this week on the famous Brooklands racing track, when Louis Coatalen successfully attempted new records in the class to which his car belonged. The 12-16-horsepower Sunbeam car which he drove, running on benzol instead of gasoline, has a bore of 80 millimeters and stroke of 120 millimeters, which is 30 millimeters shorter in stroke than is the case with standard cars. In fact, interest will be aroused when it is mentioned that the engine fitted into this car is identical to those that were installed in the Sunbeam-engined boats that competed at Monte Carlo, and it was owing to the success attained in marine work that Mr. Coatalen decided to see what results could be obtained with benzol on the track. New records were created in the Brooklands cubic capacity class C, wherein the volume must not exceed 150 cubic inches, or 2,458 cubic centimeters contents, so that the Sunbeam engine was well within its class range, being only 2,431 cubic centimeters in volume, or 45 cubic centimeters less than the limit allowed.

For the flying half-mile this car attained a speed of 86.96 miles an hour, and from this distance all class records up to ten laps of the track, or 28 miles, were broken. The ten laps were covered at a speed of 82.5 miles an hour. There is therefore no further room for doubt concerning the efficiency of benzol, for as compared with the previous records set up in this class with engines running on petrol, we find that the records for the ten laps was only 72.46 miles per hour, compared with the new figures of 82.5 miles an hour, and for the half mile the previous best stood at 75 miles per hour, and the old figures were created by cars which had a larger cubic capacity volume than the Sunbeam engine. One point that must not be overlooked is that when starting on the ten lap journey in the first lap, from a standing start, progress was slow, but as soon as the engine warmed to its work it gave a speed of 84 miles an hour.

Fear Corner in Benzol

LONDON, ENG., May 20.—Things are developing rapidly with regard to the use of benzol in automobiles in England. The one possibility to be guarded against today is that benzol may be cornered. In fact, there are rumors already of a combine to control it. The suggestion has been made by *The Motor* that the state step in and prevent anything in the nature of trust methods being adopted in handling this new fuel.

The whole motor community is agog with excitement on the subject, particularly as tests with the coal spirit result in surprising results. The engine pulls better with it and a greater mileage per gallon is obtained with it. At Birchenwood in Staffordshire a huge plant for producing motor spirit and all the other by-products has been in full swing for some time, but the bulk of the spirit is contracted for abroad, and the coke produced after all the products are obtained fetches a good price—and is in great demand for metallurgical purposes. The interesting point about this and other plants is that coal of quite indifferent quality can be treated and will produce very good spirit. If plants were erected at other collieries like that at Birchenwood or on the lines of the del Monte low-temperature system our prodnction of home spirit would supply all our requirements without the necessity of importing a single gallon per annum, and we should be using up coal slack or dust and coals of so poor a quality that they are a drug on the market. For instance, cannel coal is a coal that was once used for gas-making in the old days before the use of incandescent mantles. To-day that coal which is too rich in gas cannot be used by the gas companies, so it is running to waste. By either the Birchenwood or the del Monte process this coal yields 20 gallons of excellent spirit to the ton, but the residue is not so good as a burning fuel as that produced by some other coals. Cannel is a slatey-looking coal and is hopeless-looking stuff as a fuel, yet is rich in oil, and what is most interesting is that the supply available for distillation purposes is enormous.

It will be gathered from all this that, providing our collieries erect the plant for treating coal at the pit mouth, by extracting all its valuable properties, which under the wholly wasteful usage hitherto existing have been entirely lost, Great Britain can supply herself at home with all the crude oil and motor spirit she requires, thus rendering her independent of outside supplies, and making her position secure in time of war when her imported supplies might conceivably be cut off.

The position at the moment of writing is an extremely interesting one, and the possibilities are great. I do not think there is any doubt about the ultimate development of the scheme on the broadest possible lines, and I feel quite confident that Great Britain is on the eve of one of the most remarkable industrial revolutions yet recorded in her history.

Put concisely, the scheme is to trap the wastage that can be seen belching from every factory chimney stack and household dwelling in the country and turn it into power and profitable materials, and at the end of it all to produce smokeless fuel. That is the ideal, and we are now on the very eve of its realization.

The reader may ask what about the possibility of the gasoline trust cutting prices when faced with competition of the serious nature portended. Well, that is exactly what I have in mind when I say we must call in the state. This is no small matter of individual interests. It is vital to the country that it shall have its liquid fuel unfettered by any mind of rigging combine. It has been figured out on some processes that the motor spirit can be given away and still the other products will produce a huge profit.

Recently the plant at Birchenwood has increased its output of benzol to over 3 gallons to the ton of coal.

An important development of the home-produced fuel problem is to be found in the fact that our leading daily newspaper, *The Times*, has now fallen in line and in one of its recent engineering supplements deals very fully and very capably with the whole subject of motor fuel production from coal, confirming and emphasizing all that has been published in *The Motor* since it started its advocacy of benzol. This is a very significant step.

With regard to gasoline the situation is unchanged. Prices are unchanged, but the oil controllers are viewing the growing demand for benzol with some signs of uneasiness. At present there are difficulties in obtaining the English spirit in many parts of the kingdom, but as soon as we can create sufficient demand at home to hold up the exports, supply and demand will adjust themselves. The gasoline people are wonderfully organized here as regards distribution, but the benzol business is for the present quite hopelessly handicapped in that direction. There are restrictions about distribution in bulk—the 2-gallon can is the only legalized form—which place it at a very serious disadvantage. Shell spirit can be purchased in 2-gallon red tins in every small village throughout the kingdom.

Ohioans Against Double Tax Law

COLUMBUS, O., May 27—Both of the warring factions in the Ohio State Automobile Association were brought together and all differences were buried at the annual meeting of the organization held at Columbus May 24. The meeting was harmonious in every respect and was attended by representatives from seventeen auto clubs in the Buckeye State. In all thirty-seven delegates were present representing about 4,000 members of all of the clubs.

One of the most important actions was the adoption of a resolution instructing the new executive committee to take legal steps to have the new Warnes double-taxation law declared unconstitutional.

Officers were elected as follows: President, C. C. Janes, Columbus; first vice-president, G. E. Mentell, Springfield; second vice-president, W. L. Faunce, Youngstown; third vice-president, W. L. Winning, Dayton; secretary, L. M. Browne, Columbus, and treasurer, J. H. Allen, Kenton. The president was empowered to name all standing committees.

AUSTIN, TEXAS, May 24—In order to show the need of legislation governing the registration of automobiles and with a view of having a measure of this character passed at the special session of the law making body which is to be held in July, statistics have been collected showing that in 1912 there were 10,000 automobiles registered in Texas. This shows an increase of 65 per cent. over the registration in 1911.

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The Indianapolis Cars

IN the descriptions and specifications of the cars to contest in the 500-mile race at Indianapolis this week the observer cannot but note the reduction in motor sizes as compared with a year ago, the maximum limit for this season being 450 cubic inches as compared with 600 a year ago. The result of this reduction cannot be stated until after the race but the management is to be congratulated in reducing the maximum of last year by 25 per cent. in that it is in keeping with present day trends of automobile construction. From announcements already made by manufacturers, the motors of 1914 will average lower in horsepower than those of 1913. There is a general reduction in bore and stroke. Racing has taught its lessons in Europe and America and will continue to teach them and if Friday's race of this week, under conditions practically parallel to those of a year ago, can demonstrate speeds as fast as made by the winner last year then there is done genuine good. The days of bulk are passing, the days of efficiency are at hand. The small motor is showing its superiority in test and in economy.

This year France is combining fuel economy with speed in its important road races It is to be hoped that next year Indianapolis will add the fuel economy feature and also the oil feature. By so doing the management will be conferring a favor on the industry at large in this country.

A Three-Fold Contest

THE recent Catskill reliability contest, in which reliability on the road, hill-climbing reliability and economy of gasoline consumption were taken into consideration as factors in determining the grand winner, has opened the way for developing increased interest in competitions of this nature. Some years ago the individual reliability contest was an attractive field of battle for the manufacturer. The hill-climb was equally interesting. The economy contest never became popular but, whenever held, developed not a little interest It lacked the spectacular features of the hill-climb and the continued interest of the long-distance reliability. Combining the three proved particularly popular in the contest referred to and will be a success in future.

The three-in-one contest meets the requirements of the automobile owner better than any other type of contest. It develops economy and reliability.

The most satisfactory method of properly proportioning the importance of each with regards to the other must receive consideration. On a basis of 1,000 points 600 were given for reliability; 200 for hill-climbing and 200 for economy in the test referred to. It is debatable if this proportion should not be slightly altered, giving 250 for economy and 150 for hill-climbing.

It will not be too difficult to accurately gauge the relative economy of the contestants because under the formula generally used, which takes into consideration the vehicle weight with load and the amount of gasoline consumed, it is possible to put all of the contestants into a common division and give the small car an equal standing with a large car, the reasoning in connection with this being that the lighter weight vehicle will have a smaller motor, proportional to its load, than the larger vehicle. In years past it has been generally argued that the economy run decided on these two factors has generally favored the heavier vehicle and placed a premium on weight. It is a question of open debate whether this has actually been the case or not, and if it can be proven that such is the case then the formula should be altered so as to place a discount on weight and a premium on that nicety of proportion between motor capacity and load carried so that the motor will work at its point of maximum efficiency most of the time.

A new scheme of reckoning must be established for hill-climbs; in other words a formula must be introduced the same as in fuel tests. Some years ago a formula was used in determining the winner in the Algonquin Hill-Climb at Chicago. This formula took into consideration the weight of the car, the piston displacement of the motor in cubic inches, and the length of time to climb the hill computed in seconds. The result was that all of the vehicles competed in a common class so far as determining their standing was concerned. It is possible to use some similar formula in the new three-in-one contest, and the results so obtained would be immeasurably more satisfactory than those obtained on a time basis only.

It is to be hoped that more of these three-way contests will be staged. It is excellent advertisement to the industry. It gives an opportunity of renewing that interest in contests of this nature which is so desired to-day.

The Ideal Garage for Electric Cars

From a Paper Read by H. M. Martin Before the Electric Vehicle Association of America, at the Meeting Held Tuesday Evening, May 27.

SIMPLICITY and cleanliness are the electric's prominent characteristics, and these ideas can be exemplified in an electric garage which will be complete in every detail, and yet be in strong contrast to the more elaborate equipment and larger space necessary to garage and repair gasoline cars.

The location of the garage should be central with regard to the places of business of its customers. Since customers are not usually promised in advance, other conditions assume greater importance. If possible, it should be on a well-paved street near a main artery of travel—and here we strike the first necessity for compromise since property of this description will probably be too expensive.

The number of floors of the building will be determined by a compromise between the cost of additional vertical construction with all that that implies, elevators, etc. Particularly if there are many floors, the elevators (of which there must be at least two) will be of as high a speed as good judgment will allow, because on the elevators' speed will depend the number of cars that can be accommodated.

Electric Elevator Control

Electric control from the car should, of course, be employed instead of the usual hand rope. The electric control precludes the possibility of starting the elevator by anyone not on the platform itself. Automatic gates will prevent, nine times out of ten, the serious accident of having a car fall down the shaft.

It is preferable to have no posts to interfere with the free movement of cars, though to leave them out will add materially to the initial expense and make the floors thicker and the whole building higher. If posts must be used, let them be spaced with regard to the number and sizes of cars that are planned to stand between them.

Concrete floors should be painted with a preparation giving them a smooth surface which is easily cleaned and saves the concrete from wear and gritty dust from rising. These floors should be pitched slightly from the center line down to the side walls, both ways, with gutters formed in the concrete along the walls so that washing may be done, if necessary, without moving the cars.

Lighting should be well distributed, and each floor's lights controlled in several groups for the sake of economy of current. Around the walls, at frequent intervals, receptacles should be installed for drop cords so that these need not be of an unhandy length. The wall receptacles should be of sufficient capacity to take care of a portable drill.

The heating system should be ample to keep all floors, where cars are stored, up to at least 30 degrees during the coldest weather. This is essential in order to start the batteries out warm. A gasoline garage can get along with any temperature above 32 degrees, but not so with the electric.

The charging equipment, switchboard, wiring, etc., should be of approved type, solid and well erected. This apparatus is so standardized that no special remarks are necessary except to suggest that rheostats, being usually grouped as closely together as their frames will permit, should be ventilated in summer.

Ventilation should also be well looked to in the battery repair room, for here batteries are often gassing for a day or more on their initial charge. The floor of this room demands special attention, acid-proof brick or tiles laid in pitch being the best construction. It is of the utmost importance that the drainage system from this department—all the way to the sewer—should be either of lead or glazed earthenware, and preferably run as "open plumbing," not buried in the walls.

A small machine tool equipment is a very useful adjunct in an electric garage, even where most of the work is sent out. A lathe, drill press and emery wheel will do most of the odd jobs that come up from day to day. A more complete equipment would include a sharper milling machine and power hack-saw. If the garage is to be complete to handle everything that may become necessary, it should include well-equipped carpenter and paint shops. There is much to be said in favor of this, since then a car need never leave the garage except for its daily work.

Now as to management: In the first place, let there be one head to the entire system. If it is possible (and it ought to be nowadays) to combine in one person business ability and a thorough technical knowledge of the industry, then this is the desideratum. If not, then let the head be by choice a good business man, with a broad enough mind to know his limitations in other fields and to trust his well-chosen subordinates.

There are a number of important questions that come up for decision almost daily in the operation of a garage. For instance, shall the customer be billed for accidents which may have been preventable? There are some garage managers, I am afraid, who regard such accidents in the light of "acts of Providence" especially provided to furnish them a source of revenue. In general, it may be said that a public garage cannot afford to have as many really preventable accidents as a private garage can.

Another question is, just what repair shall be included in the flat monthly rate? Minor adjustments are conceded without extra charge, but there are a number of repairs that become necessary from time to time that hardly come under this head. An owner asks to have his smashed tail lights straightened out, or new licenses put on, or perhaps says: "Just lend me a bell, or a spring, or an armature (as the case may be) until mine is repaired," the word "just" indicating that he does not expect to be charged for the service. Sometimes it is hard to decide just how far generosity can be stretched, but, as a rule, I may say that it all depends on the customer's record.

Small Cars Pay the Dividends

At the present rates charged for garaging, the small cars are the ones that pay the dividends. This is not because the rates are so far from equable, but because the small car on the average does not carry so large a proportion of its possible load as does the large one.

In dealing with the owners of commercial cars, as a rule, it is only the recent purchaser who is unreasonable and not willing to meet the garage management half way in the matter of disputes on bills or service rendered.

A few words about pleasure cars:

In dealing with the owners of pleasure cars, considerable tact is required, rather than straight business acumen. A good many of these owners have no special interest in understanding the workings or limitations of their cars, and consequently there is no common ground on which an argument can be based. On the other hand, some owners consume a lot of the garage manager's time in arguments and explanations of "how it all happened." Both the commercial car manager and the pleasure car manager have all they can do, but the first has the easier job.

The 1913 Targa Florio

Nazzaro's Skilled Driving and Reliable Car Are Winning Factors

PALERMO, SICILY, May 14—Felix Nazzaro's success in the Targa Florio race was due to skilled driving and an absolutely reliable car. It was a race in which the man counted for much. Starting from Palermo, the competitors had to make a complete circle of the island of Sicily, the road keeping within sight of the Mediterranean practically the whole of the way. Throughout the 650 miles there was not a straight stretch of more than a quarter of a mile, the greater portion of the route forming a ledge cut on the mountain side, with hairpin turns, and short, steep gradients. The regulations allowed a cylinder volume of 549 cubic inches, but owing to the nature of the road it was impossible to make use of all the power available from such dimensions and very few of the competing cars approached the limit. Quick acceleration was an important factor, the weight problem had to be carefully studied, the cars required a wide steering lock and moderate wheelbase and the course was too dangerous for dare-devil driving. No attempt was made to guard the roads: the competitors had to take their chance of meeting with mountain mules which became scared at the sight of an automobile, and of Sicilian peasants who were hardly less frightened.

Thirty-seven Cars Start

Thirty-seven cars lined up for the start, which was given in the center of the town of Palermo at 5 a. m., the first car to get away being a Minerva with Knight motor. The others followed at intervals of 10 minutes. Practically all the cars were standard touring models stripped as low as possible for racing purposes. The equipment consisted of nothing more than a couple of seats, a gasoline tank, three to five spare wheels or tires, and a couple of headlights. These latter were necessary on account of the start of the second stage of the race being given to the leading car at midnight. Italians figured most prominently in the race. Among the foreigners were five American cars: an Overland, two Fords, a Metz, and a Flanders. France had an eight-cylinder De Dion Bouton and a 20-30 Renault; Belgium had one Minerva, with Knight motor; Switzerland had a couple of Sigma, also with Knight motor: and Germany was represented by a Mercedes team.

The first stage stopped at Girgenti, after a run of 447 miles. The real struggle on this stage was between Felix Nazarro, on his own car and Marsaglia on the Aquila-Italiana of which he is the designer. Marsaglia had started eighth, or nearly 2 hours before Nazzaro, and was therefore not aware how dangerous his competitor might be. This first stage proved a weed-

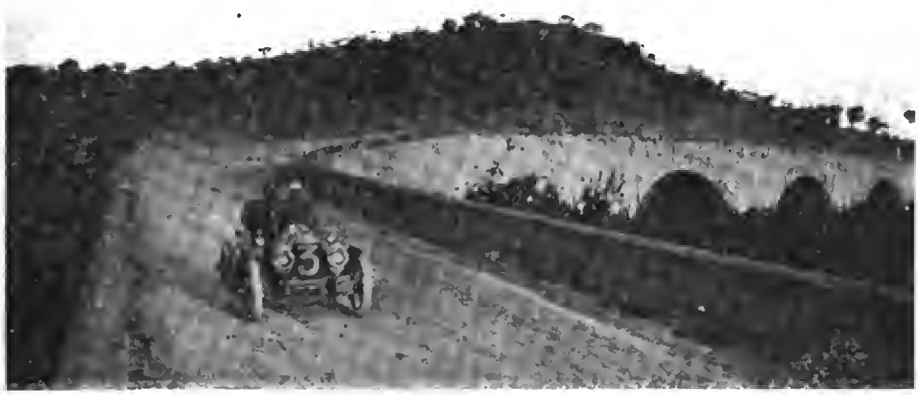
Fracassi taking the curves in a Ford

Giordano coming through a pass in his Fiat

Nazzaro, the winner, and his Nazzaro car

Berra, fourth, in his eight-cylinder De Dion

in Picture and in Story



Demoraes crossing a culvert in his Fiat

Cerano and his S.C.A.T. at high speed

Diana, Isotta, was ninth to finish the race

Berla and his Aquila ready for the race

ing out of the weaker cars and of the less skilled of the drivers, only sixteen of the competitors getting to Girgenti within the time allowance. Marsaglia maintained his lead on the first day's run with an advantage of 30 minutes on Nazzaro. Bordino on Lancia came in a very close third, there being an interval of more than an hour between this car and the fourth. Of the American competitors only the Overland was able to finish the first stage, Lopez bringing his car into tenth position sandwiched between a De Vecchi and an Isotta.

On their arrival at Girgenti the cars were locked up, the continuation of the race being fixed for midnight for the first car, Marsaglia's Aquila-Italiana, the others following with the same interval as marked their arrival. At an early stage Marsaglia had trouble with his headlights, which gave Nazzaro a chance to creep up to him and finally get ahead.

Bordino, who had finished the first stage a good third, had trouble on the second day's run, causing him to fall back to eighth place.

One of the rotary valve Italas dropped out, and the Overland crept up two places, finishing seventh. The cars which fell out on the second day's run were Itala, Isotta, Fiat, Sigma (Knight), and Mercedes.

Speed Was 33.5

Nazzaro's speed worked out at the average of 33.5 miles an hour, which is considerably faster than any other competitor has made over this course. In 1907 Nazzaro won the Targa Florio for Fiat, the race on that occasion being three rounds of the island. The winning Nazzaro car is a standard model built by Nazzaro at Turin, and having a four-cylinder block motor of 3.9 by 5.5 inches bore and stroke. The cylinder make, a fine, clean-cut casting with integral intake and exhaust manifolds, and having the body of the water pump cast with the crankchamber.

The Aquila-Italiana with which its designer, Marsaglia, finished second, has a six-cylinder motor of 3.1 by 5.1 inches bore and stroke, the construction being distinctive by reason of the block casting of cylinders and upper half of crankchamber.

Results of Targa Florio Race

Nazzaro	Nazzaro	19:28:40
Marsaglia	Aquila-Italiana	20:43:49
Gloria	De Vecchi	21:48:04
Berra	De Dion Bouton	22:22:25
Giordano	Fiat	22:26:04
Sivocci	De Vecchi	22:47:00
Lopez	Overland	23:12:47
Pordino	Lancia	23:43:25
Diana	Isotta	23:46:00
Stabile	Minerva (Knight)	23:59:04
Turner	Renault	24:30:00

Position at End of First Stage

Marsaglia	Aquila-Italiana	13:04:13
Nazzaro	Nazzaro	13:34:44
Bordino	Lancia	13:56:52
Giordano	Fiat	15:03:34
Gloria	De Vecchi	15:14:09
Stabile	Minerva	15:16:37
Berra	De Dion Bonton	15:22:19
Negri	Itala	15:31:51
Sivocci	De Vecchi	15:38:10
Lopez	Overland	15:52:39
Diana	Isotta	16:15:57
Turner	Renanlt	16:17:21
Conti	Isotta	17:38:08
De Romase	Fiat	17:42:12
De Prosperi	Sigma (Knight)	18:27:00
Inglese	Mercedes	19:09:23

Developments in the Trade Field

SPLITDORF Service Station Established—The Splitdorf Electric Co., Newark, N. J., has established a thoroughly equipped service station. J. H. Dickinson is manager.

Newton Opens Cedarhurst Garage—S. E. Newton has opened a garage in Cedarhurst, L. I.

Philadelphia Hood Tire Agent—The Petry-Cassidy Co., Philadelphia, Pa., has been appointed agent for the Hood tire.

Haskins Krit Manager—C. B. Haskins has been appointed manager of the retail branch in Buffalo, N. Y., of the Krit Motor Car Co.

Lininger Keeton Purchasing Agent—W. Lininger has joined the Keeton Motor Co., Detroit, Mich., as purchasing agent and office manager.

Chicago Ward Leonard Agent—The Badt-Westburg Electric Co., Chicago, Ill., has been appointed agent for the Ward Leonard Electric Co., Bronxville, N. Y.

Peete Rayfield's Detroit Manager—R. C. Peete has been appointed manager of the Detroit, Mich., branch of the Rayfield carbureter, located at 997 Wodward avenue.

Edwards Adopts Hartford Absorbers—The Edwards Motor Car Co., Long Island City, N. Y., has adopted Truffault-Hartford shock absorbers as standard equipment.

Ajax In New Location—The Boston, Mass., branch of the Ajax-Grieb Rubber Co. has been moved from Park Square where it was for years to a new home at 1084 Boylston street.

Powers Hood Tire Manager—F. Wade Powers has been appointed general manager of Petry-Cassidy, Inc., Philadelphia, Pa., which recently took the local distribution of Hood tires.

Jameson Resigns from Maxwell—W. B. Jameson, who was with the Maxwell-Briscoe Motor Co. from 1904 on, has resigned his connection with the Maxwell Motor Co., Inc., Detroit, Mich.

Weber Out of Walpole—E. P. Weber, who has been manager of the Boston, Mass., branch of the Walpole Tire Co., ever since that company made its entry into the tire business, has resigned.

Adams Stewart-Warner Advertising Manager—Gridley Adams has been appointed advertising manager of the Stewart-Warner Speedometer Corporation, with headquarters at the Chicago, Ill., plant.

Cowling Resigns from Case—J. G. Cowling, for the past 12 years connected with the J. I. Case T. M. Co., Racine, Wis., has resigned to accept a position as vice-president of the Federal Pressed Steel Co., Milwaukee, Wis.

Oldsmobile Change—W. B. Fewell, for some years manager of the New England branch of the Oldsmobile at Boston, Mass., has just resigned and his place has been filled by the appointment of L. G. Dodge.

Overland's Racing Track—The Willys-Overland Automobile Co., Toledo, O., has purchased sufficient land in the rear of its Central avenue plant to build a half-mile racing track. This track will be used for testing cars.

New Marion Garage—N. H. Davis, Marion, O., agent for the Ford, has purchased a site on South Prospect street upon which he will erect a one-story garage and salesroom. The structure will be of cement block construction.

With Campbell-Ewald Co.—N. T. Brotherton, formerly secretary and advertising manager of the Keeton Motor Co., Detroit, Mich., has resigned those connections to join the staff of the Campbell-Ewald Co., advertising specialists, that city.

Malley Resigns In Boston—Charles Addison Malley, who was instrumental in forming the M-B-M Co., to handle the Maxwell line at retail in Boston, Mass., has resigned and the new company is now under the management of E. H. Marsters.

Humpage in New Field—F. R. Humpage is now president of the International Color & Chemical Co., Inc., Buffalo, N. Y. This company is now installing a plant in Bridgeport, Conn., which will be in active operation within the next 2 weeks.

Bradford Joins Maxwell—J. R. Bradford, for the past 5 years assistant manager of the Boston, Mass., branch of the Buick Co., who recently resigned, has been made sales manager of the M-B-M Co. of that city, retail handler of the Maxwell cars.

Wolverine Club Quarters Moved—The quarters of the Wolverine Automobile Club, Detroit, Mich., have been removed from the Tuller Hotel to the new location in the Springfield Building, on Woodward avenue opposite the Pontchartrain Hotel.

Mayo On the Job—George H. Mayo, formerly with the Hubmark Rubber Co., is now the manager of the Enterprise Rubber Co., in Boston, taking the place formerly occupied by William E. Barker, who has gone to New York with the U. S. Rubber Company.

Wacker Resigns from Simms—G. W. Wacker has severed his connection from the Simms Magneto Co., New York City. He was sales manager of this company prior to its reorganization last July. Since then he was the engineer in charge of the Bloomfield, N. J., works.

Detroit Firm Surrenders Charter—The Lee & Porter Mfg. Co., Buchanan, Mich., recently consolidated with the Lewis Spring & Axle Co., Jackson, Mich., and will surrender its charter and all its business in the future will be carried on under the direction of the Lewis concern.

Oakland Moves In Boston—Manager Fred Walsh of the New England branch of the Oakland Motor Car Co. has moved the Boston, Mass., salesrooms from Boylston street to the old quarters of the United Motors Boston Company, corner of Massachusetts avenue and Newbury street.

Will Motorize Mail Service—Two automobiles used in the collection of mail in New Orleans, La., have proven that they can handle the work of eight of the wagons which are in use. The test was made under the personal observation of the superintendent of mails, who has authorized the installation of two cars for the service. It is intended to motorize the entire service.

Automobile Mart Formed—The Automobile Mart Assn. was recently formed in St. Louis, Mo., by J. J. Behen, who is its president. Its purpose is to facilitate the sale of used, renewed and rebuilt automobiles. Arrangements are being made for the holding of a mart in the near future where a large assortment of automobiles and trucks of different makes and models will be displayed and demonstrated.

Gasoline Freight Rates Cut—The United Fruit Co. has made a 20 per cent. cut in its freight rate on gasoline between New Orleans, La., and Puerto Barrios. This is the result of a protest made by the automobile owners in Guatemala City. The government also has been asked to reduce the duty on gasoline so that the price, which is almost prohibitive, from 75 cents to 85 cents a gallon, may be reduced.

New Lozier Manager—The resignations of manager R. B. Nettleton and George C. Crittenden, as branch manager and sales manager respectively of the New England branch of the Lozier, recently brought sales manager Paul Smith to Boston, Mass., on a hurried trip to install E. R. Hunnewell as manager of the New England branch. Messrs. Nettleton and Crittenden have gone over to the newly formed Chandler Motor Car Co. of New England, and will occupy the same positions they had with the Lozier branch. Temporary salesrooms have been secured at the new Fenway garage in the Back Bay.

Cultivating Rubber In Peru—In order to make possible the cultivation of rubber in the Madre de Dios region of Peru the government has established an agricultural experiment station. The reckless exploitation of the wild rubber trees in recent years is resulting in the death of many trees and ultimately will mean the stopping of the supply unless steps are taken quickly to protect the trees and arrange for cultivation. The government is offering inducements to colonists to undertake the cultivation of rubber plants. Instruction to the farmers of the Madre de Dios region will be given free at the new station.

Many Factories Under Construction

GORDON Rubber Erecting Plant—A contract will be let in the near future by the Gordon Rubber Co., Canton, O., for two brick buildings to be erected at Williams street and the B. & O. crossing. The company expects to occupy the new structure by July 15. The main plant of the company is now located at Beach City, O., and it will be consolidated with the Canton, which will be the headquarters. The new plant will cost $25,000, consisting of two buildings, one story high, one to be 165 by 40 feet and the other 200 by 40 feet.

Bridgeport Motor Co.—The Bridgeport Motor Co., Bridgeport, Conn., is erecting an addition to its plant.

Allen Contemplating Addition—The Allen Motor Car Co., Fostoria, O., is considering the erection of an addition to its factory.

A. & J. Doubles Capacity—The A. & J. Mfg. Co., Binghamton, N. Y., has completed plans for the doubling of the capacity of its plant on Noyes Island.

New Equipment Worth $30,000—The Chicago, Ill., Pneumatic Tool Co., manufacturer of the Little Giant motor truck, is adding $30,000 worth of equipment to its factory.

U. S. Rubber Adding—The United States Rubber Co., Indianapolis, Ind., is building a new addition to its Indianapolis, Ind., plant and is using reinforced concrete for frame, floors and roof.

Hughey Will Erect—W. J. Hughey & Son Co., Chicago, Ill., will erect a factory on Prairie avenue and Thirty-third street for the manufacture of motor trucks. The estimated cost is $100,000.

Chase Doubles Office Capacity—The Chase Motor Truck Co., Syracuse, N. Y., has had plans completed for doubling the capacity of the general offices and extending the manufacturing facilities.

Rochester-Mais Plans Factory—The Rochester-Mais Commercial Car Co., Rochester, Ind., recently organized, is having plans prepared for a new factory to be used for the manufacture of motor trucks.

Ford's Chicago Warehouse—The Ford Motor Co., Detroit, Mich., is proceeding with the construction of its six-story factory and warehouse at Chicago, Ill. The building will be 160 by 230 feet and will cost $400,000.

Hewitt's Three-Story Building—The Hewitt Rubber Co., Buffalo, N. Y., has been granted a permit to proceed with the construction of a three-story factory building, to be of concrete and cement construction and 40 by 48 feet in size.

One Hundred Hups a Day—The Hupp Motor Car Co., Detroit, Mich., is building and shipping 100 Hupmobiles a day. This company has erected a huge tent adjoining the executive building to be used for assembling purposes and a test department.

Trenton Company Builds Addition—The Fitzgibbon & Vrisp Co., Trenton, N. J., manufacturer of carriage and automobile bodies, has taken out a permit to build an addition to its plant. The structure will later be equipped with new machinery.

Overland Planning Extension—The Willys-Overland Co., Toledo, O., is planning for a further extension of its Toledo plant and to make it possible for it to do so the City Council at its last meeting vacated a number of streets and alleys, most of which were paper thoroughfares only.

Bids $22,500 for Middleby Plant—Although $22,500 was offered for the plant of the Middleby Automobile Co., Reading, Pa., at public sale recently held by the executor, M. A. Gherst, the sale was continued, because, in his opinion, the bid was too small. For the building $13,000 and for the equipment $9,500 was bid.

Pope's Production Increasing—The production at the factory of the Pope Mfg. Co., Hartford, Conn., has been at a good rate and without interruptions. To date the company has built approximately 1,100 Pope-Hartfords as against 531 in the same period in 1912 season and 820 for all the twelve months to July 31 last.

Jefferson Wants New Firm—At a meeting of the business men of Jefferson, O., recently, a resolution was adopted providing that as soon as the Pressed Steel Motor Car Co. would bring a completed car to Jefferson and place $25,000 in a local bank, the citizens of that city would raise $25,000 to buy a site and erect the initial building for the establishment of the automobile concern.

Ohio Electric Planning Extension—The Ohio Electric Automobile Co., Toledo, O., is planning an addition to its plant which will practically double its capacity and will employ 200 additional men. The Ohio Electric makes 55 electric pleasure vehicles a month. The new building will adjoin the present four-story brick plant, will be of the same height and dimensions, and will cost $100,000.

Swartz Electric Purchases Factory—The Swartz Electric Co. has bought a factory building and 1 acre of ground opposite the Indianapolis, Ind., Motor Speedway, the consideration being $10,000. Arrangements are to be completed immediately to erect two additional fireproof factory buildings and these and the building now on the site will be occupied by the company, which manufactures electric lighting equipment.

The Automobile Calendar

Shows, Conventions, Etc.

June 2-7	Racine, Wis., "Made in Racine Exposition," J. I. Case Co.'s foundry.
June 5, 6, 7	Detroit, Mich., Midsummer Meeting of Society of Automobile Engineers.
October 13	Philadelphia, Pa., National Fire Prevention Conference, Philadelphia Fire Prevention Commission.

Race Meets, Runs, Hill Climbs, Etc.

May 29-30	Chicago, Ill., Inter-Club Reliability to Indianapolis, Ind., Chicago Motor Club vs. Illinois Athletic Club.
May 30	Indianapolis, Ind., 500-Mile Race, Speedway.
June 5	New York City, Orphans' Day Picnic at Glen Island, Orphans' Automobile Day Assn.
June 7	Philadelphia, Pa., Inter-Club Reliability, Quaker City Motor Club, Automobile Clubs of Delaware County, Philadelphia and Germantown.
June 10	Columbus, O., Reliability Run, Columbus Automobile Club.
June 14	Cincinnati, O., Hill Climb, Cincinnati Auto Dealers.
June 14-15	San Francisco, Cal., Track Races, E. A. Moross.
June 16, 17, 18	Columbus, O., Reliability Contest, *Ohio State Journal*.
June 19	Chicago, Ill., Algonquin Hill Climb, Chicago Motor Club.
June 21	Cincinnati, O., Hill Climb, Cincinnati, O., Automobile Dealers.
June 21	Philadelphia, Pa., Fletcher Cup Run, Automobile Club of Philadelphia.
June 21-22	San Francisco, Cal., Track Races, E. A. Moross.
June 23	Des Moines, Ia., Little Glidden Tour, Iowa Automobile Assn.
June 25-28	Chicago, Ill., Non-Motor-Stop Reliability, Chicago to Boston, Chicago Automobile Club.
July 1	Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Assn. to the Pacific Coast.
July 1-16	Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.
July 4	Columbus, O., 200-Mile Track Race, Columbus, O., Automobile Club.
July 4	Taylor, Tex., Track Meeting, Taylor Auto Club.
July 4	Washington, D. C., Track Races, National Capital Motorcycle Club.
July 4-5	Sioux City, S. Dak., Track Meetings, Sioux City Automobile Club and Speedway Assn.
July 5-6	Tacoma, Wash., Road Race, Montemara Festa Automobile Committee.
July 8-16	Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager.
July 11	Twin City, Minn., National Reliability Tour, A. A. A.
July 20	Seattle, Wash., Track Races, E. A. Moross.
July 27	Grand Rapids, Mich., Tour, Grand Rapids Auto Club.
July 27-28	Tacoma, Wash., Tacoma Road Races.
July 28-29-30	Galveston, Tex., Beach Races, Galveston Automobile Club.
Aug. 5	Kansas City, Mo., Sociability and Endurance Run from Kansas City to Colorado Springs, Col., Kansas State Automobile Assn.
Aug. 12	Kansas City, Mo., Reliability Tour, Kansas State Auto Assn.
Aug. 29-30	Elgin, Ill., Elgin Road Races, Elgin Road Race Assn.
Aug. 30-Sept. 6	Chicago, Ill., Reliability Run, Chicago Motor Club.
Sept. 1	Columbus, O., 200-Mile Track Race, Columbus Auto Club.
Sept. 9	Corona, Cal., Track Race, Corona Auto Assn.
Oct. 4-11	Chicago, Ill., Around Lake Michigan Run, Chicago Motor Co.
Nov. 24	Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 27	Savannah, Ga., Grand Prize Race, Automobile Club of America.

O'Kill Is a Simple Pressure Indicator

By Professor W. C. Marshall

IT is a well-known fact that the successful design and the economical working of the steam engine were brought about by the invention of the indicator.

The original design consisted of a tube within which a spring was compressed by the pressure of the steam from the engine cylinder acting on a piston fastened to one end of the spring. The movement of the piston was recorded on a strip of paper by means of a pencil attached to the moving piston. The paper was made to move by connecting it to the reciprocating parts of the engine.

The first engines to use such indicators made few revolutions per minute and used steam at low pressure.

The line traced by the pencil on the moving paper was an indication of the pressure within the cylinder of the engine at every point of the stroke of the piston.

As the speeds of engines increased the inertia of the spring caused the pressure line of the indicator card to become a series of waves, making it difficult to determine the true pressure line.

Shortening the spring and at the same time lightening the moving parts of the pencil-actuating mechanism, obviated this difficulty for speeds used in steam engine practice.

When gasoline engines began to increase in numbers the same difficulty, which had caused steam engine designers so much difficulty years before, presented itself.

The optical indicator or manograph was invented to be used at speeds of rotation of from 700 to 2,500 revolutions per minute. The pencil of the old style indicator was replaced by a beam of light. This beam of light striking a ground glass screen traced on it the indicator card of pressures in the engine.

Permanent records were made on sensitized paper which was afterwards developed and fixed in the photographic dark room.

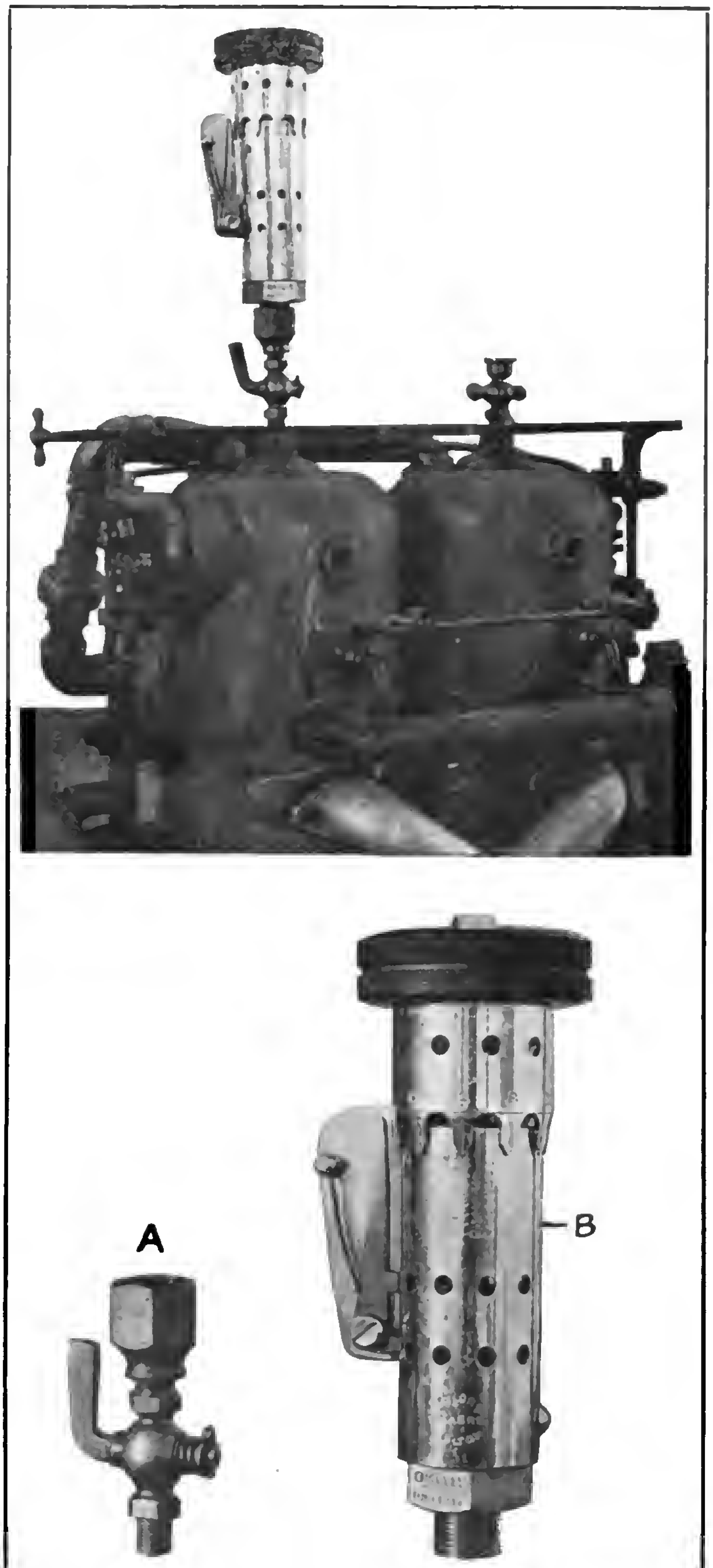


Fig. 1—Upper: O'Kill Indicator as it appears mounted on the cylinder ready to give pressure readings. Lower: Enlarged view of the O'Kill indicator and the valve by means of which it is attached to the motor cylinder which is to be tested by the instrument

The manograph was expensive, hard to attach, and much too cumbersome to carry on an automobile or motor boat.

As the power of an internal combustion engine depends on the compression and explosion pressures in its cylinders, it becomes an important matter to determine what these factors are in a given engine.

In case there are several cylinders it is advisable to divide the work equally among them. This can only be done by having the same compression and explosion pressures in them all.

A manograph is not necessary to determine these pressures, nor could it be used without considerable trouble.

Mr. J. O'Kill, M.I.A.E., has designed a pressure indicator which enables the maximum pressure in an internal combustion engine cylinder to be determined accurately and easily.

This instrument is shown in Fig. 1, and is about 7 inches high, its maximum diameter being 2.5 inches. It is attached to the motor by screwing into the spark-plug hole, in case there are two plugs in the cylinder, or by unscrewing the petcock used for priming and screwing in the connection shown in Fig. 1 at the lower left.

This serves for one cylinder at a time in a multi-cylinder motor. Other arrangements for rapidly connecting each cylinder to the indicator will be shown further on.

The working of the indicator is explained by referring to Fig. 2, which is a vertical longitudinal section.

Pressure from the cylinder of the motor enters the casing A through the hole H_1 and causes the piston B to rise a short distance. This upward motion is opposed by the plunger F which is pressed downward by the helical spring.

Any rise of B causes the bell crank H to turn about its fulcrum K and its upper end to vibrate along the scale E.

By turning the milled rubber head L of the sleeve D the compression of the spring may be varied until the piston B does not rise and the finger H stops vibrating.

The lower edge of sleeve D is made like a micrometer caliper.

On the casing C is a vertical scale graduated to 40 pounds. One complete turn of the sleeve D causes a vertical motion equal to one of these divsions and adds or takes off 40 pounds from the spring. As the lower edge of the sleeve is divided into ten divisions by turning it through the space of one division we can read to 4 pounds.

These divisions, as well as the graduated vertical scale, are shown at B in Fig. 1.

Plunger F can rise but a short distance before striking the casing C.

Its lower end is spherical and bears against the top of piston B.

A hole is drilled from the outside of the piston B to its axis, where it meets a hole drilled from the top of the piston.

As the plunger and its stem also have an axial hole, any oil injected at the top of the plunger stem finds its way to the outside surface of the piston, preventing leakage and sticking of the piston.

If we wish to obtain the compression pressure in a cylinder the indicator is attached as explained previously and the milled head rotated until the graduated scale reads 40 pounds. The cock between indicator and cylinder is opened after cutting off the ignition spark from the cylinder.

If the finger H vibrates the sleeve is screwed down until this vibration ceases. The sleeve is then gradually screwed back until the finger commences to show a slight movement.

By placing one's finger lightly on top of the oil tube any movement of the plunger can be easily detected.

The divisions on the casing and sleeve are then read to obtain the pressure in the motor cylinder.

The explosion pressure is obtained by connecting the spark plug and igniting the charge of gas in the cylinder.

As the pressure is liable to be 300 pounds or more it is advisable to screw the sleeve down to this pressure and then to turn it back, in case the finger does not vibrate.

In order to obtain the true compression pressure under load conditions it will be necessary, in the case of an automobile motor, to run with throttle wide open either on the road or by cutting off enough cylinders to prevent racing of the motor and centering the load on the remainder.

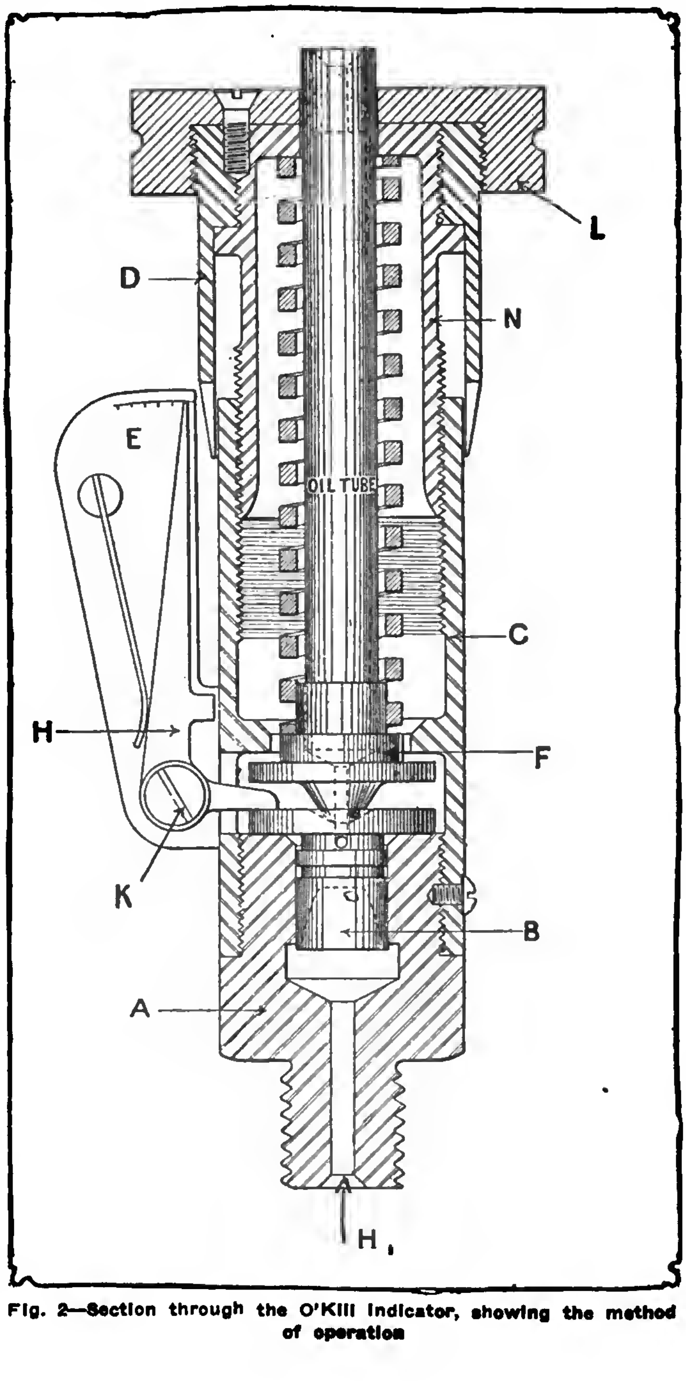


Fig. 2—Section through the O'Kill Indicator, showing the method of operation

The ignition should be in full-advanced position when obtaining the explosion pressure.

When several cylinders are tested it is advisable to carefully mark the throttle position, in order to obtain the same conditions for each cylinder.

When the indicator is used on an automobile motor it will appear as shown in Fig 1. In this case the petcock has been removed and the connection of A, Fig. 1, used.

The writer has found it difficult to use this connection on some cars and so designed the attachment shown in Fig. 4. This can be attached to a priming cock without removing the cock.

Piece A is slipped over the cock shown in X. B is then screwed into the top of A so that the bottom end of it presses tightly over the hole in the cock. The indicator is then screwed into B, making the complete connection from cylinder.

If it is not possible to screw the indicator into B, the fitting C is used instead, and a copper pipe connection made to the indicator which may be clamped to some fixed part of the automobile in a convenient place. Y shows how A, B and X appear when assembled.

The best way of indicating a multicylinder motor is to screw the indicator into a manifold from which a pipe runs to each one of the cylinders. By means of a cock at each cylinder it may be instantly connected to the manifold and the pressure can be read on the indicator.

By arranging a cut-out it is easy to cut the ignition off in any cylinder and take the compression reading.

Occasionally the manifold is provided with cocks and located on the dash of a car, which enables readings to be made while running on the road. A falling-off in power of the motor means poor compression and this is instantly shown by the indicator pressure.

The loss of compression may be due to leakage past the piston or the valve seats.

Too rich or too weak a mixture will give a low explosion pressure. Faulty ignition or ignition too much retarded is indicated by a low explosion pressure.

In a car running with wide-open throttle on a slight ascent the writer found the compression pressure to be 50 pounds per square inch and explosion pressure 212 pounds per square inch.

In this case the indicator was placed on one cylinder only and readings had to be taken by an observer seated on the mud guard over the front wheel.

The motor was 48 horsepower, six-cylinders, 4½ by 5½ inches.

Another six-cylinder car of

30 horsepower, tested with wide-open throttle on a slight ascent had a maximum compression of 64 pounds, with maximum explosion pressure of 260 pounds.

The indicator was attached to the dash and piped to one cylinder. Readings could easily be made from the front seat and those given above were the highest observed.

The ignition of the cylinder tested was arranged to be easily cut off by a short-circuiting device operated from the front seat of the car.

These two experiments show the value of higher compression in obtaining increased explosion pressure.

Determination of both of these pressures can be made very easily with this indicator.

The writer has made a number of tests to determine the compression and explosion pressures in automobile motors running idle with the car standing still. The throttle, of course, is nearly closed, which accounts for the low pressures obtained.

The following table shows the results of these tests.

Car No.	H.P.	No. Cyls.	Spark	Compression lbs.	Explosion lbs.
1	36	6	Normal	7	6
2	48	6	"	9	8
3	..	4	"	15	12½
4	..	4	"	12	9
5	48	6	"	7	10
5	48	6	Retard	8	8½
5	48	6	Adv.	6½	8½
6	72	6	Normal	6	15
4	60	4	"	11	15

It can be seen by inspection that the pressure in the cylinder at the commencement of the compression stroke must be considerably below atmospheric pressure due to the inability to suck in the charge against the resistance of the closed throttle. The low explosion pressure is probably due to delayed ignition or to a mixture of burned gases with the fresh charge, on account of the exhaust back pressure in the manifold.

The average pressure is very small as the work is done simply in rotating the crankshaft, moving the pistons, connecting-rods, valves, pump and magneto.

An approximate indicator card can easily be drawn by using the above pressures, provided the points where the inlet and exhaust valves open and close are accurately known.

The indicator readings taken with wide-open throttle will give in a similar manner the approximate card for full power, and thus enable the indicated horsepower to be obtained if the revolutions per minute of motor are known. As an example of this take the car numbered 5 in the table. This was the car the compression and explosion of which were noted previously as 50 and 212 pounds respectively.

The motor was 4½ by 5½, six cylinders, and was turning at approximately 600 revolutions per minute when the readings were taken.

The inlet valves opened about 8.5 degrees after the top dead center and closed 47.5 degrees after bottom dead center.

The exhaust valves opened 44 degrees before bottom dead center and closed 4.5 degrees past top dead center.

The clearance volume was assumed to be one-third the volume displaced by the piston movement; therefore C1 in Fig 3 was made one-third of the stroke.

The expansion and compression curves were assumed to follow the same law, namely, (PV) 1.33 = constant.

They were constructed as shown, laying off α and β by their tangents, as given.

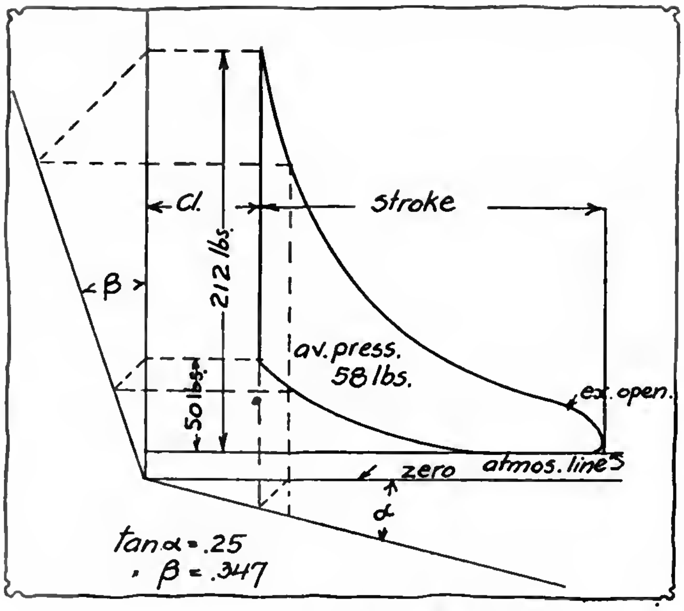


Fig. 3—Indicator diagram for determining engine performance

From this indicator card the average pressure was found to be 58 pounds.

As there are six cylinders the power of one cylinder must be multiplied by six.

The area of piston was 15.9 square inches. The stroke was .458 feet.

From this data the indicated horsepower is calculated to be 23.

This is calculated for a car speed of approximately 20 miles per hour, with a 3.3 gear ratio on direct drive.

By the simple reading of the explosion and compression pressures we are thus enabled to calculate the horsepower of a motor running on the road on a slight grade.

If the grade were measured and the coasting resistance of the car as well, the efficiency of the whole mechanism could be calculated for this speed. Other speeds give different results, as regards the power, because of the increase or decrease in revolutions per minute of the motor.

At high speeds the volumetric efficiency reduces the compression pressure, with consequent falling off of average pressure in the cylinders. This can be observed with the pressure indicator and the torque curve of the motor plotted from these observations.

Laboratory experiments with the indicator on multi-cylinder motors show whether or not the cylinders are giving equal power and enable the one at fault to be instantly located. The indicator can also be used as a check on the other indicators used for making cards.

Fittings are shown in Fig. 4. which can be used to advantage as permanent fixtures.

A is used where the cylinder has no opening to connect the indicator except the spark-plug hole.

The plug is then removed and the end a screwed into the hole.

The plug is screwed into b and the indicator into c.

B is a bracket connected to two cylinders by the small pipes.

The cocks provide a quick connection to these pipes from the indicator, which screws into a.

C is a four-cylinder arrangement provided with manifold, cocks, and cylinder pipes.

The indicator is at a and can be connected to any one of the cylinders by opening the proper cock.

D is an arrangement for a launch having a two-cylinder motor.

The pipe from the indicator passes through the bulkhead to a two-way cock where it branches to each cylinder.

A good method of attaching the indicator to a permanent fixture on a cylinder is to use a bayonet joint, as shown in Fig. 4, at the right side of the illustration.

Part A screws on the indicator and fits into part B.

The pin X slips down in groove y and as A is turned it moves the pin along the slot, which is sloping down, thus forcing the end of A against the bottom of the conical hole in B.

It can be instantly detached by rotating A in the opposite direction.

The price of the indicator is $17.50 in England, where it is made and extensively used.

In this country it would probably be about $27, which is not prohibitive.

Manufacturers and users of internal combustion motors can certainly profit by having such an aid in the running and testing of their motors, easy to attach and easy to read as well as being accurate.

Among the New Books

Technical and Non-Technical Works for Both the Layman and the Engineer Recently Announced

THIS is a busy season for the publishers of engineering and kindred works, and it may be said that the reading of such literature is rapidly on the increase and is keeping pace with the development of scientific subjects in the universities. The following list will show some of the latest.

COMPLETE HINTS AND TIPS FOR AUTOMOBILISTS, fifth edition, from *The Autocar*, London, and published by Iliffe & Sons, Ltd., London, England; classified in 500 paragraphs; illustrated; Boards, 2 shillings, 6 pence. (60 cents.)

Given in a series of paragraphs, these tips should come in handy for the man who drives his own car. A comprehensive index renders it possible to find the necessary information with the least possible effort. The index is crossed so that the reader may find the needed paragraph without making two or three guesses at the most important word. These pieces of information are selected from *The Autocar*, only such being picked out as the composers have judged to be of practical value to an amateur only. The methods of making various repairs, of storing a car, driving in risky places, the constituents of various compounds used in automobiling, etc., are all to be found within its pages.

A 5 YEARS' FIGHT AGAINST FIRE WASTE, AND ITS POSSIBLE CONTROL IN THE UNITED STATES BY FIRE PREVENTIONS AND PROTECTION. By Powell Evans. Published by the Merchant & Evans Co., Philadelphia, Pa.; 180, 6 by 9 inch pages. Paper, 25 cents.

The annual waste by fire in the United States amounts to hundreds of millions of dollars. In Philadelphia alone it amounts to $2,500,000 a year, and this is good as compared on a per capita basis with other cities. The annual per capita loss in Philadelphia is $1.65. In the entire United States the average per capita fire loss is $3, or, in other words, $270,000,000 a year is lost in fires in the United States. Boston has the highest per capita loss, amounting to $5.15. As compared with some of the foreign cities, this is tremendous. In Berlin the annual per capita loss is 25 cents. in Paris it is 47 cents, in London, 50 cents. This is a subject which is well worth the study of those interested in economics. Fire protection is not always an expense. In one case where sprinklers were put into a building the price of the installation was saved on the reduction in premium in 2 years. This was on a $1,000,000 policy. The papers contained in this pamphlet are full of interesting facts many of which are brought home in a startling manner.

FAULTS AND HOW TO FIND THEM. By J. S. V. Bickford, B. A., a list of 180 faults, their symptoms and remedies; published by Iliffe & Sons, Ltd., London, England; arranged in 1,190 paragraphs and illustrated. Boards, 2 shillings, 6 pence.

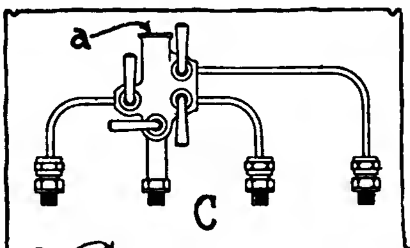
This work attains its maximum value when a knowledge of how to use it is possessed by the reader. There are two indexes, the main index to be used when the fault is known and the cure is wanted, and the secondary index or tables are to be used when the fault is not known but merely the symptoms. At the end of the book there is a list in alphabetical order giving the principal symptoms which, if known, can be referred to directly and thus save the trouble of working through the tables which are arranged in the order of a genealogical tree. The list contains practically every trouble that can possibly be run into on the road and by the aid of the index there should be no trouble in hunting them down. When found, the proper paragraph will give some good, "meaty" advice as to the remedy for the trouble.

A SYNOPSIS OF THE ELEMENTARY THEORY OF HEAT AND HEAT ENGINES. By John Case, B. A., Published by W. Heffer & Sons, Ltd., Cambridge, England, and Simpkin, Marshall & Co., Ltd., London, England. Sixty-five 5 by 8 inch pages. Cloth, 2 shillings, 6 pence.

The student of gas engines should know his thermodynamics as he knows his A. B. C.'s. A knowledge of the laws of gases is absolutely required to design a successful expansion engine, and the same applies to the laws of heat. The problem now in gas engines is to secure a higher thermal efficiency and it is by the path of thermodynamics correctly applied that the conversion of losses into useful work will be accomplished. The gas engine is not a mere mechanical contrivance but it is an instrument for converting the energy contained in gas into useful work. This little work gives some useful problems in thermodynamics and employs some very direct methods in the solution of them.

HOW TO DRIVE A MOTORCYCLE. By Charles S. Lake, author of the *Motorcyclist Handbook*, published by Percival Parshall & Co., London, England, or Spon & Chamberlain, N. Y. Eighty-eight 4.5 by 7 inch pages; illustrated. Paper, 25 cents.

In this little pamphlet full directions regarding the operation and maintenance of a motorcycle are given. It is one of those little works which are of great convenience to a man who first takes up some such pastime as motorcycling, and who wishes to gain more than a superficial knowledge of the subject. Such a book as this is of almost unlimited assistance to the amateur.



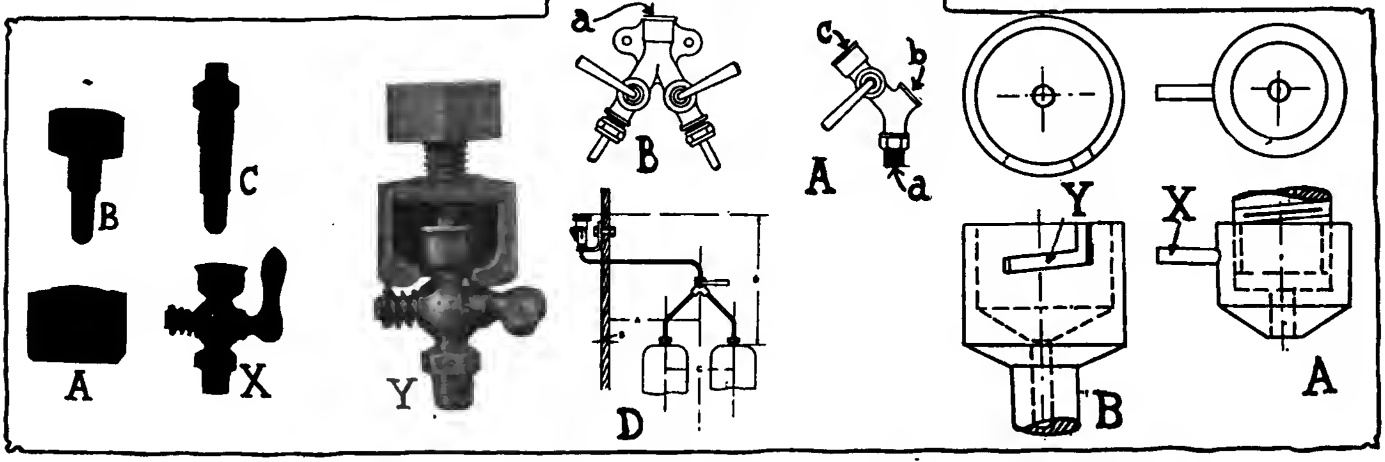


Fig. 4—Fittings used in connection with the O'Kill indicator for dash attachment, manifold attachment, etc.

The Engineering Digest

A Digest of Technical Information from the Engineering Journals

Effects of Taxation Toward Standardizing Small German Cars—Novel Pump Applicable to Automobiles and Fire Engines—Conversion of Cannel Coal into Liquid Motor Fuel

GERMAN 10-Horsepower Cars.—Owners of automobiles in Germany pay a tax of 80 mark (20 dollars) for a car of 10 tax-horsepower and 155 mark for a car of 11 horsepower of the same kind. A tax-horsepower is figured by the formula: $HP = D^2nL \times 0.3$. For this reason nearly all German manufacturers build a model which is sure to come within the 10-tax-horsepower rating. The motors have all four cylinders, excepting the Loreley which has six of 70 millimeters bore and 113 millimeters stroke. Nine out of the 24 four-cylinder cars have 80 bore and 130 stroke. These are the Adler, Apollo, Audi, Benz-Mannheim, Daimler, Komnick, Mathias, Nacke and Windhoff. The one first built in these dimensions was the Daimler-Untertürckheim in 1909. Adler and Windhoff at first built their 10-horsepower motors with 85 bore and 115 stroke but changed to the dimensions mentioned. The Hansa was changed from 85-115 to 80-130, but, curiously enough, the last models—1912 and 1913—are changed to 88-104. Beckmann, Brennabor and Protos have a motor of 82-123, N. A. G. and Phänomen one of 83-120 and Priamus and Opel 84-118. Opel formerly built their 10-horsepower motor with 80 bore and 130 stroke.

Benz-Ladenburg (meaning the cars built by Benz and his sons after the severance of their connection with the large works at Mannheim), Horch, Neckarsulm and Oryx constitute an important group in which the motors are 85-115. The two last ones have been made in these dimensions since 1907. Horch formerly built motors of 85-120, and the reputation of the firm was largely built up on these, but they gave 11 tax-horsepower, and so the stroke was shortened to bring them within the rating. In the Eisenach (87-110), Hansa (88-104) and Ehrhardt (90-100) the stroke is shorter than now ordinarily accepted in automobile motors.

Out of the 24 motors referred to 18, are cast in pairs and 8 in blocks, 9 have water-circulation pumps, while 15 have the thermo-syphon system. Komnick is the only one in which the radiator is behind the motor.

The thermo-syphon system is also employed in some larger German motors; in the Audi-Zwickau up to 22 tax-horsepower, in the Richard-Hering up to 25 and in the Bergmann-Metallurgique up to 29 tax-horsepower.

All the motors, excepting the N. A. G. and the Ehrhardt, which are of the T-type, are made with 1 camshaft. In 18 of them the valves are placed side by side. In 6 of them the inlet valves are of the pendent type; in the Mercedes, Horch and Windhoff these hang directly over the pistons and in the Audi, Komnick and Nacke over the exhaust valves. This is not a matter of fashion but renders it possible to have the combustion chamber of the most favorable compact shape.

The fuel feed is by gravity only in 6 cars; all the others have pressure feed. A still more pronounced standardization is noticed in the clutches, among which only 4 are of the multiple-disk type, all the rest being cone-clutches. All have 4 gear speeds, except Ehrhardt, with 3. Wheel base and gauge are fairly uniform. The longest wheel base, 3.23 meters, is found in the Opel car; the shortest, 2.90 meters, in the Eisenach. The latter also has the narrowest gauge, 1.26 meters, while Ehrhardt has the widest, 1.40.

In the Adler, the Komnick, the Protos and the Horch, tires of different dimensions for the front and the rear wheels are still used, although the contention that narrower front tires make

Gear Reductions, Motor Speeds and Theoretical Fuel Consumption Data for Representative German 10-Tax-Horsepower Cars

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Manufacturer	Gear Reduction Ratio at Speed 1	2	3	4	Reduction in Rear Axle	Total Gear Reduction Ratio at Speed 1	2	3	4	n—Revolutions per Minute of Crankshaft at 60 Kilometers per Hour Car-Speed on Direct Gear	h—Stroke, Meters	$\frac{2hn}{60}$ Average Piston Speed at 60 Kilometers per Hour. Meters per Second	d—Bore. Centimeters	$\frac{d^2\pi}{4} \times \frac{2hn}{60}$ Volume of Fuel Gas Consumed at 60 Km. per Hr. Liters per Second	$\frac{d^2\pi}{4} \times 8$ Gas Consumed at 8 Meters per Second of Piston Speed. Liters per Second	Revolutions at 8 Meters Piston Speed	Car Speed at 8 Meters Piston Speed Kilometers per Hour	Piston Area, Square Centimeters	Cylinder Volume, Cubic Centimeters
1	Audi	4	2.28	1.48	1	3.71	14.8	8.5	5.6	3.7	1,480	0.13	6.08	8	30.6	40.2	1,850	75.0	50.3	65.4
2	Benz-Mannheim	4.3	2.26	1.46	1	3.87	16.8	9.0	5.9	3.9	1,560	0.13	6.76	8	34.2	40.2	1,850	71.1	50.3	65.4
3	Benz-Ladenburg	3.7	2.2	1.6	1	3.8	14.1	8.4	6.1	3.8	1,520	0.115	5.49	8.5	31.2	45.4	2,090	82.5	56.8	65.3
4	Daimler	4.26	2.9	1.91	1	4.06	17.2	12.0	7.6	4	1,600	0.13	6.93	8	34.7	40.2	1,850	69.3	50.3	65.4
5	Eisenach	4.35	2.35	1.49	1	4.05	19.8	10.8	6.8	4.5	1,800	0.11	6.60	8.7	39.3	47.2	2,180	72.6	59.5	65.5
6	Komnick	4.16	2.12	1.41	1	3.53	14.7	7.4	4.9	3.5	1,400	0.13	6.06	8	35.8	40.2	1,850	79.2	50.3	65.4
7	Nacke	4.33	2.5	1.72	1	3.44	14.6	8.5	5.8	3.4	1,360	0.13	5.89	8	29.7	40.2	1,850	81.6	50.3	65.4
8	N. A. G.	4.5	2.4	1.56	1	4.28	19.4	10.3	6.9	4.3	1,720	0.12	6.88	8.3	37.3	43.3	2,000	68.7	54.1	64.9
9	Oryx	4.33	2.2	1.6	1	4	17.2	8.9	6.4	4.0	1,600	0.115	6.13	8.5	34.6	45.4	2,090	78.3	56.8	65.3
10	Windhoff	4	2	1.5	1	4	16	8	6	4	1,600	0.13	6.93	8	34.7	40.2	1,850	69.3	50.3	65.4

easy steering only holds good if the steering mechanism is faulty. The anthor has observed during an experience embracing much long-distance traveling for a number of years that when the tires on front wheels were changed—to take advantage of demountable rims—the broader tires did not affect the steering if the latter was otherwise right, while the car ran more pleasantly by reason of the softer suspension. Among the 20 cars in which front and rear tires are alike, the Benz-Ladenburg has the smallest dimensions, 810-90, and the Benz-Mannheim the largest, 820-120.

Matters relating to the gearing, the speed and the fuel consumption of the cars are exemplified in an appended table, giving the figures for 10 out of the 24. It is seen that the highest and the lowest gear in all the cars come close to the ratio of 1 to 4, while the intermediate gears are less uniform between these limits. As now well understood, the gears should be so chosen as to render it possible to utilize the motor at its best—say between 1200 and 1800 revolutions per minute—for all of them and for as wide a range of car-speeds as possible for each of them, so as to have as few gear changes as practicable. This requirement brings the ideal gear-reduction to 1 for direct, 1.6 for third speed, 2.5 for second speed and 4 for low. But if the reduction for low lies at 4.4, for example, instead of 4, the proportions become 1-1.76-2.75-4.4, and if the reduction for the low gear is only 3.6, the figures become 1-1.44-2.25-3.6. By comparing these ideal proportions with those listed, it is seen that all but Daimler and Benz-Ladenburg are geared too low for the second and third speeds.

The gear reductions in the rear axle range from 3.44 in the Nacke car to 4.5 in the Eisenach. The total reduction, as obtained by multiplying the change-gear reductions with the rear-axle reductions are found in columns 7 to 10 and vary, for the low gear, from 14.1 in the Benz Ladenburg to 19.8 in the Eisenach, while the variation on direct is identical with that given for the rear axle.

The interesting differences with regard to motor speed, car speed and fuel consumption may be studied directly from the subjoined table.—From article by Von Löw in *Automobil-Rundschau,* April 30.

—

MONIN'S Reversible Rotary Pump with Tight Joints—Among the rotary pumps which must be taken into consideration in the future for fire engines, for the water circulation in automobile motors and as a possible element in hydraulic power transmissions, clutches and kindred forms of mechanism, one recently invented by Charles Monin and described with all detail in *l'Ingénieur-Constructeur* for April 15 is based upon an entirely new principle by virtue of which it can snpport high pressures and high speed while acting as positively as any other piston pump, being in fact a rotary piston pump, like the Von Pittler *Rundlaufpumpe* used in some of the Berlin fire engines. It differs from the latter, however, in being more perfectly positive and therefore more reliable for drawing water from a lower level through an air-filled supply hose, or, in one word, as an evacuation pump. Its movable parts are balanced, this including the members which are only rotary and the two pistons whose movements are at the same time rotary and reciprocating.

Fig. 1 shows a diagrammatic section of this device together with a perspective view of the movable portion and, underneath, five consecutive positions of one of the pistons in relation to its rotary housing. The cylindrical casing B is closed in front and rear by two plates and is connected with the suction pipe A on one side and the discharge pipe R on the other. The body M can turn in the bore C of this casing and is formed with a recess across each of its faces, one at a right angle to the other, and in these recesses the two piston-blocks C and D, which are similar, can slide. The driving-shaft O passes eccentrically through the face-plates of the casing and through the middle of both piston-blocks but is formed in one piece with two eccentric enlargements extending in diametrically opposite directions and each constituting a cylindrical bearing for one of the piston-blocks.

When turning, the driving-shaft turns with it the two blocks and the body M, the lower portion of the illustration showing the positions successively taken up by the front piston-block and the body M during one turn of the shaft. It is noticed that the water is at first drawn in by the lower face of the piston and discharged by the upper. Then, as the parts are turned further around, in the direction indicated by arrows, the suction takes place at the left side and the discharge at the right. In the continuance of its rotary and also reciprocating movement the piston draws in water at the upper left and discharges at the lower right and then returns to its starting position—with the piston reversed, however. The piston and the body M thus make one-half of a turn when the shaft makes a full turn. The other piston effects a similar movement, following 90 degrees behind the first one. No valves being required, the operation is automatic without any other movable parts. The mechanism is reversible; that is, by changing the direction of the shaft-movement the flow of the water is reversed, and the supply and discharge pipes exchange functions. The possibility of operating this pump at very high speed without troublesome vibrations imparts to it a high capacity for its weight and size.—From *Le Génie Civil,* May 10.

—

BRITAIN'S Struggle to Evolve New Liquid Motor Fuels—It has long been the aim in English motor circles to emancipate the tight little isle from dependence upon imported gasoline and gasoline made from imported crude oil. A certain secretiveness, which apparently may be traced to the desire of patentees and promoters for securing an ample return for their labors and which has cropped out in the form of ambiguous or inconclusive statements of the results obtained, as well as in charges, countercharges and insinuations, is keeping the exact status of recent developments in this respect somewhat under cover. But it is known that one or two processes for extracting a liquid motor fuel direct from coal are under way and have advanced to such a point of feasibility as to place all older plans for utilizing alcohol or benzol completely in the shade for the present. While the new distillate from coal is frequently designated as benzol, it is not the benzol which has heretofore been turned out as a by-product of cokeries and gas works but a new liquid hydrocarbon resembling gasoline more than benzol in chemical composition and one which, unlike the real benzol, may be produced in practically unlimited quantity from poor grades of coal and from certain grades of shale.

It does not yet seem certain whether the product derived from coal differs materially from that derived from bituminous shale, especially as the coal preferred as raw material in England is shale-like in structure, while parallel experiments in France are directed upon the utilization of the shale there abounding.

A contributor to *The Motor,* a British journal which has been prominent in agitating the movement and describing the processes

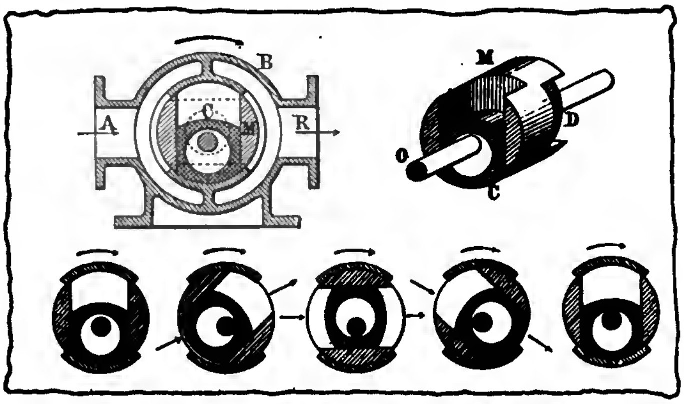


Fig. 1—Sectional view of the Monin rotary system pump, with perspective of movable parts and diagrams of operative stages

involved, summarizes the situation in the issue of May 13, as follows: "We are probably only at the beginning of a vitally important movement in the preparation of motor spirit from coal. But whatever process is arrived at, it is absolutely certain that there will be a considerable number of by-products, and on the profitable sale of these will depend the commercial success of the whole undertaking." The same contributer proposes the name of coalol for the new product so as to distinguish it sharply from benzol. The fact that benzol is a by-product in the utilization of valuable materials, while the coal distillate is a main product from fresh raw materials heretofore considered as of very low value and that the process of distilling it creates new by-products from these cheap materials, perhaps of greater value than any which the raw materials were supposed to contain, apart from the value of the new main product, evidently establishes a contrast which warrants the search for a new name. [The name of coalol, however, does not seem very acceptable from any point of view, being of hybrid derivation, too close to "coal oil" in sound, and lacking in the vigorous individuality always eventually wanted for an important article intended for popular consumption. Perhaps "canneline" would come nearer to the requirements, in view of the derivation of the new fuel from "cannel coal."—Ed.]

The process for converting coal into motor fuel, plus by-products, of which most details have become known is one identified with the name of Del Monte as inventor. With special reference to the results of this process, the authority quoted above states that the products gained by the decomposition of the coal range as follows in market value: (1) Solid fuel similar to coke, 56 per cent.; (2) gas, which may be sold or used as fuel in the cycle of the distillation itself, the quantity not yet determined; (3) motor fuel 20 per cent.; (4) heavier oils .04 per cent.; (5) sulphate of ammonia 10 per cent. and (6) tar or pitch 8 per cent.

From this accounting it is plain that the motoring public will buy only $20 worth out of every $100 worth of product brought into existence by the contemplated new enterprise, and that consequently the public in general must be relied upon for finding suitable uses for the rest of the production. Assuming that the minor products may be readily disposed of, the great commercial problem which must be solved before the motoring public can get the benefit of the "coalol" [or "canneline"] is therefore to stimulate the at present languishing demand for a smokeless coke-like fuel for domestic or industrial purposes.

Another great difficulty to be overcome, it is stated, lies in the transportation problem of the new materials which is hedged with legal provisions said to favor prospective competitors.

The nature of the Del Monte process is described in *Omnia* of April 12 by J. Marsillac, a French observer who was present at some of the tests which have been conducted in a semi-public manner. According to his account, the motorists of the British islands consume at present more than 400 million liters of gasoline per year, and the Del Monte process promises to satisfy all of this demand, because it extracts from 20 to 30 times more liquid fuel from coal than could be extracted by the established methods used in the production of benzol. The latter is made by placing the coal in a vat which is heated

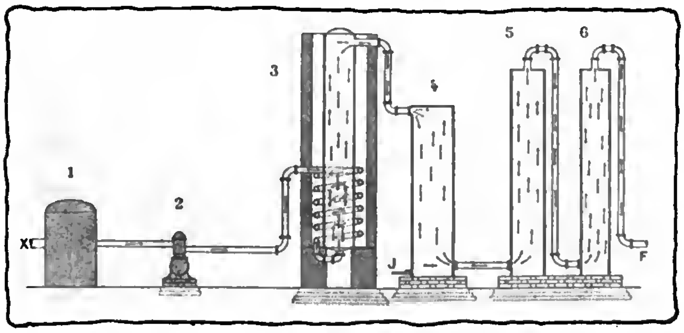


Fig. 2—Sketch of Del Monte plant for producing liquid motor fuel from cannel coal and other inexpensive materials

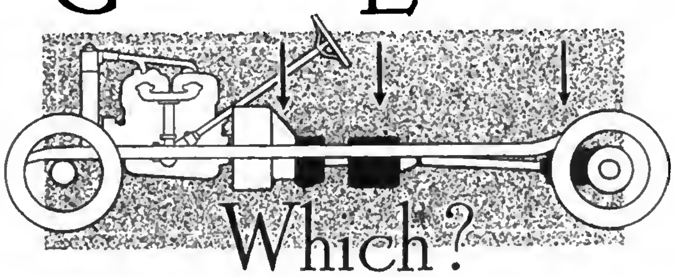
from the outside to about 1,000 degrees Centigrade. Illuminating-gas and a whole series of volatile products are in this manner driven out, and the volatile products are successively condensed. From one of them the benzol is obtained by refinement. The residue in the vat is the ordinary coke employed for different heating purposes. The system of heating from the outside alone entails a great waste and a lack of uniformity in the products, as those coming from the interior of the heated mass have not been subjected to nearly as much heat as those coming from near the walls. By the Del Monte method the temperatures imparted to the coal rise nowhere much above 500 degrees but are applied in the interior as well as to the exterior of the mass of treated material. The operation is a cycle in which the products of the distillation at one stage in the process are utilized for the other stages. The apparatuses used are placed in a circle and connected, so that the operation becomes nearly automatic and wholly continuous. Fig. 2 represents the different parts as placed in a row, for the sake of clearness, but in reality the pipes X and F are connected. With reference to the illustration, the plant comprises (1) a gasometer, (2) a compressor pump, (3) a retort of special construction, (4) a condenser with drain pipe at J and (5 and 6) two scrublers, or combined washers and condensers of gases. The retort is composed of a metallic receptacle slightly conical, with the taper toward the top, where a gate may be opened for the reception of coal from an automatic charging apparatus and hopper. At the bottom another gate serves for the removal of the coke. At about one-third of the height of this retort, a pipe from the compressor-pump enters through the side of the surrounding wall, carrying gas under slight compression. This gas is at the start ordinary illuminating-gas, with which the gasometer is charged, but subsequently the gases generated by the process take its place. The pipe follows a serpentine course to the bottom of the retort where it enters the latter. It is heated externally by means of Bunsen burners, the arrangement of which may be readily imagined, and the retort naturally receives a great deal of heat from the same source. The pipe and the gas contained in it is raised to a temperature of about 800 degrees, and when this hot gas is discharged at the bottom of the coal it rises rapidly heating the coal uniformly. All the gaseous products driven out of the coal, and among them those containing the new motor fuel, rise to the top of the retort and from there reach the condenser (4), from which some of those with the highest flashing point are drained. The others continue their course to parts 5 and 6, where they are "scrubbed" and liquefied. Only a few non-condensable gases are returned to the gasometer, from which they are sent out in the circuit again as heat producers.

Among the different sorts of coal which may be used in this plant the variety known as cannel coal gives the best economical results. It looks like very dark shale but is rich in the constituents formerly desired for illuminating gas. But it has now been abandoned for this purpose in favor of other coals of higher caloric value. Its combustion in fireplaces develops smoke and odors which render it undesirable as a domestic fuel. For these reasons the price of it has dropped to $1.25 per ton, and large deposits of it are available in Scotland. From a ton of this material the Del Monte process produces 200 liters of motor fuel in some instances. The estimates mentioned in connection with the projected enterprises are much lower, however, the probable price of the coal being placed at about $3.25 and the output of motor fuel per ton of material at 40 to 60 liters, whereto comes 700 to 800 kilograms of coke which burns with a clear and smokeless flame, 14 to 20 kilograms of sulphate of ammonia and up to 200 cubic meters of gas.

The flashing point of the new fuel varies from 50 to 150 degrees C., while that of benzol varies from 80 to 110 degrees and that of gasoline from 47 to 110 degrees. The specific gravity is 746 at 14 degrees C. The product does not attack or foul cylinders or pistons, and a motor may be started with it as easily as with gasoline.

The Engineers' Forum

Gearbox Location



Part V

Positive Alignment of Gearbox and Engine Argument for Unit Motor

THIS week appears the opinion of one of the few engineers whose views on the subject of gearbox location have not been published in THE AUTOMOBILE to date. Another engineer writes regarding stock car racing and its effect on the public and a third gives his ideas on the subject of horsepower rating.

Unit Type with Three-Point Motor Suspension—Klinger

DAYTON, O.—Editor THE AUTOMOBILE:—With reference to our opinion of proper location of gearbox, we are very pronounced in our preference for three-point suspension of the motor with a unit gearbox. This insures a positive alignment of gearbox and engine, not only in the assembly of the car, but also the maintenance of this alignment in years of service. It also makes it possible to absolutely inclose the clutch and operating parts, making it possible to lubricate them properly and exclude dust and dirt, thereby largely eliminating the wear and tear.

This location of the gearbox also eliminates a number of parts, such as rods, levers and pins which are necessary with the amidship location as well as rear-axle location, and the elimination of parts on an automobile usually means a decided step toward the elimination of trouble and expense as well as weight.

The unit plant certainly is much more accessible than the rear-axle plant and equally as accessible as the mid-ship location. While trouble does not often arise with gearset these days, yet were one to attempt to look into the gear of a rear-axle transmission on the road he would be quickly convinced that either the mid-ship or the unit plant is much more desirable location. It is necessary to inspect these gearsets occasionally to see that they are oiled, and we believe the rear-axle location is not nearly so likely to receive attention as unit or amidship. Each day's experience with the unit power plant only tends to confirm our very decided preference for it.—P. W. KLINGER, Chief Engineer, Speedwell Motor Car Co.

Stock Cars Are Not Fit for Racing Purposes—Porter

TRENTON, N. J.—Editor THE AUTOMOBILE:—I note in a recent issue of THE AUTOMOBILE that the stock car racing bee is at large and has evidently stung a few people. The different opinions expressed as to the value of this type of racing is, to my mind, offered without a perfect analysis being made as to the conditions involved. I wish to appeal to you to use every possible effort through the columns of your paper in an endeavor to stop this question gaining any momentum at this time. To my mind, this is one of the greatest impositions ever perpetrated on the public and it surely gives the manufacturers a great amount of trouble from which they get no return whatever.

The several expressed advantages for stock car racing do not express at all clearly the real facts governing the situation. In the first place, a stock car is not fit for a race nor is a racing car fit for stock use. Then, besides, it seems so unreasonable for any reputable firm to be parading its wares in front of the public, shouting continually that they are honest goods. My impression is that this is a position that should be at least assumed by all manufacturers of standing and one that is, I believe, conceded by the public, or, at least, should be. There is no real reason why the manufacturers should not incorporate in any stock car their most earnest and honest efforts to produce a product free of trouble, especially since it is much cheaper to make one's product good in the beginning, than it is to maintain an expensive and elaborate road department in order to keep the car running. I believe the public thoroughly understands this and when any firm can demonstrate its ability by producing a speed creation capable of record-breaking performances it is reasonable to suppose that the experience gained will be used to better the stock production. Besides, the general principles are involved just as much in racing machines as they are in stock cars. The basic principles are the only ones at stake in either of them. Consequently, my impression is that when you find a man howling about stock car racing you will have one not capable of producing a speed creation. In other words, he knows his production is not what it should be, but he wants to try to convince the people that it is. No purely stock car ever won a race or ever will as long as the conditions involved are so entirely different from those demanded in stock car use.

Aside from the reasons given above, it is almost impossible to promote a stock car race, as the public is not at all interested in any competition unless its very nature promotes thrills beyond the possibility of a stock car. This fact alone leads to all sorts of inducements being offered to swell an entry list and necessarily permits the entry of a great many cars not at all fit for the purpose, which only makes a farce out of the proposition.

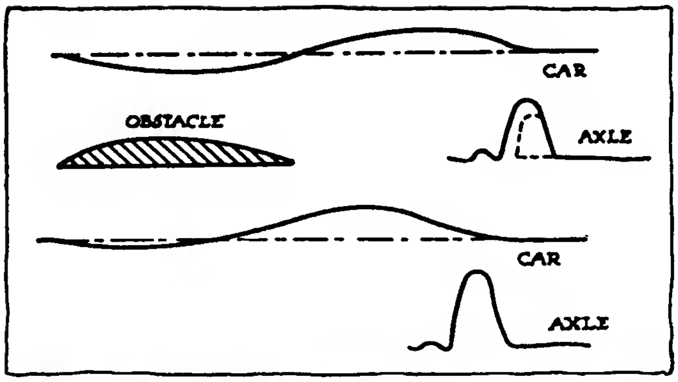
In view of the conditions involved, I urge upon you the necessity of opening and keeping open a thorough discussion of these points, so that it will be kept continually before the public.
—FINLEY R. PORTER, Engineer, Mercer Automobile Co.

Manufacturer Could Give Both S. A. E. and Own Rating

EAST MOLINE, ILL.—Editor THE AUTOMOBILE:—The manufacturer of a long-stroke motor has been forced to give actual horsepower rating and not the A. L. A. M. rating on account of the fact that he is not getting any credit for the gain in the longer stroke against the manufacturer that is putting out a shorter-stroke motor.

On the other hand, the manufacturer of the long-stroke motor will, as a rule, gear his car high enough to work only with a modern engine speed on the average road, consequently the power developed will not be any greater than the power developed by the short-stroke engine at the same car speed but higher engine speed.

We believe that the A. L. A. M. or S. A. E. ratings should not be abolished, but the manufacturer could, perhaps, give the public both ratings; the rating of the standard formula as well as the rate of the actual average horsepower that the motor is capable to develop. This is the practice of many European manufacturers. They will give the tax rating and the actual rating.—E. GRUENEWALD, Moline Automobile Co.



Figs. 1 and 2—Sample records made by model car, the obstacle being a bent piece of thin steel of the actual shape shown

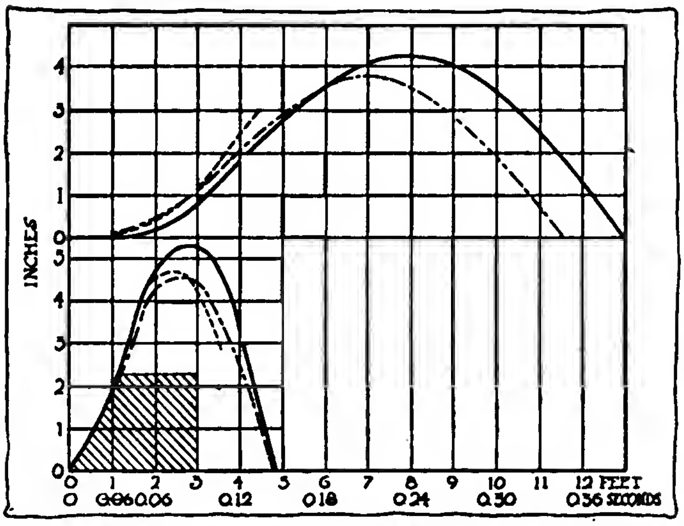


Fig. 3—Showing in full-line curves the motions of the axle and car with no friction. Note how closely the curves agree with those obtained by the use of the model

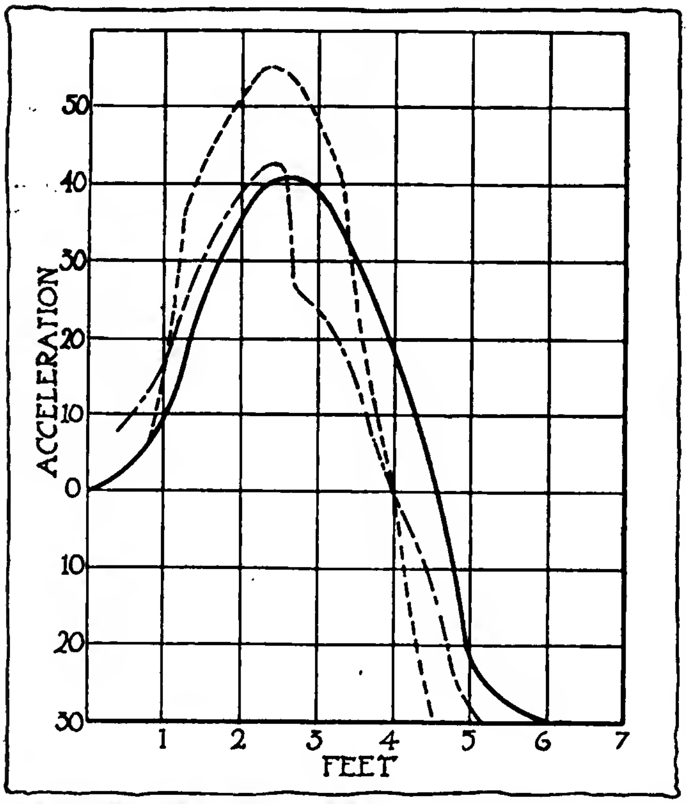


Fig. 4—Full-line curve is acceleration curve of the car. Broken lines are the same except that the spring is stronger by 100 pounds than that shown in the full-line curve

Defects in Springs

Use of Shock-Absorbers Indicates That Present Construction Leaves Much To Be Desired in Comfort

From a Paper Read Before the Institution of Automobile Engineers by G. H. Baillee

AUTOMOBILE springs have received less attention from those who talk and write than any other part of the car. I do not know whether those who do things have been equally neglectful, but they have been remarkably silent about what they have done. A hunt through the automobile literature has shown practically nothing of interest, apart from the question of the qualities of steel suitable for springs. An examination of the practice in cars now on the market shows that, with two or three exceptions, all springs are of the same pattern, neglecting differences too subtle for the ordinary observer. The most notable exception is due to the man who has introduced more novelties into motor cars than anyone else, and, unlike most other novelists, has introduced successful novelties.

I was first induced to commence investigations on the subject of springs by owning a car which was peculiarly uncomfortable to ride in. The next impulse towards an endeavor to find out something about springs was the rage for auxiliary springs and shock-absorbers. At the present time it is rare to see a car without a fitting of this kind, a fitting not belonging to the car but stuck on to it. Now, unless it is assumed that the utility of all these things is entirely imaginary, their existence is a grave reflection on chassis builders; it means that the makers have not done their best in springing the chassis, and have left room for improvement, and if any improvement can be effected by an owner by casually putting on the first contraption he sees advertised it means that the room for improvement must be very large.

Springs Are Now Most Important Feature

Some makers certainly have given a great deal of thought to their springs, and the results can be felt in their cars; but the author knows others, and he believes their number to be large, who do not give the springs anything approaching the attention they deserve. Now that cars have given up breaking down, I consider their springing the most important feature. It is only necessary to run for a few hundred miles over a flat, dull and bumpy road to realize how much the pleasure of the trip depends on the springs.

And something more than comfort depends on it. The author believes that tires are more affected by the action of the springs than by anything else, both as regards wear and bursting.

I started by constructing a model car to one-eighth linear scale, having wheels with solid rubber tires. For convenience I made the road move under the car, the road consisting of a strip of webbing 12 feet long, passing round a motor pulley and an idle pulley. The webbing ran over a board where the car rested on it. After trying a front and back wheel, I discarded the front wheel and retained only a single wheel on the end of an axle pivoted some way back, so that the wheel had an approximately vertical motion.

Fig. 9 shows the arrangement of the model and its equipment after the second wheel had been removed.

To the axle was fixed the lower leaf of a double elliptical spring made of two single pieces of clock spring, the upper leaf being fixed to a framework and also pivoted some way back.

The framework, which represented the spring portion of the car, had provision for carrying load. Pencils were fitted to the car and to the axle and recorded on a moving strip of paper.

Obstacles of different kinds were attached to the road, and frictional devices were attached between the axle and the car.

Figs. 1 and 2 show two sample records, the obstacles being a bent piece of thin steel of the actual shape shown. According to the linear scale of the car, the obstacle would be 2 inches higb to a full-sized car.

It will be noticed that the wheel jumped above the obstacle in each case and came to the ground beyond the obstacle, and the shape of the obstacle appeared to make no appreciable difference unless its slope was very gentle.

It will also be noticed that the wheel reaches the top of its path before the car has moved appreciably, and by the time it has returned to level ground the car has completed only some 40 per cent. of its upward path.

In Fig. 1 no friction was introduced to damp the oscillations, the amount of damping being actually about the same as that which exists in an ordinary leaf spring. In Fig. 2, in which the track speed was about double, friction was introduced, and the damping effect is very noticeable in the rebound of the car.

No Difference in First Half Oscillation

Now, examination of a considerable number of records, without friction, with constant friction and with friction increasing with the amplitude, showed no appreciable difference in the first half oscillation of the car, and in this respect the model car was most disappointing. It became clear, in fact, that the difference lay in the initial movement of the car, while the axle was rising, and, in the model records, this part of the curves was on too small a scale to admit of accurate examination.

I then reckoned out the motions of the axle and the car on meeting an obstacle, making certain assumptions in respect to the obstacle to circumvent the difficulties which arise while the tire is "drinking the obstacle." The resulting curves are, as far as comparison is possible, of the same type as those given by the model, and this leads him to hope that the calculated curves do show what actually happens.

Fig. 3 shows in full line curves the motions of the axle and the car with no friction, and it may be noted how closely the curves agree with those from the model.

The assumption made in regard to the obstacle was that it was of a shape to give a constant pressure on the tire, and the pressure assumed was that required to flatten the tire till 40 square inches of tire with 85 pounds of air pressure were in contact with the obstacle. This is approximately what happens with a large section tire. The obstacle is 2.25 inches high and the tire is in contact with it for 14 1-2 inches. The author assumed a car with 750 pounds sprung weight per back wheel and 250 pounds unsprung weight, including the weight of the spring, a spring deflecting 1 inch per 200 pounds, and a velocity of 22.5 miles per hour.

It had to be assumed that the tire left the top edge of the obstacle suddenly, and released the pressure suddenly, but this point does not show any break of continuity on the curves in Fig. 3. The abscissæ of the curves are feet of travel of the car and the ordinates inches of rise. It has been assumed that there is no rebound of the axle from the road.

Now, the path of the car, as shown in the curves, is not really of much importance. So long as the maximum movement does not pass the limit reluctantly allowed by the coachbuilder, a large swing causes no discomfort merely because it is large. In crossing a humped bridge at just the right speed, there is often a very big swing with a gentle switchback movement and no sign of a jerk.

The full line curve in Fig. 4 is the acceleration curve of the car, corresponding to the curve of path in Fig. 3, the curve being plotted from the calculated figures, and not deduced from the curve of path. In this figure the abscissæ are feet of travel, as before, and the ordinates accelerations, those above zero being upward accelerations. The maximum upward acceleration is reached just before the axle reaches the top of its path, and the acceleration changes sign just before the axle returns

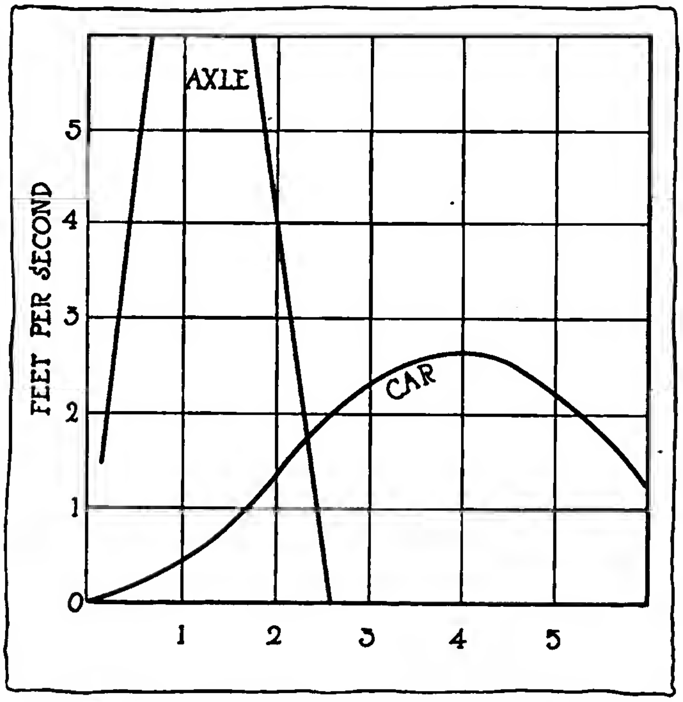


Fig. 5—Enlarged curve, showing comparatively the motion of the car and axle in passing over an obstacle

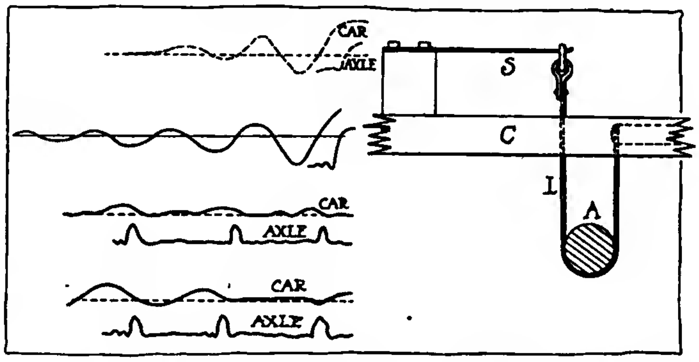


Fig. 6—(Upper left), two graphs of a 15/16-inch drop of the car fitted with the friction device and with the road stationary. Fig. 7— (Lower left), two graphs with the road running and three obstacles at equal distances. Fig. 8—(Right), special friction device fitted to model car in which the friction element consists of a leather band acting against the axle on the rebound when the axle passes beyond its normal position

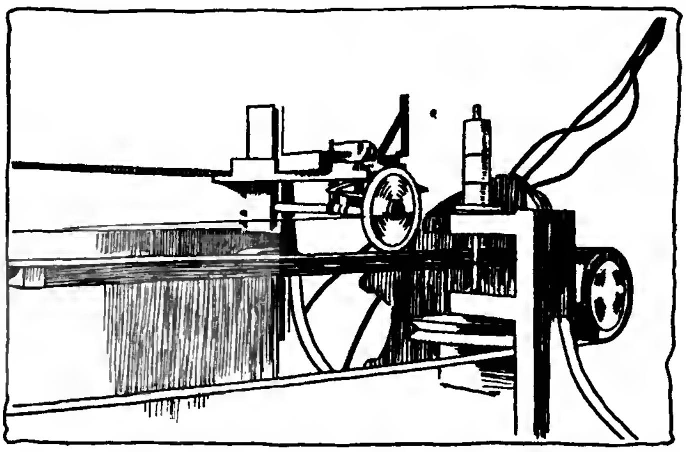


Fig. 9—Model car, constructed to one-eighth linear scale, and roadbed formed by belt running on pulleys actuated by an electric motor. An obstacle is shown at the middle of the upper part of the belt. In the operation of the device, the wheel and the axle are stationary, the moving roadbed imparting the shocks recorded through the spring

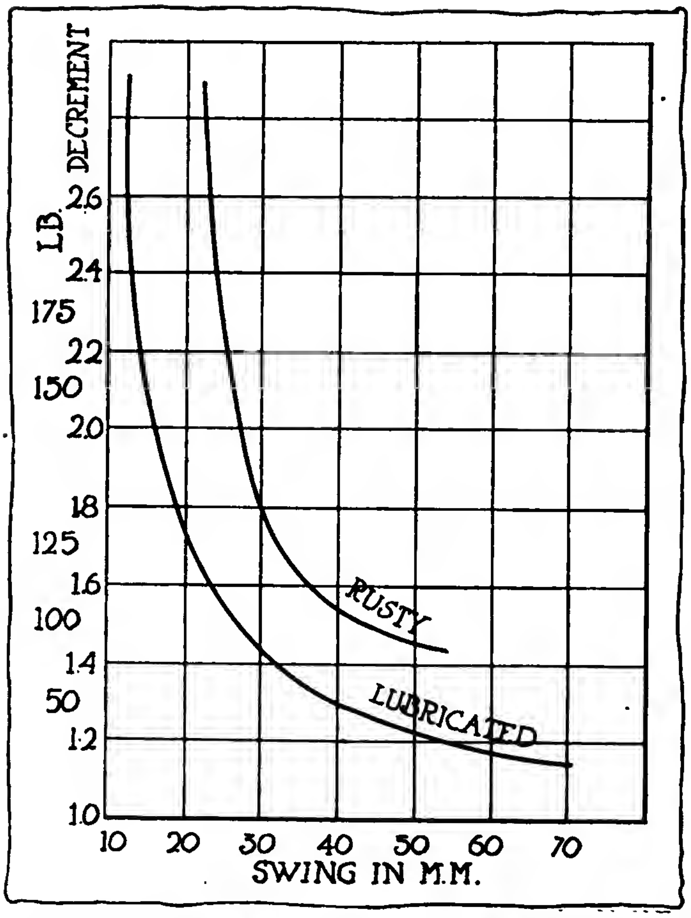


Fig. 10—Curves plotted from a number of records. It is remarkable how rapidly the decrement (ordinates) increases as the oscillations decrease

to level ground. After this point the car executes free harmonic motion up and to the end of its travel, and the acceleration curve is a sine curve.

The broken line curves in Figs. 3 and 4 are corresponding curves to the full line curves, with the one difference that the strength of the spring is 300 pounds per inch instead of 200 pounds. The whole movement is over sooner, but otherwise there is little difference to be seen in the curves of path. Turning, however, to the acceleration curve, this, at the corresponding point, is markedly steeper. The maximum inclination is 48 ordinate per unit abscissa, or 50 per cent. more than with the weaker spring. The inclination is in the same proportion as the strength of the spring, and this clearly shows the importance of having a spring no stronger than is necessary.

The dot and dash curves in Figs. 3 and 4 correspond to the full line curve, with the single difference that friction has been assumed to exist in the relative motion of car and axle. The friction has been assumed constant and equal to a force of 170 pounds. To give an idea of what this means in practice, it may be said that the friction in an ordinary seven-leaf spring tested by the author was, when clean and well greased, about 50 pounds, and when rusty about 85 pounds, these values being obtained by measuring the decrements, which were 1.24 and 1.45 respectively. Now, the author does not know what friction shock-absorbers are supposed to give. After a few months on a car the friction is generally negligible, but when new he presumes they have a fair amount. The frictional force of 170 pounds he has assumed is not, therefore, out of the way for a spring in average condition fitted with a shock-absorber.

The fluid friction device appears to be an excellent thing, and the only trouble about it is that, as far as I know, it will not work in practice.

The other kind of friction device is that which comes into action only on the rebound. My assistant, Mr. Gregory, designed a very ingenious form of this, which he fitted on the model car. It is shown in Fig. 8, in which A is the axle, C the car and L a leather strip fixed to the car at one end, passing under the axle and hanging at the other end on a spring S, fixed to the car. In the normal position of the spring, the leather band is quite free, the spring S exerting no force on it. Therefore, for any compression of the spring from its normal position no friction is introduced. On the rebound, however, as the axle passes beyond its normal position, it comes against the leather band, which rubs round it with pressure increasing with the rebound deflection.

Fig. 6 shows two graphs of the model car fitted with this device taken with the road stationary, merely by dropping the car through 15-16 inch. The lower graph represents the undamped swings, the upper graph shows the result obtained with the leather band.

Fig. 7 shows two graphs taken with the road running and with three obstacles at equal distances, the speed being adjusted to make the effect of the obstacles cumulative. As before, the lower graph represents the undamped swings and the upper graph the effect of the leather band.

I will now mention some tests made on a motor car spring which was very kindly lent to me by the Wolseley Co. It was a light spring, deflecting 1 inch with about 135 pounds, and was 49 inches long, and had seven leaves. This was hung by its ends on two long shackles, and a platform was hung from its center to take weights. Weights up to 690 pounds deflected the spring till it was nearly flat, the height above the chord being only 16 millimeters. A pencil attached to the center of the spring recorded on a drum. The spring was made to oscillate by hand, and at the moment the hand was removed the pencil was put in contact with the drum upon which the records were taken.

For the first tests the spring was cleaned and well greased, and then the grease was thoroughly cleaned off and strong sal ammoniac put between the leaves, with the result that in a day the spring was as rusty as the ordinary motor car spring generally is.

From the graphs obtained, the decrement was measured as the ratio of one half-oscillation to the next half-oscillation. The ratio of the positive amplitude to the negative was not taken because the zero position, owing to friction, was not quite definite. Fig. 10 shows curves plotted from a number of records, the abscissæ being the total amplitude, plus to minus, of the first half-oscillation from which the decrement (ordinates) was reckoned. It is rather remarkable how rapidly the decrement increases as the oscillations get small.

To gain an idea of what the decrement means in friction, the average frictional force over a swing was calculated by equating the loss of energy in the system over a whole oscillation to the work done by the movement of the center of the spring. The frictional force so calculated would be that in a friction device attached to the center of the spring if the spring itself were without friction. The second scale of ordinates gives this force in pounds. The difference between the two conditions of the same spring is very striking, especially when it is remembered that the deflections are small ones in a nearly flat spring. Thus, for a total swing of 24 millimeters the frictional force is 100 pounds in the lubricated spring and 175 in the rusty one. For a larger swing of 54 millimeters they are 46 and 83 pounds respectively.

It would be interesting to ascertain the difference in friction between a flat spring and a highly cambered spring, but it would mean the construction of a number of different springs. I took a number of graphs with a weight of about 380 pounds with which the height of the chord was 80 millimeters instead of 16 millimeters with 690 pounds. The resulting curve is of the same shape as those in Fig. 9, but the decrements are lower. For a swing of 30 millimeters, with lubricated spring, the decrements are 1.253 and 1.420 for 380 and 690 pounds, respectively. I do not think, though, that any deduction can be made from these results to give an indication of the difference in friction due to camber only.

Benzol Beats Gasoline in Economy Test

Trials with Favorit Carbureter on Brooklands Show Saving of 17 Per Cent. in Miles Per Gallon

Economy of Benzol Was Particularly Noticeable at Low Speeds, Giving 33 Miles to the Gallon as Compared to 26 Miles with Gasoline

LONDON, ENG., May 20—Benzol gives better fuel economy than gasoline, according to the reports on the Favorit carbureter just given out by the Royal Automobile Club and published in the *Journal* of that institution. The carbureter was fitted to a Benz 28-35-horsepower car and the trials were held on Brooklands track. The speed of the car was noted and the amount of fuel consumed recorded in terms of miles per gallon. An average of the tests showed that the benzol was 17 per cent. more economical in miles per gallon than the gasoline. The difference in economy was particularly noticeable at low speeds, as may be seen from the tables, where the car attained a mileage of over 33 miles to the gallon on benzol as compared to 26 miles per gallon for gasoline. The full report as given by the R. A. C. is as follows:

This is to Certify that a Favorit carbureter was entered for trial by Messrs. Favorit Vergasergesellschaft m. b. H., of Berlin, and 14 Caxton House, London, S. W.

Description of Carbureter—The carbureter is of the usual form, with float chamber and mixing chamber. There are two sources of fuel supply to the engine: (*a*) The usual central jet (which is adjustable by a taper needle); (*b*) a by-pass entering the induction pipe at the point at which the lip of the butterfly throttle touches. In addition, air is admitted to the engine through the throttle spindle when the throttle is completely closed and the engine not firing.

Description of Trial—The carbureter was fitted to a 28-35 horsepower (22.4 R. A. C. rating) Benz car. The carbureter was warmed by the engine cooling water. The particulars of the car were as follows:

Engine, four cylinders	95 mm. by 140 mm.
Volume of the compression space of a cylinder	293 c.c.
Volume swept by the piston	991 c.c.
Compression ratio	4.3
Weight of car	3,626 lb. (32 cwt. approx.)
Weight of car and load as run	4,181 lb. (37⅓ cwt. approx.)
Gear ratio on top gear	3.25 to 1
Size of wheels	880 mm.
Wind area of body	14.0 square feet
Country of origin of carbureter	Germany

The trials were held upon Brooklands track. The weather for Tests 1 to 7 and 13 to 17 was fine, cold and windy, while there was rain during 8 to 12.

Benzol was used in Tests 1 to 12, the following being the result of a distillation test of a sample:

First drop distilled at	75 ° C.
10 per cent. distilled at	84.5° C.
20 per cent. distilled at	85 ° C.
30 per cent. distilled at	86 ° C.
40 per cent. distilled at	87 ° C.
50 per cent. distilled at	88 ° C.
60 per cent. distilled at	89 ° C.
70 per cent. distilled at	91.5° C.
80 per cent. distilled at	94.5° C.
90 per cent. distilled at	103.5° C.

The specific gravity of the fuel, which was 0.873 at 15.5 degrees Centigrade, may indicate the presence of an extremely small quantity of gasoline, so small as probably to be caused by imperfect draining of the tank and pipes prior to filling up with the benzol.

After Tests 1 to 7 the carbureter was adjusted and the valves of the engine ground in. No adjustment or alteration was made between the tests in which benzol was used and those in which gasoline was used.

SUMMARY OF TESTS

No. of test	Fuel used	Speed, m.p.h.	Consumption — Miles per gallon	Consumption — Ton miles per gallon
1	Benzol	13.17	19.5	36.4
2	Benzol	18.85	19.5	36.4
3	Benzol	25.99	18.77	35.03
4	Benzol	31.41	17.55	32.75
5	Benzol	38.45	17.55	32.75
6	Benzol	44.02	17.55	32.75
7	Benzol	48.79 (Maximum)	15.59	29.09
(The carbureter was then adjusted)				
8	Benzol	13.35	33.40	62.34
9	Benzol	19.31	30.44	56.82
10	Benzol	25.10	28.63	53.44
11	Benzol	31.12	26.52	49.51
12	Benzol	37.17	21.67	40.44
(Higher speeds were not attempted by the entrant)				
13	Gasoline	13.53	26.57	49.60
14	Gasoline	19.21	25.30	47.22
15	Gasoline	25.21	23.93	44.67
16	Gasoline	32.01	22.36	41.74
17	Gasoline	36.45	20.68	38.60

(Higher speeds were not attempted by the entrant)

NOTE.—The speeds are average speeds, hut were kept as constant as possible during each test.

J. W. ORDE, *Secretary.*
April 29, 1913.
Pall Mall, London, S. W.

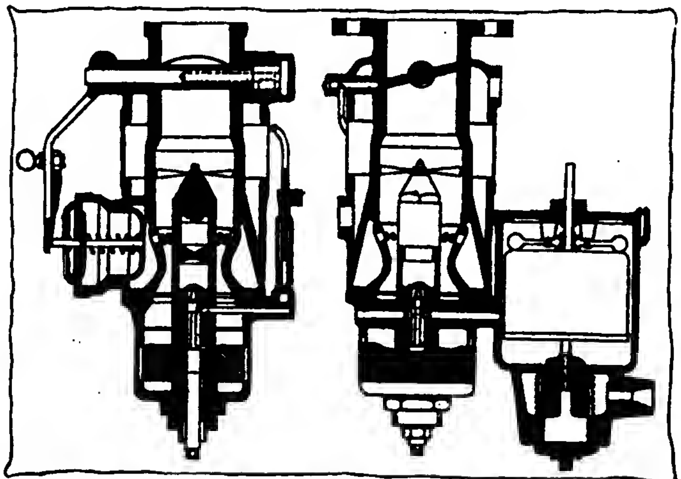
ARTHUR STANLEY, *Chairman.*
W. WATSON, *Vice-Chairman of Technical Committee.*

R.A.C. Tests on Globe Car

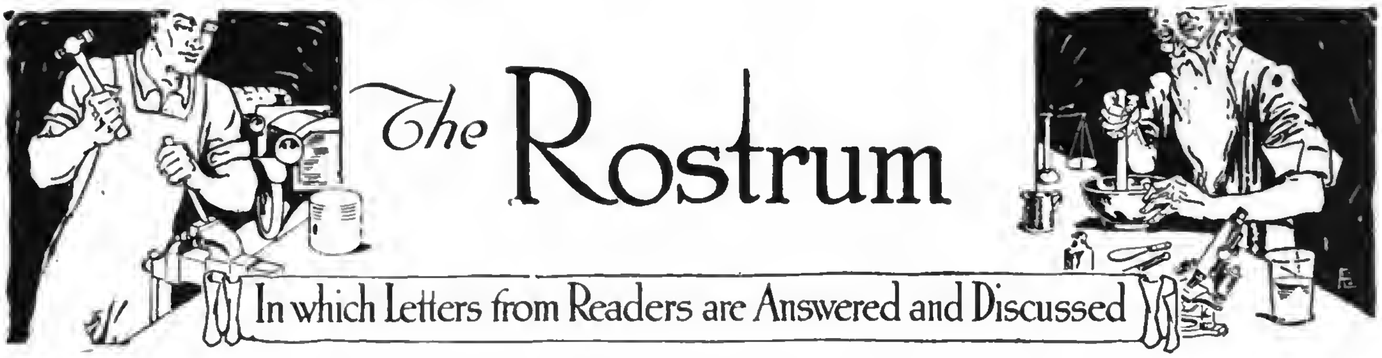
LONDON, ENGLAND, May 20—Reports just published by the Royal Automobile Club on the tests of a Globe car on the roads between Russell Court and Bow Road, London, for the purpose of determining the performance of the car under traffic conditions, show English car performance on high gear.

The car weighed 1,300 pounds in running condition and was equipped with a two-passenger body. The motor was of French manufacture with a bore of 4.13 inches and a stroke of 4.72 inches, has one cylinder and has a gear ratio of 4 to 1 on high. The route followed was between Russell Court, St. James and Bow Bridge. This takes in some of the heaviest traffic streets in London. The trial was started at 8 a. m., and ended at 1.30 p. m. The total distance covered was 46.4 miles. There were voluntary stops of 6 minutes and 58 stops for traffic totaling 23 minutes and 36 seconds. The average speed was 8.3 miles per hour. The car was started and driven on high gear only. After the luncheon period it was found that the car could not be started owing to a sticking exhaust valve.

A second test over the same route was made with this car a week later during which time the car covered 79 miles at an average rate of 10.7 miles an hour. During the test there were 113 stops all being voluntary.



Transverse and longitudinal sections through Favorit carbureter



No Taxation on Horse-Drawn Vehicles—Fire Department Collects Fees—Correct Place To Put Gearset—Development of the Cyclecar—Correction on Tax Laws—Bad Mesh Causes Gear Growl

Horse-Drawn Vehicles Are Not Taxed

EDITOR THE AUTOMOBILE:—Is there any law in the United States by which the horse-drawn vehicles pay a tax, the same as automobile owners? As you will see by the inclosed clipping, Colorado passed a law imposing a tax according to horsepower upon automobiles, and I consider it class legislation to tax one vehicle and not another, and will fight paying my $10 a year automobile tax after July 15, 1913, if I have a precedent to go by, as I already pay personal taxes on same, and heretofore we have been only paying $2 for a registration license and got a number and no more tax, except for personal property each year.

If you put me on the right track of someone who knows or tell me what has been done in other states, I will appreciate same, as I feel we automobilists are being unduly taxed.

Denver, Colo. W. L. H.

—THE AUTOMOBILE does not know of any state where horse-drawn vehicles are taxed in the same sense that motor cars are taxed for registering purposes. There are states where horse-drawn vehicles are compelled to pay a wheel tax the same as motor cars, but not to my knowledge a state where a registration fee is charged for horse vehicles.

This registration of motor vehicles beyond the cost of identifications is purely a double taxation matter as we have expressed from time to time.

As you are no doubt aware, the American Automobile Association is going to contest this matter in the Courts and take it to the Supreme Court in order to decide whether the present method of registration is legal or not.

Average Speed on a Tour of 2 Weeks

Editor THE AUTOMOBILE:—I am planning a vacation tour of 2 weeks in my car. In making my plans for this tour by the aid of a road map I have counted on averaging 20 miles an hour throughout the trip. During each day I am counting on making 120 miles in 6 hours as I intend traveling from 10 a. m. until 5 a. m. with a stop-off of an hour each day for dinner. At this rate, I will just finish the trip I intend making. The roads are for the most part very fair. Is this average about right? I do not want to travel more than 6 hours a day as I desire time for other recreation.

Cleveland, O. VACATION.

—You will have no trouble in making 120 miles a day over fair roads but you will find that unless you travel uncomfortably fast for a tour you will never average 20 miles an hour. It has been found that the many times it is necessary to slow down on account of villages, hills, curves, tire repairs and the various other likely causes that the average touring speed is close to 15 miles an hour.

Has Authority to Collect Automobile Fees

Editor THE AUTOMOBILE:—Has the Fire Department, Division of Combustibles, authority to collect $5 per year for a permit to keep an automobile?

Flushing, L. I. A. H. W.

—The law on this subject is printed in the regulations of the Municipal Explosives Commission adopted January 3, 1912, governing the storage and use of mineral oils, inflammable mixtures, combustibles mixtures, garages, motor vehicle repair shops, etc. Section 372 of the laws states that: "A permit may be issued for a garage on premises on which there is a dwelling occupied by the applicant or by his employee, provided that the entrance to the living apartment shall not be through the garage; and provided further that all motor vehicles stored or kept therein shall be the property of the applicant or of his immediate family, and that none of such vehicles shall be let out for hire."

Section 373 states: "A permit may be issued for a garage in a building occupied as a dwelling by either the applicant and one other tenant or by the applicant's employee and one other tenant, provided that not more than two floors or stories above the garage are occupied or used as living apartments, which apartment shall be separated from the garage by unpierced fireproof walls and floors; and provided further that all motor vehicles stored or kept in such garage shall be the property of the applicant or of his immediate family and that none of such vehicles shall be let out for hire."

In regard to fees, to quote section 101—"For a permit allowing the maintenance and operation of a garage as provided for in section 372 and 373 of these regulations, the applicant shall pay an annual fee of $5 for a single motor vehicle stored therein and an additional annual fee of $2 for each additional motor vehicle so stored."

A. L. A. M. Rating Known as the S. A. E.

Editor THE AUTOMOBILE:—I know how to figure the A. L. A. M. rating, but would like you to explain the S. A. E. and R. A. C. ratings and any other rating that may be used. Kindly explain same in such a manner that I can take my pencil and figure the horsepower after knowing the bore and stroke.

2—What is the proper horsepower for a car weighing 4,600 pounds with full equipment and tanks filled?

Morgantown, W. Va. B. H. MADEIRA.

—1—When the A. L. A. M. passed out of existence the old standards which had been adopted by this body were in a way wished upon the S. A. E. because it is part of the work of the Society of Automobile Engineers to standardize the measurements of all fittings. The A. L. A. M. spark-plug thread, for instance, which was adopted by that body, has now passed over to the S. A. E. which has adopted it as their standard. In the matter of the horsepower formula the old A. L. A. M. formula has become to be known as the S. A. E. rating, although there is no official record on the books of the Society of Automobile Engineers to show that they as an institution have adopted the A. L. A. M. formula as their own. The R. A. C. is at present using the same rating that we know as the A. L. A. M., that is:

$$\text{Brake horsepower} = \frac{D^2N}{2.5}$$

In this formula D represents the bore of the motor, N the number of cylinders and 2.5 is a constant for all four-cycle automobile motors.

2—It is impossible to state what the proper horsepower for any given car weight should be because it depends upon where it is going to be used. It is evident that in the weight you give, the weight of the motor is included and this brings the matter down to the point of what proportion of the 4,600 pounds should be devoted to the motor. Automobile motors weigh very close to 25 pounds to the horsepower when they are built in the sizes ranging between 30 and 40 horsepower. A 40-horsepower motor, that is, one that will develop 40 horsepower on the brake, will weigh close to 1,000 pounds.

If you want a motor in the car that will take the passengers up any hill and in which you will not have to be continually dropping to a lower speed everytime that a slight grade is reached, the motor should be capable of developing 40 horsepower at least to carry comfortably the load of 4,600 pounds.

Where To Place the Gearset

Editor THE AUTOMOBILE:—A gearbox in unit with the motor enables the clutch to be inclosed, giving a very neat appearance: it is easily and therefore cheaply manufactured. Regarding simplicity, this depends upon the design of the unit, as some cars using unit power plants are readily accessible while others are anything but accessible. Regarding flexibility this type of construction can be hung so as to be undisturbed or thrown out of line.

The amidship position is very good for heavier and higher-powered cars when used without a subframe. However, the manufacturing expense is greater, and the extra universal joints, while no doubt in many cases trouble-proof, require lubrication from time to time. This construction insures a good distribution of the weight on the frame.

The rear axle location is one that requires much more thought and study than the average designer who has attempted this design has given it. The drawback is not the additional unsprung weight, but the absolute necessity of swinging the propeller tube and gearshift levers from the same common point. If this is not followed out, one of the most simple laws of mathematics is not taken into consideration and undue, and to say the least, unnecessary, wear is imposed upon the transmission gears. The fact that practically all [illegible] gearboxes, as well as [illegible] gearboxes, have [illegible] time and to add gear [illegible] gearshift lever [illegible] or less trouble. [illegible] gearbox and the gear [illegible] connections means that [illegible] later in these linkages [illegible] lever is in its proper place [illegible] words, the ten foregoing [illegible] having a fair show as they are [illegible] partly in mesh.

It is granted that, by placing a [illegible] differential and rear axle gearbox, these [illegible] ably be overcome; but why not [illegible] construction and thus do away with [illegible] tear on the gearbox gears, one of the [illegible] modern motor cars?

East Orange, N. J. [illegible]

Motor Will Not Throttle Down

Editor THE AUTOMOBILE:—What is the [illegible] It will not throttle down but will run very [illegible] If I leave the motor running slowly it will [illegible] cylinders and the other two will be dead. [illegible] beautiful condition and I get a vigorous spark [illegible] at 50 revolutions a minute.

New York City. [illegible]

—You have probably by this time tried giving [illegible] a little more gas. A richer mixture is really what [illegible] at low speeds but the cause of the trouble is [illegible] much air gets into the cylinder through bad valve [illegible] leaky intake manifold. Note the joints and gaskets [illegible] pipe as shown in Fig. 1. The valve guide also may [illegible] of suspicion. The probable cause of the entire trouble [illegible] you will find to be in that the valves need grinding

Needs Larger Gasoline Spray Nozzle

Editor THE AUTOMOBILE:—In regard to Mr. Webb's trouble as printed May 15, I have had and am still having the identical experience with a car equipped with a Zenith carbureter. My car (Gregoire 18 horsepower) was built in 1910 and the carbureter was probably built for 1910 gasoline. I have had my cylinders rebuilt as you suggested to Mr. Webb, and did not in any way improve matters. It is my opinion that both of these machines (his and mine), are not getting enough gasoline and that enlarging the spray nozzle in the carbureter will help. If Mr. Webb wishes to know the results of my experience I will be glad to let him know.

As to Mr. De Luke's trouble, if he had a 30 by 4 tire instead

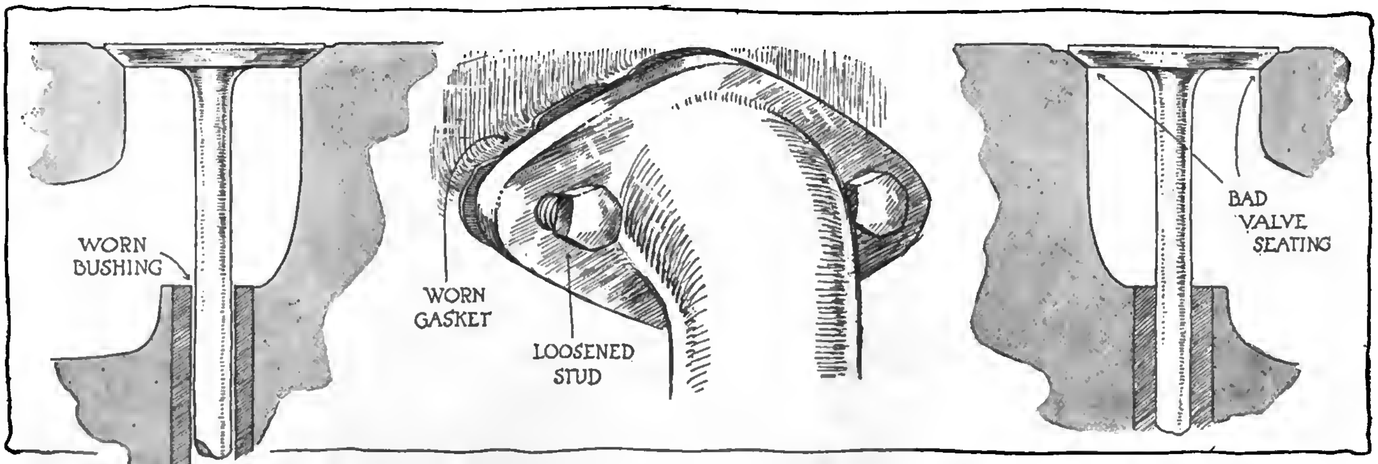


Fig. 1—Four causes of air leak are: worn bushing, worn intake gasket, loose stud and pitted valves

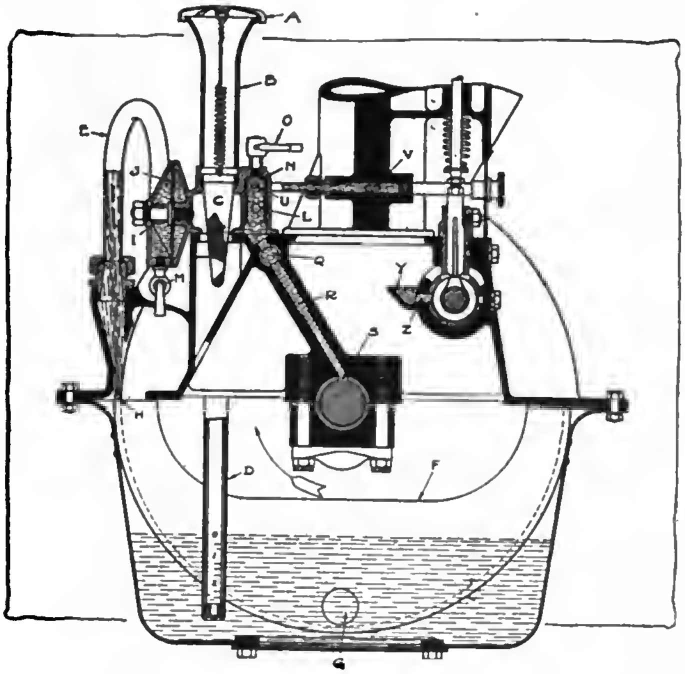


Fig. 2—Transverse section through the Hupmobile 32 crankcase

of a 30 by 3.5 he would have had an awful job getting it on and a worse one getting it off, as a 30 by 4 tire is smaller on its inside diameter than a 30 by 3.5.

New York, N. Y. GEORGE OPPENHEIMER.

Interested in Cyclecar Development

Editor THE AUTOMOBILE:—I am interested in the cyclecar which is attaining such prominence abroad and cannot see any reason why there is not a big field for such a type of vehicle in this country without infringing on the present field. From what I have been able to learn about the cyclecar it is a rational vehicle, and anything that is rational is sure to prove a winner if consistently pushed. With the increasing price of gasoline I see no reason why these economical little vehicles should not come into prominence in this country.

In your last issue I noted the consumption of gasoline in the recent Catskill tour over the 65 miles of road from New York City to Newburgh and having been over this road I know of the steep winding climbs up Crow's Nest Mountain, but am still convinced that our cars today use motors that are too large and also that many of our cars are too heavy.

I am quoting herewith some figures on cyclecar economy

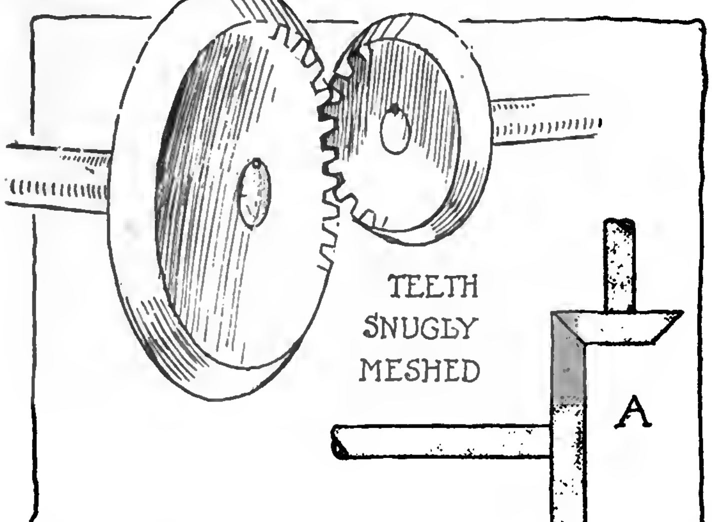


Fig. 3—Differential pinion should not project out of or into bevel gear

which I noticed in a recent issue of *The Cyclecar*. This was a road test with steep hills. The winning cyclecar averaged 82.1 miles per gallon. Its weight with passengers was 819 pounds. Other cyclecars averaged 69.67, 62.59, 56.54, etc., miles per gallon.

These figures speak real economy. With gasoline at 20 cents per gallon and 1 gallon doing for 80 miles, there is a cost of but .25 cent per mile for fuel. This is the type of vehicle that thousands of would-be car owners would like to have. It is a light car, one easy on tires and very cheap on fuel. It is not necessary that such a car be exceptionally cheap at first cost, rather that it be cheap to operate. There are hundreds who can afford to buy vehicles, but who object to the high cost of maintenance. It seems to me that the cyclecar offers an excellent solution to this problem.

Albany, N. Y. LIGHT CAR.

Correspondent's Error Corrected

Editor THE AUTOMOBILE:—The writer noticed in THE AUTOMOBILE for March 20 an account of the new automobile tax laws of Indiana, and note that you have an incorrect report of same. The correct rates are copied from the Acts of the 1913 Indiana Sixty-eighth Session, Section Six, as follows: "The following fees shall be paid to the secretary of state upon the registration or re-registration for each calendar year. For each motor bicycle so registered, the sum of $2; for each motor vehicle of 25 horsepower or less, the sum of $5; for each motor vehicle of 40 horsepower or less and more tban 25 horsepower, the sum of $8; for each motor vehicle of 50 horsepower or less and more than 40 horsepower, the sum of $15; for each motor vehicle of more than 50 horsepower, the sum of $20, and for each and every electrically propelled motor vehicle so registered, the sum of $3. Provided that for motor vehicles which are used or to be used solely for commercial purposes, the fee for such registration shall be $5 annually."

I note that you did not state in your previous account the method to be employed in calculating the horsepower in conjunction with this law.

Section 2 states that "in application for license party must state name of manufacturer and factory number of vehicle, the character and amount of motive power stated in figures of horsepower in accordance with the rating established by the association of licensed automobile manufacturers." This the writer concludes to be the old A. L. A. M. formula which is

$$\frac{D^2N}{2.5} = \text{H.P.}$$

There has been much discussion among Indiana automobile owners regarding this law, as most of them had read your accounts in THE AUTOMOBILE. Consequently, I think you owe it to your Indiana readers to make the correction.

Romney, Ind. CLYDE L. BURGHARDT.

—This was an error by the correspondent which THE AUTOMOBILE is glad to have corrected as per Mr. Burghardt's letter.

Lubricating System of the Hup 32

Editor THE AUTOMOBILE:—Would you call the Hupmobile 32 lubricating system a splash system? Does a splash system use more oil than a pressure-splash or pressure system?

San Diego, Cal. MARK JUNGK.

—The Hupmobile 32 lubricating system is a combination gravity and force-feed type. Although the camshafts and valve mechanism are lubricated by the spray thrown off by the connecting-rods the bearing surface of the motor are lubricated in the main by the gravity system.

The oil is contained in the lower part of the crankcase of the motor which has a capacity of 3 gallons. This is one point in which it resembles the splash lubricating systems and in this type of lubrication the reservoir is generally found in the crankcase. In the Hup car the flywheel acts as the oil pump. Referring to Figs. 2 and 5, the oil is lifted up by the spaces

G in the flywheel and carried up to the passage H. At this point the oil is thrown with considerable force, due to centrifugal action, through the inverted U-shaped passage E. From this point the oil runs to the chamber I. Within this chamber there is an oil strainer J, through which all the oil is compelled to pass, taking out the dirt and grit which can be drained off occasionally by opening the petcock M.

The oil now passes to the body of the oil regulator I, which governs the amount of feed to the bearings. It is automatic in its action and is controlled by an interconnection with the throttle. The oil is distributed from the regulator to the crankshaft and cylinders by means of a valve N, which is operated by a lever O connected to the accelerator through the mechanism P. When the throttle is opened about one-quarter the entire way, the valve N in the regulator starts to open and allows the incoming oil at L to flow down the channel R to the main bearings S. The oil channel is an integral part of the crankcase being drilled through the webs of this casting. From the main bearings the oil passes through the holes in the crankshaft and thence to the lower connecting-rod bearings and by centrifugal force the excess is sprayed all over the interior of the motor. This oil spray which pervades the entire crankcase is sufficient to oil the pistons at low or ordinary motor speeds. At higher motor speeds or when climbing hills and the throttle is more than half open the valves begin to open to the oil tubes at U and allow the oil to flow to the cylinders through the openings which register with the opening in the ends of the wristpins when the piston is at the bottom of its stroke. Though the openings in the wristpin the oil finds its way in sufficient quantities to thoroughly lubricate the piston.

Splash and force-feed systems use about the same amount of oil. It takes a definite amount of oil to properly lubricate a motor and a correctly designed system will first use that given amount.

Difference in Power with Muffler

Editor THE AUTOMOBILE:—Kindly let me know if there is any increase in power by reason of running cars using gasoline as fuel with the muffler cut out. I claim that there is no appreciable increase if the car is provided with a large size exhaust pipe entering muffler. In cities the practice is, I believe, generally prohibited. Is there any make of car that is not provided with a cut out?

Warrensburg, Mo. A. L. KENYON.

—The chart, Fig. 4, shows the small difference in power with and without a muffler cut out at a recent test made on a Packard motor. It will be noted that this was so small that it could not be noted in running the car.

There are several makes of cars that are not furnished with cut outs. The Peerless car is a noteworthy example of this as the makers have not been putting cut outs on the car since the car was first put on the market.

Incorrect Meshing Causes Growl

Editor THE AUTOMOBILE:—Will you kindly give me some information on how to silence a noisy differential gear? My car is a Maxwell runabout AA model, 1910. The gears make a growl. There is plenty of heavy grease in the housing. In fact, it was recently taken out and examined. What depthing should the drive pinion have? Is this noise caused by pinions not being meshed properly, either too deep or shallow? Please give me instructions on how to obtain the proper depthing for pinions, also other probable causes to be looked into for this trouble.

Clinton, N. C. F. R.

—Gears which are meshed improperly have a tendency to set up a rubbing action when meshed too deeply and thus give rise to a humming sound. When the meshing of the gears is not deep enough a rattling sound is produced rather than the continuous hum of the too deeply meshed gear. The correct meshing of the gears cannot be better described than that the teeth

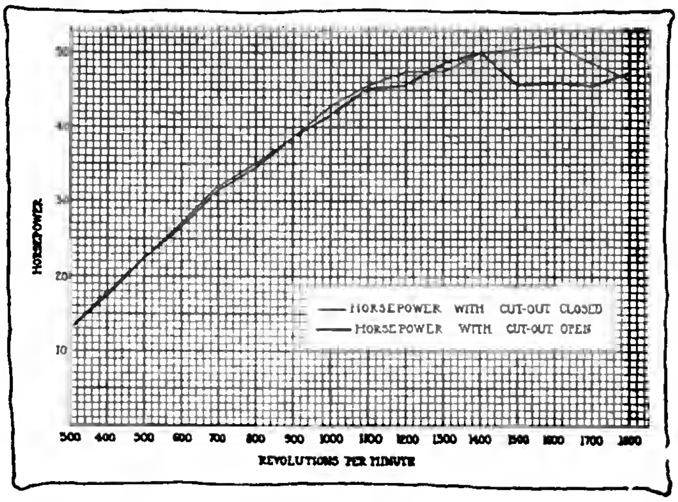


Fig. 4—Chart showing difference of horsepower with and without muffler

should fit together snugly without play. This is distinguished from gears in which the teeth are pressed tightly against one another. It will be remembered that where the 45-degree pinion meshes with the differential wheel there is a considerable wedging action possible. This may be understood from Fig. 3 which shows how these two gears mesh. When the pinion is moved back too far it is capable of exerting a tremendous wedge action which, combined with the ordinary driving pressure, is sufficient to cause a rapid grinding away of the teeth. Grinding actions are always combined with noise because the nature of the operation sets up a strong vibratory action in the metal.

When the gears are meshed too deeply a tap or knock will result at every change of load. Under a constant load there is a good possibility of the gears being pressed firmly together by the load and the knocking or rattling effect will not be so apt to be produced.

It must be remembered that the main cause of noisy gears is not so apt to be a faulty meshing of the gears but will rather be due to the fact that the gears themselves have worn. When the gears are worn, a temporary silencing effect will be secured by bringing them deeper into mesh, but the next wear will be quicker since the hardest part of the gears will have been worn away by that time. In bringing differential gears closer into mesh with the driving pinion the two gears should be worked together. That is, the pinion should be moved back slightly while the differential gearwheel should, at the same time, be moved over toward the pinion. This makes a sort of double adjustment which is really necessary to compensate for the different conditions which will result from changing only one of the gears.

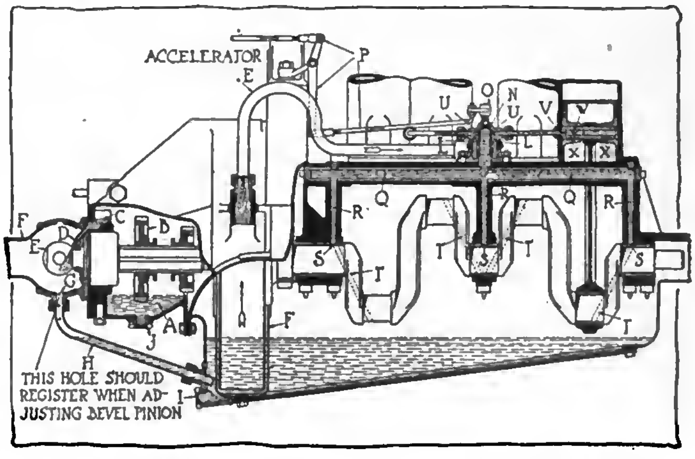


Fig. 5—Longitudinal section of the Hupmobile crankcase showing oiling

Howard Six Has Double Exhaust Line

Cylinders Cast in Threes with Separate Manifold and Muffler for Each Block—Design To Minimize Back Pressure and To Insure Silence

ONE of the new cars which was announced at the time of the Chicago Show was the Howard Six, manufactured by the Howard Motor Car Co., Connersville, Ind. This company is utilizing the old Lexington plant and started the work of assembling chassis in March. The plant has a capacity of 1,000 cars a year.

The new car is distinguished by minor refinements rather than by any radical tendencies in design. It is an assembled car and one of the aims of the designers, H. P. Tuttle and J. C. Moore, was to standardize all parts as far as possible. Some of the novel features are the use of a double muffler, double flexible exhaust pipe, and the bracket for extra tires bolted to the frame as shown in Fig. 2. The carrying of the wiring, gearshift slot arrangement and other similar details form practically the only departures from conventional practice as may be seen in the accompanying illustrations. The Electro starting and lighting system is used. The six-cylinder Continental motor of 4.125 and 5.25-inch bore and stroke develops 45 brake horsepower at 900 revolutions per minute and 60 brake horsepower at 1,500 revolutions per minute. The cylinders are cast in threes, the valves being inclosed by cover plates. Views of the motor are given in Figs. 3 and 4. The cover plates are shown in Fig. 3, which also shows the high mounting of the carbureter for accessibility and the exhaust manifold, the flexible tubes of which may be seen in Fig. 1. The idea in using the double exhaust system is to minimize a back pressure from the muffler and also to insure silent running. Three exhaust valves open into each exhaust line so that any one valve in either line if closed for 45 degrees crankshaft travel before the next valve in the same line opens. Four-point suspension is used for the motor and gearbox unit. The big truss support used at the front of the motor is shown in Figs. 3 and 4. The unit power plant is also supported by a subframe. An interesting feature of the design is that the motor is secured directly to the frame, thus obviating the necessity of a dustpan.

As may be seen in the illustration, Fig. 1, left drive and center control have been adopted by the designers, the steering column passing under the hood, while the gearshift is located directly on the gearbox.

Fig. 1—View of Howard six chassis, looking forward. Note flexible double exhaust pipes and junction box carrying the wiring beyond the dash. The box on the left running board contains the control switch and batteries for the Electro lighting and ignition system

Lubrication is of the splash system with constant level, driven by a plunger pump, with pockets for all bearings. The oil is fed up around the valve push rods, with an overflow back into the crankcase. Two oil fillers are used, one situated on the timing-gear case and the other at the back of the crankcase. Two universal joints are used between the gearbox and the differential.

Cooling is effected by means of a fan and centrifugal pump. The fan is adjustably mounted on top of the timing-gear case. An English and Mersick radiator of large capacity are used.

The method of carrying the wiring is distinctive, all wires passing through a junction box in front of the dash.

The Electro lighting and ignition system is employed. This system drives and is driven through the pump shaft and pump gear by means of a silent chain pulley belted to a pulley on the crankshaft by a Conventry chain. The control switch and battery for the starter are carried inclosed on the left running board. The battery used comprises twelve 24-volt, 20-ampere Willard cells.

Adjustable Individual Clutch Brake

An adjustable individual brake is used on the clutch to facilitate shifting of the gears. The adjustment is tightened in order to bring the clutch to a quick stop.

A Warner-Toledo gearbox is used, furnishing three speeds forward and reverse.

Drive is by shaft and bevel gear, final drive being through the springs and the torsion rod which is shown in Figs. 1 and 2.

The rear axle is of the standard Timken type having continuous press steel housing. The carrier comprises a complete power unit with gears, bearings and differential integral. Gears are forged heat-treated and ground. All moving parts are mounted on adjustable rolling bearings. The torque rod pins are hardened and ground and swivel in hardened and ground bushings with an adjustment for end thrust. The driving shaft is of nickel chrome steel with driving dogs formed integral and all moving parts are thoroughly protected from dust.

Brakes are of the external contracting and internal expanding type, 17 inches in diameter, the drums being of heavy pressed steel and all operating parts being provided with anti-rattling devices.

The tires are 36 by 4.5 inches all around and Firestone quick-demounable rims are regular equipment.

The Warner type of steering column and gear is employed. This embodies the worm and full gear construction, the latter being mounted below the worm in the usual way. Ball thrust bearings are fitted above and below the worm. It is adjustable in every way. The worm gear is integral with its shaft which is eccentrically mounted in a sleeve so that wear may be easily taken up.

The car is built in five-passenger touring form only, at the present time.

Although the designers have adhered to usual practice in the major details there are several little refinements which are well worthy of mention as indicative of unusual forethought and consideration for the comfort of the driver. Some of these are as follows:

A feature especially worthy of notice is the big tire bracket shown in Fig. 2.

This is bolted to the frame. It will carry either one or two tires and is designed to sustain a weight of 1,000 pounds. It is adjustable so that when arranged for carrying one tire there is no visible indication of a support for a second. No straps are required for securing the tires to the bracket.

An interesting departure is incorporated in the gearshift gate. Most gates have some mechanical stop arrangement to keep the driver from inadvertently throwing the lever into the reverse position while changing gear. In the Howard car a little psychological study evolved the idea that the driver will unconsciously pull the lever toward the reverse slot when he desires to reverse and that he will not exert this pull in simply changing from one forward gear to another. Consequently the Howard gate contains no stop but there is a slight curve in the gate itself which throws the gearshift lever across the H of the slot into second speed, reverse requiring the side pull to prevent the lever from crossing the slot.

The accelerator is of an unusual type, being globular in form, so that it may be operated from any angle. It is also made in such a way that it fits under the instep of the ordinary shoe, so that all the driver has to do to actuate the accelerator or to release it is to move his foot slightly backward or forward. This design permits of so great a variety of positions on the part of the driver that it should be a welcome feature, as the ordinary accelerator pedal permits of but one or two positions of the foot, which consequently becomes very tiring.

Novel Design of the Gasoline Tank

The 18-gallon gasoline tank is located under the front seat and pressure is maintained by an automatic positive pump driven by the camshaft. The novel feature of the gasoline tank is that it is shaped with an inclined bottom in order to assure fuel pressure at the carbureter when the car is tilted on an uneven road surface. There is a gauge on the footboard which shows that the gasoline is apparently all out at a point when there is still capacity for 40 miles.

The front lamps are controlled by a switch situated at the bottom of the steering column. The wiring of these lamps is interesting, the wires being carried up into the inside of the lamp brackets, thus protecting them and at the same time concealing them. The rear lamp is wired in a somewhat similar manner, the wire passing up through the frame to the lamp mounted on the tire bracket as shown in Fig. 2.

The spark lever on the steering column segment is fulcrumed in such a way that, although the lever is operated in the ordinary way to vary the timing of the spark, pressing it down blows the electric horn which is mounted at the left of the motor inside the hood with the bell projecting through the side of the hood. In mounting the horn in this manner it is no longer an excrescence but at the same time its efficiency as a warning signal is not diminished.

Fig. 2—Rear of the Howard chassis, showing the method of carrying the tire bracket. The spring suspension may also be seen, as well as the manner of covering the bolts on the rear hub caps

A feature of the horn mounting is that there is a fuse for each line permitting of testing out the wiring for any short circuit without removing the body.

The unsightly bolts on the rear wheel hubs are concealed by a metal cover put on inside the hub cap. The springs on the brake band levers are continued up in front.

Hassocks are used instead of a foot rest in the tonneau and are fastened to straps so that they can be pulled backward or forward according to the desire of the passenger.

Springs are of the conventional type, semi-elliptic being used in front and three-quarter-elliptic at the rear. Grease cups are fitted on all spring shackles and bolts. In designing the car special attention was paid to making the springs accessible for external lubrication.

Tools are carried in compartments in the cowl of the dash. There is also a small light fitted in the dash. The Troy rain vision windshield used is made a part of the cowl and requires no braces. Pump, jack, and inner tubes are carried in a compartment under the back of the front seat.

Regular equipment includes Stewart speedometer and grade indicator, mohair top and Jiffy curtains as well as the usual complement of tools and similar minor details.

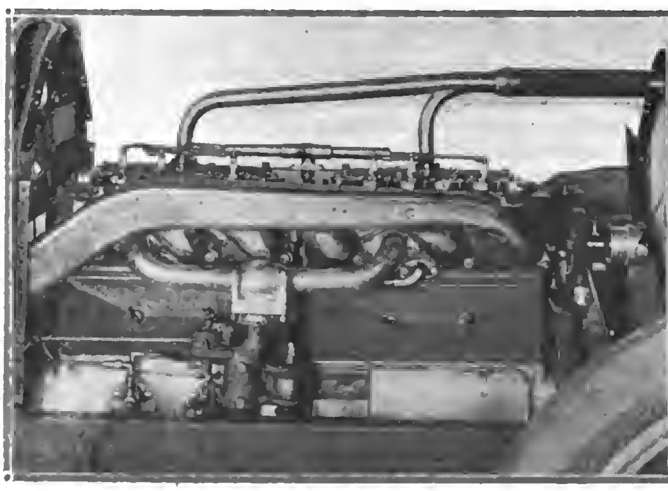


Fig. 3—Right side of the Howard six motor, showing high mounting of carbureter, neat method of carrying wires over the top of the motor and novel form of exhaust manifold

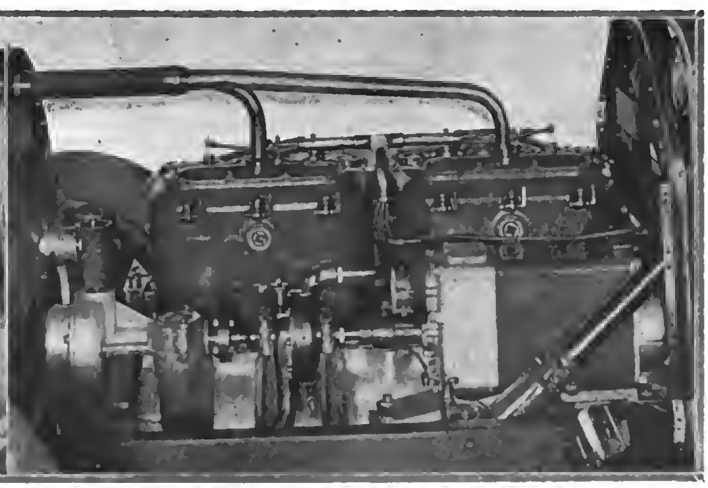
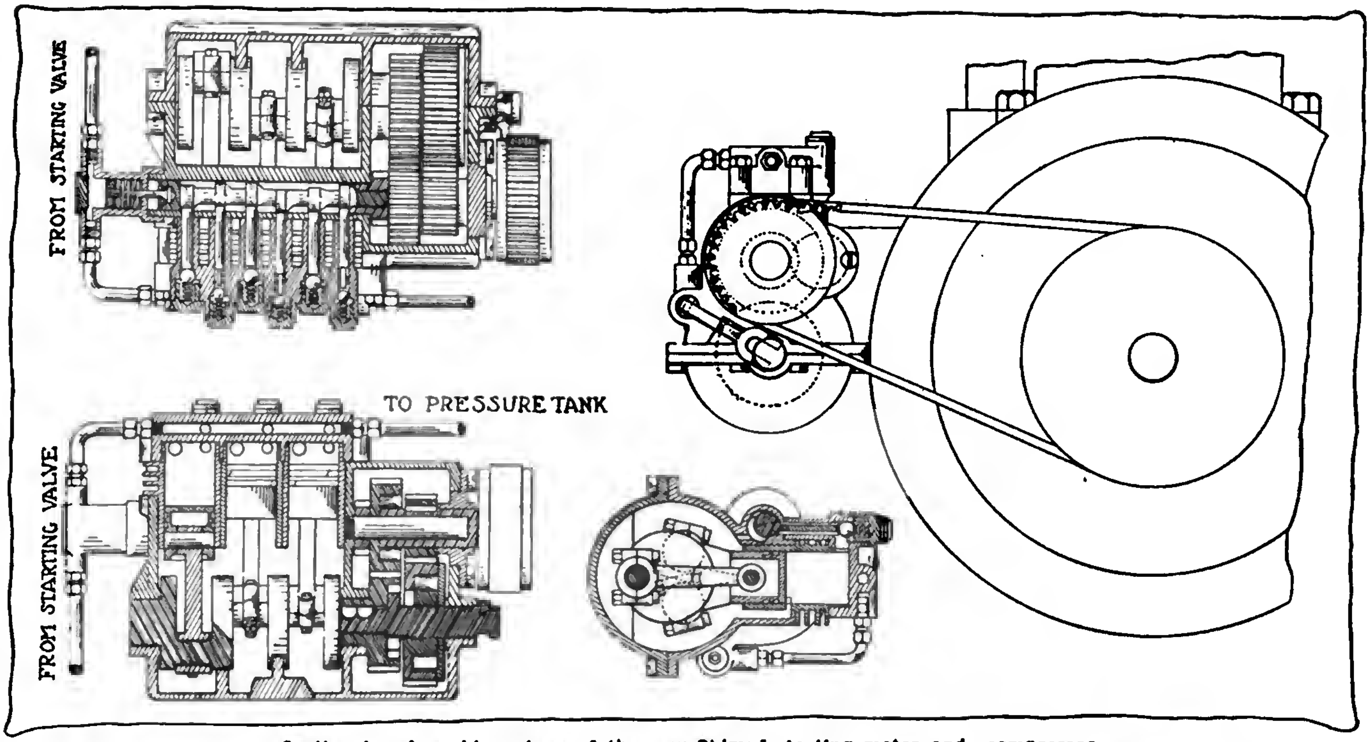


Fig. 4—Left side of the Howard six motor, showing mounting of the Electro lighting and ignition system on the pump shaft, manner of wiring and placing of patcocks on sides of cylinders



Sectional and working views of the new Shimpf starting motor and compressor

Unit Pumps and Starts

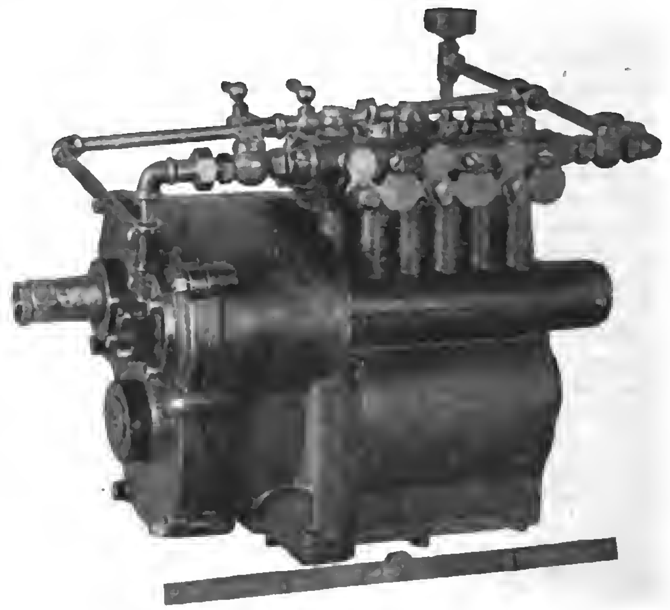
Can Crank the Motor or Pump the Tires As Owner Desires by Making One Simple Adjustment

THE SHIMPF starting motor and compressor, designed and built by Walter H. Shimpf, 1931 Broadway, New York City, as indicated by its title, is a motor and compressor combined in one unit, a device which under certain adjustment will act as a motor and under different adjustment will act as a compressor for compressing air, which may thereafter be utilized for various purposes, such as cleaning the car, operating brakes, blowing signals, pumping tires, etc., including the operation of the device as a motor.

When used in connection with an automobile, it is directly connected by a suitable means with some moving part of the engine, and through a system of gearing and automatic clutches, will either drive the engine for the purpose of starting it or be driven by the engine for the purpose of compressing air to a predetermined pressure into a receiving tank, thereafter remaining idle while the engine is in operation until the pressure is reduced.

The point of connection between the combined starting motor and compressor and the engine is, of course, immaterial as long as such connection insures the proper driving effect from the motor and compressor to the engine, and from the engine to the motor and compressor. The combined motor and compressor is what might well be termed a single-acting motor and and a multiple compressor, inasmuch as the various pistons receive an impulse of movement from the compressed air, exhaust at the end of the stroke, and discharge the contents of the cylinders during the return stroke without working against the compressed air; and when acting as a compressor, compress as individual pistons.

The opening of a valve on the dashboard automatically shifts the camshaft so as to bring into contact with the cams one or more of the push-rods, opening the valve to whichever cylinder



Exterior view of the Shimpf air-compressor motor

is at that time in position to receive the air under pressure; this in turn drives the piston and crankshaft, making an independent air motor which, through the two-to-one gear between the crankshaft and the jackshaft of the motor and a two-to-one gear between the jackshaft and the engine, revolves the crankshaft of the automobile engine, rotating the same until combustion takes up these duties. As soon as the automobile motor has started the closing of the dash valve allows the camshaft to return to a position where the cams do not actuate the push-rods, this operation making the valves automatic and the device a compressor. This device is so designed that by the shifting of the camshaft the various pistons will act directly as compressors or as driving pistons utilizing the same valves and depending upon whether the valves are actuated by the camshaft or actuated automatically.

With the two-to-one gear reduction between the jackshaft of the motor and the engine, when the engine is running, the jackshaft would revolve twice as fast as the engine shaft; to overcome this increased speed so that the crankshaft of the compressor will revolve at the same speed as the crankshaft of the engine, a counter reduction of two to one is placed between the jackshaft and the crankshaft of the compressor. The gearing of the starting motor and compressor is controlled automatically by roller clutches.

The present device is a three-cylinder, 1.625-inch bore by 2.125-inch stroke with crankpins at 120 degrees. The cylinder, crankcase and gearcase are block castings, occupying a space 13 by 10.75 by 8 inches.

The lubrication is by splash, the crankcase and gearcase acting as an oil reservoir. A pneumatically controlled dental clutch between the crankshaft and the two-to-one counter reduction controls the action as a compressor, allowing the compressor to operate until a pressure of 200 pounds is attained, and at that point automatically disconnecting so that the crankshaft, piston, etc., are idle. With this feature a very small amount of time and only a minimum power are required for its operation.

Observed and Calculated Critical Speeds—Prof. Dunkerly has demonstrated by experiment the existence of critical speeds in shafts and found that for shafts freely supported at the ends the observed critical speeds agreed very closely with those obtained by calculation.

Dr. Stodola in his experiments upon shafts has proved the existence of critical speeds of the second and third order and found that the ratio between the first and second and third speeds agreed closely with the calculated values.

To quote Dr. Stodola, "To prevent fracture of the shaft its greatest amplitude of vibration was limited to about .394 inch radius by rings about the shaft. The very first experiment proved the existence of higher critical velocities. The shaft vibrating originally at about .04 inch showed with an increasing velocity an unstable running; at about the critical value it bent and began to rub hard against the rings. Hardly had the critical value been exceeded before the shaft straightened out and no initial vibration could be observed."

It appears that as a general rule the running speed of automobile shafts is well below the critical value. It is, however, possible in some instances that at the high speeds used under service conditions, the vibrations due to the inequalities of the road surface may have a value so close to the natural frequency of the shaft under these conditions, as to become dangerous.

Claims 60.5 Efficiency

Combination Two-Cycle and Turbine Motor Said to Make Big Cut in Heat Losses

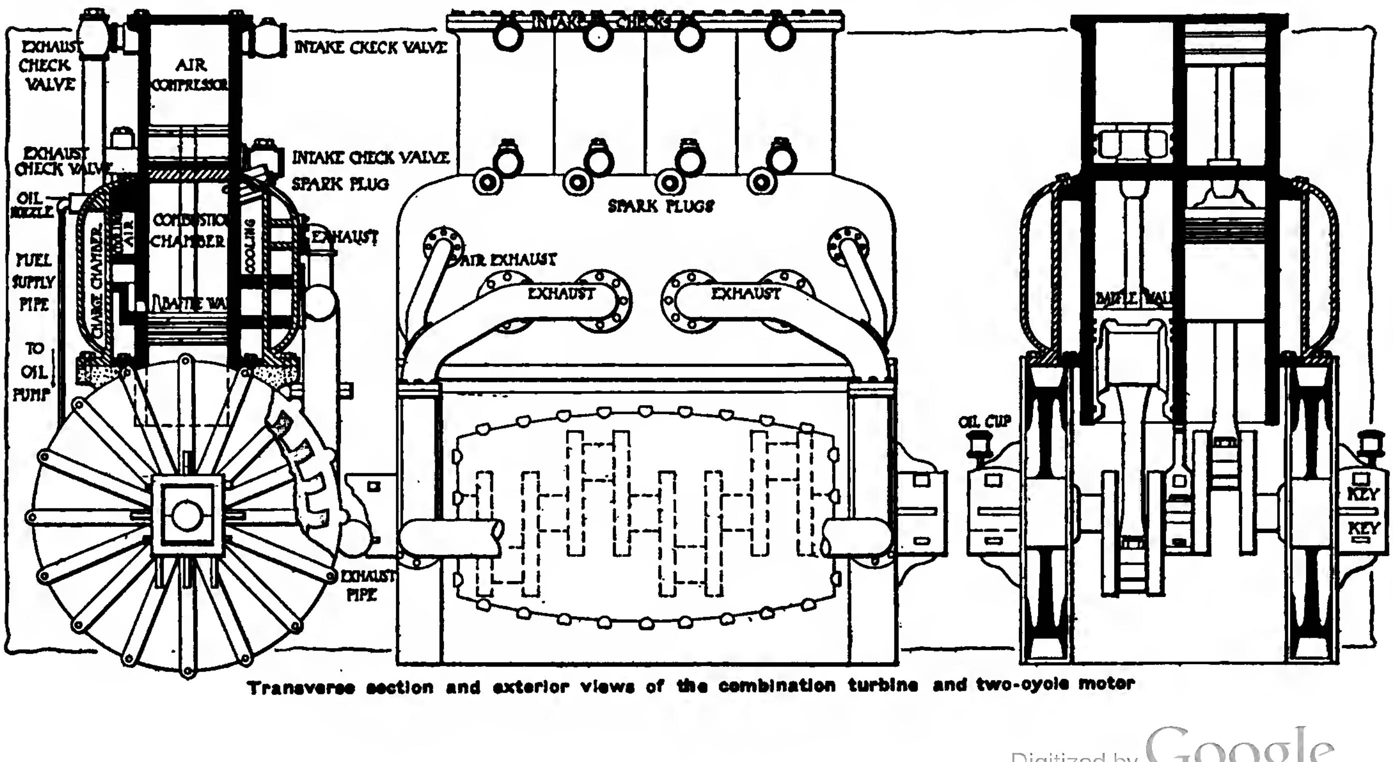
A COMBINATION two-cycle and turbine motor is the latest offer to the trade and public. The motor, which is shown in the illustration at the foot of this page has a double jacket around the cylinder. The inner jacket is for the cooling air while the outer jacket is for the incoming charge. Air is compressed in a cylinder above the combustion chamber and passes through the cooling jacket.

The lower part of the motor looks very much the same as an ordinary two-port two-cycle motor. The intake port is uncovered by the piston in its travel and the charge which is released from the passage around the cylinder enters the combustion space. The compression stroke takes place and the charge is then fired, exhausting at the bottom of the stroke into a passage leading to the flywheel casing which contains the turbine wheel.

The designers of this motor claim a marked gain in thermal efficiency resulting from their method of cooling and by utilizing the exhaust. It is claimed that the cooling losses instead of amounting to 33 per cent. as is now the case with the gasoline motor, will be cut down to one-half that and the exhaust loss which has been estimated at 44 per cent. in the average engine will be cut down to 22 per cent. The designers state that a large proportion of this loss will be transferred to the useful work of the motor and the resulting gain in thermal efficiency will amount to 38.5 per cent. According to this the thermal efficiency would amount to something like 60.5 per cent. This startling figure is claimed by the makers, the American Sem-Turbine Co., St. Louis, Mo.

A two-cylinder stationary engine of the type described above and illustrated herewith has been built and is now on exhibition at the headquarters of the company in St. Louis.

From a study of the drawings a motor of this design would appear to be 30 per cent. higher than an ordinary type. This is due to the placing of the air compressor on top of the cylinder. The air compressor is an integral part of the cylinder and in reality forms a supplementary reciprocating air pump.



Transverse section and exterior views of the combination turbine and two-cycle motor

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

Brooklyn, N. Y.—Barber Anto Service Co.; capital, $10,000; to deal and hire automobiles. Incorporators; William Barber, A. S. Barber, M. F. Barber.

Cincinnati, O.—Allen Breed Tractor Co.; capital, $5,000; to manufacture tractor engines. Incorporators: Allen Breed, L. J. Dolle, H. V. Reedy.

Cincinnati, O.—Queen City Motor Delivery Co.; capital, $30,000; to deal in automobiles, transporting and delivering merchandise and passengers. Incorporators: Louis Hehman, H. G. Hehman.

Cleveland, O.—Haupt Co.; capital, $5,000; to deal in antomobiles. Incorporators: W. D. Haupt, H. A. Couse, R. G. Curren, Mary McManus, Alfred Clum.

Detroit, Mich.—Grant Motor Co.; capital, $100,000; to manufacture a small type of car of tha cyclecar class. Incorporators: G. D. Grant, C. A. Grant, David Shaw, G. F. Salsman, J. M. Howe.

Detroit, Mich.—Wahl Motor Co.; capital, $85,000; to manufacture automobiles. Incorporators: G. G. Wahl, A. M. Dodge, Michael Matchwill, W. J. Heckish, E. E. Havens, T. M. Lemon.

Jacksonville, Fla.—White Sales Co.; capital, $100,000; to deal in automobiles. Incorporators: J. R. Collins, P. D. Cassidy, N. A. Collins.

Lansing, Mich.—Carter-Car Sales Co.; capital, $4,000; to deal in automobiles. Incorporators: E. H. Jenks, Charles Schmidt.

Little Rock, Ark.—Arkansas Automobile Exchange; capital, $5,000; to deal in antomobiles. Incorporators: Sam Yout, Estell Yout, S. J. Fechbeck.

Louisville, Ky.—Crown Motor Car Co.; capital, $500,000; to manufacture antomobiles. Incorporators: V. F. Lambert, N. V. Lambert, O. H. Lambert.

New York City—Universal Equipment Co.; capital, $50,000; to deal in engines. Incorporators: George Gray, T. W. Hatfield, I. B. Owens.

Pittsburgh, Pa.—Pittsburgh Haynes Antomobile Co.; capital, $10,000; to deal in automobiles. Incorporators: H. S. Morrow, E. K. Morrow, Alva Hughson.

Rochester, Ind.—Rochester-Mais Commercial Car Co.; capital, $25,000; to manufacture motor trucks. Incorporators: J. A. Mais, A. C. Davisson, E. A. Miller, J. M. Ott, R. P. True.

St. Louis, Mo.—H. G. Borbein & Co.; capital, $10,000; to deal in automobiles. Incorporators: H. G. Borbein, L. W. Becker, L. B. Borbein.

Syracuse, N. Y.—Service Boat and Engine Co.; capital, $10,000; to deal in motors. Incorporators: W. J. Eastman, L. J. Rolfsen, C. L. Ripley.

Trenton, N. J.—Hall & Taylor Co.; capital, $25,000; to deal in antomobiles. Incorporators: W. H. Taylor, H. A. Hall, Harold Hall.

Wilmington, Del.—Electromobile Co.; capital, $100,000; to manufactura an electric automobila. Incorporators: H. E. Latter, W. J. Maloney, O. J. Reichard.

Wilmington, Del.—Victor Motor Car Co.; capital, $100,000; to deal in automobiles.

Buffalo, N. Y.—Buffalo Automobile Spring Co.; capital, $10,000; to manufacture springs for nutomobiles. Incorporators: Earl Plants, W. E. Slater, H. E. Spangler.

Chicago, Ill.—Ferns Motor Livery; capital, $50,000; automobile livery. Incorporators: M. M. Franey, A. J. Coline, H. P. Mumms.

Cleveland, O.—Cleveland Antomobile Country Club; capital, $7,500; to carry on an automobile club. Incorporators: T. P. Cagwin, H. M. Adams, R. H. Lee, F. H. Caley, A. A. Atwater.

Detroit, Mich.—Chambray Carburetor Co.; capital, $50,000; to manufacture carburetors and other automobile accessories. Incorporators: J. H. Chambes, H. W. Mowbray, C. H. Bennett.

Flushing, N. Y.—Flushing Auto Moving Express and Taxi Cab Co.; capital, $1,000; automobile express business. Incorporators: Nicholas Gilroy, James Whitcher, Robert Mills.

Indianapolis, Ind.—Oakes Pressed Steel Co.; to manufacture steel stampings. Incorporators: W. H. Oakes, W. D. Oakes, C. G. Swenson.

Milwaukee, Wis.—Porto Metal House & Garage Co.; capital, $5,000; to manufacture and market portable steel structures for automobile storage or outing purposes. Incorporators: J. E. Tracy, P. G. Meyer, J. P. Weber.

New York City—Specialty Auto Parts Co.; capital, $5,000; to deal in automobile accessories. Incorporators: G. I. Aronow, A. M. Newburg, A. H. Peyser.

New York City—Square Motor Horn Co.; capital, $5,000; to deal in antomobile horns. Incorporators: S. Socgnamillio, Frank Buckman, Alexander Karlin.

Philadelphia, Pa.—New Idea Tire Co.; capital, $500,000; to manufacture automobile tires. Incorporators: F. R. Hansell, G. H. B. Martin, S. C. Seymour.

San Antonio, Tex.—International Automobile School of San Antonio; capital, $4,000; to instruct pupils in repairing automobiles. Incorporators: T. P. Price, J. A. Kerr, Gus Leroy.

Scranton, Pa.—Economy Automobile and Lackawanna Vulcanising Co.; capital, $10,000; to vulcanise automobile tires.

Syracuse, N. Y.—Syracuse Auto Radiator Co.; capital, $50,000; to manufacture the Kaman radiators. Incorporators: Max Kaman, Minnie Kaman, Thomas Vickers.

Toledo, O.—Toledo Merchants Delivery Co.; capital, $50,000; to do a general deliver business and storage business. Incorporators: J. H. Pheatt, G. M. Reswick, H. W. Braser, L. F. Luscombe, J. E. Parsons, Jr.

Wilmington, Del.—E-Z Anto Tire Pump Co.; capital, $20,000; to manufacture an automobile tire pnmp. Incorporators: F. D. Buck, G. W. Dillman, B. M. Grawl.

Wilmington, Del.—Pneumatic Rim & Tire Co.; capital, $200,000; to deal in antomobile tires and accessories. Incorporator: Harry Davis.

GARAGES AND AGENCIES

Antigo, Wis.—Holland Flexible Auto Wheel Co.; capital, $10,000; to manufacture a flexibla wheel for automobiles and trucks, which obviates the need of pneumatic tires. Incorporators: J. L. Donahue, J. E. McKenna.

Baltimore, Mo.—Dreadnought Tire & Rubber Co.; capital, $1,000,000; to mannfacture antomobile tires. Incorporators: A. F. Gilbert, Wilmer Dunbar, W. E. Hill, C. P. Tiplett, W. B. Swindell, Sr., A. A. Adt, A. F. Gilbert, W. E. Hill, C. P. Triplett, B. H. Diggs, H. E. Whitelock, A. B. Whitelock, G. H. Rice.

Brooklyn, N. Y.—Atlantic Garage Co.; capital, $5,000; general garage business. Incorporators: J. M. Simon, Charles Steinbeck, Mary Steinbeck.

CHANGES OF NAME AND CAPITAL

Akron, O.—Diamond Rubber Co.; capital, decreased from $100,000 to $10,000.

Birmingham, Ala.—Robertson Tire & Auto Co.; capital increased from $20,000 to $50,000.

Fostoria, O.—Allen Motor Car Co.; capital increased to $500,000.

Indianapolis, Ind.—Cole Motor Co.; capital increased from $500,000 to $1,000,000.

New York City—Studebaker Vehicle Co.; capital decreased from $3,600,000 to $600,000.

New Agencies Established During the Week

PLEASURE VEHICLES

Place	Car	Agent
Battle Creek, Mich.	Henderson	A-B Stove Co.
Boston, Mass.	Knox	Knox Auto Co. of Springfield.
Calgary, Alta	Cadillac	McLeod & Williams.
Carrollton, O.	Studebeker	Tope & Beamer.
Charleston, S. C.	Henderson	Automobile Repair Co.
Charleston on Kanawha, W. Va.	Henderson	R. L. Frasier, Jr.
Cleveland, O.	Henderson	W. E. Warters.
Columbus, O.	Herreshoff	Johnston Sales Co.
Columbus, O.	Regal	Ohio Auto Sales Co.
Creston, Ia.	Oakland	N. M. Brown.
Fredericton, N. B.	Franklin	Smith Foundry Co., Ltd.
Hundred, W. Va.	Henderson	F. Q. Berdine.
Huntington, W. Va	Henderson	J. A. Tucker.
Huntsville, Mo.	Henderson	M. H. Callahan.
Kamloops, B. C	Cole	Leacroft & Hepburne.
Kamloops, B. C	Studebeker	Leacroft & Hepburne.
Little Falls, N. Y.	Henderson	Frank Burgor.
Logan, O.	Ford	C. B. Lutz.
Merritt, B. C.	Ford	Nicola Valley Gar. Co.
Niagara Falls, N. Y.	Henderson	Mat Walsh.
Oskaloosa, Ia.	Henderson	Amsberry & Henniess.
Philadelphia	Maxwell	Farming-Paxon-Maxwell Co.
Pittsfield, Mass.	Alco	C. C. Gramwell.
Plymouth, Ind.	Oakland	F. H. Kuhn.
Portland, Ore.	Haynes	J. D. Pacquet.
Portland, Ore.	Marion	United Auto Co.
Richmond, Va.	Henderson	L. Casselman, Jr.
Richmond, Ind.	Henderson	W. T. Bradway.
San Antonio, Tex.	Ohio	Woodward Carriage Co.
Seattle, Wash.	Chandler	Clayton Gibson.
Toronto, Ont.	Norwalk	Norwalk Motor Car Co. of Martinsburgh, Va.
Waukegan, Ill.	Henderson	H. L. Beach.
Youngstown, O.	Velie	T. H. Chambers.
Burnside, Ga.	Indiana	N. W. Findley.
Calgary, Alta	Stewart	Lougheed & Webster.
Chicago, Ill.	Stewart	Austin Doyle's Sons Co.
Columbus, O.	Brown	Fourth-Chestnut Auto Repair Co.
Cook County, Ill.	Four Wheel Drive	W. B. Wells.
Elizabethtown, Pa.	Dart	E. C. Cobble.
Fort Plain, N. Y.	Stewart	H. B. Oray Co.
Harrisburgh, Pa.	Dart	Ensminger Garage.
Herkimer, N. Y.	Stewart	G. E. Clark.
Hudson, N. Y.	Stewart	Wm. Petry Garage.
Jacksonville, Fla.	Urben	Jacksonville Electric Gar. Co.
Johnstown, N. Y.	Stewart	Johnstown Motor Car Co.
Kingston, N. Y.	Stewart	Van's Garage.
Kittanning, Pa.	Adams	Fisher & Lambing.
Long Beach, Cal.	Stegeman	Wire & Lee.
Los Angeles, Cal.	Autocar	M. S. Bulkley & Co.
Los Angeles, Cal.	Lewis	Pacific Coast Motor Car Co.
Newburg, N. Y.	Stewart	The Van Motor Co.
Nawark, N. J.	Atlantic	Hoagland-Thayer, Inc.
New York City	Harvester	Harvester Truck Co.
Oakland, Cal.	Lewis	Keystone Motor Car Co.
Omaha, Neb.	Dart	McIntyre Auto Co.
Poughkeepsie, N. Y.	Stewart	John Van Benschoten.
Providence, R. I.	Stewart	Edgewood Garage.
Richmond, Va.	Atlantic	D. J. Baker.
San Francisco, Cal.	Indiana	Auburn Sales Co.
Saskatoon, Sask.	Stewart	G. H. Hack.
Savannah, Ga.	Indiana	Cassels Co.
St. Louis, Mo.	I-H-C	International Harvester Co.
Syracuse, N. Y.	Stewart	Syracuse Garage.
Tama, Ia.	Dart	Harlan & Cary.
Troy, N. Y.	Stewart	Payne Automobile Co.
Vallejo, Cal.	Lewis	E. J. Knox.
Winona, Minn.	Four Wheel Drive	Ben Kalmes.

COMMERCIAL VEHICLES

Place	Car	Agent
Appleton, Wis.	Stegeman	Griffin & Scott Auto Co.
Boston, Mass.	Dart	W. F. Magill.
Boston, Mass.	Mercury	O. F. Kelen.

ELECTRIC VEHICLES

Place	Car	Agent
Los Angeles, Cal.	Atlantic	G. A. Johnston.
Montreal, Can.	Atlantic	A. Jennings & Co.
Montreal, Que.	Tate	Tate Electric Garage.
Toronto, Ont.	Baker	Pope Hartford Motor Co.
Toronto, Ont.	Standard	Masco Co.

HENRY S. CHAPIN, New York City, has invented a new type of rebound check which is distinguished by effectiveness, smoothness of action and light weight, in addition to the extraordinary simplicity and consequent low cost of manufacture. In short, the device shown in Figs. 11 to 13 consists of a flat bar or plate secured to the masterleaf of an elliptical spring, on the free side of the same, its length and rigidity being so proportioned as to afford a resistance to spring rebound. The end edge of the plate bearing against the spring is rounded.

As Fig. 11 shows, one of the simplest forms in which this spring check may be applied, consists in placing a plate shaped to contact with the central portion of the masterleaf in such a position that it is in touch with the concave side of it, when the spring is under normal load. If the car travels, the spring, of course, begins to vibrate, thereby tending to alter its shape continually from moment to moment. The plate P, being more rigid than the spring steel, does not follow the alterations of the shape of the spring, but its rounded edge is made to slightly slide along the spring surface, due to its curvature and by its changing point of contact helps considerably to counteract and annihilate vibration, first, of the masterleaf and through this of the other leaves.

In case of a shock, when the masterleaf of the spring tends to curve itself beyond normal, the plate comes into principal action. Thanks to its rigidity, it cuts—so to speak—each side of the spring in two parts; namely, that covered by the plate and the remaining portion. The rounded edge of P provides a fulcrum, almost stationary due to the rigidity of the material, around which the outer portion of the spring must turn. As the spring leverage is considerably shortened by moving the fulcrum from the end of the U-bolt to the edge of P—as is done by the use of the plate—the force acting at the end of the spring and which otherwise would result in a considerable deformation of the same is reduced very much and the deformation proportionately. In other words, the short leverage from the edge to the end of the spring masterleaf makes excessive deformation very difficult and frees the ordinarily sudden return to normal shape from the shocking nature otherwise accompanying it. One of the main reasons for the action of this spring check is the fact that the check-bar or plate P and masterleaf are always in contact at their common point of attachment as well as at the edge of the plate, so that a sudden jumping action on the part of the spring leaf is impossible. In addition, there is the devibrating effect of the plate.

Rushmore Electric Starter—S. W. Rushmore, of the Rushmore Dynamo Works, Plainfield, N. J., has designed a starter of the electric-motor type which is operated by the simple pressing of a button mounted in reach of the driver's hands. If this is done, a pinion of the armature is brought into engagement with a gear formed on the flywheel periphery.

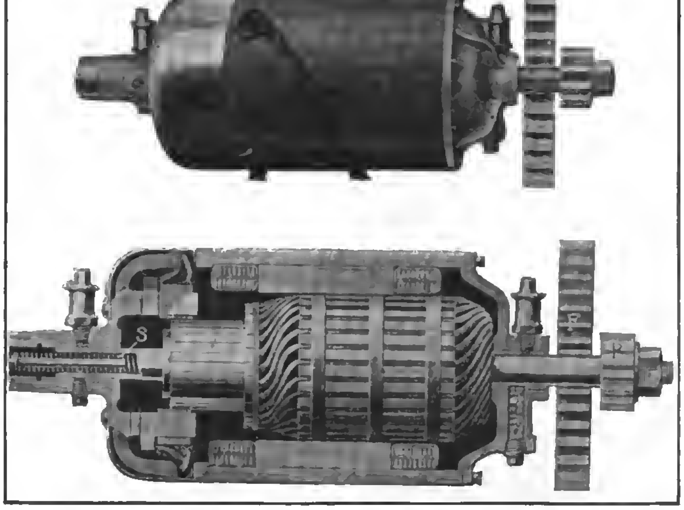
The starter which consists of the motor and pinion, weighs 47 pounds. It is constructed with a 6-volt series winding, both for the general use of this voltage in lighting systems and because a higher operating efficiency is claimed for it than if a higher voltage were used. One of the most interesting, and in fact, most ingenious features of the device is the device for engaging and disengaging starter gear and flywheel. It consists of a compression spring S contained in the hollow armature shaft, which presses the latter and the armature out of its central or working position, so that pinion P and the gear F on the flywheel remain out of engagement. When the circuit is closed, the field is magnetized and by this action is made to draw into the working position the armature, on the principle of the solenoid. Thereby P and F are brought into engagement and the flywheel is turned over by the torque of the electric motor. As soon as the engine picks up above the speed of the starter, the latter is relieved of its load, the current drops and almost becomes nil, thereby permitting the spring to press the armature out of the operation position and to disengage the gears P and F.

Perfectite Waterproof Compound—The Price Fire & Water-Proofing Co., Poughkeepsie, N. Y., has begun to market a waterproofing compound which comes in a semi-solid form, being inclosed in cans and which may be made ready for application by thinning with gasoline, linseed oil or any other drying oil. It is furnished in 1, 2 and 5-pound cans, as well as in kegs of 25 and 100 pounds. Two pounds of Perfectite should be dissolved in 1 gallon of liquid and such a mixture is sufficient for waterproofing 100 square feet of canvas, top material, or the like.

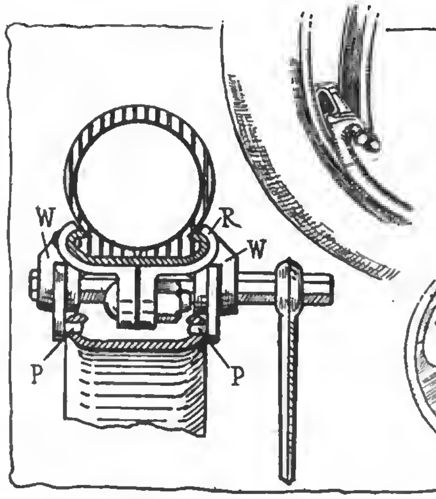
Funk Demountable Rim—Richard W. Funk, 1876 Broadway, New York City, is the maker of the demountable rim illustrated in Figs. 3 and 4. The rim proper is a split ring, the ends of which are connected by a pin-link mechanism, as in Fig. 4. One pin serves as a fulcrum, around which the other may be moved by applying a wrench to the hexagonal head formed on the pin, so that the two rim ends may be brought into alignment and contact. When this is the case, the rim, formed as at R, Fig. 3, forms a secure basis for the casing and the inner tube contained in it.

Rust-No Graphite—Asch & Co., 1777 Broadway, New York City, handle graphite stick shown in Fig. 16. It consists of graphite and a binder, being used to prevent rusting on of tires.

Edelmann Watch-Type Tire Gauge—E. Edelmann & Co., Chicago, have brought out a tire gauge, Fig. 5, in the shape of a watch which is fitted with a ring, so as to be adaptable for carrying on a chain. The size of the gauge is that of a small Ingersoll watch, and the appearance also resembles this, being contained in a nickel casing. The air which acts on the indicator mechanism enters through the stem portion of the casing, which portion is so designed as to fit any Schrader valve. The device works on the principle of the steam gauge; the indication remains and is released by pressing an extension of the indicator hand through the frame.



Figs. 1-2—Rushmore electric engine starter



Figs. 3-4—Funk rim.

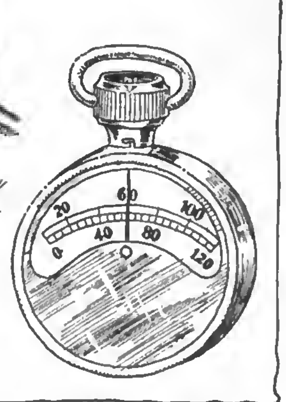


Fig. 5—Edelmann tire gauge

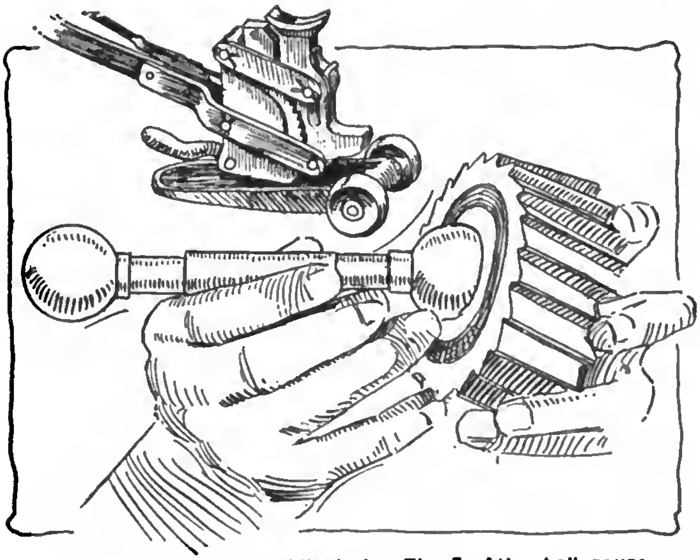


Fig. 6—Excel automobile jack. Fig. 7—Atlas ball gauge

The Excel Auto Jack, Fig. 6, designed for use in garages and tire agencies, is mounted on a wheeled base and provided with a long hand lever for quick and easy jacking. The housing is of crucible cast steel and all teeth are machine cut. The weight is 35 pounds and the height range from 9 inches lowered to 25 inches raised. The change from up to down movement is effected by a small thumb lever in a convenient position on the operating handle. These jacks are the product of the Excel Jack Mfg. Co., Fenway, Boston, Mass.

The Detroit Automobile Fire Extinguisher Co. has brought out the extinguisher shown in Fig. 9, which is furnished in either nickel or black enamel to match the trimming of the car.

It is so constructed that the operator can quickly detach the connecting tube from the end brackets by grasping same next to the spring clip. One quick pull releases the tube and it is thus open ready for action and can be thrown directly on the flame.

This extinguisher is made with two types of mountings, so that it can be screwed to the tonneau floor and used as a foot rail fixture or attached to the dash. In the latter case the brackets are shorter. The dash equipment is made in two sizes, that for pleasure cars being 12 inches in length and 2 inches in diameter, while the truck type is a heavier tube of steel measuring 20 inches by 2 inches. The foot-rail equip- is 12 inches by 2 inches.

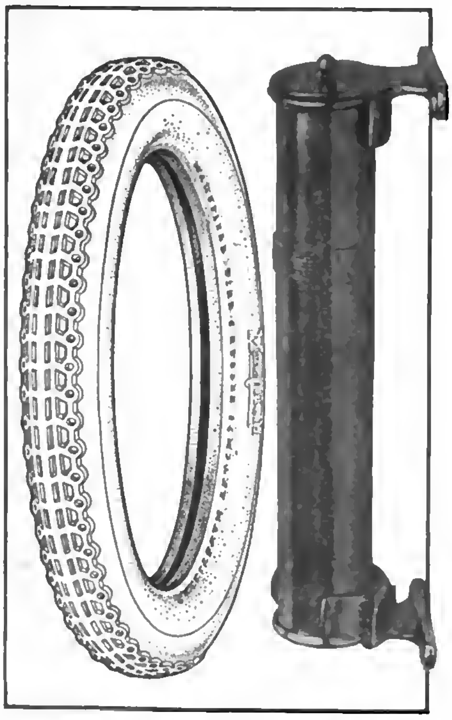


Fig. 8—Mansfield tread. Fig. 9—Detroit extinguisher

Stanley Hinges—The automobile hinges of the Stanley Works, New Britain, shown in Fig. 10 give evidence of accuracy in manufacture that will prevent rattling when in use. They are supplied in wrought steel 1.5-, 1.75- and 2-inch sizes. The lengths range from 2 to 5 inches and the makers punch and countersink the screw holes according to the specifications of the purchaser. The makers are also prepared to execute orders for hinges of any special size or shape.

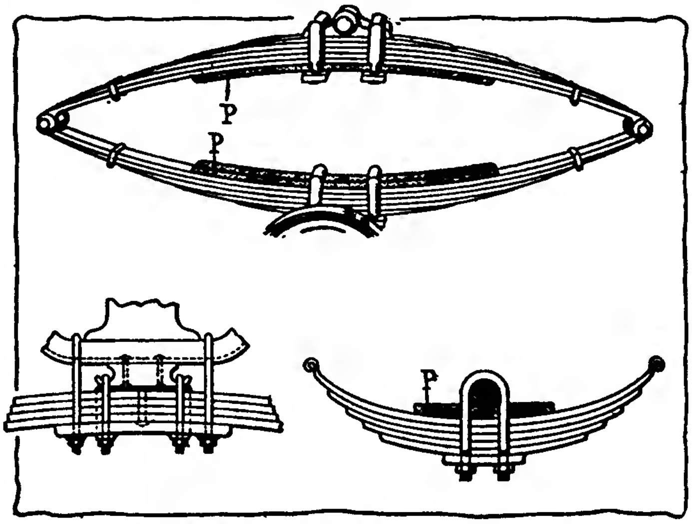
Fig. 10—Stanley hinges for automobile doors

A new non-skid tread has been brought out by the Mansfield Tire & Rubber Co., Mansfield, O. It has five parallel cables which are connected by cross-bars in M manner. These bars are space .75 inch to provide hollows which grip the road surface. It is claimed by the maker that the uneven surface of the tread not only gives good traction but that the spaces formed between the cross bars prevent side skidding.

The illustration shows that the principle used in this casing is not new, but well tried out before; but a new and pleasing shape has been found, which undoubtedly is accompanied by a number of distinct advantages.

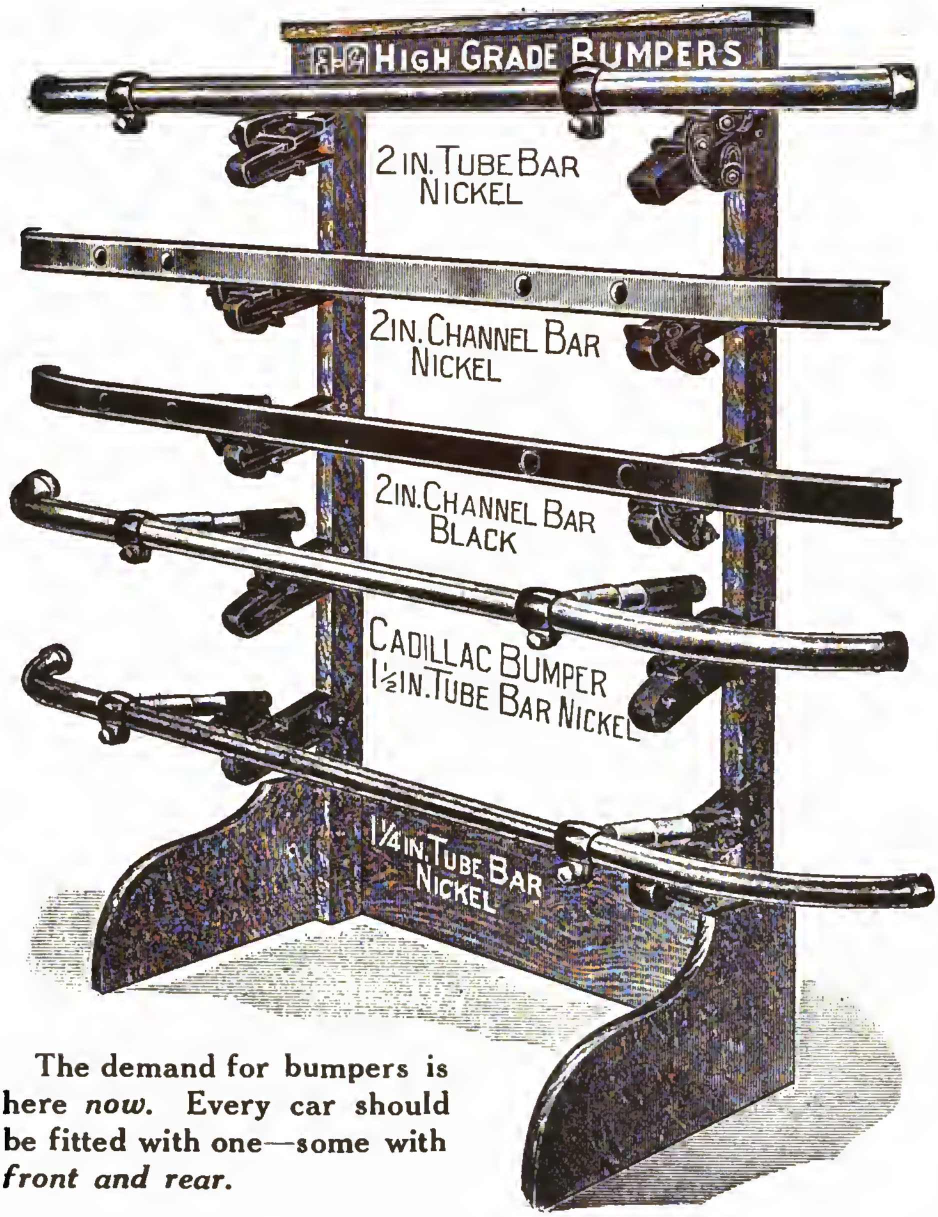
The Atlas Ball Gauge consists of a hardened and accurately ground steel sphere welded to a handle. Its purpose is the accurate measurement of internal diameters. In use the spherical shape facilitates the insertion of the gauge and also renders the operation of taking a measurement much simpler as the handle can be held at any angle to the part being measured. These gauges are guaranteed to .0001 inch and for the gauging of the shaft hole in gear wheels, etc., they are made in a double type as shown, in which one ball is called the "go" end and the other the "no go" end. The machined part can be passed when the hole is such that the smaller ball, the "go" end, can be entered but the larger or "no go" end cannot. These gauges are made by the Atlas Ball Co., Philadelphia, Pa.

Miller Grease Gun—The manufacturer of the Miller grease gun, Fig. 14, has brought out the new grease scoop, Fig. 15, so as to make charging of the gun easy. The gun here shown is made of brass throughout, consisting of four parts: The cylinder and cap fastened to it, the leather-packed piston reciprocable in it by turning the screw-cut rod formed with a pentagonal handle, the removable cat at the opposite end and the spout screwing into hole in its center. The leather washer fitting around the piston makes a tight joint with the inside of the gun cylinder and the removable cap fits the latter tightly, so that all grease put into the gun is positively discharged by way of the spout if the handle is turned. The scoop is stamped from a single strip of steel and is slightly bent along its longitudinal center line so that it easily picks up the lubricant. The other end of the scoop is cut, as shown in the illustration, so as to form a handle. This scoop is furnished gratis with the grease gun. Asch & Co., New York City, are distributors for this article.



Figs. 11-13—Sterling-Chapin rebound check for springs

This Display Stand Will Sell Bumpers For You



The demand for bumpers is here *now.* Every car should be fitted with one—some with *front and rear.*

This compact bumper stand displays five full size models of E. G. HOOKBOLT Bumpers—in nickel, black and brass—for nearly all makes of cars. The stubs to which the bumpers on the stand are attached are patterned after automobile spring hangers in order to demonstrate that E. G. Bumpers may be applied to the frame without drilling.

To obtain one of these stands FREE, it is only necessary to purchase five bumpers as shown in the cut, at trade prices.

	List.		List.
1¼ in. Round Bar Bumper, Black	$6.75	2 in. Round or Channel Bar, Black	$10.00
1¼ in. Round Bar Bumper, Brass	7.50	2 in. Round or Channel Bar, Brass	12.50
1¼ in. Round Bar Bumper, Nickel	9.00	2 in. Round or Channel Bar, Nickel	15.00

Cadillac and Rear End Bumpers

Same prices as above, according to style and finish of bar.

Bumpers are shipped assembled on the stand—ready for the display room—no bother or work.

Emil Grossman Company Manufacturer **250 W. 54th St., N. Y.**

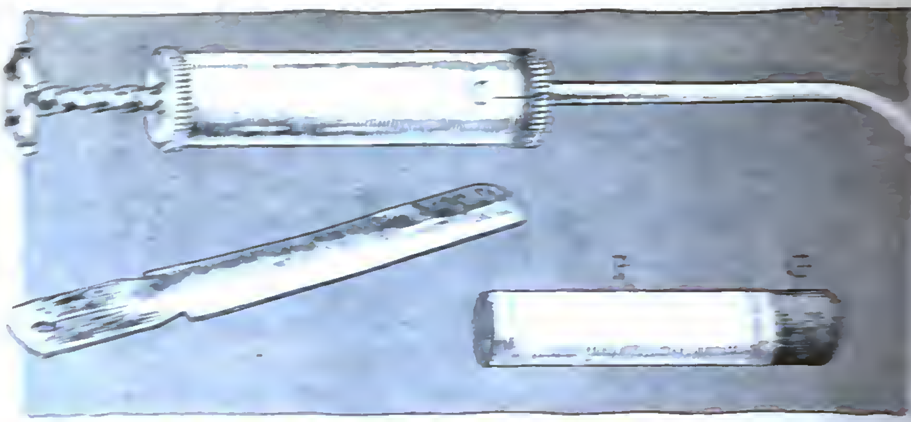
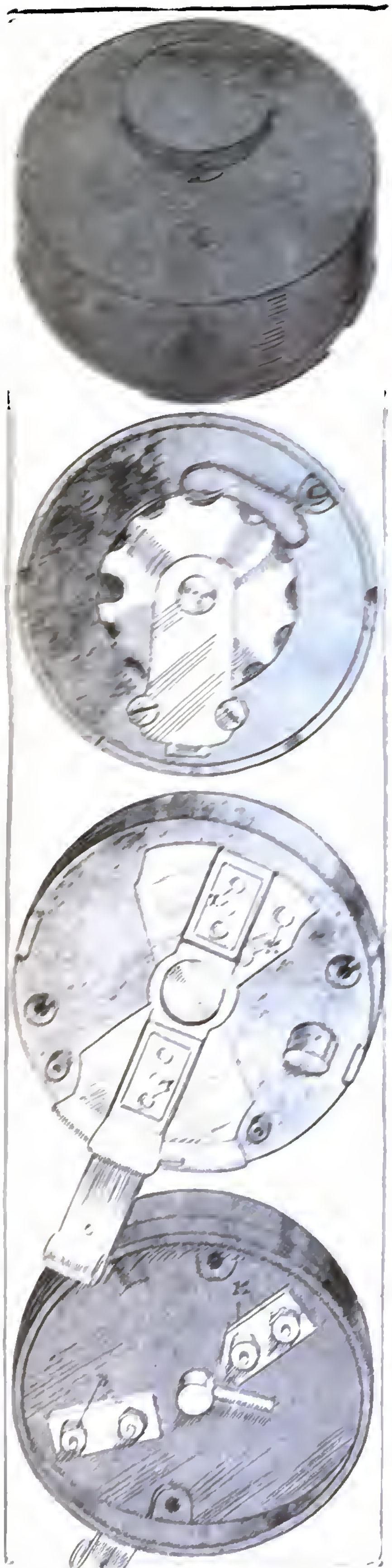


Fig. 14—Miller grease gun. Fig. 15—Miller grease scoop. Fig. 16—[illegible]

Motor Car Equipment Horn.—The Motor Car Equipment Co. of New York City has taken up the sale of a novel automobile signal which combines the clearness of the bulb-horn note with the ease of operation otherwise obtained only from electric or exhaust-operated signals. The new horn is shown in Fig. 17. It consists of two principal parts, namely, the bulb horn and the small air pump which impels the air used for producing the sound of the horn. As Fig. 17 shows, the pump is mounted so that the wheel attached to it does not touch the flywheel rim, but is brought into contact with it if the lever to which the Bowden wire is attached is drawn forward toward the small wheel's shaft. This is done by pressing upon a small lever shaped like a pedal and mounted on the rim of the steering wheel, as here illustrated. The Bowden wire proper is enclosed in a flexible tube which is so mounted that pressure upon the small lever does not move it, but the wire passing through it. The pump thus operated by the force of the flywheel contacting with the small wheel produces an intense current of air which is taken in at the opening of the pump casing fitted with a screen and discharged at the other opening of the casing in the direction of the tangent of the impeller blade periphery. The air current is led through a heavily-woven metal-covered tubing to the inside of the horn, where it is expanded into a bell-shaped space. From there it passes through the reed and the conical tube into the projector, whence it leaves the horn with great strength. The mounting of the pump is by means of bolts and nuts which fasten to the motor frame, while the horn proper is secured to the front of the dashboard or at any other suitable place.

Amper Lock Switch.—A lock switch which is controlled by a combination lock is being made by the Amper Electric Co., Lockport, N. Y. Figs. 18 to 21 illustrate the construction of this lock. A knob on the front of the casing controls three cylinders which have peripheral grooves to permit spring tumblers to drop into them if the knob is turned to the proper places. If this is done the spring tumblers arrest all three cylinders one after the other until certain slots formed in the cylinders are in alignment with the switch lever so that the latter may be turned moving the cylinders along with it. If the switch is then turned back to the off position a slight turn of the knob is sufficient to lock the device. On the back of the instrument connections are provided for the wire contact from battery and magneto to the spark-plugs.



Figs. 18-21—Amper electric lock switch. The top shows the outside front view, the second illustration the inside of the front section, the third the inside of the back section, and the bottom view the outside rear view, with connections.

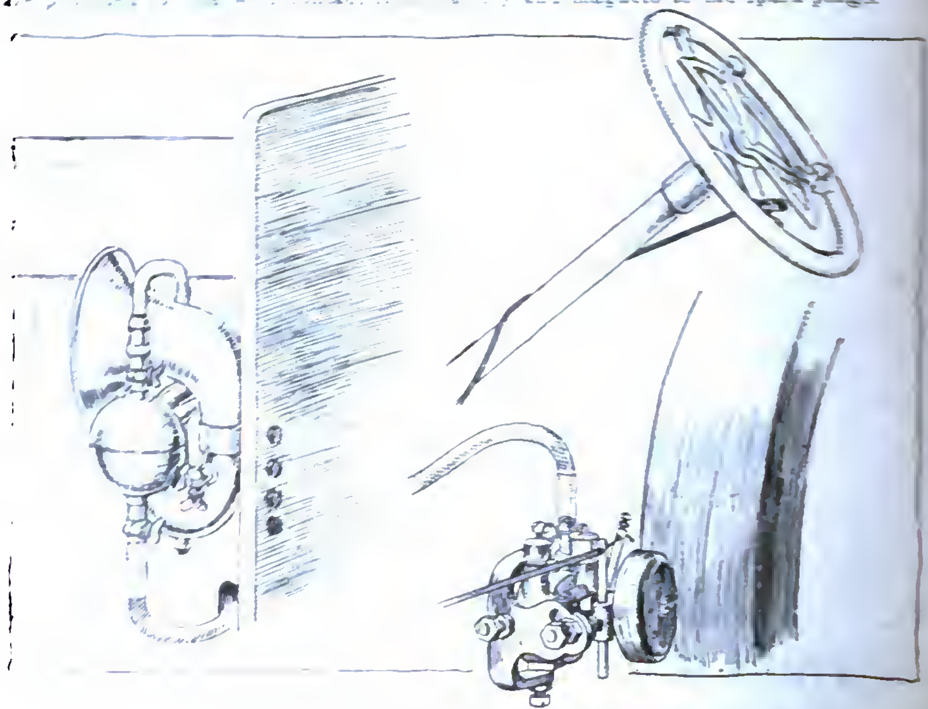
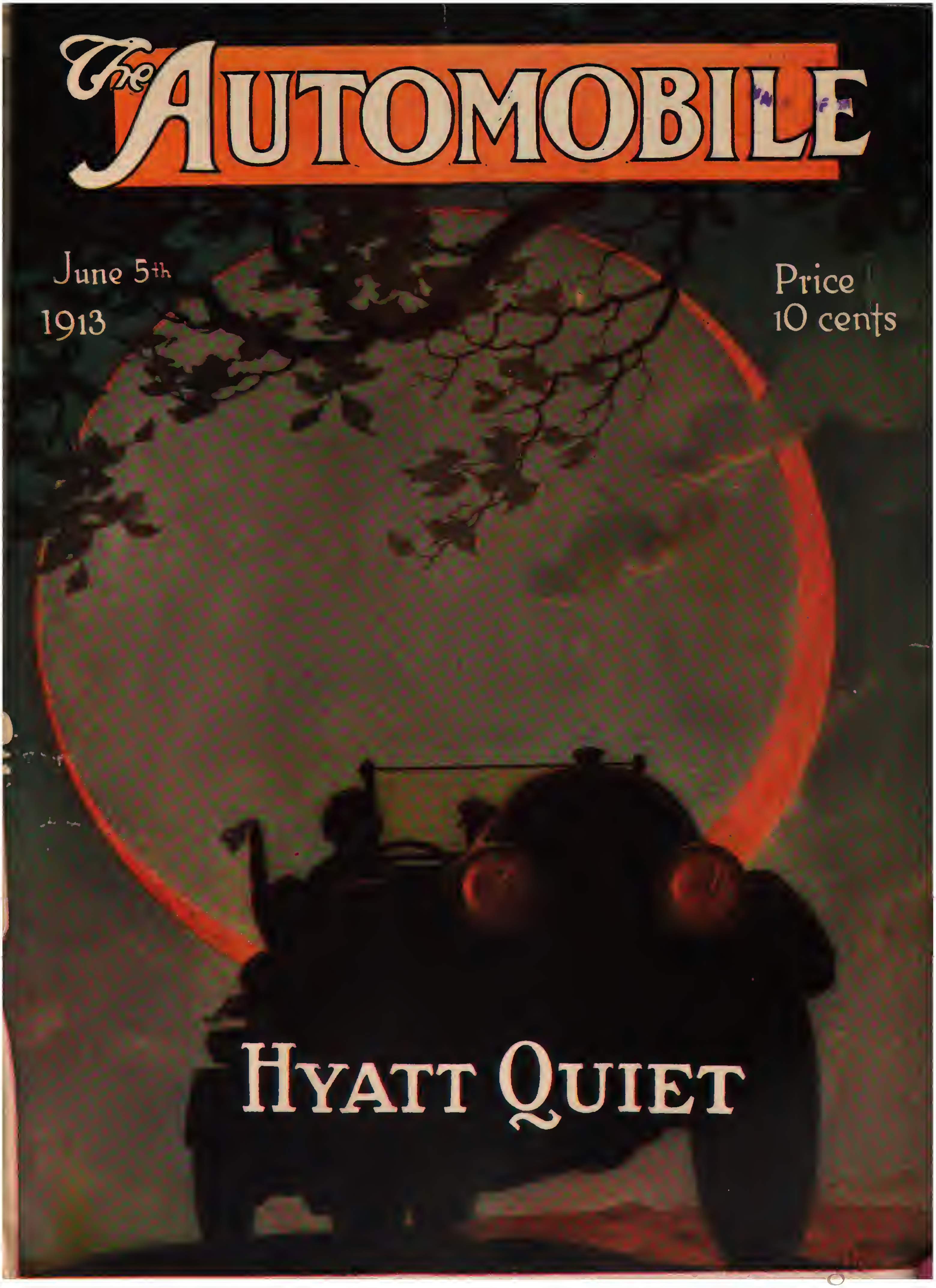


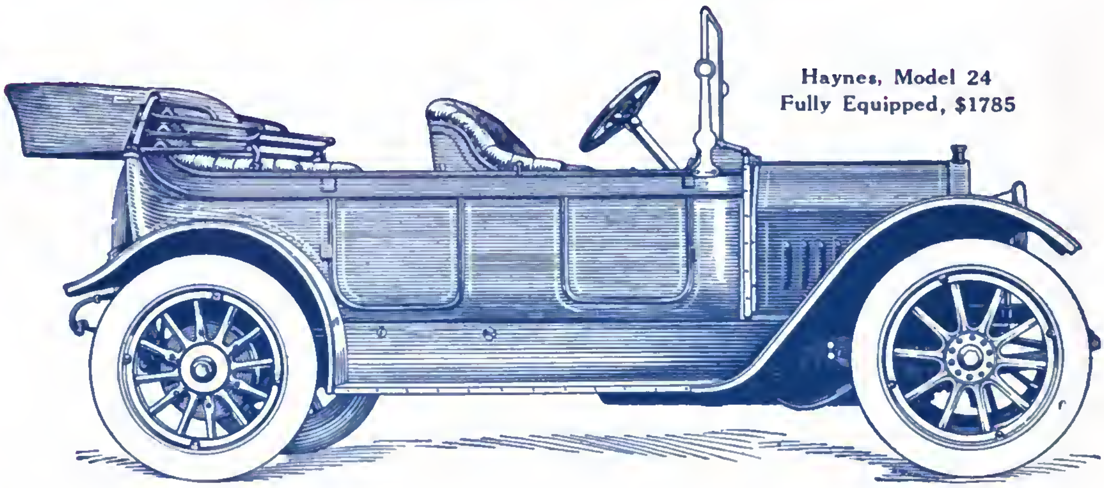
Fig. 17—Novel horn of Motor Car Equipment Co.


The AUTOMOBILE
June 5th
1913
Price
10 cents
HYATT QUIET

Sincerity is Built Right into the

HAYNES

America's First Car



Haynes, Model 24
Fully Equipped, $1785

LOOKING at it from your view point, in choosing a line you will consider several things which are more important **to you** than the size of a manufacturer's factory, or how many **thousands** of cars he builds, or how many **talking points** he may have in **equipment**.

The Haynes factory (new plant built and completely equipped in 1911) has been called by authorities "one of the most efficient plants in the world." The Haynes output is large enough to earn minimum costs on parts and materials—not so large as to make Haynes cars **common.** Haynes equipment leaves **nothing** to be asked for.

But Haynes **Sincerity means more to you** and to your trade than these things mean.

Haynes sincerity is possible only in such an organization as this, where the original builder of the original Haynes of 1893 still is, and through all these years has been, at the head of the same organization; where the skilled machinists have **grown up** in the plant, inspired always by the Haynes spirit; where the same designing engineer has, for many years, worked out the logical development of the motor car; where every workman's wage is paid by the week and **not** by the piece; where for nearly a generation the business policy has been dictated by honesty of purpose and earnestness of effort.

No other car at a medium price can offer you such Sincerity. Those who own Haynes cars know the tangible money value of this sincerity. You, too, can find in it an assurance of dependable service, comfort, safety and economy.

Two Models

Model 24, four cylinder, 5-passenger touring - - - $1785
Model 23, Haynes "Six," 5-passenger touring - - - $2500

Regular equipment complete. All models electrically started and lighted by the Leece-Neville separate unit system. Left-side drive, center control. Generous advertising support for Haynes dealers.

HAYNES AUTOMOBILE COMPANY

503 Union Street **Kokomo, Indiana**

VOL. XXVIII NEW YORK—THURSDAY, JUNE 5, 1913—CHICAGO No. 23

The AUTOMOBILE

Goux, Peugeot, Wins $50,000 Race

World's Record Holder Covers Course at 75.92 Miles Per Hour—Race 14 Minutes Slower Than Last Year

INDIANAPOLIS, May 30.—Goux, Peugeot, France, are the three words on the lips of 96,000 automobile racing enthusiasts who gathered at the speedway in this city today to witness the 500-mile classic race for a purse of $50,000. Translated into motoring vernacular these mean that Jules Goux in his French Peugeot racing car vanquished the pick of America's speed pilots, defeated some of England's best known sons, laid the pride of Italy low, triumphed over the skill of Belgium's best and carried away all honors at today's great contest.

Starting in a field of twenty-seven, Goux piloted his special racing creation over the entire 500 miles at a speed of 75.94 miles per hour, between 2 and 3 miles per hour slower than the winning pace of a year ago. During the 200 circuits of the speedway he fought in turn with the picked drivers of the world, but finally won out with a margin of 13 minutes and 8 seconds over his nearest competitor and 1 hour and 21 minutes ahead of the tenth driver to finish and carry off a part of the $50,000 spoils.

Jules Goux, a youthful, slender Frenchman, had many contenders whom he fought with in turn on practically even terms until he had turned the 400-mile mark when he seemed to enjoy renewed life, shook off all other contenders and shot his fleet monster toward the 500-mile goal. His time was exactly 14 minutes slower than the pace set by Dawson in the winning National a year ago. Goux won three trophies, Remy Brassard, for leading at 200 miles, the Prest-O-Lite for leading at 300 miles and the Wheeler and Schebler for leading at 400 miles.

But if France was first and carried the coveted $20,000 to foreign shores, American brawn was well to the fore and captured second and third places for the Stars and Stripes, yielding fourth position to England, fifth to Belgium and the remaining five places to America.

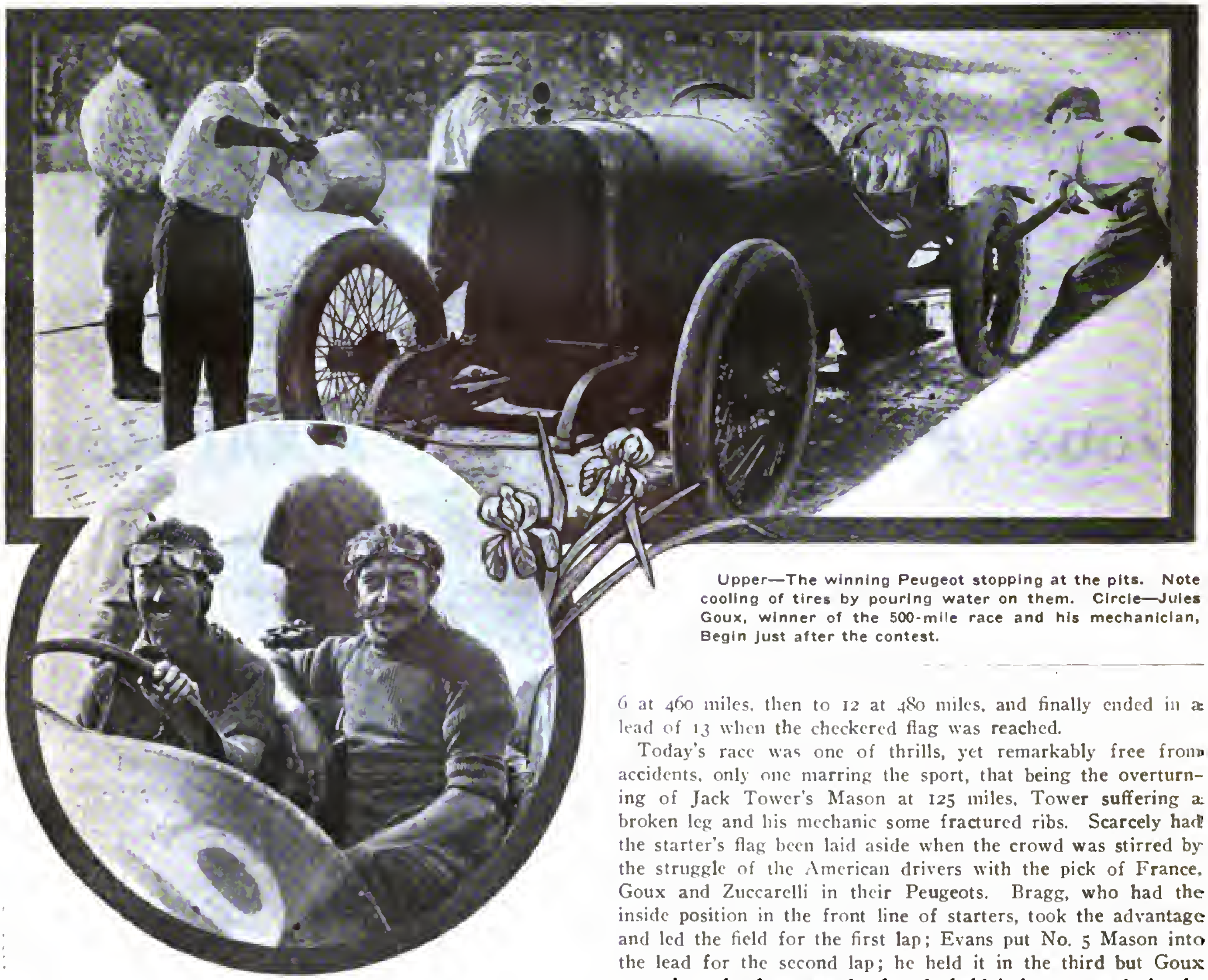
Spencer Wishart in a Mercer was second, traveling 73.49 miles per hour, nosing out his fellow-American, Charles Merz in a Stutz by the narrow margin of 36 seconds.

The English Sunbeam piloted by Guyot, a Frenchman, was fourth at 70.92 miles per hour, and fifth position went to Pilette of Brussels driving a Mercedes-Knight sleeve-valve motor entered by E. C. Patterson, the Chicago sportsman. The Mercedes-Knight, one of the smallest motors in the race,

Goux's Peugeot receiving the checkered flag as the winner

Dividers of the Spoils

NO.	CAR	DRIVER	TIME	M.P.H.	PRIZE
16	Peugeot	Goux	6:35:05.00	75.92	$20,000
22	Mercer	Wishart	6:48:13.40	73.49	10,000
2	Stutz	Merz	6:48:49.25	73.38	6.000
9	Sunbeam	Guyot	7:02:58.95	70.92	3,500
23	Mercedes-Knight	Pilette	7:20:13.00	68.14	3,000
12	Grey Fox	Wilcox	7:23:26.55	67.65	2,200
29	Mercedes	Mulford	7:28:05.50	66.95	1.800
31	Case	Disbrow	7:29:09.00	66.06	1,600
35	Mason	Haupt	7:52:35.10	63.47	1,500
25	Tulsa	Clark	7:56:14.25	62.99	1,400



Upper—The winning Peugeot stopping at the pits. Note cooling of tires by pouring water on them. Circle—Jules Goux, winner of the 500-mile race and his mechanician, Begin just after the contest.

250 cubic inches displacement in a 450-cubic inch class, averaged 68.14 miles per hour and made one of the most consistent performances of the day.

Five other cars finished, making ten in all to complete the five centuries. Their order was: Howard Wilcox in the Grey Fox, a special car built by C. P. Fox, an Indiana sportsman, speed 67.65 miles per hour; Ralph Mulford in a Mercedes, poppet-valve type, 66.94 miles per hour; Louis Disbrow, Case, 66.79 miles per hour; Willie Haupt, Mason, 63.48 miles per hour; and George Clark in a special car, the Tulsa, built by Oklahoma sportsmen, speed 62.98 miles per hour.

Only Eleven Cars Finished

Only one other car was running at the finish of the ten who divided the money among them, it being Bob Burman's Keeton which had led for many miles during the early hours of the contest but lost hours due to puncturing the gasoline tank, having to change carbureters and his carbureter catching fire.

Of the twenty-seven starters, sixteen fell by the wayside for one cause or another. The race, though slower, was a more enjoyable, and fascinating one than that of a year ago, the slower pace not being recognized by the contestants because of the changing positions of the leaders until the 400-mile mark was reached, after which the Peugeot was never headed off and started opening a gap of 3 minutes between it and Gil Anderson's Stutz which disputed every mile of the race until eliminated at 460 miles when running in second place by a broken camshaft. From 3 minutes the gap grew to 4 at 440 miles, then to 6 at 460 miles, then to 12 at 480 miles, and finally ended in a lead of 13 when the checkered flag was reached.

Today's race was one of thrills, yet remarkably free from accidents, only one marring the sport, that being the overturning of Jack Tower's Mason at 125 miles, Tower suffering a broken leg and his mechanic some fractured ribs. Scarcely had the starter's flag been laid aside when the crowd was stirred by the struggle of the American drivers with the pick of France, Goux and Zuccarelli in their Peugeots. Bragg, who had the inside position in the front line of starters, took the advantage and led the field for the first lap; Evans put No. 5 Mason into the lead for the second lap; he held it in the third but Goux came into the front on the fourth, held it by 200 yards in the fifth, increased it to 400 in the sixth, added a little more in the seventh and gained some more in the eighth. With eight laps, 20 miles, covered, it looked as if the much-touted Goux was going to make a runaway of the day. But the hopes of his admirers were short lived for Burman, who was late reaching the starting line due to replacing a broken steering knuckle, and who got away at the tail end of the list, was getting his graceful Keeton under way and at 40 miles was leading the Frenchman by 2 minutes, Goux having blown a tire 20 minutes after the start and requiring 78 seconds to change his wheels with tires.

Burman a Possible Winner

Burman had his Keeton running perfectly, hitting over 100 miles per hour on the straightaway and coasting the turns. It looked as if his chances were good. At 60 miles he had 3 minutes' lead on the Frenchman with three other cars between him and Goux. At 80 miles he still led with over 3 minutes leeway, at 100 miles he retained a good margin; at 120 miles he still led, but fortune failed him, his carbureter caught fire, he lost nearly an hour and Goux took the lead at 140 miles with Anderson's Stutz, Mulford's Mercedes and Guyot's Sunbeam all bunched 3 minutes behind him. Once more it seemed Goux's chance to pull away if his tires would only hold up. They did and he led for another 100 miles until pushed out of position at 240 miles by the Anderson Stutz and Mulford in the Mercedes. At 260 miles the Frenchman got the premier position back with a margin of less than a minute. Mulford and Anderson hung on with the desperation of demons. At 300 miles Goux had opened a gap of scarcely 2 minutes on Anderson but at 320 Anderson was back in front with 23 seconds on the Peugeot.

But fortune changed and positions went up and down. Goux took the lead at 340 miles and held it to the end. For 120 miles Anderson's Stutz hung onto him with determination that warmed the heart and fired the enthusiasm of every American who watched the gladiators, and until a broken part robbed him of a well-earned second place when but 30 miles from the finish.

Anderson and Goux in a Duel

Anderson and Goux were battling in a class by themselves 8 to 10 minutes ahead of the remainder of the field. It was a noble fight, with odds favoring the special Peugeot, the prize-winner for the tricolor a year ago. When Anderson coasted into the pits, lifted the hood of his motor, gave a few turns of the starting crank and then pushed his white racing machine back a pall of gloom fell over the countless thousands. America's best fighter had given away to a foreign foe and the public looked to new leaders for America. Hopes were placed on Wishart's Mercer and Merz's Stutz running scarcely a minute apart. But they were 12 minutes behind the flying Goux and with scarcely 20 miles to go there was little hope of victory. Goux counted on tire trouble, but with expert pit aid he scarcely lost a minute to a change, he saw the race was won, he slackened his pace and won easily.

With first position settled, the fierce duel between Wishart and Merz for second position and the $10,000 purse was taken up by the grandstands and bleachers. Although not in the limelight, these two had been waging equal warfare from the very start of the grind. They were generally 4 or 5 minutes back of the leaders until the 400-mile mark when they were 13 or 14 minutes back of the Frenchman.

From the drop of the flag to the finish it was a neck-and-neck battle between Wishart and Merz, with but 35 seconds separating them at the finish. First one had the advantage, then the other, with not a minute separating them for over 300 miles. Merz led his rival by 26 seconds at 100 miles; at 200 Wishart led by a minute and a half; at 300 miles Wishart had his greatest margin, nearly 6 minutes; at 400 miles Merz had reduced it to less than 2 minutes; at 420 miles Wishart led by 9 seconds; at 440 miles he was 58 seconds up; at 460 it was 51 seconds, at 480 but 29 seconds, and then 35 seconds apart. Merz's finish was spectacular in the extreme. Just as he got the green flag, meaning that he started his last lap, flames burst out under the bonnet at each side. Simultaneously the cry went up "He is on fire." All looked for him to stop, but, never slackening his pace, Merz sped for the finish. Up the back stretch the flames could be seen gaining headway. Everybody wondered if he could make it, wondered if the insulation on his wires would bring him to the tape or if second or third position would be snatched from him as was De Palma's lot a year ago. Every eye followed the white racer around the far turn, back of the bushes and then into the home stretch. The flames brightened but Merz held his pace and as he shot over the line with the mechanic vainly endeavoring to keep the flames under the hood he was given a cheer that rarely is accorded to a third-place car. The 35 seconds meant $5,000, the difference between second and third places.

Sunbeam Pleased I. A. E. Men

The Sunbeam, winning fourth place, gave all the visiting English engineers, the guests of the American Society of Automobile Engineers, a chance to wave their Union Jacks from a private stand erected for them close to the timers' pagoda. The running of this car was one of the consistent features of the race. Guyot put it into fourth place at 60 miles and held it in fourth, fifth, sixth or seventh position until 400 miles when he

Circle—The timers' pagoda, the Marmon which run in 1911, and the National, last year's winner

Lower—Bragg's Mercer, the Sunbeam, Liesow's Anel almost abreast at an early stage of the race moved into fourth and held it to the finish. The car, with its long bottle-shaped black body, moved with the utmost ease, its long wheelbase handicapping it slightly on the turns. Guyot never pushed it. He was playing the safe game from start to finish, being determined to end within the money, of which he eventually carried off $3,500. He changed but one tire from start to finish.

Mercedes-Knight Very Consistent

If the consistency of the Sunbeam was noteworthy that of the Mercedes-Knight was more so. It being the first Knight-type motor to be seen in a race of any nature in America its performance was watched with the utmost interest. It had a piston displacement of 250 cubic inches as compared with 450 of the Peugeots. Pillette, who sells the car in Belgium, started on a 75-mile an hour clip. He started in eighteenth position; at 100 miles he was tenth; at 200 miles he was ninth; at 300 he was seventh; at 400 miles seventh, and at the finish fifth. So consistent was his work that everybody felt from the start he would finish well up in the money. He finished 45 minutes after Goux. At 100 miles he was 4 minutes back of Goux; at 200 miles 16 minutes; at 300 miles he was 21 minutes back, and at 400 miles 29 minutes.

A contender all through the race and one who might have finished in second or third place had he not carelessly run out of gasoline on the backstretch and lost half an hour getting a supply from the grandstand, was Ralph Mulford in No. 29 Mercedes. Mulford made one of the greatest runs of the day in that he did not change a tire from start to finish and did not make a stop until the race was more than half over. He was a leading contender until the race was past the 400-mile mark when he dropped from third to seventh and was not able to regain his lost advantage. Mulford was in fourth place at 100 miles; at 200 miles he was third; at 240 miles he was second, being less than 2 minutes back of Anderson's Stutz leading at that time; at 300 miles he was fourth, and at 400 miles he was

TABLE SHOWING TIME OF CARS IN 500-MILE SWEEPSTAKES AT 20-MIL

No.	Car	Driver	Dis-place-ment	Lap: / Miles:	8 / 20	16 / 40	24 / 60	32 / 80	40 / 100	48 / 120	56 / 140	64 / 160	72 / 180
16	Peugeot	Goux	448	Elaps. Time 20 Laps Time	15:17	33:25 18:08	49:53 16:28	1.04:40 14:47	1.19:23 14:43	1.34:06 14:43	1.48:48 14:42	2.06:21 17:33	2.21:13 14:52
22	Mercer	Wishart	299.7	Elaps. Time 20 Laps Time	16:26	34:56 18:30	50:31 15:35	1.06:13 15:42	1.21:49 14:36	1.37:27 15:38	1.53:56 16:23	2.08:41 14:45	2.25:04 16:23
2	Stutz	Merz	399.97	Elaps. Time 20 Laps Time	16:20	35:59 19:39	49:58 13:59	1.05:47 15:49	1.21:23 15:36	1.36:37 15:14	1.52:14 15:37	2.07:40 15:26	2.20:04 18:24
9	Sunbeam	Guyot	380.8	Elaps. Time 20 Laps Time	16:29	32:17 15:48	48:11 15:54	1.04:02 15:51	1.20:02 16:00	1.36:01 15:59	1.51:49 15:48	2.07:39 15:50	2.23:47 16:08
23	Mercedes-Knight	Pilette	251.33	Elaps. Time 20 Laps Time	16:49	35:08 18:19	51:18 16:10	1.07:29 15:11	1.23:36 16:07	1.39:54 16:18	2.00:39 20:45	2.17:43 17:04	2.34:44 17:01
12	Fox	Wilcox	389	Elaps. Time 20 Laps Time	16:17	31:36 15:19	50:22 18:46	1.09:53 19:31	1.27:22 17:29	1.43:02 15:40	1.58:50 15:48	2.14:36 15:46	2.30:41 16:05
29	Mercedes	Mulford	440.8	Elaps. Time 20 Laps Time	16:27	32:16 15:49	48:08 15:52	1.03:48 15:40	1.19:33 15:45	1.35:31 15:58	1.51:29 15:58	2.07:17 15:48	2.22:54 14:39
31	Case	Disbrow	449	Elaps. Time 20 Laps Time	17:45	33:57 16:12	49:47 15:50	1.05:36 15:49	1.21:52 16:16	1.38:05 16:13	1.54:40 16:35	2.11:30 16:50	2.33:26 21:56
35	Mason	Haupt	350.5	Elaps. Time 20 Laps Time	15:46	32:19 16:33	50:22 18:03	1.10:23 20:01	1.57:53 47:30	2.15:11 17:18	2.32:02 16:51	2.50:10 18:08	3.18:39 28:29
25	Tulsa	Clark	340.1	Elaps. Time 20 Laps Time	18:10	35:14 17:04	52:00 16:46	1.11:11 19:11	1.27:50 16:39	1.48:01 20:11	2.06:12 18:11	2.27:15 21:03	2.45:25 18:10
3	Stutz	Anderson	399.97	Elaps. Time 20 Laps Time	16:19	32:17 15:58	48:55 16:38	1.04:14 15:19	1.19:26 15:12	1.36:19 16:53	1.51:49 15:30	2.07:09 15:20	2.22:30 15:21
4	Keeton	Burman	387	Elaps. Time 20 Laps Time	16:06	31:10 15:04	46:13 15:03	1.01:24 15:11	1.16:35 15:11	1.32:03 15:28	2.27:41 15:38	3.03:43 36:02	3.18:10 14:27
5	Mason	Evans	350.5	Elaps. Time 20 Laps Time	16:52	32:02 15:10	50:09 18:07	1.15:58 25:49	1.31:40 15:42	1.47:11 15:31	2.08:15 21:04	2.26:25 18:10	2.41:24 15:59
17	Anel	Liesaw	318.1	Elaps. Time 20 Laps Time	16:20	33:56 17:36	49:54 15:58	1.08:32 18:38	1.24:34 16:02	1.40:30 15:56	1.57:44 17:14	2.25:50 28:06	2.42:16 16:26
19	Mercer	Bragg	424.36	Elaps. Time 20 Laps Time	16:15	32:40 16:25	49:29 16:49	1.53:55 63:26	2.12:33 18:38	2.27:50 15:17	2.47:41 19:49	3.03:11 15:30	3.18:48 15:37
10	Henderson	Knipper	350.5	Elaps. Time 20 Laps Time	16:19	32:24 16:05	51:16 18:52	1.07:10 15:54	1.27:26 20:16	1.46:25 18:59	2.08:37 22:12	2.25:36 16:59	2.45:57 20:21
27	Isotta	Tetzlaff	443.86	Elaps. Time 20 Laps Time	16:58	33:02 16:04	49:22 16:20	1.05:07 15:45	1.21:09 16:02	1.37:10 16:01	1.53:05 15:55	2.13:00 19:55	2.29:16 16:16
32	Case	Nikrent	448	Elaps. Time 20 Laps Time	16:08	31:22 15:14	46:26 15:08	1.05:50 19:24	1.22:09 16:19	1.37:44 15:35	1.53:34 15:50	2.09:17 15:43	Out 67th
6	Mason	Tower	350.5	Elaps. Time 20 Laps Time	16:03	40:40 24:37	58:06 17:26	1.16:04 17:58	1.31:22 16:18	1.48:15 16:53	Out, turne	d over, lap	51.
28	Isotta	Trucco	443.86	Elaps. Time 20 Laps Time	23:09	36:28 13:19	52:17 15:49	1.07:55 15:38	Out; gas	tank brok	e loose, la	p 39.	
1	Nyberg	Endicott	389	Elaps. Time 20 Laps Time	19:31	1.13:32 54:01	Out lap	39, broke	gearset sh	aft.			
15	Peugeot	Zuccarelli	448	Elaps. Time 20 Laps Time	16:13	31:14 15:01	Out lap 18	, burned	main bear	ing.			
21	Mercer	DePalma	424.36		15:47	Out lap 15	, burned	out bearin	g.				
26	Isotta	Grant	443.86		15:55	Out lap 14	, loose gas	tank.					
18	Schacht	Jenkins	410.6		18:26	Out lap 13	, broke cra	nkshaft.					
8	Stutz	Herr	399.97		Out lap 7,	broke clut	ch shaft.						
33	Case	B. Endicott	449		Out lap 1,	broke driv	e shaft.						

third. Soon after came his downfall, by a shortage of gasoline. His tank held 40 gallons and was filled at the start. At 275 miles 20 gallons were added but he ran out at 440 miles. His falling from third place moved Wishart and Merz up and when later Anderson, who was running second, fell out Wishart and Merz were moved up to second and third positions. Mulford won $1,800; had he held his place he might have been second with $10,000. It was costly gasoline.

Today's race had more than its share of troubles with cars due to a general lack of preparedness. They had not been driven enough, the parts were not well enough worn in. As a result, bearing troubles were many. Of the sixteen to fall out, at least five had troubles traceable to burned-out bearings. The Shacht broke a crankshaft; Stutz No. 3 broke a camshaft; De Palma's No. 2 Mercer burned out a bearing; Zuccarelli in No. 15 Peugeot, a duplicate of the winner, burned out a motor bearing; Nikrent's Case lost a bearing, and the Anel withdrew because of loose connecting-rod bearings.

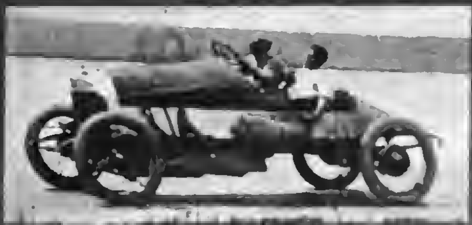
Next to bearing troubles came those due to faulty gasoline lines and poor support of gasoline tanks. Two of the Isotta cars went out with leaky gasoline tanks. These cars arrived at the speedway 3 days before the race started. They were fresh from the Italian factory, where their manufacture was delayed by a strike. The bodies with the gasoline tanks in them had been built specially at an outside factory. The rivets tore through the tank walls. Harry Grant and Truccò, the Italian diiver, both withdrew for this trouble. Burman in the Keeton had gasoline troubles and changed carbureters during the race, putting on a Rayfield in lap fifty-seven. Mulford had more or less gasoline trouble from the start of the race.

Peugeot's Pit Well Managed

A measure of the glory accruing to Goux and the Peugeot car should be awarded to the excellent management of the repair pit. The Peugeot team was fortunate in having as its manager John Aitken, of National fame, whose experience in racing as a

INTERVALS FROM START TO FINISH, WITH THE TIME FOR EACH 20 MILES

80 200	88 220	96 240	104 260	112 280	120 300	128 320	136 340	144 360	152 380	160 400	168 420	176 440	184 460	192 480	200 500	Miles per Hour
2.36:07 14:54	2.50:58 14:51	3.09:49 18:51	3.24:34 14:45	3.39:27 14:53	3.56:59 17:32	4.14:00 17:01	4.28:04 14:04	4.44:17 16:13	4.59:22 15:05	5.14:35 15:13	5.31:20 16:45	5.47:33 16:13	6.02:35 15:02	6.19:00 16:25	6.35:05.00 16:05.00	75.94
2.41:24 16:18	2.50:04 17:40	3.14:52 15:48	3.30:12 15:20	3.45:53 15:41	4.01:32 15:39	4.19:06 17:34	4.36:33 17:27	4.55:09 19:36	5.11:44 16:35	5.27:33 15:49	5.43:40 16:07	6.00:33 16:53	6.16:21 15:48	6.31:57 15:36	6.48:13.40 16:16.40	73.50
2.43:02 16:58	2.50:15 15:13	3.13:22 15:87	3.30:11 16:49	3.50:48 20:37	4.07:48 17:00	4.23:23 15:35	4.41:26 18:03	4.57:17 15:51	5.13:18 16:01	5.28:47 15:29	5.44:23 15:36	6.01:31 17:08	6.17:12 15:41	6.32:35 15:23	6.48:49.25 16:14.25	73.39
2.40:07 16:20	3.01:05 20:58	3.17:02 15:57	3.33:29 16:27	3.57:27 23:58	4.11:44 14:17	4.28:12 16:28	4.42:44 14:32	4.59:29 16:45	5.20:55 21:26	5.37:47 16:52	5.54:29 16:42	6.11:39 17:10	6.28:15 39:36	6.45:31 17:16	7.02:58.95 17:27.95	71.00
2.51:49 17:05	3.09:05 17:16	3.26:13 17:08	3.43:32 17:19	4.00:44 17:08	4.17:57 17:13	4.34:48 16:51	4.51:53 17:05	5.08:49 16:56	5.26:05 17:16	5.43:05 17:00	5.59:54 15:49	6.17:52 17:58	6.34:46 16:54	6.52:00 17:14	7.20:13.00 28:13.00	68.14
2.48:42 18:01	3.04:45 16:03	3.28:44 23:59	3.49:48 21:04	4.07:33 17:45	4.25:52 18:19	4.46:33 20:41	5.10:39 24:06	5.26:28 15:49	5.42:30 16:02	5.58:42 16:12	6.16:30 17:48	6.33:28 16:58	6.51:03 17:35	7.07:12 16:09	7.23:26.55 16:14.55	67.65
2.38:32 15:36	2.54:00 15:28	3.09:30 15:30	3.25:03 15:33	3.45:21 20:18	4.03:41 18:20	4.20:45 17:04	4.35:37 14:52	4.51:32 15:55	5.08:47 17:15	5.26:47 18:00	5.43:31 16:44	6.31:59 48:28	6.53:44 21:45	7.11:06 17:22	7.28:05.50 16:59.50	66.94
3.13:46 40:20	3.30:32 16:36	3.46:34 16:02	4.02:30 15:56	4.18:16 15:46	4.38:36 20:20	4.55:50 17:14	5.12:52 17:02	5.29:19 16:27	5.46:18 16:59	6.01:19 15:01	6.18:27 17:08	6.35:10 16:43	6.51:57 16:47	7.12:02 20:05	7.29:09.00 17:07.00	66.79
3.34:33 15:54	3.50:20 15:47	4.06:17 15:57	4.26:05 19:48	4.51:27 25:22	5.06:42 15:15	5.26:49 20:07	5.41:45 14:56	5.58:45 17:00	6.16:58 18:13	6.32:20 16:22	6.48:08 15:48	7.04:00 15:52	7.19:36 15:36	7.35:49 16:13	7.52:35.10 16:46.10	63.48
3.05:62 20:27	3:23.47 17:55	3.41:24 17:37	4.04:28 23:04	4.22:33 18:05	4.40:24 17:51	4.58:00 17:36	5.18:05 20:05	5.35:47 17:42	5.53:36 17:49	6.14:42 21:06	6:33.46 19:04	6.52:44 18:58	7.13:27 20:43	7.35:04 21:37	7.56:14.25 21:10.25	62.98
2.37:66 15:26	2.53:13 15:17	3.08:27 15:14	3.25:14 16:47	3.41:08 15:54	3.58:04 16:56	4.13:37 15:33	4.29:33 15:56	4.48:27 18:54	5.13:22 15:20	5.39:30 16:08	5.54:49 15:19	6.12:36 17:47	6.37:48 15:12	Out lap 187		
3.33:10 15:00	4.07:40 34:30	4.56:17 48:37	5.09:16 12:59	5.24:05 14:49	5.39:46 15:41	4.59:45 19:59	6.14:24 14:39	6.35:42 11:18	6.50:50 15:08	7.08:16 17:26	7.23:03 14:47	7.36:00 12:57	7.52:37 16:37	Running at	finish.	
2.57:55 15:31	3.20:36 22:41	3.36:44 16:08	3.52:49 16:05	4.08:45 15:56	4.24:19 15:34	4.40:25 16:06	5.00:11 19:46	5.16:16 16:05	5.32:27 16:11	Out lap	158.					
2.50:37 16:21	3.12:53 14:16	3.29:20 16:27	3.45:49 16:29	4.07:16 21:27	4.27:23 20:07	4.46:42 19:19	5.04:50 18:80	5.22:29 17:39	Out lap	148, loos	e connect	ing rod.				
3.34:33 15:45	3.52:37 18:04	4.12:57 20:20	4.28:47 15:50	4.44:12 15:25	5.01:35 17:23	5.15:05 13:30	Out lap	128, twis	ted pum	pshaft.						
3.02:43 16:46	3.36:16 33:33	4.20:34 44:18	4.43:37 23:03	5.16:50 32:13	5.42:32 15:42	Out lap	125, slip	ping clut	ch.							
2.47:10 17:54	3.03:10 16:00	3.19:17 16:07	3.36:23 17:06	3.52:01 15:38	Out lap	118, brok	e chain a	nd disqu	alified.							
Out 67th	lap.															



Pilette in the Mercedes-Knight

Guyot in the Sunbeam

Wilson in the Gray Fox

A snap shot of Jenkins in his Schacht, taken just before the great contest began

driver on the Speedway and in pit work helped him to make an efficient organization in the French quarters. He was assisted materially in his efforts by Charles Faroux, consulting engineer of the Peugeot factory.

It was a matter of question as to the effect wire wheels would have on tire wear and it was expected that this year's race would be of some value in determining just how the wire wheels would affect the life of the casings in the race. However, the results of the race are not such that any definite statement can be made either for or against wire wheels as tire savers. Of the ten cars which finished, three of them were equipped with wire wheels and all three were well up in the money. The winner, Goux, Wishart, who took second, and Pilette, who captured fourth money rode on wire wheels, the others using wood. The Sunbeam used the demountable type.

There were a few breaks of parts that were quite unlooked-for. Two of the Masons and the Henderson had troubles with slipping clutches. Tetzlaff's Isotta broke a driving chain on the home stretch. The driver and mechanic pushed the car into the pits only to be disqualified for pushing a car on the course. Bragg twisted off a pumpshaft on his Mercer at 325 miles. H. Endicott, driving the Nyberg, withdrew under 100 miles because of the reverse shaft in the gearbox seizing. Tower's Mason skidded and upset at 125 miles. Burman, with all his trouble, had the only car to be running at the finish of the race when ten cars had completed the course and taken all of the prizes. For consistent work he and his car deserve credit.

Haupt and his Mason as they looked before the race

The elimination of cars started early in the race. Six contestants dropped out before 100 miles were covered, these being Schacht, Grant's Isotta, DePalma's Mercer, Zuccarelli's Peugeot, Endicott's Nyberg and Trucco's Isotta.

Between 100 and 200 miles two more withdrew, Tower's Mason upsetting and Nikrent's Case withdrawing.

Between 200 and 300 miles only one fell out, Tetzlaff's Isotta.

Between 300 and 400 miles a Waterloo occurred, four withdrawing, namely, Henderson, Bragg's Mercer, the Anel and No. 5 Mason.

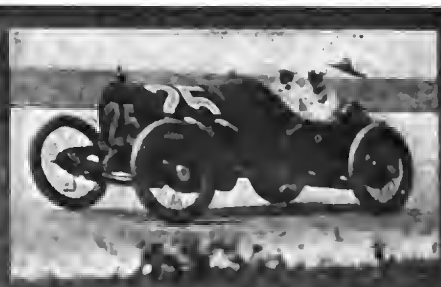
Between 400 and 500 miles only one fell by the wayside, it being the most pathetic of the race, No. 3 Stutz, driven by Gil Anderson, when it was in second position.

Wire wheels played a greater part in today's race than in any previous race in this country. Four different makes were in the race, Rudge-Whitworth, McCue, Frayer and Riley. The winning Peugeot used French-made Rudge-Whitworth detachables; No. 22 Mercer used American-made Rudge-Whitworths; and No. 23 Mercedes-Knight, finishing fifth, used English-made Rudge-Whitworths. No. 31 Case used McCue wire wheels; No. 35 Mason used Rudge-Whitworth, and No. 25 Tulsa used the McCue type of wheel. In recapitulation six of the ten cars to finish were equipped with wire wheels. Burman's Keeton, running at the finish, used McCue wire wheels and of the other contestants the three Isottas used the Riley wire wheels. It is impossible to state the accurate report of tires on wire and wool wheels with the object of gauging the relative merits of wood and wire wheels.

The tire story continues to be one of the engrossing ones of a big race. Owing to the cool weather preceding the race and the cool rains the bricks of the speedway were cooler than usual, but still much tire trouble developed. The right rear wheels suffered the most. Then came the left rear and lastly the right front. The left front tires gave little if any trouble. Goux, using Firestones, changed nine, five on the right rear, two on the left rear and two on the right front. The left front tire went through the race and was little worn at the finish. The big reason for wearing out the

Mulford in Mercedes

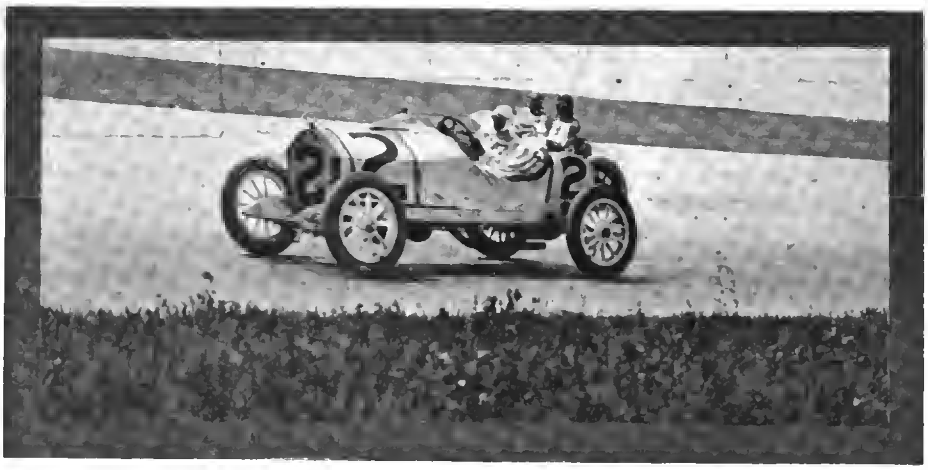
Case with Wisbrow driving



Clark driving Tulsa

right rear was because of getting off the smooth oiled center of the track. The rear wheels invariably slipped on the oily stretches and the dry, rough bricks tore the treads clean off several tires as the wheels spun around at great speed.

The most remarkable tire performance of the day were the Braender tires on Mulford's Mercedes. These are single-cured wrapped tread tires, made in Rutherford, N. J. By single cure is meant that the carcass and tread portion of the tire are all vulcanized together in one process, whereas in many tires there are two curing processes. Mulford's rear tires did not have a mark on them at the end of the 500 miles. There was one short cross-cut in the right front.



Stutz car rounding one of the banks, with Merz at wheel

Various other makes of tires were represented in the race. No. 22 Mercer, which won second place, used Michelins in front and Firestones in rear. No. 2 Stutz used Michelins all around. No. 9 Sunbeam used English Dunlops and changed but one during the entire race. No. 23 Mercedes-Knight used Michelins. No. 12 Fox used Michelins.

Practically all of the contestants used shock-absorbers in front and rear, some contenting themselves with one set of four but many others putting on two sets or eight in all. Hartfords were in general use with a few of other makes. Both Peugeots used eight Hartfords each. The Mercer used a set of four Hartfords and on the Stutz finishing third were two Hartfords in front and four in rear. The Sunbeam used four Hartfords in front and a hydraulic set in rear. The winning Peugeot used Bosch ignition and a Claudel carbureter.

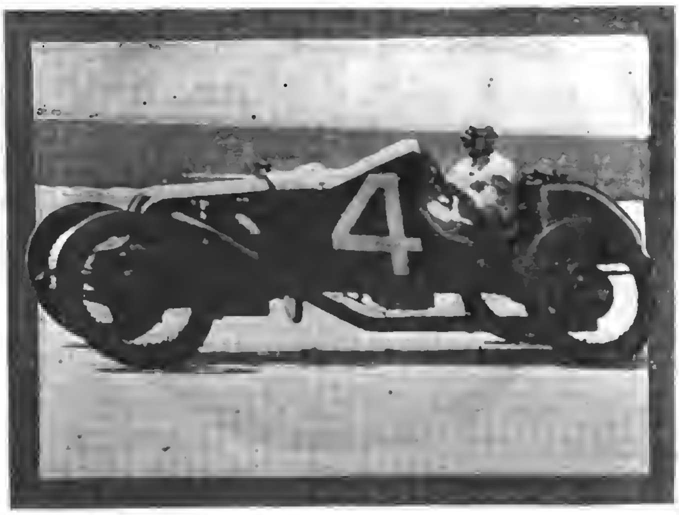
Some conception of the relative performances of the ten cars completing the race can be gained from the accompanying table, which gives their piston displacement and the speed in miles per hour that they averaged. The Peugeot was right up to limit and so was the Case.

These were the only cars to exceed the 400 cubic inch mark, the limit set by the rules being 450 cubic inches. No. 28 Mercer, and No. 23 Mercedes-Knight were the smallest capacity motors in the race, the Mercer 299 and the Mercedes-Knight 251. It would be possible to use a 400-cubic-inch limit next year and have practically as fast a race as that run this season.

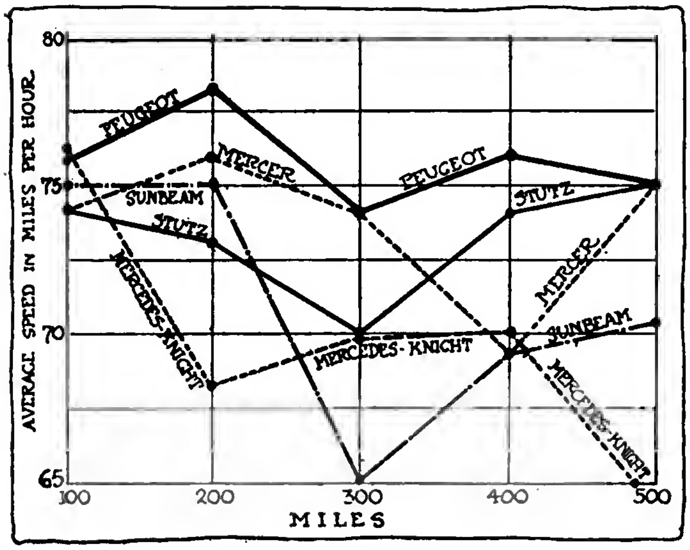
No.	Car	Piston Displacement	Speed
16,	Peugeot	448	75.92
22,	Mercer	299.7	73.49
2,	Stutz	399.97	73.38
9,	Sunbeam	380.8	70.92
23,	Mercedes-Knight	251.33	68.14
12,	Grey Fox	389	67.65
29,	Mercedes	440.8	66.95
31,	Case	449	63.08
35,	Mason	350.5	63.47
25,	Tulsa	340.1	62.99

To the Stutz team belongs the palm for quick and efficient pit work and to the men in the Stutz repair pit must be given a great measure of credit for the excellent showing made by Merz's car. In the matter of tire changes particularly did Stutz teamwork show up brilliantly. Tire changes were made in 30 seconds flat in some instances. The average time required to change the tires on the Stutz car was about 45 seconds and opportunity was taken during this time to renew the supplies of gasoline, oil and water.

This showing was due not only to the training of the pit men but also to the preparation and arrangements that had been provided for fast work. For instance, the jack used was a long wooden lever which lifted the wheels clear of the ground with one movement, an iron strap acting as a catch which was released by a kick and let the wheels which had already been started spinning down on the ground. Another feature of the preparation was the special funnels which could be dropped into the filler opening and the can of gasoline or oil up-ended into them without wabbling.



Burman's Keeton going over 100 miles an hour



Average speed of first five cars for each 100 miles

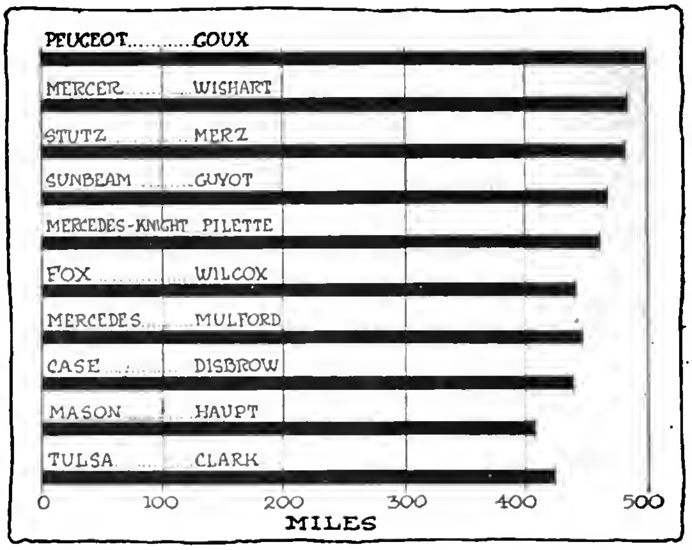


Chart showing positions of cars when Goux finished

Excellent generalship also was shown in the pit work of the Mercer team and although changes were not made as quickly as they were in the Stutz pits, yet stops for tire change and water, gasoline and oil required on an average only a minute and a quarter. The Mercer people had some difficulty with their jacks.

The Peugeot had a method of jacking that made for quick changes when two tires were to be replaced on either the rear or front axle. With this, a single jack of the long lever type was slipped under the differential housing and the entire rear axle lifted in one operation so that both the right and left tires could be changed simultaneously. The first stop of this car consisted of changing both rear tires and taking on gasoline and oil and the car was on the road again in 1 minute and 43 seconds. The Peugeot pit was ably managed by John Aitken, of National fame, assisted by Charles Faroux, consulting engineer of the Peugeot factory.

So far as mechanical troubles were concerned there were five cars that came through with clean scores and four of these were the ones that finished 1, 2, 3, 4 in the race. Goux' Peugeot, the Mercer 22, the Sunbeam and Clark's Tulsa did not have to stop at any time during the 500 miles for mechanical adjustments.

The only difficulty encountered by the Sunbeam was in the sticking of the hub-retaining nut when one wheel was to be replaced. The Mercedes-Knight came very close to finishing without difficulty but on its last few laps had a stuck float valve. Pilette diagnosed the trouble as due to the magneto and wasted considerable time before discovering that the fault was in the carbureter.

Troubles with the gasoline connections seemed to be the most frequent of any of the mechanical difficulties. The extreme vibration of the cars over the brick track at high speed played havoc with gasoline tanks and piping. In several instances flexible conduit had been employed to lead the gasoline from the tank to the carbureter but this conduit seemed to break with as great frequency as did the stiff copper tubing ordinarily employed. The pounding of the cars started the rivets in the gasoline tanks and caused leakage in several of them. In fact, this very difficulty was the cause of the withdrawal of two of the Isottas. A broken gasoline lead held up the Fox Special for 3 minutes during the early part of the race. The No. 10 Henderson, along with its other difficulties, had trouble with a break in the flexible conduit which led the gasoline from the tank to the carbureter. Burman's Keeton also developed a leak in the gasoline tank but a wad of chewing gum plugged up the hole successfully.

Tower's Mason, which turned over in lap 51. This was the only accident of the race. Tower suffered a broken leg and his mechanician some fractured ribs—C.N.E.

Next to difficulties with the gasoline line, slipping clutches were the most frequent cause of trouble. The Henderson was forced to spend nearly 20 minutes altogether in trying to adjust the clutch so that it would hold. Frequent applications of gasoline with a squirt gun were necessary and every few laps the treatment had to be repeated. Knipper, a large portion of the time before his withdrawal, was on his back under the car. The difficulty was relieved temporarily by driving in pieces of saw blade in the leather facing. Disbrow's Case also was bothered with a slipping clutch and lost 2 or 3 minutes on this account. The Mason No. 35 made eight stops after running about 200 miles, on account of clutch slipping. The saw blades wedged into the facing gave temporary relief but slipping continued in less aggravated form.

There was not as much trouble with valves and valve operating mechanism this year as during last year's race in spite of the fact that the motors were run at a higher speed than they were a year ago. Wilcox's Fox Special had to replace a rocker arm in one cylinder and had to change exhaust valves in two cylinders. No. 3 Stutz broke its camshaft which was the only mechanical difficulty it had. It put the car out. Liesaw's Anel had valve trouble and the exhaust valve had to be changed. It was found necessary to adjust the rocker arms on Trucco's Isotta and occasion was taken to try to remedy the leak which was beginning to show itself in the gasoline tank. The gasoline continued to leak.

Carbureter troubles affected several of the cars and this difficulty was the only one which Mulford encountered throughout the race, one stop being made necessary by a slight carbureter adjustment.

The $20,000 handshake of Goux and Begin, as the winners congratulated each other after the race—C.N.E.

Burman's chief difficulty was occasioned by carbureter troubles and he lost 21 minutes in changing carbureters shortly after noon. This, together with another 21-minute stop to fix the gasoline tank, lost him his position of leader which he had held up to that time and dropped him down to sixteenth place. Knipper's Henderson had to stop twice, losing in all 7 minutes on account of carbureter adjustments.

Difficulties with the steering gears occurred in only two instances, Disbrow's Case losing a nut off the tie-rod bolt and Burman having to replace a bushing on the steering gear. Burman's trouble was to be expected in as much as he had broken a steering gear twice in practice and his final adjustments on a front axle that had just been put in that morning made him late at the start of the race.

Lubrication troubles, while they were not the direct cause of any of the stops at the pits, were responsible for some of the difficulties already enumerated. The burned-out bearings on Nikrent's Case, Zuccarelli's Peugeot, DePalma's Mercer, and Harry Endicott's Schacht probably all can be laid to insufficient lubrication.

Eighty-eight new tires were worn out during the race. This means an outlay for tire equipment along of between $3,000 and $4,000. Tires were eaten up more rapidly this year than in previous speedway races because the day was warm and because there were oily spots on the track in which the tires spun and rasped the treads.

The ten cars which finished together with the two contenders, Anderson's Stutz and Burman's Keeton, used in all fifty-eight casings. These were divided among the four wheels as follows: right rear tires, twenty-nine; left rear tires, eleven; right front tires, twelve, and left front tires, three.

Disbrow's Case was nearly as fortunate as Mulford's Mercedes, making the complete run with only one tire change. The Tulsa, driven by Clark, wore out only two tires. The Sunbeam, fitted with demountable wooden wheels, replaced three tires. Goux's Peugeot wore out seven tires in all, three on the right rear, two on the left rear and two on the right front wheel. Wishart's Mercer made the run with five tire changes. Merz changed as many tires as did Goux, but lost only 5 minutes. The Peugeot lost 10 minutes. Pilette ground off the tread of one of his tires when running off an oily spot and stopped for a change. At the same time he took the precaution of replacing the other three tires, although they showed no signs of wear. Later in the day he stopped for another tire change, rather than run the risk of blowing out. The Fox Special ate up seven tires, losing less than 6.5 minutes. Haupt's Mason had to replace six tires, four of which were on the right rear wheel, losing 5 minutes. Anderson's Stutz held the record.

POSITIONS OF CARS EVERY EIGHT LAPS OR 20 MILES IN THE 500-MILE INDIANAPOLIS RACE

No.	Car	Driver	Miles: 20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500
16	Peugeot	Goux	1	13	9	5	2	2	1	1	1	1	1	3	1	1	1	2	1	1	1	1	1	1	1	1	1
22	Mercer	Wishart	16	16	15	10	9	8	8	6	6	5	5	5	6	5	4	4	4	4	3	4	3	3	3	3	2
2	Stutz	Merz	14	19	11	8	7	6	5	5	5	6	4	4	4	4	5	5	5	5	4	5	5	4	4	2	3
9	Sunbeam	Guyot	17	8	4	3	5	4	4	4	4	4	6	6	5	7	6	6	6	6	6	6	6	5	5	4	4
23	Mercedes-Knight	Pilette	18	17	17	12	11	11	12	11	10	9	9	8	8	8	7	7	7	7	7	7	7	6	6	5	5
12	Fox	Wilcox	10	4	14	15	13	13	11	10	8	8	8	9	10	10	9	9	10	10	9	8	8	8	7	6	6
29	Mercedes	Mulford	15	6	3	2	4	3	2	3	3	3	3	2	2	3	3	3	3	3	2	3	4	7	9	7	7
31	Case	Disbrow	21	15	8	7	8	10	9	8	9	14	13	13	12	12	11	11	11	11	10	9	9	9	8	8	8
35	Mason	Haupt	2	9	13	16	18	18	17	16	16	16	15	14	14	14	13	13	13	13	12	11	11	11	11	10	9
25	Tulsa	Clark	22	18	18	17	15	16	13	15	13	13	12	12	13	13	12	12	12	12	11	10	10	10	10	9	10
4	Keeton	Burman	6	1	1	1	1	1	16	18	15	15	17	17	17	16	14	14	14	14	13	12	12	12	12	Running when race was called.	
3	Stutz	Anderson	12	7	5	4	3	5	3	2	2	2	2	1	3	2	2	1	2	2	5	2	2	2	2	Out 188 Lap—469 Miles.	
5	Mason	Evans	19	5	12	18	17	15	14	14	12	10	11	11	11	11	8	8	8	8	8	Out 158 Lap—395 Miles.					
17	Anel	Liesaw	13	14	10	14	12	12	10	13	11	11	10	10	9	9	10	10	9	9	Out 148 Lap—370 Miles.						
19	Mercer	Bragg	9	11	7	20	19	19	18	17	17	17	16	15	15	15	15	15	Out 128 Lap—320 Miles.								
10	Henderson	Knipper	11	10	16	11	14	14	15	12	14	12	14	16	16	17	16	Out 125 Lap—312.5 Miles.									
27	Isotta	Tetzlaff	20	12	6	6	6	7	6	9	7	7	7	7	7	6	Out 118 Lap—295 Miles.										
32	Case	Nikrent	7	3	2	9	10	9	7	7	Out 67 Lap—167.5 Miles.																
6	Mason	Tower	5	21	20	19	16	17	Out 51 Lap—127.5 Miles.																		
28	Isotta	Trucco	25	20	19	13	Out in 39 Lap—97.5 Miles.																				
1	Nyberg	Endicott	24	22	Out 23 Lap—57.5 Miles.																						
15	Peugeot	Zuccarelli	8	2	Out 18 Lap—45 Miles.																						
21	Mercer	DePalma	3	Out 15 Lap—37.5 Miles.																							
26	Isotta	Grant	4	Out in 14 Lap—35 Miles.																							
18	Schacht	Jenkins	23	Out in 13 Lap—32.5 Miles.																							
8	Stutz	Herr	..	Out in 7 Lap—17.5 Miles.																							
33	Case	W. Endicott	..	Out 1 Lap—2.5 Miles.																							

The members of the I. A. E. marveled at the production facilities of the Ford Motor Co., Detroit, Mich. The

S. A. E. and I. A. E. Off on Lake Trip

Distinguished Visitors Royally Entertained at Indianapolis Race—Inspect Hoosier Capital's Automobile and Accessory Plants and Wonder at Magnitude of the Industry in Detroit

NEW YORK CITY, May 28—The British visitors, members of the Institution of Automobile Engineers, who arrived 2 days ago to be the guests of the S. A. E., left here at 9 a. m. today on a special train for Pittsburgh, after having been given a local reception by the members of the Metropolitan section.

After the first handshakes had been exchanged on Monday, when the guests arrived and were welcomed with an American beefsteak dinner, Tuesday was utilized to show them the greatness and splendor of New York. The Britishers were taken about the town in automobiles and during the morning they received a fair idea of what Gotham is and how it looks. This was followed by a luncheon tendered by the Automobile Club of America in its headquarters at Fifty-fourth street. In the evening, the monthly meeting of the S. A. E. was held in the ballroom of the McAlpin Hotel.

There, the subject of engine starters was taken up in an exhaustive manner. This subject had been chosen, because it was truly representative of American inventive and manufacturing spirit. R. B. Whitman read a paper on the starter situation and the influence of starters on design. After this representatives of starter manufacturers read papers illustrated by screen pictures and intended to be limited to 10 minutes each. Following were the starters described: Prof. W. C. Marshall's, Prest-O-Lite, Warner Gear Co.'s, Gray & Davis, Hartford, North East, Disco, Rushmore, Westinghouse, Ward Leonard, Bailey, U. S. Lighting & Heating companies and Entz.

H. Marmon, president S. A. E.

PITTSBURGH, PA., May 29—The visiting English engineers enjoyed a stay of one day here and then boarded their train en route for the races at Indianapolis tomorrow. During the forenoon a visit was made to the Carnegie steel works, while the afternoon was spent in a trip down the Monongahela and Alleghany rivers.

INDIANAPOLIS, IND., May 31—True Hoosier hospitality was shown the English engineers by the Indiana division of the S. A. E. during the 2 days spent in Indianapolis. The visitors

above shows the members of the English engineering society and the American S. A. E. grouped before the Ford plant

did not have an idle moment from the time they reached the city yesterday morning until they left at 9 o'clock tonight for Detroit. The 500-mile race at the speedway, of course, was the *pièce de résistance* of the visit, but the hospitality did not end there. That used up yesterday, while today was devoted to visits to the Wheeler and Schebler and Prest-O-Lite plants and a ride through the country adjacent to Indianapolis with a so-called luncheon at the Indianapolis Canoe Club, which in reality was a noon-day banquet, finishing with a visit to Broad Ripple where the visitors were treated to an old-fashioned clambake, which kept them busy until time to catch the train to Detroit.

The visitors were late in reaching the speedway yesterday, but as they marched into the paddock and took their seats in the special stand provided for them, which was located just north of the pits, they created quite a sensation. The hospitality of the speedway management was extended to them in the shape of refreshments and the men from across the big pond spent the rest of the day pulling for the Sunbeam and expressing their admiration of the big track and the system that prevailed in handling the race.

"It's a magnificent track and we from England are much surprised at your enterprise," said one of the visitors, H. Massac Buist. There's a vast difference, though, between it and Brooklands. At our speedway you cannot get the view of the race you can here. With us it is more in the nature of a road race, with the cars disappearing from view, while here one can watch them all the way around. I must say that I like this the better. Brooklands is faster—there is no doubt about that, but that's because of our high banking, where the cars can run to their limit. Here a car that has a powerful motor has the best chance because of its accelerative powers. On these turns, where you have to shut down, it is necessary to be able to make a quick pickup of the speed after coming out of the turn."

The admiration of the English for the 500-mile race was followed by the suggestion that possibly a similar race could be organized at Brooklands, although the Britons confessed that it would be impossible to get anything like the attendance Indianapolis had. It was suggested that possibly an international team race could be organized, with five cars representing each country. Some of the visitors promised to take up the matter upon their return.

T. B. Browne, president I. A. E.

It was 10 o'clock this morning when the Englishmen started on the last lap of their Indianapolis visit. Climbing into cars at the Claypool which were driven mostly by engineers from the Indianapolis factories, the first visit made was to the Wheeler & Schebler plant, where the process of carbureter manufacture proved an interesting study. Each of the party was presented with a rose by President Frank H. Wheeler, while every department of the big plant was thrown open for inspection.

Following this the visitors were whirled to the Prest-O-Lite plant at Speedway, the new horseless town. This plant, just opened, kept everyone going for more than an hour. The Britons, who rely mostly on acetylene lighting hy generators, marveled at the utility and simplicity of the Prest-O-Lite tank system, and absorbed every word of information given out by the company's employes. A demonstration of the new starter was made, which also enthused the visitors, who know comparatively little of self-starters.

Next a jump was made to the Indianapolis Canoe Club, also just opened, where the visitors had a chance to see what country club life was like. It was an oppressively hot day and the cool porches were most inviting. The luncheon tables were spread on one of the porches overlooking the river and a most elaborate meal was served, which was followed by several speeches. Howard Marmon, president of the Society of Automobile Engineers, presided as toastmaster and called on H. O. Smith, president of the Premier company, for the first remarks. In a most graceful speech which breathed the hospitality of America and the admiration of the Americans,

Henry Souther congratulating Basil H. Joy on George Houk's gift

for the English engineer, Mr. Smith extended a cordial welcome to the Middle West. Replying, President T. B. Browne of the I. A. E. spoke wittily, while C. A. Bookwalter, former mayor of Indianapolis, made the address of welcome on the part of the municipality, showing a familiarity with the motor industry that impressed his hearers.

Leaving the club at 4 o'clock the engineers next were treated to a 10-mile drive through the country adjacent to Indianapolis to Broad Ripple, the scene of the clambake. It was a novel experience, that clambake, and although the party had just got up from the table, still everyone was able to make inroads into the repast, which consisted of chicken, lobster, fish and clams.

Prominent in the entertining were several of the Indianapolis engineers—Wall of the National, Weidley of the Premier, Crawford of the Cole, Howard Marmon and George T. Briggs, of Wheeler and Schebler.

Busy Time in Detroit

DETROIT, MICH., June 2—The party of twenty-five English engineers, which has been augmented to the number of about 150 by the arrival of representatives of American concerns from all over the country, have been putting in a busy time since their arrival in this city.

Yesterday being Sunday was spent by the party in gaining a slight rest from their tiresome travel and rather arduous program. Motoring trips to various parts of the city were taken and an opportunity for general relaxation was given. Today a start was made at 9.30 a. m., for the Ford plant.

The party of 115 engineers and ladies spent the forenoon at the Ford plant getting an idea of what it means to manufacture 1,000 cars per day. The activity of the plant, the organization of the various departments and the methods of manufacture and assembly astounded and bewildered the Englishmen, many of whom were unable to comment on the production methods, other than giving vent to their amazement at the speed of production.

J. B. Dunlop, of tire fame, and T. Clarkson

Henry Ford personally piloted the party through the factory, having as his right-hand guest President Browne of the Institution of Automobile Engineers, and on his left J. B. Dunlop of Dublin, the inventor of the pneumatic tire. The procession first went to the final inspection department in the back yard of the plant where each chassis is given its road test amounting to scarcely 100 yards of driving necessary in order to get in line and pass between two inspectors who glance over the chassis, examine the production papers with it and pass it along to take its body. Today the chassis were passing one in every 20 seconds, or three a minute and 180 per hour. At this rate an 8-hour day should register 1440 chassis.

The method of shipping Ford cars in knock-down condition

George W. Houk and H. M. Swetland are Interested

in the freight cars was next seen. The chassis occupy one end of the car, the bodies and all other parts the opposite end. The wheels are taken off the chassis and they are placed at an angle of 45 degrees across the car. This permits of the closest packing possible.

The production sheet for today showed that by 8 this morning 100 cars had passed through; by 9 o'clock 200 had been manufactured; at 10 the records showed 317, and an hour later 437 had been checked through. The daily output ranges between 925 and 950 at present. A short time ago a record was made, 1,117 cars being turned out in a single day.

The English and American engineers alike were interested in the multiple methods of production which have characterized Ford manufacture since the inception of the present four-cylinder model. Interest at one minute centered in a multiple-drilling machine which makes forty-five holes at the same time. These holes are drilled in the cylinder casting. The drills work from four sides—namely, top, bottom, right and left. By stop-watch it took exactly 2 minutes from the time the workman picked the casting from the pile back of him until he put it into the jig, drilled the holes, took the casting out and laid it down on the pile at the other side of him. A few feet away other machines were behaving with equal human intelligence. The stop watch showed exactly 1 minute necessary to put castings into the drills, have the holes drilled and return the casting to its place.

What interested Basil H. Joy, secretary of the I. A. E., most was the method of piston manufacture, it being accomplished in about the same fashion that a lead pencil is sharpened by an automatic machine sharpener. The piston in the rough is mounted on a vertical spindle. Immediately it starts to revolve two cutters begin operations, one cutting the sides and the other the piston head, both being so timed that the operations are completed at practically the same second. Immediately they are done four other cutters begin, three cutting the grooves for the piston rings and the fourth the broad recess opposite the end of the wristpin. The beveled edge of the piston head is accomplished by another cutter. While the stop watch was not held on the operation, it was but a slight pause in the procession to watch the entire job.

The fact that Henry Ford employs workmen by the day and week and has no one at piece work astonished all of the visitors. They imagined that piece work was the only possible method to be employed in a factory employing 16,000 workmen. Their excursion through the plant soon convinced them that Ford accomplishes results in other ways, in a word, that he is a general of men and so arranges much of the work that the pieces undergoing work pass in procession through the hands of perhaps six or a dozen workmen so that if any one workman slackened the regular pace he would hold all of the others in the series back, the work would pile up around him, and the only conclusion would be that he was not competent for the job. Ford has proven that he is right, and that results can be obtained without piece work.

T. Clarkson, manufacturer of steam omnibuses for the city of London, was an interested observer and student of Ford production. Mr. Clarkson was a visitor to America for the Chicago Fair 20 years ago, when motoring was scarcely in its swaddling garments.

Group on steps of Ford plant—Mackie (hands in pockets), Norton (arms folded), Prestwick (arms behind back)

One of the pleasantest features of the day occurred just at the completion of the Ford visit when George W. Houk, controller of the Rudge-Whitworth wire wheel interests in America, presented a full-fledged touring car to Secretary Basil H. Joy of the visiting engineers. Mr. Houk has known Mr. Joy for years, having lived 14 years abroad. Henry Souther, ex-president of the S. A. E., made the presentation speech. The presentation was a spur-of-the-moment affair, Mr. Houk purchasing the car a few minutes before it was presented, and the car itself having been manufactured while the visitors were passing through the factory.

The entire afternoon was spent by the party in making the rounds of the factory of the Cadillac Motor Car Co. Here the visiting engineers were given an opportunity of seeing the American methods of manufacture which had been worked out in a plant which is working on an annual schedule of 15,000 cars.

Two of the visitors—C. H. Wheeler and R. H. Smith

The last 1913 car is scheduled to leave the factory of the Cadillac company at 5 p. m. of June 14. On that day the last of that model will have passed through the assembling plant and the entire manufacturing attention will be given over to the 1914 product. For the coming season 18,000 cars are scheduled, and material and accessories for that number of cars has been ordered.

Welcome from the Cadillac

On the arrival of the party at the Cadillac plant after luncheon at Ardussi's, the members were led to a reception room which but a few hours before had been a part of a busy machine shop. Seats were arranged in rows and the party seated themselves and listened to an address of welcome by H. M. Leland, president of the Cadillac company. Mr. Leland explained the manner in which the party was to be conducted through the various departments and assigned each group to a separate guide.

Following one of the parties through the works many expressions of interest were head from the English visitors. The elaborate system of gauging every piece of work by under and over-limit gauges provoked general comment. The large machines designed for special work were also greatly admired.

One of the representative parties going through the works started at one of the shops where some large milling operations were being carried out. In this department there was a large Ingersoll milling machine which faced off sixteen of

D. Beecroft, Ker of Scotland, and A. L. McMurtry

Mr. Souther's presentation of the Ford car was amusing

the engine supporting arm faces at a time, eight on each side. This machine takes the place of four machines which formerly carried on this work.

Passing to the block testing room in which each of the engines are tested before they are mounted in the chassis, the full set of seventy-five engines were seen running on separate blocks. Each of the motors is given a thorough running test here under a moderate load of about 10 horsepower. The racks upon which the motors are carried are of special design and attracted the interest of the entire party. Mr. T. B. Browne, president of the Institute of Automobile Engineers, was particularly interested in the explanation of the guide of these racks. It is possible to turn the motor upside down in less than a minute and to adjust the bearings by simply removing the bottom of the crankcase which arrangement seemed very ingenious to the visitors.

In the bearing department a special feature of interest is the method used in placing the babbitt in the brass bearing caps. The babbitt metal has no affinity for brass. Solder, however, has an affinity for both brass and babbitt, so that babbitt liners are put on after the brass bearings have been tinned. The solder forms a binding strip between the babbitts and the brass.

New Machines Interest Visitors

The manufacture of the smaller parts brought in some machinery which was new to the English guests as well as to many of the American visitors. In making the shackle bolts for the springs a revolving fixture is used which feeds to the cutters 3,500 bolts per day. A shackle bolt passes through the machine every 45 seconds.

The assembling work throughout the plant was examined with the greatest care. In the motor assembly department the crankshafts were set up and run by belt in their own bearings and then taken down and the bearings scraped by hand. The Cadillac car uses five main bearings which amount to a total of 95.75 square inches of bearing surface. All of this surface is gone over by hand, not a shim being used in the motor.

In assembling the connecting-rods the lower bearing cap screws are very carefully made. This is an exceptional piece of work as the screws are first done in the rough to within .001-inch limit and are then sent through a special burnishing tool through which they must come within .0005 inch. The lower end of the connecting-rod itself its ground to .001 inch and the exterior of the bearing bushing is ground within the same limit. This gives two ground surfaces against each other in this bearing.

Before visiting the testing room of the plant in which all the chassis receive their work-out instead of on the road, the party was conducted to the room in which they were originally assembled and there found a series of tables at which tea and bread and butter were served. At the close of this repast H. M. Leland presented each of the English visitors with a gold Cadillac fob.

The two presidents, T. B. Browne and Howard Marmon

The testing room proved of great interest. Twenty-two Sprague dynamometers were arranged along the longitudinal walls of the room. In each of these a chassis was passing through what corresponds to the road test.

The chassis is backed into place and a hydraulic jack lifts the rear wheels from the ground. In 10 minutes the wheels are connected by chains to the dynamometer and the entire driving mechanism is put through a 3.5-hour test. During this time the car is run an hour at a speed of 30 miles an hour and 10 minutes on the lower speeds and reverse. Various speeds are tried and any noises which develop are carefully noted by the attendant who is in charge of two testing stands. The road test is entirely eliminated and a great saving results.

Detroit Banquet Well Attended

DETROIT, MICH., June 3—*Special Telegram*—The most successful banquet in the history of the S. A. E. was held tonight at the Pontchartrain. Seated at the tables were men of the greatest prominence in the industry both of this country and England. Howard Coffin acted as toastmaster.

Howard Marmon, president of the Society of Automobile Engineers, made a short address on the welcome accorded to

Henry Souther and George W. Houk, donor of the Ford car

The two secretaries, Coker Clarkson and Basil Joy

Group of engineers, T. B. Browne and Henry Ford in the center

the visiting engineers of both countries by the city of Detroit. He thanked the city of Detroit for the freedom of the city and for the symbol given to the engineers of both bodies in the form of the engraved parchment granting the courtesies of the greatest city of the industry. T. B. Browne, president of the I. A. E., was introduced as one of the pioneers of the industry in Great Britain. In 1900 he was an active participant in the 1,000-mile test run given the old single-cylinder horizontal engine of that day. His speech was one of thanks for the hospitable welcome given the English visitors.

Browne on American Hospitality

Mr. Browne said: "You are the most hospitable nation in the world. I am impressed by the organization of the industry in your country, particularly as it is in Detroit. A perfect Niagara of cars streams forth from the factories here. We are also impressed by the beautiful city. Detroit reminds us of Paris more than any other city we have been in. You have made enormous strides in the past 20 years and in a short time you will have nothing but automobiles here.

"Fuel, of course, is a serious consideration with you, as with us. It now costs 1 shilling 9 pence a gallon, but we may soon use kerosene, especially for the commercial vehicles, and we have hopes of being able soon to use a coal product. We admire the care used in the work here and we hope to emulate the standardization which you have worked out so well here but which is apt to be much slower of establishment in England.

"We feel at home here, not as if we were in a foreign land, and your jokes appeal to us in spite of the story that an Englishman cannot see a joke."

Swetland, Prestwick and Houk reading the latest

Mr. Browne concluded with some appropriate words of thanks for the freedom of the city extended by the Mayor and for the parchment proclaiming the same which was presented to the I. A. E.

T. C. Pullinger, one of the English engineers, in speaking on the subject of production in a motor car factory said: "You must know your business before you can be a success in it. What is needed most in a factory is men who will operate the machines as you want them to be operated. It is not a bit of good taking a lot of engineers to work machines in your factory because it is the most difficult thing to teach them how to operate them as they should be operated. They all think they know more than the factory manager. In Scotland I looked around for soldiers and sailors who were ready to go to work and I found them willing to learn what you want to teach them. At the present time these men are doing better work in their several operations than many of the educated men we have.

Reduce Dead Charges

"To make a motor car factory successful you must first of all get away from dead charges or what is known as non-productive labor as much as possible. Inspection departments are good but it is better policy to teach your men to do accurate work. If you get your men to make the parts accurately you have accomplished one of the biggest things in the automobile shop. Try in this way to reduce your dead charges and you will reach eventual success."

H. M. Leland, president of the Cadillac Motor Car Co., gave what he characterized as a little shop talk. This was really a look into the future and it showed how the ideal car will have to be made under a combination of ideal production methods by which all factors entering into the making of such a vehicle will be of the most efficient character. Mr. Leland dealt with the ideal automobile plant, that which might be and will be in operation at some distant time; he said the success of such a plant depends upon a combination of ideal conditions. He explained how this ideal car, which he said had not yet been produced, could be a success and be manufactured so that its factory could pay dividends. It is made possible by just two words—knowing how. Just as it is necessary to know how to breathe before one

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Automobile body manufacturers in attendance at the Haynes Automobile factory, Kokomo, Ind., May 24, 1913. Standing, from left to right: J. J. Parkhurst, Laporte Carriage Co., Laporte, Ind.; Ward Halladay, Central Mfg. Co., Connersville, Ind.; A. Noble, Racine Mfg. Co., Racine, Wis.; H. W. Paton, Detroit Body Works, Detroit, Mich.; J. A. Eberhart, Portland Body Works, Portland, Ind.; C. O. Mainor, Carriage-Woodstock Co., Owensboro, Ky.; Ernest Wood, Laporte Carriage Co., Laporte, Ind.; W. A. Lyons, Capitol Body Co., Indianapolis, Ind.; W. B. Ansted, Central Mfg. Co., Connersville, Ind.; A. L. McCullough, Carriage-Woodstock Co., Owensboro, Ky.; L. C. Smith, Portland Body Works, Portland, Ind.; R. Crawford, Advertising and Publicity Manager, Haynes Auto Co., Kokomo, Ind. Sitting, from left to right: C. C. Adelsperger, Union City Body Co., Union City, Ind.; C. S. Davis, Glascock Bros. Mfg. Co., Muncie, Ind.; C. M. LeJuste, Purchasing Agent, Haynes Automobile Co., Kokomo, Ind.; Frank N. Nutt, Chief Engineer, Haynes Automobile Co.; A. G. Seiberling, General Manager, Haynes Automobile Co.; J. S. Power, Draughtsman, Haynes Automobile Co.; W. T. Helfer, Racine Mfg. Co., Racine, Wis.; D. L. Watson, Manager Order & Service Dept., Haynes Automobile Co.; L. E. McKenzie, Assistant Sales Manager, Haynes Automobile Co.; A. H. Wilhelm, Superintendent, and A. E. Starbuck, Treasurer and Director of the Haynes Automobile Co.

French Car Workmen Clamor for 5.5-Day Week

Majority of Plants Crippled—All Italian Works Are Closed—Altogether 8,000 Men Are Affected

PARIS, May 24—Trouble has again broken out among the workers in the French automobile factories with regard to what is known as the English week. For some time past there has been a strong movement towards the closing of the factories on Saturday at noon, as is done throughout practically the whole of England. This has been done in a few of the factories, among them being Delaunay-Belleville, Hotchkiss, Gnome Aviation Motor Works and the Goodrich tire factory. The present discontent began with the bodymakers, such leading firms as Belvalette, Labourdet, Rothschild, etc., being affected. It spread to the bodyworking department of Bayard-Clement, and from there has spread to the engineering section. A large number of the workmen at the Bayard-Clement factory are now on strike. The Delage factory was affected to a slight extent, but after an explanation by the owner the question was submitted to a private vote and a small majority decided against a strike. In view of possible disorders at the Bayard-Clement factory gendarmes and soldiers have been called out.

Practically all the Italian factories have been closed for the last 60 days, the workmen asking for an increase in wages which the manufacturers refuse to grant. Altogether 8,000 workmen are affected, the shops closed by reason of the strike being Itala, Fiat, Isotta-Fraschini, Bianchi, Aquila, Storero and Spa.

Connecticut's Wood for Automobile Use

HARTFORD, CONN.—The manufacture of automobile bodies is conspicuous among the wood using industries of Connecticut. Automobile body construction demands ash in greater quantities than any other kind of wood, and its immense production of this wood places Connecticut in a leading position. Out of the total quantity of ash used annually in the construction of vehicle and vehicle parts over one-quarter, or 26 per cent., is grown in Connecticut. The exceptional strength of this wood combined with its light weight renders it a favorite for body framework. Yellow poplar, or white-wood, is the other important body wood and meets an exacting demand for panel work. Because of its fine grain and the fact that it is soft and easily worked, besides having a special capacity for holding paint, it is the favorite wood with builders of high-class automobiles and other vehicles. Another wood worthy of mention is cypress, although it is not used as yet in any very great quantities. This wood, however, is growing in favor as a panel wood for fine vehicle bodies.

NEW YORK CITY, June 4—Fred J. Wagner has been made vice-president of the Ajax-Grieb Rubber Co. He will superintend the company's tire sales.

State Registration Running High

COLUMBUS, O., June 2—During the first 4 months of 1913, more than 67,000 automobile licenses have been issued in this state, as compared with a total of 63,117 for the entire year 1912. Up-to-date receipts of $278,729 exceed those of last year by $3,000.

SAVANNAH, GA., June 1—The first 4 months of this year show a state registration of 20,078 cars as against 14,000 for the same period last year. The other southern states have also made considerable progress, the comparative figures being as follows: Tennessee, 1913, 11,225 and 1912, 7,181; Florida, 9,978, 4,896; Alabama, 4,350, 3,360; North Carolina, 7,000, 4,000; Arkansas, 4,500, 3,360; Virginia, 7,000, 4,000; Mississippi, 3,079, 2,000; Kentucky, 7,500, 4,000.

AUSTIN, TEX., May 31—There are at present 10,026 automobiles in San Antonio, Dallas, Houston and Fort Worth, which four cities have an aggregate population of 340,830, the population per automobile being 36, 31, 28 and 45 respectively.

MADISON, WIS., May 31—Alexander J. Cobban, in charge of motor registry in the secretary of state's department of Wisconsin, predicts that the Wisconsin pleasure car registration for 1913 will reach 30,000. On May 12 the registry passed the 25,000 mark, and on May 21 license No. 26,442 was issued, meaning that on May 21, 1913, the registry was nearly 900 in excess of the total registry for the entire year of 1912.

Peugeot and Benz Break Climb Record

PARIS, FRANCE, May 26—Originally held by the local champion Deydier, on a Cottin-Desgouttes car, the record for the Limonest hill climb was this year broken twice. First Georges Boillot, on the Peugeot, 1912 Grand Prix model, similar to the two taking part in the Indianapolis race, lowered the record from 2.24 to 2.07. A few minutes later Fritz Erle on a 200-horsepower Benz clipped the time to 2 minutes 2.5 seconds. As the hill has a length of 2.32 miles, the average speed is at the rate of 68.26 miles an hour. The gradient varies from 2 to 7.5 per cent., and the hill is marked by two very difficult turns, almost impossible to take at full speed. The victorious Benz is a special four-cylinder racing model with which Erle broke the Gaillon hill-climbing record last year at an average speed of 101.5 miles an hour. The car has a bore and stroke of 7.1 by 7.8 inches, and is chain-driven. Boillot's Peugeot, which came second, is a smaller car, measuring 4.3 by 7.8 inches bore and stroke. Third place was secured by Champoiseau on a Th. Schneider car intended to be run in this year's French Grand Prix at Amiens.

The fastest time in the touring car section was made by a six-cylinder Gobron-Brillie driven by Pons in 3 minutes 4.4 seconds. Second place went to Descours on a Turcat-Mery touring car, defeating a six-cylinder Peugeot entered in the higher class. The Peugeot, however, had the disadvantage of running with a wind-resisting closed body. René Thomas, who is scheduled to drive one of the Schneiders in the French Grand Prix, made a good showing with one of the 3-liter models on a touring chassis in 3.32.6 seconds. Juvanon, also on a Th. Schneider, won his class with one of the sleeve valve models in 3:54.5.

Results, Racing Cars

No.	Car	Bore and Stroke, Inches	Driver	Time
1	Benz	7.1 by 7.8	Fritz Earle	2.02.5
2	Peugeot	4.3 by 7.8	Georges Boillot	2.07.3
3	Tb. Schneider	3.7 by 7.4	Champoiseau	2.36.8
4	Bugatti	2.5 by 3.9	Friedrich	3.12.8
5	De La Chapelle	3.1 by 6.2	Riviere	3.13.2
6	Vermorel	2.9 by 4.7	Dupont	3.13.9
7	Benz	2.8 by 4.7	Bourdon	3.47.9
8	Clement	2.9 by 4.7	Servoz	3.51.3
9	Mors (Knight)	2.9 by 4.7	Felix Dubois	4.43.3
10	Ronteux	2.4 by 3.1	Jolibois	5.07.7

Touring Cars

No.	Car	Bore and Stroke, Inches	Driver	Time
1	Gobron-Briellie 6-cyl	4.3 by 7.8	Pons	3.04.4
2	Turcat-Mery	4.3 by 6.2	Descours	3.19.7
3	Th. Schneider	3.2 by 5.5	Rene Thomas	3.32.6
4	D. F. P.	2.7 by 5.1	Lacharnay	3.40.6
5	Diedericbs	2.7 by 5.5	Laurent	3.49.6
6	Bugatti	2.5 by 3.9	Luc Germain	3.53.8
7	Th. Schneider	3.1 by 5.5	Juvanon	3.54.5
8	Alcyon	2.9 by 4.7	Giroux	3.58.3
9	Vermorel	2.9 hy 4.7	Gerard	3.58.7
10	Benz	2.8 hy 4.7	Spamann	4.28.4
11	Peugeot 6-cyl.	4.7 by 5.1	Reith	4.38.9
12	Baby Peugeot	2.1 by 3.5	Pichenot	5.09.6
13	Baby Peugeot	2.1 by 3.5	Aime	5.58.8
14	La Sauterelle 1-cyl.	3.9 by 4.7	Tamisier	9.28.5

Ninety-Eight Trucks Entered in French Trials

PARIS, FRANCE, May 26.—Instead of a series of trips around Versailles, tbe ninety-eight commercial vehicles entered for this year's French trials will be sent on a journey across France with Lyons and Bordeaux as the extreme points. Tris competition, which is almost exclusively a military event, is organized witb a view to testing the endurance of tbe trucks and tbeir suitability for participation in the military subsidies. If a vehicle accomplishes the tests in a successful manner the manufacturer has tbe advantage of selling all duplicates of this model as army subsidized types, the purchaser receiving an annual subsidy and entering into an agreement to hand over the truck to the military authorities in case of mobilization.

This year's trials will last from July 1 to August 12. The first 3 days will be occupied in weighing and sealing tbe vehicles at Versailles. From July 5 to 12 a series of runs will be made from Versailles, the daily distance being from 60 to 90 miles, the fuel being gasoline. On July 16, 17, 18, 19, and 20 town to town runs will be made under full load with carbureted alcohol used as fuel. After a rest at Dijon tbe competing machines will continue to Lyons, Montbrison, Clermont-Ferrand, Limoges, Perigueux, and Bordeaux, carrying full load and using benzol. A day's rest will be allowed at Bordeaux, tbe return to Versailles being made in five stages, through Angouléme, Poitiers, Tours and Chateaudun, using gasoline as fuel. August 8 and 9 will be rest days, and the 3 following days will be occupied in dismounting the various organs of the machines in order to judge the amount of wear that has taken place. The firms entered in the trials are tbe following: Delahaye, Panhard-Levassor, Balachowsky & Caire, De Dion Bouton, Rochet-Schneider, Berliet, Motobloc, Delangere & Clayette, Latil Saurer, Brasler, La Buire, Peugeot, Clement-Bayard, Lorraine-Dietrich, Aries, Cohendet and Cottin & Desgouttes.

RACINE, WIS., June 2.—Of the 120 Racine manufacturing concerns that will exhibit in the first annnal Made-In-Racine exposition, to be held in the new J. I. Case foundry at Lakeside, Racine, from June 9 to 14, under the auspices of the Racine Commercial Club, nearly fifty are manufacturers of and will exhiblt motor cars, parts, accessories, bodies, etc.

FINDLAY, O., May 26.—Beecber W. Waltermire has been appointed trustee in bankruptcy of the Findlay Motor Co., recently sold to L. E. Ewing, its promoter, for $50,000. Tbe debts will aggregate $158,000, wbile claims to the amount of $121.000 have been allowed.

Two Killed in Grand Prix Practice

PARIS, May 23.—While training for the French Grand Prix, Guido Bigio, chief engineer of the Itala Co., and his mecbanician, Giovanni Abrizzon, were killed in the neighborhood of Dieppe yesterday morning. Bigio, who had been connected with tbe Itala factory at Turin for about 7 years and was somewhat recently appointed technical director, was tuning up tbe cars specially built for the French Grand Prix race next July.

PARIS, FRANCE, May 27.—An examination of all the circumstances under which the Italian engineer, Guido Bigio, and his mechanician met their deaths while practicing near Dieppe for the French Grand Prix point to the fact tbat the Itala race driver attempted wbat appeared to be a fairly easy turn at too high a rate of speed. The road on this portion of the old course comprises some magnificent straightaways, a short portion of a switchback nature and a very fine down grade into Eu. One of the sbort rises was followed by a fairly easy bend. It is supposed that the Itala engineer came up to this rise at a very high speed to discover that he bad to make a turn. His rate of speed was too bigh to get round correctly, the car skidded violently, grazed a tree, taking the bark off for a beight of 10 feet, and turned over, coming to a stop in the ditcb with the four wheels in the air.

Milwaukee's Inter-Club Run

MILWAUKEE, WIS., June 2.—Saturday, June 28, has been selected as tbe date for tbe first annual Milwaukee Inter-Club, a team match trophy tour between the Milwaukee Atbletic Clnb and the Milwaukee Automobile Club. The run will be modeled along the lines of the annual competition between the Chicago Automobile Club and the Chicago Athletic Association.

WASHINGTON, D. C., June 2.—The Washington Automobile Racing Association has been formed to conduct a series of race meets on Benning track. The first event is scheduled for June 21.

View of the Turcat-Mery touring car, which was second among cars of this class in the Limonest hill-climb, at the beginning of the upward gradient

Wreck of the rotary valve Itala, in which Guido Bigio, chief engineer of the Itala company, and his mechanician were killed near Dieppe, France, while practising for the Grand Prix

Case and Pierce Defeat Stephenson Truck

Weed Is Granted an Injunction Against Makers of the Federal Grip—Cole Capital Raised to $1,000,000

Knight Motor Finds Truck Field in Europe—Benz Importers Lose Froelich Suit

MILWAUKEE, WIS., June 2—Judge W. J. Turner of the Circuit Court of Milwaukee county found in favor of the defendants in a decision handed down in the suit of the Stephenson Motor Truck Co. of South Milwaukee vs. the J. I. Case Threshing Machine Co. and Pierce Motor Co., of Racine, for $100,000 damages on the claim of breach of contract. The finding of Judge Turner in favor of the Case and Pierce concerns is virtually a dismissal of the suit. The costs are taxed against the plaintiff.

The Stephenson Motor Truck Co., of Milwaukee, with works at South Milwaukee, entered into an agreement with the J. I. Case Threshing Machine Company, of Racine, which had at that time effected an affiliation with the Pierce Motor Co., and since absorbed this concern, to purchase its entire output of delivery cars for a certain period, at the end of which the Stephenson company was to be purchased by the Case company under certain conditions. By this means the Case company virtually became a factor in the motor delivery car field, having previously entered the pleasure car field as marketer of the output of the Pierce Motor Co.

However, the Stephenson product did not come up to the expectations of the Case company, and when the time came for the consummation of the agreement, the Racine concern refused to proceed, claiming that the Stephenson company's product was not up to specifications. Upon the Case company's refusal to purchase the Stephenson company, the latter brought suit to enforce the agreement, and asked for $100,000 damages due to the loss of business and inability to market its own product because of the arrangement with the Case company.

Since the beginning of the suit the Stephenson company has been marketing its own product and intends to continue to do so. The Case company has not made further efforts to engage in the delivery car field and confines its motor car business to the manufacture of Case passenger cars.

Federal Chain Injunction Issued

NEW YORK CITY, June 3—The Federal Chain & Mfg. Co., as well as James Millard & Son Co., William F. Holroyd, Maurice H. Cormack and Frederick Cormack were enjoined from manufacturing chain tire grips which were claimed by the Parson Non-Skid Co., Ltd., and the Weed Chain Tire Grip Co. to be infringements of the Weed patents. The preliminary injunction was issued by Judge Lacombe in the U. S. District Court, Southern District of New York, on the strength of the fact that the grips resemble closely the products which brought about the injunction against the makers of Atlas chains.

Cole Doubles Capital to $1,000,000

INDIANAPOLIS, IND., June 2—Application has been made to the Indiana secretary of state for authority to increase the capital stock of the Cole Motor Car Company, Indianapolis, from $500,000 to $1,000,000. The company has adopted plans for increasing its manufacturing facilities to a large extent.

Motor Wagon Co. Adjudicated Bankrupt

DETROIT, MICH., May 24—The Motor Wagon Co. of this city was adjudicated bankrupt on May 12. A meeting of the creditors will be held here in June to arrange matters.

NEW ORLEANS, LA., May 27—Freight rates on practically all of the European lines to South America were raised May 1. The increase in many cases amounts to 20 per cent. This will be a decided advantage to the American manufacturer of motor cars.

Knight Motor Used on Trucks

LONDON, ENGLAND, May 24—The Knight sleeve valve motor is being used considerably in the commercial field in Europe. The Daimler company, of Coventry, has to date 250 buses and trucks with Knight motors in commission and is at present building 450 buses for the London service, these being equipped with four-cylinder motors 4.33 by 5.91 inches bore and stroke. The chassis of these buses are so designed that they may be used for truck purposes. Forty of these buses have now run an average of 20,000 miles each on the London streets carrying their average load of 40 persons. They are built with a gear ratio of 7 to 1 and are frequently called upon to do 25 miles an hour which means 1,600 revolutions per minute of the motor.

There are several of the Knight type trucks in use throughout England and on the Continent. One bus operating in Constantinople takes in in fares $40.00 per day, seven are running in Munich, Germany, and others in different cities. Recently a sample bus has been placed in the service of the Fifth Avenue Coach Co., New York City.

Froelich Wins Against Benz

NEW YORK CITY, June 4.—The Benz Auto Import Co.'s two suits against Jesse Froelich, its former manager, were dismissed with cost yesterday, when they came up in the Supreme Court of New York before Justice Erlanger. The first suit was for $7,500 in payment of two Benz cars, and the second for $22,500 in payment of 225 shares of stock of the American company. J. S. Epstein, attorney for the defendant, showed to the satisfaction of the court, that Mr. Froelich, in the matter of the first suit, had sold to the home Benz company at Mannheim, Germany, $15,000 of stock formerly his property, half of which was paid for in cash by the German company and half in the form of two Benz cars delivered by the New York concern, who charged the Mannheim company with it, against a credit of the latter with the New York company. This was shown by the books of the Benz company. As for the 225 shares of stock of the New York company, these were transferred to the German company by its American legal representative, Walter Mass, as the stock books of the New York concern showed. On the strength of this proof, the jury dismissed the suits, with payments to be borne by the Benz Auto Import Co.

Automobile Securities Quotations

STOCKS this week varied but little from the prices of last week, due to few developments. Trading was limited.

	1912 Bid	1912 Asked	1913 Bid	1913 Asked
Ajax-Grieb Rubber Co., com	110	120	155	..
Ajax-Grieb Rubber Co., pfd	90	100	95	100
Aluminum Castings, pfd	100	102	98	100
American Locomotive Co., com	40⅝	41	31	32
American Locomotive Co., pfd	107	108	102	103
Chalmers Motor Company, com	..	..	128	138
Chalmers Motor Company, pfd	..	..	98	102
Consolidated Rubber Tire Co., com	16½	18½	14	18
Consolidated Rubber Tire Co., pfd	55	59	60	75
Firestone Tire & Rubber Co., com	268	272	259	263
Firestone Tire & Rubber Co., pfd	106½	107½	105	107
Fisk Rubber Company, com	..	..	..	..
Fisk Rubber Company, pfd	..	..	..	100
Garford Company, preferred	99½	100½	..	97½
General Motors Company, com	34	35	26	30
General Motors Company, pfd	73	75	73	74¾
B. F. Goodrich Company, com	82½	83¼	29⅞	32
B. F. Goodrich Company, pfd	108¼	108¾	91	94
Goodyear Tire & Rubber Co., com	270	273	312	317
Goodyear Tire & Rubber Co., pfd	100	105	98½	99¼
Hayes Manufacturing Co	..	103	..	90
International Motor Co., com	28	32	5	6
International Motor Co., pfd	90	94	10	15
Lozier Motor Company, com	45	55	15	20
Lozier Motor Company, pfd	..	..	..	92
Maxwell Motor Co., com	..	..	3	5
Maxwell Motor Co., 1st pfd	..	..	32	36
Maxwell Motor Co., 2nd pfd	..	..	10	15
Miller Rubber Company	160	163	138	147
Packard Motor Company	104½	106½	98	102
Peerless Motor Company, com	..	..	45	50
Peerless Motor Company, pfd	..	..	..	96
Pope Manufacturing Company, com	29	30	12	15
Pope Manufacturing Company, pfd	74½	75½	45	48
Portage Rubber Co., com	..	..	35	40
Portage Rubber Co., pfd	..	..	90	95
Reo Motor Truck Company	9	10½	11	12
Reo Motor Car Company	23	24½	20	22
Rubber Goods Mfg. Co	105	110	105	110
Studebaker Company, com	38½	40	24¼	25½
Studebaker Company, pfd	96	98	89	90¼
Swinehart Tire Company	106	107	85	88
U. S. Rubber Co., com	..	..	60	61
U. S. Rubber Co., 1st pfd	..	..	104¼	105
White Company	108	110	107	110
Willys-Overland Co., com	..	..	58	65
Willys-Overland Co., pfd	..	..	85	94

A. C. of C. Will Revise Car Warranty

Committee To Arrange Details—Evans Moves to Nashville—Luverne Has New Unit Power Plant

Ford's Machinery Moved from Buffalo to Detroit—Remy Company May Make Oil Engines

NEW YORK CITY, June 4—A revision of the standard warranty on passenger cars was proposed by the members of the Automobile Chamber of Commerce who were present at the monthly meeting of the board of directors today. These were: Charles Clifton, W. E. Metzger, W. T. White, W. C. Leland, G. W. Bennett, L. H. Kittredge, F. T. Davis, Jr., J. N. Gunn, H. H. Rice, C. C. Hanch and A. L. Pope.

Mr. Metzger resigned as representative of the Maxwell Motor Co., Inc., but was re-elected to the board as representative of the Argo Electric Co., Saginaw, Mich.

The committee for warranty revision is composed of Messrs. Hanch, Rice and White. The show committee of the body was given the task of working out details for the coming Chicago and New York shows. A request was received from the A. A. A. to co-operate with it in the fight against truck legislation now pending in New Jersey and this matter was referred to the legislative committee.

The next meeting will be held at Christmas Cove, Me., on July 18.

LOUISVILLE, KY., June 2—The Ten Broeck Tire Co., capitalized at $250,000, announces the opening of its plant on June 10 for the manufacture of pneumatic and solid tires in all standard types, both plain and non-skid. The tire is named for Kentucky's famous race horse Ten Broeck. The factory is located at Twenty-sixth and Courtney streets. There are 55,000 square feet of floor space under one roof. The officers of the company are H. L. Lewman, president; Fred Haupt, vice-president; W. N. Cox, treasurer, and Dr. F. L. Koontz, secretary.

DETROIT, MICH., May 31—The Evans Motor Car Co., which has absorbed the Automobile Mfg. & Engineering Co., a former Detroit concern fathered by R. H. Evans, has definitely located its plant at Nashville, Tenn., where a complete factory for the manufacture of commercial cars and motors is to be built, according to Mr. Evans. The Evans company was organized March 20 under the laws of Tennessee with a capital of $50,000, which, however, is soon to be increased to $200,000, it is stated. The factory is to measure 60 by 200 feet and 500 trucks are to be made the first year with a force of men in the neighborhood of 500. The Evans car has a capacity of 1,500 pounds and is equipped with a 30-horsepower Continental motor and a Timken rear axle.

Luverne Has New Unit Power Plant

LUVERNE, MINN., May 31—The Luverne Automobile Mfg. Co., of this city, have placed upon the market a four-cylinder, unit power plant which is completely equipped, consisting of motor with carbureter and high-tension magneto attached. Multiple-disk, dry-plate clutch, selective transmission, with control levers and pedals attached and connected are included in this power plant. If desired, the motor is equipped with electric generator and starter.

Ford Buffalo Branch Moves

BUFFALO, N. Y., May 31—Employees of the Ford Motor Co. branch at Kensington avenue and Liberty street were paid off Friday afternoon and preparations at once were made to ship all machinery of the plant to Detroit, where the firm has contemplated removal for some time. The recent labor trouble and strike in the local Ford plant hastened action of the firm in removing its machinery to Detroit. About 500 men were regularly employed in this plant.

INDIANAPOLIS, IND., June 2.—There is an unconfirmed rumor that Frank and Perry Remy of Anderson, formerly owners of the Remy Electric Co., expect to engage in the manufacture of kerosene oil engines. They have been engaged in secret experiments for several months and have been negotiating for a factory. It is reported that within a short time the Remy brothers will be ready to make public their plans for the future.

NEW YORK CITY, June 2.—The Grimm ordinance abolishing private stands for taxicabs in New York City and the leasing of the streets in front of hotels by the proprietors of the latter and reducing the rates for taxicab service was passed last week by the Board of Aldermen's vote of 65 to 1.

WASHINGTON, D. C., June 2.—Recognizing the great question of good roads the Democratic caucus of the House of Representatives today created a committee on roads, with Representative Dorsey Shackleford, of Missouri, as chairman.

NEW YORK CITY, June 3.—A meeting of the creditors of the bankrupt New York Motor Works, Inc., Newark, N. J., has been ordered by the Chancery Chambers in Newark for June 24. At this meeting the creditors and stockholders are to show cause why the receiver's account now on file should not be allowed, allowance for the receiver's services made, a 66 per cent. dividend with interest paid and a final dividend paid out of the money remaining in the hands of the receiver after this payment.

NEW YORK CITY, June 4.—The Brady-Murray Motors Corp., distributor of the Chandler six cars and the Maccarr, Lansden electric and Smith commercial vehicles, has leased the first two floors of the new eleven-story building under construction at 245 West Fifty-fifth street. The company will move into its new quarters July 1. R. J. Laciar is sales manager.

ANDERSON, IND., June 2.—G. A. Lambert and James A. Burk have bought the interests of B. F. Lambert, president of the Buckeye Mfg. Co., Anderson, Ind., which builds Lambert motor cars. They have been interested in the company for some time. B. F. Lambert has bought a controlling interest in the Elwood Iron Works, Elwood, manufacturers of heavy castings and of an oil engine recently perfected by David Morrison, a machinist of Anderson.

NEW YORK CITY, June 3.—The Packard Motor Car Co. has declared a quarterly dividend of 1¾ per cent. on its preferred stock.

Market Changes for the Week

TIN slumped this week to $46.55 per hundred pounds. The market was unsettled and irregular and still below the cost of importation from London. Copper was dull and heavy, the consumers here and abroad buying sparingly and the speculators showing small interest. Both electrolytic and Lake coppers dropped in prices, the former $.00 3-10 and the latter $.00 1-4 per pound. Lead was dull but steady, remaining constant at $4.35 per hundred pounds. Bessemer and Open-Hearth steel rose $1.50 and $.50 respectively. Automobile tire scrap held firm at $.10 per pound. Cottonseed oil rose $.05 per barrel, though there was decided weakness on Tuesday due to a break in lard. Petroleum prices remained firm and unchanged and the consumption was liberal. Linseed oil was quiet and unchanged. Gasoline, rapeseed oil, sulphuric acid and antimony remained unchanged.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb...	.07½	.07½	.07½	.07½	.07½	.07½	....
Beams & Channels, 100 lbs.	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	25.00	25.00	25.00	25.00	26.50	26.50	+1.50
Copper, Elec., lb...	15 11/20	.15⅓	.15⅓	.15½	.15¼	.15¼	— .00 3/10
Copper, Lake, lb......	.15¾	.15¾	.15¾	.15 7/10	.15½	.15½	— .00¼
Cottonseed Oil, lb.	7.15	7.18	7.20	7.22	7.28	7.20	+ .05
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil, Menhaden, brown.	.34	.34	.34	.34	.34	.34	....
Gasoline, Auto, 200 gals.....	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime	.95	.95	.95	.95	.95	.95	....
Lead, 100 lbs..	4.35	4.35	4.35	4.35	4.35	4.35	....
Linseed Oil....	.48	.48	.48	.48	.48	.48	....
Open-Hearth Steel, ton....	26.00	26.00	26.00	26.00	26.50	26.50	+ .50
Petroleum, bbl., Kansas crude	.88	.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa., crude...	2.50	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	....
Silk, raw Italy.	....	4.35	....	....	4.35	4.50	+ .15
Silk, raw Japan	....	3.70	....	....	3.70	3.75	+ .05
Sulphuric Acid, 60 Baume...	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb....	48.00	47.70	47.65	47.13	46.65	46.55	—1.45
Tire, Scrap....	.10	.10	.10	.10	.10	.10	....

The Automobile

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The Visiting English Engineers

IT is to be hoped that more visits between foreign and American engineers will take place, now that the ice has been broken and both sides have taken the first step. American engineers learned much when abroad a couple of years ago and already all of the foreigners are pleased with the insight they have been given of American production methods. There are always two sides to a question and there is no better way of making progress than to get together. The automobile is an international creation, a machine built in a particular country but used in all the lands that make up the continents. The get-together spirit is needed more than in many other industries. The greater the standardizing work that can be mutually accomplished the better for maker and consumer. Visits of this nature are bound to bring people closer together and in this age of international congresses of peace, international congresses of good roads, international congresses of commerce and international congresses of government and chambers of commerce, the automobile industry would not be keeping step with the march of progress if it failed to work for closer international relationships in matters of design, manufacture and production. It is to be hoped that annual visits may be stimulated, or if once a year should prove too frequent, not more than 2 years should be the interval between visits.

Unpreparedness Is Costly

INDIANAPOLIS' 500-mile race was slower this year than last because of unpreparedness on the part of several contestants and because of much greater caution in driving by not a few of the best-known pilots. True the motors were limited to 450 cubic inches displacement as compared with 600 cubic inches a year ago, yet this reduction of 25 per cent. in capacity was not the major reason for the reduction in pace for the entire distance.

Scarcely one-half of the cars were racing fit. Some of them were not any more fit to start in the race than a drug store clerk would, without training, be fit to start in an Olympic marathon. Others had new motors, new sets of cylinders being put on the day before the race, and nothing but dropping out before the race was well under way was all that could be expected. With other entrants there was not sufficient time previous to the race, to test thoroughly the running gear parts and gasoline tank leaks gave more trouble than motor defects.

In spite of the years of experience American makers have had in preparing cars for severe contests, a majority of the factories are slow to learn the lessons of the early bird. Last week's race has proven once more that the car to endure the gruelling punishment of 500 miles is the car that has been well run in, several of the foreign cars that finished having had many thousand miles of previous running.

It is one thing to design and build a racing car and it is another thing to get it ready for the race. The best-designed and best-built car in the world will generally fail signally in a contest if it has not been previously prepared for the fray; whereas a relatively inferior machine may make a surprising showing if it has been well groomed for the work. The cylinders must be worn in; the bearings must be worn in; and a hundred other parts must be worn in. After being worn in the motor or other part has to be taken apart, every iota of worn material removed, every part thoroughly cleaned and then re-assembled ready for the final trial run.

The exceptional amount of oil on the track held the speed down considerably, a fact which led to the utmost conservatism, translated by many as being good judgment in order to get a share of the $50,000 prize money.

The enormous consumption of gasoline and oil by some contestants directs attention to making fuel economy a factor in such a race, a factor only in that a contestant must not use in excess of a determined maximum. Such a regulation would apply with equal effectiveness to lubricating oil also. In last week's race one car averaged 23 miles to the gallon and landed well up with the leaders. Compared with this some others averaged but 5 miles to the gallon.

This year's victory of a foreign car is bound to give this classic a greater following a year hence, in fact, it will be surprising if the $50,000 does not attract a galaxy of foreign racing stars and the premier racing machines of Europe. Those who participated this year will surely return and each is bound to bring others over because of his tale of American gold. Viewed from a contest viewpoint the French victory will do more to stimulate American entries next year than if an American made machine had won.

The Growing Popularity of Electrics

From a Paper Read by H. H. Ricè at the Recent Convention of Electric Vehicle Makers in Boston.

THE encouraging feature of the growth of sentiment in favor of electrics is not limited to those who derive profit from them. The public itself acknowledges the desirable features of the electric car in ever-increasing numbers. There are thousands of owners of automobiles, who, if they were to make their automobile investment over, would find in their stable a place for an electric. They will do this eventually, as is shown by the large number of gas cars which are traded in for electrics and many more which are offered in trade.

Another indication of the growing popularity of the electric is that manufacturers and dealers in gasoline cars have changed their attitude of outright contempt or good-natured tolerance to recognition that the electric, both in the passenger and truck vehicle, is a car which in its own field is unequaled by the gas car.

Only a few years ago, the manufacturer of a gasoline car looked upon the electric as a toy or a car for the woman or the man who did not dare, but today they have been forced by figures of cost and maintenance to acknowledge that the electric cannot be ignored for service and that in spite of self-starters and all the other improvements the electric is par excellence the car of convenience for city use.

Electrics Really Necessary

It hardly seems in place to argue for the growing popularity of electric vehicles to those who are entirely familiar with the fact, but sometimes we do not see best the things that are nearest to us and when we hear of the tremendously large scale of gasoline vehicles we wonder if the electric is really growing as fast as its friends and well wishers would have us think. But it is really becoming an important numerical factor.

According to THE AUTOMOBILE there were in October, 1912, some 33,842 electric pleasure cars registered in the United States, while the new registration for the year was 5,550, showing a growth of 20 per cent. These figures show that there are half as many electric vehicles in use in this country as there are automobiles of all types in France or any other of the leading countries of Europe.

At present there is no accurate way of obtaining a definite report on the actual number manufactured except by very tedious inspection of the registration records and from these, owing to the different laws of the various states, it is difficult to obtain satisfactory information.

However, one only needs to look about and to count the large number of new firms manufacturing vehicles to know that at least from that source there are a great many electrics being placed on the market. Then, by noting the number of new vehicles of the older manufacturers which are seen on the streets, further proof is added of the increase. One has but to look about him in any city of the country, except the East, perhaps, to realize to what extent electric vehicles are used, and even in the East itself people are beginning to take up the electric pleasure vehicle.

For a number of years, indeed, certain sections of the East have shown a larger use of the electric commercial vehicle than anywhere else in the country.

It is generally considered in the automobile trade that the gasoline car and the electric occupy different fields and there should be no active competition between them. It is a fact, however, as we all recognize, that many owners of gasoline touring cars have become so accustomed to the use of their machines that they employ them without considering the cost in daily service, to and from business and in their pleasure rides in and about the cities in which they live.

The general use of high-priced touring cars for both city and country service is one of the most expensive and uneconomical fads of the day. It is much the same as if the carriage owner of 50 or 100 years ago had insisted on driving a stage coach on city streets because it was necessary to use such a vehicle for long-distance work on country roads.

The electric pleasure car as it is built in this country fills the place of the fashionable pleasure vehicle as it was used before the introduction of the motor vehicle. It has all the speed allowed, or mileage necessary, within the city limits.

It is built with greater luxury than the most fashionable carriages of the last generation and it has every advantage over the gasoline car for daily service. It is simpler in construction, free from all the mechanical troubles that beset the gas car and far more economical to maintain than any gas car.

The man who has $4,500 to invest in automobiles will do well to consider whether he can find a better investment than a $3,000 electric for city use plus a $1,500 gas car for touring purposes.

It is now 21 years since the first electric vehicle was seen on the streets of Chicago, but it was 5 or 6 years after that that they began to be manufactured. If it were not for the phenomenal growth of the gasoline during these later years, the increase in the use of the electric vehicle would itself be considered phenomenal.

The growth of the business has never taken on boom proportions and hence has not been subject to the fluctuations that have affected the gasoline car industry. The increase in the demand for electrics has been sufficiently moderate to be a normal and healthy growth and it has never been stimulated by an extraordinary amount of free publicity.

Yet the electric has done a very, very large amount of straight advertising in proportion to its business and the advertising done by the manufacturers has always been in advance of the volume of business. They spend a larger percentage of their gross business on advertising account than almost any gas car company.

It is accordingly not surprising this year to find the manufacturers of electrics working at full capacity and in some cases increasing their product over last year's business, a result that can be largely attributed to the increased advertising.

Today there is no manufacturing industry in the United States that is more firmly established, more safely within the bounds of its legitimate field than the electric automobile business.

As for the car itself, it may well be claimed that while many improvements, small and great, may be looked for within the next few years, as in the past, it is at this moment a highly developed, well-balanced piece of mechanism which runs with comparatively little attention.

What I have said about the general attitude of the public, the central station men and the gas car manufacturers as to the growth of the electric, applies both to pleasure and commercial vehicles, but I cannot help referring particularly to the steady growth of the electric truck and delivery wagon business, and the increasing importance of that side of the industry. The field of the electric pleasure carriage, as now built, is already pretty well defined and its future growth may be predicted with some degree of certainty. The field of the electric commercial wagon has hardly been explored as yet. There is an immense opportunity for the use and distribution of electric motor wagons which remains to be opened and exploited. It is the undiscovered country of the future and the growth of that branch of industry is likely to be one of the phenomenal developments of the next few years.

Commercial Vehicle Growth

This growth of the electric commercial vehicle is all the more remarkable because the comparatively few manufacturers have had to make headway in face of the competition of a hundred manufacturers of gasoline trucks. Nearly every manufacturer of gasoline pleasure vehicles puts a commercial body on his chassis and thus has an outlet for his surplus stock or obsolete styles. He can make a demonstration on pneumatic tires, which will, of course, be excellent in speed and in performance, but day in and day out and year in and year out the electric invariably shows the lower cost per package.

Let us continue persistently to claim for the electric the advantages which it so surely possesses, be careful not to claim superiority in fields where it is not as yet superior, and show by our deeds as well as our words that we believe everything we claim.

Fig. 1—Neat hat for touring in white ratine with rose colored band. Listed at $3

Fig. 2—Smart reversible bonnet in red silk with visor of black flexible hemp straw. $6.50

Fig. 3—Close-fitting gray bonnet with turned over brim and trimmed with bow at front. $2.25

Fashions for the Woman in the Automobile

This Year's Dustcoats Are Smartened with Colored Trimmings—Hats Show an Interesting Variety of Design

THE touring season is rapidly approaching and within a few weeks thousands of happy automobile parties will be skimming along the open highways drinking in the scenery in its springtime freshness. Such a party forms a pleasing picture, always granting that the load of enthusiastic tourists includes a proper complement of members of the fair sex in holiday raiment. None know this better than the ladies themselves and their taste in clothing that combines neatness of appearance with comfort and the peculiar demands of automobile travel is reflected in the extensive display of motor wear at present being eagerly examined at the supply store counters.

Lightness of material and looseness of fit so as to allow that ease from which a considerable part of the pleasure of automobiling is derived, mark the latest developments in motor garments for both sexes. And the designers have so worked that these desirable features are obtained without in the least sacrificing the charm of graceful lines. All through the range of coats, dusters, waterproofs, slip-ons, etc., on the ladies' counters are strong evidences of the hand of the artistic designer.

Perhaps the most noteworthy direction in which development is passing is that of reducing the number, weight and bulk of the garments which it is necessary to carry in order to provide for all possible weather contingencies. Formerly the waterproof was too warm for the midday sun, and the necessity of changing into it at every summer shower was rightly considered a trouble that should be avoided. This brought about the introduction of rubberized garments in gabardine, silk and other materials light enough to perform the ordinary duties of the duster. For a warm showery day these garments are ideal.

Fig. 4—Popular type of linen duster with color relief of blue or red for the collar and cuffs. Listed at $7.50

Fig. 5—Linen dustcoat trimmed with white and tan leather. The oblique front gives a distinctive appearance. Price $29.75

A few years ago it was customary to meet the cold air of evenings with a massive coat whose bulk monopolized an undue share of the baggage space on the car when it was taken off. This has been remedied by the use of garments made from closer cloths, with more attention paid to the correct design of collars and buttoned parts, and by the use of wind shielding devices at the wrists. By these means it is now an easy matter to keep warm without acting as a support for a weighty top coat. This duality of purpose of the lighter wear and reduction in bulk and weight of the heavier renders the all important question of what clothing shall we carry one that can be faced with comparative calm.

In order to provide that freedom of arm movement which is essential to comfort while sitting in the car and also to insure the least damage by crushing to delicate wear underneath the top coat it is the universal custom in motor garments to provide roomy arm holes and shoulders. This perhaps explains the popularity of the raglan type of sleeve, although the particular advantages that were formerly associated only with that cut of shoulder are now incorporated in garments having the regular coat sleeve.

Of all the garments that are necessary parts of the woman motorist's wardrobe none is so indispensable as the duster. This year's display of these garments is bewildering in its variety. Scarcely any are on show that cannot claim a share of attractiveness in one way or another. The introduction of colored trimming of some sort adds considerably to the appearance of many of these summer garments. In Fig. 5 a particularly neat example of this use of contrasting color in a linen dustcoat is shown. In this the collar and wrist cuffs are of tan leather with a narrow border of white, also in leather. The collar is provided with a buckled strap so that close fitting at the neck is an easy matter. Similar adjustable fasteners are attached to the cuffs to keep out the wind. A helf belt of tan and white leather, in uniformity with the collar trimming, contributes to the smart appearance of the back.

Fig. 4 also demonstrates the enhanced appearance that is obtained by the introduction of a slight splash of contrasting color on an otherwise plain garment. This duster, supplied in linens and mohairs, has a collar of a light shade of blue or red with the cuffs to match, and is a most popular type for summer wear.

Linen has the advantage of easy laundering, but where a dustcoat of a more dressy appearance is wanted the prospective purchaser has a wide range of silks and other fine materials placed before her. The duster shown in Fig. 13, for instance, and supplied in pleasing shades of blues and grays, fits the case. It is an extremely light garment and has the advantage of being shower proof. The skirt is long and roomy and the side pockets are of a useful size.

Fig. 6—Tan mackintosh with close fitting military collar and wrist bands. Supplied with raglan shoulders or the ordinary inserted coat sleeves. The wrists have inner wind guards. Price $15.

Fig. 7—Very light, double-breasted shower proof of white rubber fitted with black collar and wrist facings. This garment is furnished with large side pockets with wide flaps. Price $10.

Another silk coat for the dressy motorist is illustrated in Fig. 12. This is in rubberized Italian silk with a convertible collar and raglan shoulders. The sleeves are comfortably wide and are furnished with the conventional buttoned wrist strap. The neat appearance of the collar with the lapels buttoned up is well brought out in the illustration. In the heat of the day when a breeze about the neck is welcome the open position of the collar will be found to look equally well.

A mannish mackintosh of the conventional type is shown in Fig. 6. This is a single breasted garment in tan with a close fitting military collar. Slash pockets at the side are provided and the sleeves are furnished with wind cuffs and outer wrist straps. It is supplied in both raglan and the regular coat sleeve forms.

For those who prefer an extremely light waterproof the white rubber illustrated in Fig. 7 can be recommended. As will be seen, this is a double-breasted garment of a very smart appearance. The collar and cuffs are black, and wind guards are fitted to the wrists. The side pockets are of the patch type furnished with wide flaps. Such a coat can be folded up into a very small compass, and its price, $10, is astonishingly small when its neat appearance is taken into account.

Fig. 11 shows a tan leather coat that somehow seems to suggest that the wearer has a thorough knowledge of the mechanical details of her car. Not that it is designed primarily for the lady driver—it is a handsome garment for any one in the car—but it smacks more of the automobile than those previously described. The leather is extremely soft and pleasant to wear and with the collar raised as shown in the picture forms ample protection against the elements. The single row of buttons pass through a storm flap that produces a perfectly sealed joint

Fig. 8—Mica mask inserted into crepe de chine veil. Ventilating holes are provided. Price, $4.50

Fig. 9—Handsome silk bonnet with veil permanently attached to front of brim. Listed at $12.50

Fig. 10—White corduroy hat that is easy to wear and always looks well. The price is $2.95.

Fig. 14—Left, showing smart side view of silk and straw bonnet shown in Fig. 2. $6.50

Fig. 15—Right, smart sailor straw hat that is useful in the blazing sun. Price $10

Fig. 11—Top illustration shows handsome tan leather coat provided with high, close fitting collar, wrist guards and storm flap under front buttons. The leather is pliable and comfortable to wear. Lined with plaid silk this garment sells for $49.50

Fig. 12—Light, skeleton-lined shower proof in rubberized Italian silk of a pleasant gray shade. The collar is of the convertible type, permitting closed or open neck and straps are fitted to the wrists. It is listed at $42.50

Fig. 13—Bottom illustration shows an extremely light duster in gloria silk, fitted with the conventional lapel collar and wrist cuffs. It is treated so as to resist summer showers and is supplied in various shades of blue and gray. Price, $22.50

to the exclusion of wind and rain. Wind cuffs are also fitted to the wrists.

Turning now to the heavier wear, a general utility overcoat that will protect against the cold snaps of evenings at this time of year and at the same time act as a useful touring garment for day travel during the cooler seasons, is a necessity in the woman motorist's wardrobe. For such a coat the check pattern will always remain popular. The front and back views of a particularly handsome homespun overcoat in black and white check are given in Figs. 18 and 19. The collar is supplied in a light red or blue with piping at the buttons to match. This small relief of bright color from the black and white of the material is an exceedingly happy combination. The lapels are of the flexible order that is becoming increasingly popular, permitting of a close fitting up to the neck when desired. The buttons are of the same check material as the coat. Fig. 19 shows the distinctive appearance of the back, obtained by the use of a diagonally buttoned panel effect.

Another heavy coat that will defy the cold winds is shown in Fig. 20. This is in English tweed of a plaid pattern with a collar in broadcloth of contrasting collar. As will be seen, the buttons are massive and arranged in two sets at the side. A broad half-belt at the back, button-trimmed, agrees with the wide form of buttoned cuffs.

Favorite Colors Are Grays and Browns

Color tendencies this year show the grays and browns to be increasing in favor, these quiet tones being generally relieved however, by a judicious use of small quantities of brighter hues in the way of trimming. The use of belts and the various forms of button trimming has also had the effect of destroying the monotony of line of a garment.

It may not be out of place to mention here the great utility of the ordinary woolen sweater in connection with the wardrobe of the woman motorist. They are easily carried and are generally provided with ample pocket space. This latter is a point which should not be forgotten by the tourist. It will be noticed in respect to other garments, too, that the convenience of these receptacles of gloves and the numerous other things which on tour are always wanted in a handy place has not been overlooked by the makers of automobile wear this year.

The question of headwear has received special attention at the hands of the designers. The automobile hat must have the feature of being easily held to the head in a wind. And a great variety of hoods, bonnets and soft hats are to be had possessing this desirable feature. Fig. 1 shows a ratine hat in rose and white that is flexible and has a neat, comfortable appearance. This type of headwear can stand a good deal of knocking about and therefore is popular with those who mean to have all the fun of a tour without wasting too much thought on the care of wearing apparel.

Fig. 16—Left, reversible bonnet of flexible hemp straw with silk crown covering. Listed at $5

Fig. 17—Right, showing the charming effect of the veil and hat combination illustrated in Fig. 9

Fig. 18—Top illustration shows back view of a smart coat in black and white check homespun. The neat appearance of the back with the obliquely buttoned panel effect will be noted. The collar is of a bright blue or red. Listed at $38

Fig. 19—Another view of the garment shown in the upper illustration, showing the trimming of the collar. This collar has flexible lapels so that they can be buttoned up close or as shown. Piping at the wrists and buttons of the same color as the collar

Fig. 20—Heavy coat in English tweed with yoke effect and novel arrangement of buttons. The wide cuffs and a wide half belt at the back are button trimmed. The collar is in broadcloth of a contrasting color. Price $37.50

The center illustration, Fig. 2, shows a charming bonnet of the visor type. The crown is loosely arranged silk of a bright red shade, while the visor is of black hemp straw with black ribbons attached. A bonnet of this type has the merit of affording protection to the eyes in the sun rays and is close-fitting enough when tied to defy the wind. A view from the side is given in Fig. 14.

A neat hood in light gray with bow trimming of the same material and color is shown in Fig. 3. This hat harmonizes pleasantly with almost any light duster.

For those who use a veil to secure the hat the bonnet shown in Fig. 9 will be found suitable. In this the veil is permanently attached to the front of the hat, which is a gray silk and straw combination. The appearance of this particular hat with the veil in place is shown in Fig. 17.

Fig. 10 shows a popular hat for the sporting tourist. It is a white corduroy and looks exceedingly well in the open against the green background of trees and lawns.

The sailor hat shown in Fig. 15 is useful in sunny weather and is capable of withstanding a good deal of rain without any serious result.

Reversible hats are meeting with a ready demand. The one shown in Fig. 16 represents the most usual design. A flexible weaving of hemp straw is used, covered on one side with a silk crown. By merely turning the hat outside-in the effect of another hat is instantly produced.

The Colored Veil Is Popular

Among the minor details of wear that are of importance to the woman who finds that the continual facing of the wind has a serious effect on the complexion, veils should receive careful consideration. This year a veil that is meeting with much favor is one in which a graded effect of color, somewhat reminiscent of the treatment of skies in Japanese prints, is introduced. The color is deep at the ends where it makes up into a bow with charming effect, and gradually fades into the natural transparency of the chiffon over the face.

In choosing a veil for automobile wear it should not be overlooked that ample size and closeness of material are the two essentials if a real dust excluder is desired.

For the woman motorist who never feels comfortable wearing goggles and yet desires a protection for the eyes the mica mask in Fig. 8 is worth consideration. The plate of mica is inserted into a veil that is tied about the hat, supporting the transparent surface in a suitable position and allowing a wide view.

The Automobile is indebted to James McCreery & Co., New York, for the use of the garments and hats shown in Figs. 3, 5, 10, 11, 13, 18, 19 and 20; to Saks & Co. for those illustrated in Figs. 1, 6, 7, 9 and 12, and to The Auto Supply Co., New York, for the duster shown in Fig. 4 and the hats in Figs. 2, 8, 14, 15 16 and 17. Photographs by N. Lazarnick, New York.

The Engineering Digest

Interesting Attempts by British Engineers at Establishing Objective Standards For Judging the Quality of Automobiles—Results With Naphtaline as Taxicab Fuel—Patent Law Under Revision—Balloon Material For Tops

RATINGS of Cars by Co-efficients K and Sigma—In the *Automobile Engineer Year Book for 1913* (London) 16 pages of text and reference tables are devoted to what is called "the co-efficient K," by the proper use of which it should be possible to compare the merits of design of one motor vehicle with those of another, especially with regard to hill-climbing capacity, if the best possible performance of each vehicle under a given set of conditions is on record, the two sets of conditions not necessarily being identical.

K figures out to a number averaging between 120 and 130 for sporting cars, between 100 and 110 for touring cars and between 80 and 90 for commercial vehicles. It is composed of the factors from which motor power is figured, combined with those giving the total gear-translation (revolutions per minute of engine divided by revolutions per minute of road wheels), the diameter of the driving wheel tire and the weight of the car with passengers. K, standing for these data of construction expressed in one numerical value, represents the chosen design features which should make possible certain performances, and these theoretical performances are tabulated for values of K ranging from 400 to 30, and for different road conditions, the performances corresponding closely, it is stated, to those obtained with the best cars in the market. Now, by consulting these tables and comparing the actual performance of a car which is under investigation, and whose K has been figured out, with the tabulated performance for its K-value, it can be seen whether the performance falls behind the standard or not. If it does, it stands to reason that the design or workmanship of the vehicle falls below the standard of excellence at present attained at the best factories at some one or more of the points which influence the car's work but which are not included in K, or else that the condition of the car has suffered by use or neglect.

Under the title "The Co-efficient Sigma," H. Kerr Thomas proposes in *Internal Combustion Engineering* for April 2 to use another co-efficient which he calls sigma, and which is patterned after the co-efficient K, for comparing the gasoline consumption of different types of automobiles, and the components entering into sigma are so chosen that not only the ton-miles involved in a performance are considered but also the dimensions of the motor and, the author says, its volumetric efficiency and the degree of perfection with regard to fuel economy reached in the carbureter with which the car is fitted, it being apparently the view of the author that these features may have been selected by the car builder or owner for reasons having to do with convenience of operation and considered superior in importance to fuel economy. In other words, the co-efficient sigma serves to determine the fuel efficiency of a car in so far as it is determined by other factors than those most directly concerned, especially by the mechanical frictions in gears, tires, motor and bearings. The road resistance is left out of consideration, however, so that comparative tests should be made over identical stretches of road.

In contrast to this reservation, the tables for co-efficient K, above referred to, are figured out with reference to several classes of road surface, for each of which a certain co-efficient of road resistance is assumed, and those making use of the tables must estimate whether the road over which the performance under investigation takes place conforms nearly enough to one of the types scheduled in the tables or an allowance should be made for the variation.

The co-efficient sigma, as first devised with reference to the factors to be considered, takes the following form:

$$\Sigma\ (\text{sigma}) = \text{Constant} \times \frac{D^2 S N g T}{d W}$$

in which D is bore, S stroke, N number of cylinders, g the total gear ratio, T the presumable gasoline consumption in ton-miles per gallon, (so that 1 divided by T becomes the consumption in gallons per ton-mile), d the diameter of driving-wheels in inches and W the weight of the car in tons. The value of the constant is determined by a consideration of the weight of the air and gasoline vapor theoretically consumed for a given piston displacement per mile, and the weight of the car is supposed to increase this consumption proportionately.

By evolving the equation on this principle, the formula reaches the final form:

$$\Sigma\ (\text{sigma}) = 0.0039 \times \frac{D^2 S N g M}{d}$$

in which M represents miles per Imperial (English) gallon, and in which the weight element has been cancelled out through the fortunate circumstances of being represented in M. For use in America, where the gallon is 1.2011 times larger, the constant is changed accordingly and becomes:

$$\Sigma\ (\text{sigma}) = 0.0047 \times \frac{D^2 S N g M}{d}.$$

By taking the fuel consumption officially recorded for a Rolls-Royce car as an example of good fuel economy and figuring out the value of sigma for its performance, finding it to be 4.7, the conclusion is reached that 5 might be accepted as the maximum value likely to be attained for sigma at any car performance. If fuel other than gasoline of about .750 specific gravity is employed the constant 0.0047 must be modified.

[A cursory study of the system proposed by Mr. Thomas in this formula does not seem to disclose in what manner the volumetric efficiency of the motor and the qualities of the carbureter have been set aside and eliminated from consideration. As these factors are not found among those of which sigma is composed, it seems that they should be among those to be held responsible if a given car performance falls short of the standard.—Ed.]

REVISION of French Patent Law—A government bill is now before the French parliament according to which it is proposed to extend the life of patents from 15 to 20 years, to change the present annual tax of 100 francs to 25 francs for the first year and an additional 25 francs for each succeeding year and to establish a special form of patents for "small inventions" expiring in 5 years and taxed only 25 francs annually. The latter provision is criticised as likely to give rise to ambiguity in distinguishing between great and small inventions as well as eventual dissatisfaction to inventors who for the sake of momentary economy try to get along with protection for only 5 years. The total tax during the lifetime of a patent, according to the new bill, would amount to 5,250 francs, while at present the total is only 1,500 francs. It is mentioned as one of the reasons for proposing lower rates for the first years—the first including the fees for securing the patent—that French inventors now, in order to save initial expense on an invention, frequently apply first in Belgium where the fee is only 10 francs. By doing so, they gain protection for one year, during which they can try to make sure of the commercial value of the invention while still retaining all their rights in those countries which are members of the Patent Union. [The text does not state clearly if the year runs from the date of application in Belgium or from date of issue of Belgian patent. Those who may be interested—since the United States also are members of the Patent Union—are referred to their patent attorneys for responsible information on this point.—Ed.]—From *Omnia*, May 10.

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TAXI Run 62 Miles on 20 Cents Worth of Fuel.—The fuels now regarded as possible substitutes for gasoline in motors of small size and light weight include benzol, coal spirits (meaning the fluids), practically equivalent to gasoline, which have been distilled in large percentages from coal, especially cannel coal, in England), kerosene, enriched alcohol, dissolved acetylene (absorbed in acetone) and naphtaline; also shale oil products, of which some resemble kerosene and others gasoline. Hereto comes that methods have been devised for combining the highly volatile naphtas contained in crude oil with other constituents of the same raw material in a manner which is almost equivalent to synthetic production of gasoline and immensely increases the percentage of it obtainable from the petroleum fields; it being stated, even, that much of the gasoline now in the market is produced by these improved methods. In making this list, no account is taken of the possibility of developing the Diesel motor to the point of making it applicable to automobile and kindred purposes and getting the benefit of the heavy oils and tars with which motors of this type can be operated in the sizes and weights suitable for stationary and marine work.

Among the proposed substitutes for gasoline, some are susceptible of unlimited production, especially enriched alcohol and acetylene, but questions of cost and adaptation to existing motors have retarded the testing-out of their fitness. The coal spirits, too, are probably obtainable in sufficient quantity to compete effectively with gasoline and limit the upward tendency of its price.

Now, however, the very number of the substitutes coupled with the development of carbureters by which fuels of different density and composition may be successfully handled in connection with motors of the type in common use, or only slightly modified, forces into the background, somewhat, the question of the quantity of each fuel which may be put into the market and raises to greater importance, on the other hand, the question of what may be done with each of these fuels, on the assumption that the field for light motors is broad enough to admit of finding suitable uses for each variety, while all of them in combination will check the fuel famine, with its attending evils, more efficaciously than any one of them could be expected to do. From this new viewpoint, the results lately achieved with naphtaline—so far the cheapest of all the fuels mentioned—gain an interest which is not limited to the European countries, where the fuel question has become one of vital urgency intimately allied with the problems of national defense.

From the tests of naphtaline reported by L. Ventou-Duclaux, one of the engineers of the Automobile Club of France, it appears that this substance might well be used for heavy hauling of earth, rock and ore and perhaps for omnibuses.

The tests were conducted with a Renault taxicab whose 2-cylinder, 12-horsepower motor had been modified for the purpose, the modification consisting mainly in replacing the ordinary carbureter by the apparatus illustrated in Fig. 1, which was developed in two years of experiments conducted by G. Mohr. It consists in the double carbureter shown in subfigures 1 and 2 and the device for melting the solid naphtaline shown in subfigure 3. The latter comprises a receptacle A heated interiorly by leading a coil of pipe from the exhaust around the wire-gauze filter *c* in which the solid naphtaline is placed and which retains the impurities which it may contain. The melted naphtaline runs out through the fine tube *d*, which is so paired with the exhaust branch pipe D that the fuel arrives in the carbureter at a temperature higher than its melting point. The carbureter is also heated by the exhaust gas, which arrives through the wrapped pipe D'. A third branch D" from the exhaust manifold connects with the upper end of the coil *c*. Butterfly valves G and H in these pipes admit of regulating the heat, as between the receptacle and the carbureter. The double carbureter has two float chambers, one for gasoline and the other for the melted naphtaline. The latter is cast in one piece with the atomizing-chamber above the jets, so as to equalize the temperature in these two parts and avoid precipitation of the fuel vapors. The two jets I and I' converge toward the same atomizing-chamber, which is placed, as shown in subfigure 2, between the chamber L, filled with exhaust gas, and another chamber in which the surplus air arrives regulated by a sliding-sleeve and the wingnut *e*.

The naphtaline used in the test was of the crude variety tapped from the still of which the price is 6 francs per 100 kilograms in 5,000 kilogram lots in Paris, near which city it is produced. The test was conducted over a stretch of road 52.7 kilometers long which was covered in both directions. The laboratory engineers of the *Conservatoire des Arts et Métiers* were in charge. The motor was started a few minutes before the beginning of the test, so as to make use of no other fuel than naphtaline for the recorded time.

The results were as follows: The test lasted 3 hours, 19 minutes, 30 seconds. Stops of the motor aggregated 15 minutes 30 seconds, making elapsed time 3 hours 4 minutes. The distance covered was 105.4 kilometers. The road was a macadamized one in good order and with moderate grades. The average speed was 34.4 kilometers per hour with a maximum observed speed for one kilometer of 42.3 kilometers per hour. The total consumption of fuel was 14.996 kilograms, making a consumption of 14.228 for 100 kilometers.

The motor was started on naphtaline without difficulty after injection of gasoline in the cylinders. During the test it functioned normally and regularly, without skipping or knocking. There was little smoke in the exhaust and that only on the upgrades. Restarting after stops was effected without injection of gasoline. On the following day it was ascertained that the compression had remained normal and that the motor was not gummed up but in good working order. No deposits or abnormal fouling of the different organs was observed when it was taken

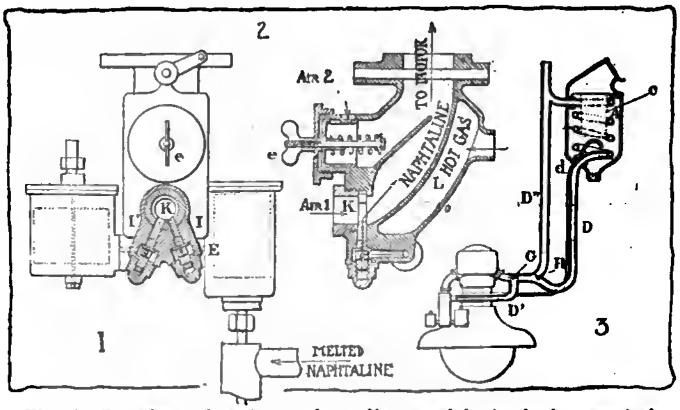

Fig. 1—Double carbureter and smelter used in taxicab operated with naphthaline as motor fuel

apart. There was, especially, no precipitation of naphtaline in the crankcase.

A supplementary test was conducted to find out how long time was required after starting the cold motor on gasoline before the naphtaline could be switched in. It could be done after 13 minutes 37 seconds, although at that moment the naphtaline in the receptacle was not yet all melted. After a stop of 10 minutes, the motor could be restarted on naphtaline without difficulty, while after another stop lasting 16 minutes an injection of gasoline in the cylinders was required to help out.

The figures, as given above, bring the cost of operating a taxicab on naphtaline over 100 kilometers, at the speed mentioned, to 0.85 franc, and if the cost of the gasoline necessary for starting is counted, the total fuel cost for 100 kilometers barely reaches 1 franc. With gasoline alone, 10 liters would be consumed, costing 5 francs.

The weight of the motor, carbureter and melting apparatus did not reach 10 kilograms per horsepower.

The annual production of naphtaline in France amounts at present to 30,000 tons, while Germany produces 175,000 tons, England 126,000 tons and Belgium 1,200 tons. The price varies according to the purity of the product and the transportation cost, ranging from 5 francs for 100 kilograms at Antwerp to 14.75 francs for German naphtaline delivered in Paris. Until recently the marketing of crude naphtaline has been extremely difficult, and the production was therefore restricted as much as consistent with the rectification of the coal oils and tars of which it is the by-product. The moment the tar distillers gain a ready market for their naphtaline, this condition will be changed, since it will be to their interest to produce as much as possible, thereby also improving the grade of their main output. Besides, a larger market is likely to be created for the tars, as soon as they can be made more economically. These things going hand in hand, it is then probable that naphtaline can be produced in much greater quantity than is now the case, and that it will rise to a considerable importance as a motor fuel, especially for heavy hauling.—From *Le Poids Lourd,* May 10.

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BALLET'S Removable Wire Wheel.—A simple construction serving the purpose of having a wire wheel substantially secured to and yet easily removed from the fixed ball-bearing hub which remains mounted on the axle-end, is shown in Fig. 2. It is designed by Ballet, and the mechanism, like that of some other demountable French wire wheels, seems inspired by gun mechanism. The fixed hub A has a semi-circular projection *a* against which abuts a similar projecting flange *b* on the demountable hub B, when the latter is pushed home against the short and steep cone on A by means of which the centering of the wheel is secured. The two projecting rims secure the rotation. The wheel is secured from coming off by the nut C, whose interior thread is interrupted like that of a screw tap. This is pushed onto the end of the fixed hub which is correspondingly formed, and a short turn then engages all of the threads of the two parts, blocking the demountable hub laterally. A spring clip engaging ratchet teeth in the face edge of the fixed hub obviates rotation of nut C. The cap D protects this clip. T is the brake drum, forming part of the fixed hub.—From *Omnia,* May 10.

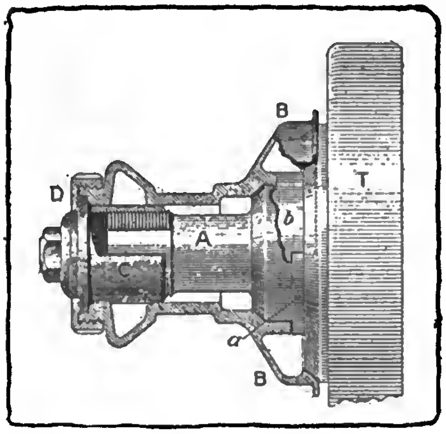

Fig. 2—Ballet's demountable wire wheel hub

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METALLIZED Textiles.—The balloon cloths covered with a thin aluminum film on one side which have recently been placed in the market are suggested as possibly of interest to manufacturers of automobile tops, as they reflect sunlight strongly, including the ultraviolet rays, and therefore tend to keep the space directly under the top cool—a feature which adds considerably to the comfort of passengers, even if the sides of the vehicle are open and particularly if the top is low and the climate tropical. The aluminum is blown upon the rubberized cloth in the form of dust when the cloth comes from the spreading-machine and while the rubber with which it is impregnated is still soft. Aluminum dust is not powdery, though it appears so, but is in reality composed of infinitely small scales, and these stick to the rubber at once and are afterwards rolled into it on the calendering machine, forming a perfectly smooth surface which sheds water quickly and, as said, reflects light rays and heat radiations. It is the last-mentioned property which makes this cloth indispensable for balloons, in view of the need of avoiding all sudden expansion of the gases which they contain, but the protection which the metal coating affords against rapid oxidation of the rubber by the sun's rays is also a matter of primary importance, meaning a much increased durability for a purpose requiring lasting gas-tightness.—From *Kunststoffe,* May 1.

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Contemporary Articles on Subjects Allied to Automobiles But Not Adapted for Abbreviation

Revue de Métallurgie for May contains a symposium of articles intended as a survey of present knowledge relating to the modifications of the properties of metals, especially steel, which are produced by mechanical working processes—as distinguished from heat-treatment—and are neutralized by annealing. One of the articles is a translation of the essay by Goerens submitted to the Iron and Steel Institute in 1911 for the Carnegie Research Scholarship. The others are by M. P. Galy-Ache on Upsetting (*écrouissage*), by M. Hanriot on the same subject and by Léon Guillet on Annealing of Upset Metal.

In *Automobil-Rundschau* for April 30 there is reproduced a paper by Dr.-Ing. Carl Büchner on the benzol question with special reference to carbureter construction. It dwells on the chemical composition of different fuels and their ignitability, on the movements of gases under different methods of throttling and on preheating of air and fuel. Illustrated. To be continued.

In *Internal Combustion Engineering* of May 14 G. H. Baillie discusses automobile spring design with illustrations of car and axle movements. He proposes to measure the jerk given by a road obstacle by means of the amount of change in the acceleration of the car produced in a finite time. The question of fitting variable loads is not taken up.

In *Der Motorwagen* of April 30 Engineer August Bauschlicher discusses fuels for explosion motors, their sources and their thermo-dynamic properties.

In *La Technique Automobile et Aérienne* for April 15 G. Lienhard analyses the movements and stresses occurring in the motor with variable stroke which was exhibited by the Itala company at the last Paris show. The variable stroke supplants the customary change-gear. The principle of the construction was described in these columns in the issue of January 4, 1912.

In the same journal an essay by Pol Ravigneaux on the reactions of transmission shafts upon their supports and an instalment of a serial by the same author upon the kinetics involved in a vehicle's capacity for "holding the road"; mathematical and relating largely to spring suspensions and tires.

The Engineers' Forum

Making More Tests in Less Space

Suggested Arrangement Gives Maximum Capacity at Least Cost

CHICAGO, ILL.—Editor THE AUTOMOBILE.—The test of the gasoline motor and its correlated parts prior to its trials upon the road is entirely taken care of by the laboratory block test. Here the assembled motor is given every conceivable load at the different speeds to bring out its characteristics. The conditions existent in the majority of automobile plants tend to sacrifice scientific accuracy and thoroughness for want of time and facilities. With a single block test equipment the allotted time for laboratory tests will not be proportionate to the number of tests and models. On the contrary, this time will be so diminished that the tests will be of an indicative nature rather than scientific proof.

The capacity may, of course, be doubled or tripled by simply multiplying the single complete testing unit, usually consisting of a bed plate for the gasoline motor and some form of dynamometer. By thus increasing capacity the time difficulty is removed and with it in consequence every opportunity is allowed for scientific thoroughness. The great objection to this means of increasing capacity is the cost.

The duty of the engineer is to find the maximum equipment purchased by the fixed allowance granted. The dynamometer represents the greatest expense when multiplying units to increase capacity. As the approved type of dynamometer is electric this expense is considerable. Not only this, but the calibration and standardizing of several dynamometers would never equal the accuracy of one common dynamometer.

The accompanying drawings represent a very compact and inexpensive means of meeting these conditions. An electric dynamometer is used common to all the bed plates upon which motors, gearsets, rear axles, etc., may be mounted for test. Thus the expense of multiplying capacity is proportional to the slight cost of adding additional bed plates and a special base for dynamometer. A still further advantage lies in the ability to use the dynamometer to absorb the power on the rear wheels of a chassis.

Fig. 1 is a side elevation of one cast iron bed plate and an electric dynamometer of conventional design. Beneath the regular stock base furnished with the dynamometer is a special subbase designed with a machined surface on which to move the dynamometer about a fixed center. The subbase should be "let in" to the flooring to keep the horizontal axis of the armature as low as possible.

Fig. 2 represents the layout of the floor plan showing the relative position of dynamometer to three bed plates A, B and C. The center lines of A, B and C are radii from the pivotal center of dynamometer base. These radii are spaced at an angle of 45° for convenience, as will be shown later, and marked on the face of each base. Thus, should a test be in progress on A, a motor may be perfectly lined with the radius of B and raised to the proper height. As soon as test on A is completed or stopped for alterations it is simply necessary to move dynamometer on its pivotal center 45° when B would be ready for test, etc. For convenience the subbase of the dynamometer is drilled for tapered dowel-pins for each position in which it may be used. As the dynamometer base proper is a square the drilled positions for A and C are the same provided the holes are drilled in corners of a square. The pins should be of sufficient taper and diameter to facilitate an approximate alignment, the driving of the pins, making the exact location always the same. When located, cap screws threaded into the subbase hold the apparatus rigidly.

If desirable the pivotal center may have a centering pin to not only keep the dynamometer centrally located, but also act as a jack with which to take the weight off the base. To do this the pin is threaded into the dynamometer base proper and has a tapered seat in the center of the subbase. However, this has not been found necessary up to 100 horsepower outfits.

The flexible cables carrying the current must have plenty of slack and be secured to the stationary frame of the dynamometer. This prevents any deflection of the scale arm outside of that due to actual power developed.

All measuring instruments reading the results of the dynamometer must likewise be connected to the movable base. Thus tachometer, revolution counter and scales will not change their relative positions with the dynamometer itself.

For testing the complete chassis the dynamometer is located as at A and suitable pulleys placed on both ends of the armature shaft. The car may then be backed into position on extended radius C. At the same time such a test will not interfere with other work set up on the various blocks.

The advantages of this system are: 1—Minimum expenditure with maximum capacity; 2—least floor space commensurate with accessibility; 3—absolute standard for measuring power common to all tests; 4—low first cost which enables the small manufacturer to have the same equipment as the largest; and 5—an expanding system which may be added to at any time.—R. M. ANDERSON, Stromberg Motor Devices Co.

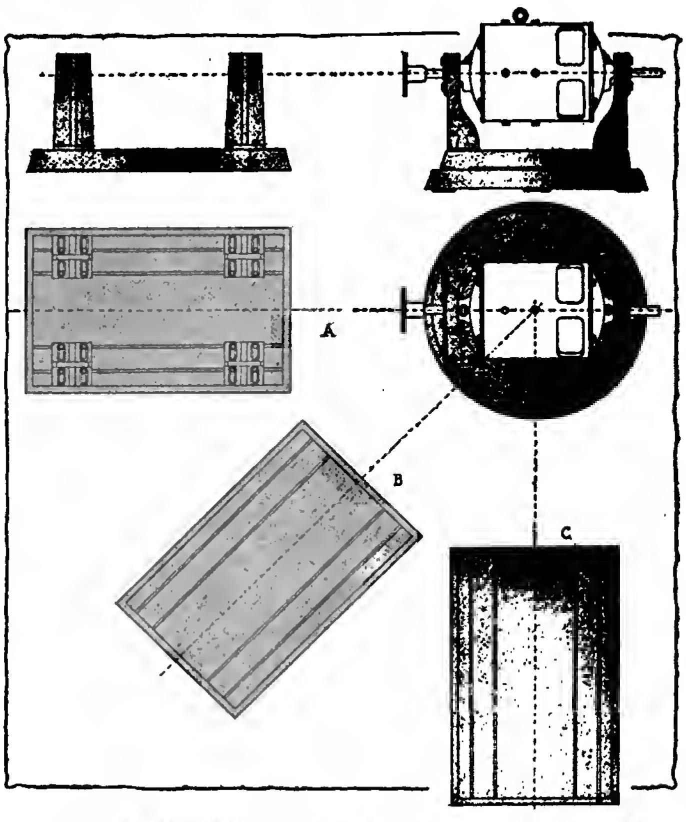


Fig. 1—Upper—Side elevation of bed plate for mounting motor in laboratory testing plant and dynamometer, showing alignment

Fig. 2—Lower—Plan view of suggested arrangement for tripling the capacity of the plant

Runabout Body Design for Paige-Detroit

Spare Tires Carried in Concealed Storage Space at Rear—Body Doors Oppositely Hinged for Ventilation of Interior

By George J. Mercer

THERE are three conspicuous essentials to consider in body designing today. These are: First, the proportioning of the body so that the comfort of the passengers is well provided for; second, the elimination as far as possible of flat external surface that would result in loss of power against the wind; and third, the provision of adequate storage space for extra parts being carried on the car.

The first two of these essentials has received careful consideration at the hands of the designers and the results are used as talking points of considerable weight by automobile salesmen. With regard to the third consideration, the provision of storage space, however, this does not seem to have been given the attention that the subject apparently deserves. Even when the space is ample the important feature of accessibility is often ignored or insufficiently considered.

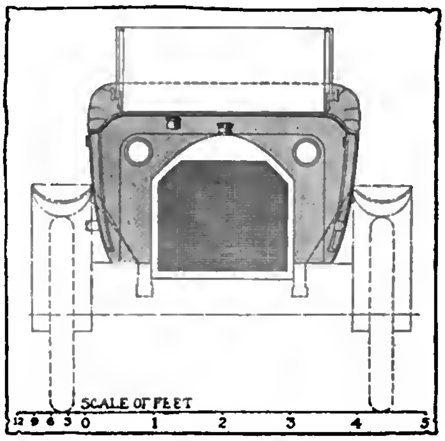


Fig. 1—Front view, showing position of gasoline filler in top of dash cowl

One matter that is receiving more attention than formerly is the disposal of the spare tires, though there is still much to be desired in the way these articles are cared for. The storage of tires inside the body has not met with the favor that it was anticipated would be the case.

A runabout body design with an interior compartment for the tires is the subject of this article, and the body is shown mounted on the medium-sized Paige-Detroit chassis, having left-side drive, 116-inch wheelbase, 34 by 4-inch tires, body space back of the dash of approximately 91.5 inches and a rating of 36 horsepower.

This car is especially adapted for rear storage, as the gasoline tank is provided for at the front. This tank, of approximately 14-gallon capacity, is standard equipment and is indicated by dotted lines in Fig. 2.

Taking the rear compartment first, this is long enough to take nicely the two tires that are considered necessary spare equipment for touring. Since the gasoline tank is provided for in front under the hood, all the space at the rear is available for carrying the tires and for luggage. In this case, the tires being 34 inches in diameter it is an easy matter to provide sufficient space. At the rear is a door large enough for the entrance of the tires. This door is hinged at the top, and at the sides and along the bottom and is made watertight by having a flanged lip, that extends inward from the inside of the door. When closed this lip enters a recess packed with either rubber or felt. At the top the hinge is continuous and keeps out the water. Fasteners are placed at each of the lower corners and in the center a hasp and padlock is fitted.

The tires are set on a tray that slides on rollers. To remove the tires, the door is first held open in the upright position, and the tray rolled out as indicated by dotted lines on Fig. 2. At the back end a hinged leg, forming part of the tray equipment, is dropped down for a support, while at the front the tray rests on the slider. The inside space of the tires is utilized by a drum that serves the double purpose of keeping the tires in position on the tray and also acting as luggage space for small articles. At each rear corner of the tray is a small triangular box that can be used for small tools. This box thus utilizes the space at the corners not occupied by the tires. Its shape and position is indicated on the plan view, Fig. 3.

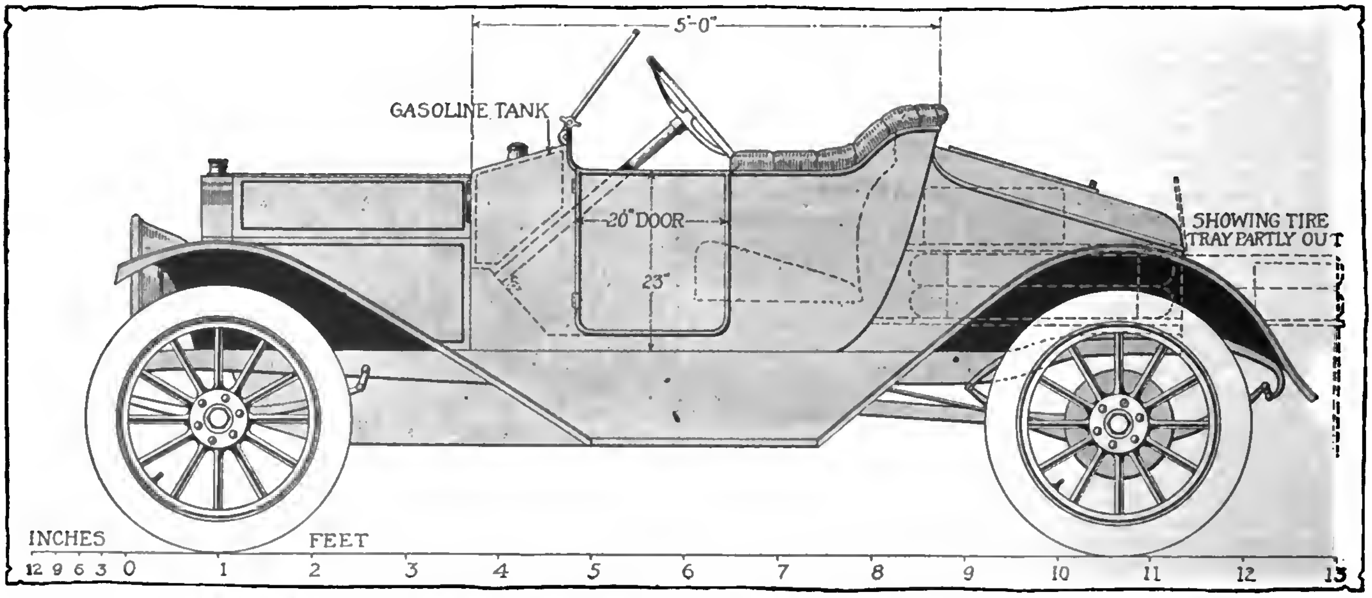
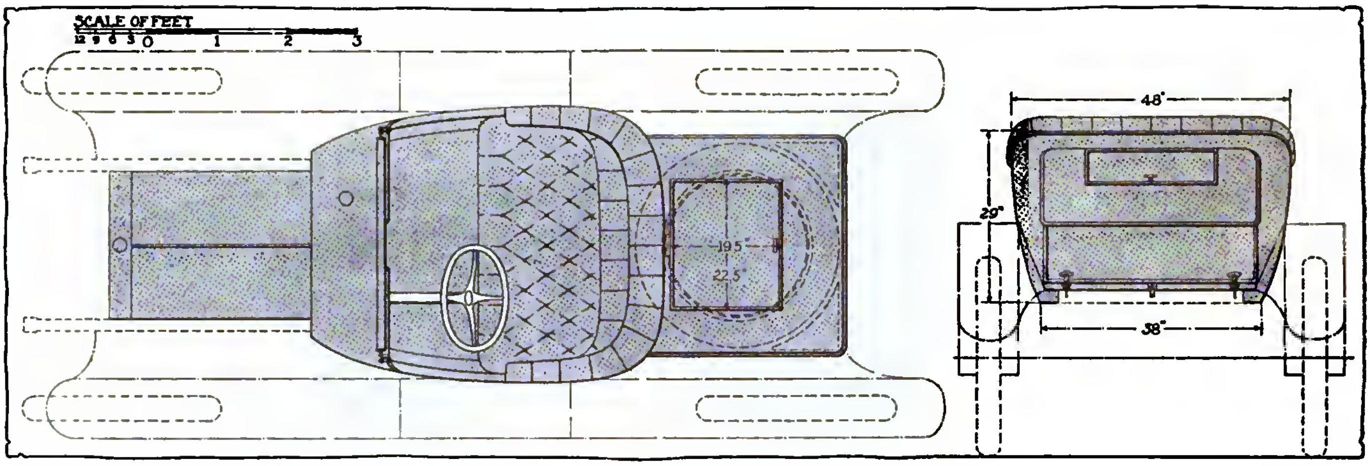


Fig. 2—Side elevation to scale of suggested runabout design adapted to chassis of Paige-Detroit 36



Plan view and rear elevation of suggested runabout body for Paige-Detroit chassis

Above the tire compartment the space is utilized for carrying miscellaneous articles of luggage. This is sufficient for one large or two small suit cases and have room besides. The floor dividing the upper and lower compartments is one sheet of metal and waterproof and there is suitable drainage, so that in case of water leaking into the top compartment it will not be carried into the lower compartment and do damage. An idea of the storage space that this upper compartment provides can be obtained by reference to the side elevation Fig. 2 in which a suit case 18 inches by 8 inches by 30 inches is indicated. The door on top is made watertight.

The body interior has ample seating space for two people. A generous thickness is allowed for in the trimming, and there is a small locker space under the seat. The gasoline tank under the cowl is not directly connected with the metal of the body; air space is allowed all around. The filling plug is directly under the cap on the cowl.

The electric dash lamps are placed flush with the dash and the horn is placed under the hood.

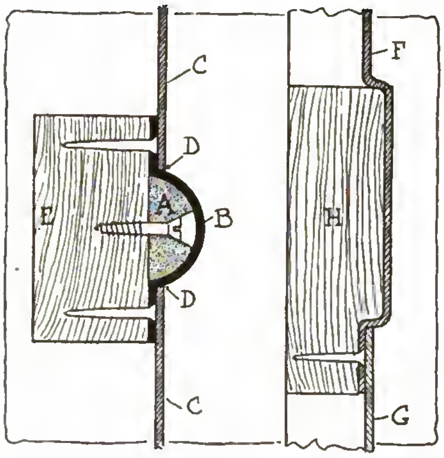
One of the novelties used on this design is the Auster windshield. This shield is of canvas that is unrolled from a spring roller and held in position by the two side arms as shown on Fig. 2. On Fig. 3 the shield is shown folded and the arms are turned down. When in use the angle of the shield can be made at will and as the material is very light it can be folded away very easily. This type of shield has most of the advantages of the glass shield without its greater weight.

The ventilation of the body is by means of the doors entirely, that on the left side being hinged opposite to the right door. By leaving both doors slightly open and as the openings are in opposite direction a cross circulation of air is obtained.

The standard equipment is utilized throughout, including the front and rear fenders. The color specification for this design cannot be improved over that of the stock car. Standard blue and striping and black leather are as good and lasting in results as can be desired. The quality of the material should be of the best for hair, springs and leather if comfort is to be had after the car has seen service.

New Metalklad System of Metal Body Construction

THE increasing use of sheet metal as a material for the panels is one of the most noticeable tendencies in automobile body construction at the present time. Metal lends itself readily to the formation of harmonious curves which enhance the appearance of the car. And the close attention which is being given to this point besides the great favor which the streamline type of body is meeting with are undoubtedly having a stimulating effect on those body builders who heretofore have devoted their energies chiefly to construction in wood. As is well known, the two metals used in body work are steel and aluminum, and the method of joining the separate sheets is a constructional detail that admits of much ingenuity in the design so that the resulting exterior surface is smooth and unbroken.



Figs. 1 and 2—Methods of joining panels in metal body construction

One method of accomplishing this result adopted by an English concern, the Regent Carriage Co., of London, is described in *The Autocar*, London. The system is known as the Metalklad system, in which a strong but light ash framing is covered with steel panels which are pinned and soldered so that they give the appearance of a jointless construction.

The method in which this is effected is shown in the diagrams, Figs. 1 and 2, the former showing how two adjacent panel sheets are joined up on either side of an aluminum moulding A. This moulding is, first of all, secured to one of the wood frame members E, and is then covered with a strip of sheet steel B, which is pinned down by small iron nails. The panel sheets C are then brought up to position and are also closely pinned, the holes being countersunk so that the pin heads are, if anything, below the surface. The two joints D are then carefully soldered and the solder is run over the pin heads, the whole being afterwards cleaned off with sandpaper. It is found that the solder finds its way well in between the panels and the strip B and makes a thoroughly secure joint, which, at the same time, is not apparent as a joint. Fig. 2 shows how, in a similar manner, the upper panel sheet is beaten out and secured.

The method of construction seems admirable and should entirely eliminate the hardening and showing up of joints.

Fig. 1—View of the country where the Easton, Conn., pipe line is being laid, showing truck and some pipes on the road

Trucks Save 86.6 Per Cent. In Heavy Work

In Constructing Pipe Line, Automobiles Transport a Pipe for $2 When By Horse It Costs $15

GIVEN: The problem to build a dam and a drinking-water pipe line over a distance of about 7 miles of hilly territory and containing mostly poor roads; the solution to be reached at the lowest possible cost. This problem means transportation at minimum cost of iron pipes weighing several tons, of thousands of hundredweight bags full of cement, of machinery, power plants, timber, telpherage, coal, etc., aggregating hundreds or thousands of tons. And of these tons, each pound and ounce must be carried over the poor roads, up steep hills, in the shortest possible time. If these facts are kept in mind, the vastness of the problem becomes apparent even to those not familiar with such work.

That motor trucks are capable of considerably assisting the contractor and engineer in such work, needs hardly to be said; but that it was ever possible to do such pieces of work without the help of trucks is a thing to be wondered at. Only concise comparison, however, brings out the marvelous advantage of the commercial motor vehicle.

First a general statement as to the comparative cost: **To build the pipe line of about 7 miles length, approximately 1,300 pipes of 5 feet diameter and roughly 10 yards length are needed. Each of these cast-iron pipes weighs 5 tons, and to transport it over the distance of about 5 miles**—if this is taken as the average travel of each pipe, on account of the hilly condition of the territory and to compensate for the hills between the loading point and half way from the end of the line—**costs $3 a ton or $15 per pipe, if horses are used for the work. If motor trucks are used, the cost is $2 per pipe or 86.6 per cent. less. The total saving on a line of 1,300 pipes is $16,900.** A similar saving as compared with the cost of horse transportation applies in the case of machinery, building material and so forth.

The Bridgeport Hydraulic Co., of Bridgeport, Conn., is

MAKE....Locomobile..... CAPACITY....5 Tons.... ENTERED SERVICE....April 9, 1912.... TRUCK NO.......2......

Month 1912	Variable Expenses	FIXED CHARGES: Garage	Driver	Interest	Insurance	Depreciation	Total	Miles	Cost per Mile	Tons	COST PER: Ton	Ton Mile	NUMBER OF: Trips	Days	Remarks
To 22nd, 1913															
January	$38.44	$10.64	$57.00	$7.04	$5.76	$62.40	$181.24	376.	$.48	332.	$.546	$.188	16	13	....
February	......	......	......	......	......	......	......	......	......	....	....	......	....	....	....
March	......	......	......	......	......	......	......	......	......	....	....	......	....	....	....
April	70.99	10.00	57.00	6.87	5.60	60.69	211.15	606.7	.348	245.2	.861	.145	52	19	....
May	91.00	15.00	82.00	9.92	8.12	88.00	294.04	1135.8	.259	340.4	.864	.106	70	23	$1 Bonus
June	42.65	15.00	76.00	9.92	8.12	88.00	239.69	1095.7	.218	344.5	.695	.091	73	24	1 Bonus
July	57.84	15.00	89.00	9.92	8.12	88.00	267.88	1438.8	.186	473.	.564	.078	96	26	8 Bonus
August	118.94	15.00	91.00	9.92	8.12	88.00	330.98	1348.	.245	459.	.719	.098	91	24	10 Bonus
September	200.34	15.00	97.00	9.92	8.12	88.00	418.38	1667.	.251	582.4	.719	.098	114	25	19 Bonus
October	304.03	15.00	101.00	9.92	8.12	88.00	525.07	1541.	.341	524.4	.101	.134	102	29	11 Bonus
November	241.32	15.00	92.00	9.92	8.12	88.00	454.36	1342.	.338	464.5	.975	.132	91	23	11 Bonus
December	81.15	15.00	83.00	9.92	8.12	88.00	275.19	920.	.299	326.	.855	.121	66	21	2 Bonus
Total per annum	1236.70	140.64	825.00	93.27	76.32	827.09	3198.02	11471.	......	4091.4	.779	......	771	227	$63.00
Average per month	123.67	14.06	82.50	9.32	7.63	82.70	319.80	1147.1	......	409.1	....	......	77.1	22.7	....
Average per day	5.44	......	3.60	......	......	......	14.00	50.5	......	18.	....	......	3.4	....	....
Average per mile	.107	......	......	......	......	......	.278	......	.278	....	....	......	....	....	....
Average per ton mile	......	......	......	......	......	......	.106	......	......	....	....	......	....	....	....

REMARKS:

Investment....................................$4764.00
Ioterest, Average at 5%
Insurance, Fire........................ $57.50
Liability........................ 40.00
$97.50
Depreciation on $4764.00 less tires ($540.00) at 25% per annum.

Average tons per trip...... 5.3
Miles per round trip.......15.2

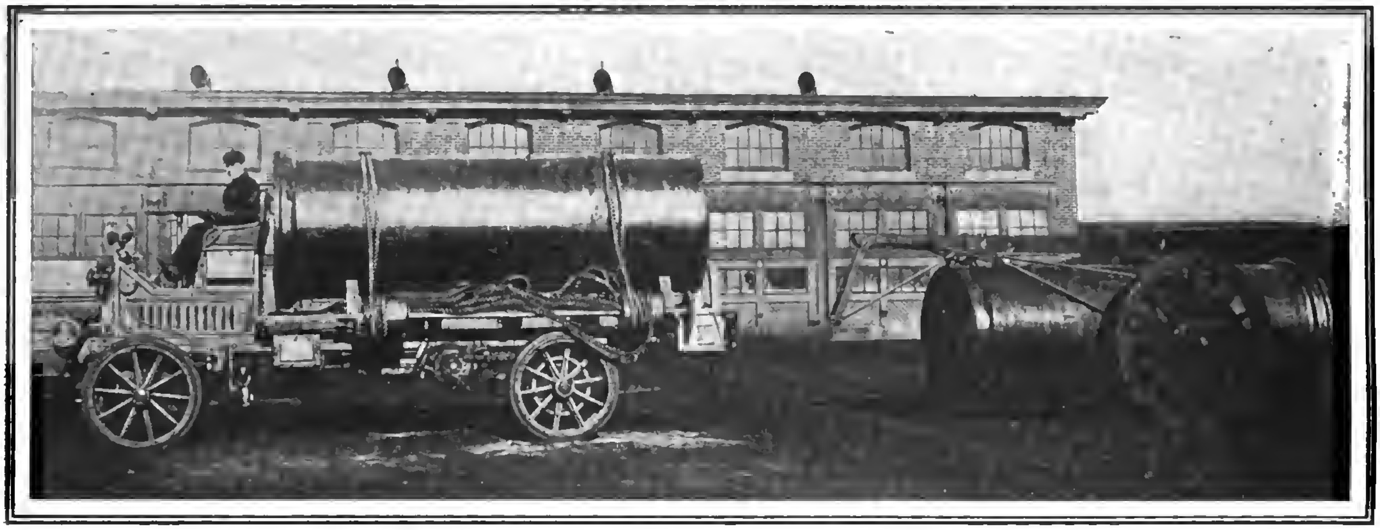


Fig. 2—Truck and trailer loaded ready for the way. Observe the hoisting mechanism on the platform of the truck

carrying out the work referred to in the opening lines, using for this purpose freight automobiles. Two of these are Locomobiles, of the 5-ton type, capable of carrying that and also of hauling an equal load resting on a trailer connected to the truck proper. Fig. 1 shows one of these trucks traveling along the road, and Fig. 2 shows it loaded and connected with a loaded trailer, ready for work. The trucks used for this work are built with a transmission permitting of using the motor power for work other than propelling the truck, and Fig. 2 illustrates the machinery which permits of applying it to the loading and unloading of the truck with the 5-ton pipes. This device consists of a pair of drums or capstans mounted on a horizontal shaft at the left side of the truck platform and driven by shafting from the working shaft of the special gearset. The operation of the drums is regulated by a lever mounted just behind the speed-change lever. In front and behind each of the front and rear drums, respectively, a cross-bar is mounted on the truck, being secured to the body platform and being fitted with a pair of blocks forming a seat, shaped to accommodate the curvature of the pipe.

Fig. 4 shows the method of leading, the pipe being drawn up over the power-operated capstan drums by means of two strong ropes. In unloading, the ropes are slackened around the drums, so that the pipe is sunk by its own weight. Two blocks of wood and a pair of pressed-steel channels form the runway for the pipe. To take the weight of the pipe off the truck springs when the pipe is positioned on one side of the

Fig. 3—Trucks backing against a platform for loading

MAKE....Locomobile..... **CAPACITY**....5 Tons.... **ENTERED SERVICE**....April 13, 1912.... **TRUCK NO**.......3......

Month 1912	Variable Expenses	FIXED CHARGES					Total	Miles	Cost per Mile	Tons	COST PER		NUMBER OF		Remarks
		Garage	Driver	Interest	Insurance	Depreciation					Ton	Ton Mile	Trips	Days	
January	......	......	......	......	......	......	......	......	......	....	....	......	....	....	....
February	......	......	......	......	......	....	......	......	......	....	....	......	....	....	....
March	......	......	......	......	......	......	......	......	......	....	....	......	....	....	....
April, 17 days	$56.53	$7.50	$45.00	$5.56	$4.54	$49.13	$168.26	535.	$.314	185.5	$.907	$.133	39	15	....
May	83.06	15.00	81.00	9.92	8.12	88.00	285.10	1037.	.275	362.	.788	.109	73	23	....
June	65.24	15.00	75.00	9.92	8.12	88.00	261.28	1151.	.227	380.	.686	.091	76	25	....
July	70.86	15.00	90.00	9.92	8.12	88.00	281.90	1495.6	.188	496.	.566	.076	101	26	....
August	62.97	15.00	88.00	9.92	8.12	88.00	272.01	1466.	.185	490.	.555	.074	97	24	....
September	218.91	15.00	94.00	9.92	8.12	88.00	433.95	1624.	.260	561.7	.775	.104	110	25	....
October	228.74	15.00	101.00	9.92	8.12	88.00	363.66	1548.	.234	515.1	.686	.093	102	29	....
November	69.59	15.00	92.00	9.92	8.12	88.00	282.63	1520.	.186	526.	.537	.073	103	25	....
December, 3 days	12.14	1.50	6.00	.99	.81	8.80	30.24	48.	.630	15.4	.196	.246	3	2	....
8 mo. Total per annum	$868.04	$114.00	$672.00	$75.99	$62.19	$673.93	$2379.03	10424.6	......	3531.7	....	......	704	194	....
Average per month	108.50	14.25	84.00	9.49	7.77	84.24	297.38	1303.1	......	441.4	$.673	......	88	23	....
Average per day	4.47	.587	3.46	.392	.320	3.47	12.26	53.73	......	18.20	....	......	3.58	....	....
Average per mile	.083	......	......	......	......	.064	.228	......	$.228	....	....	......	....	....	....
Average per ton mile	......	......	......	......	......	......	......	......	......	....	....	$.091	....	....	....

REMARKS:

Investment....................................$4764.00
Interest, Average at 5%
Insurance, Fire.............................. $57.50
Liability.............................. 40.00
$97.50
Depreciation on $4764.00 less tires ($540.00) at 25% per annum.

Average tons per trip......5.01
Miles per round trip.......14.7

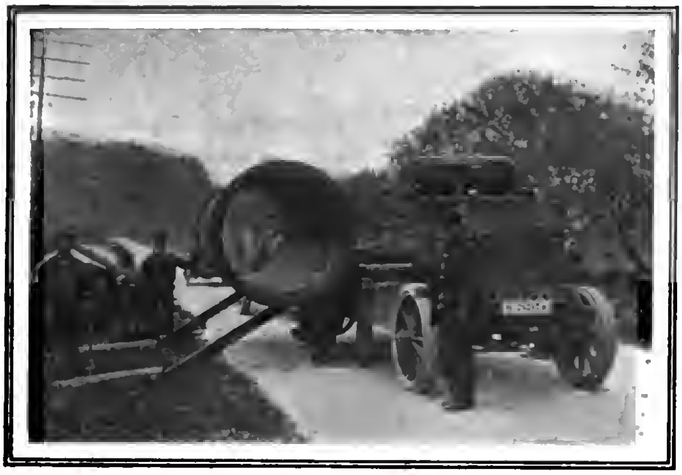


Fig. 4—Unloading the Locomobile pipe truck

Fig. 5—Unloading the trailer of the truck

chassis, a pair of jacks mounted under the frame on this side are used. The jacks proper are secured to tree stumps.

The trailer consists of a pair of wheels mounted on a steel axle curved overhead, to the middle of which a crane-neck beam is secured. The long end of this beam is trussed to the axle at four places so as to constitute a rigid system. At the short end of the beam, just above the axle, is a ratchet device with two pawls and a long lever. By working these a chain laid around the pipe is either wound around or off the ratchet wheel, thereby raising or lowering the pipe. One man controls the pawls, keeping one in and the other out of engagement with the ratchet, while two men control the end of the lever bar to which a cable is fastened.

All pipes are loaded at a dock where they are brought by a steamer. They are discharged along the roadside. Machinery and other loads are also loaded either by motor power or by means of cranes. Cement and similar material is placed on the truck in bags, being put on and off while the truck runs up against a platform which is on one level with that of the truck body, as shown in Fig. 3.

Provided each truck is used in conjunction with a trailer, it can transport seven pipes per average day, making three trips and loading for another on the next day, and making four trips on that day. As the total daily average operation cost of one of the trucks is $12.26 and that of the other $14, the latter figure may be safely taken as an average daily cost, and figuring fourteen pipes in 2 days at the cost of $28, or $2 a pipe, as stated above.

The tabulations at the bottom of this and the next page show the various expenses of both Locomobile trucks, each for the first 9 months after installation. During this time the total cost of operation and maintenance for trucks No. 2 and 3 were $3,198.02 and $2,379.03, respectively. The average cost per ton carried was 77.9 cents and 67.3 cents respectively. The various average figures appearing in this tabulation will probably be of interest to users of trucks. The tabulation showing the cost of truck No. 2 gives, under the heading remarks bonuses, premiums pair to drivers for extra trips made; a driver being paid $1.00 for each trip made in addition over the seven prescribed for 2 days.

On the bottom of page 22 some figures are given which give an idea of the time spent in loading, carrying and unloading the pipes on the job here illustrated. On May 21, the truck traveled 5.6 miles in 35 minutes, at 9.6 miles an hour. Having arrived at the point of unloading, the skids, etc., were gotten ready for unloading, the pipes were unloaded and the truck was made ready to leave, starting away from the place of unloading 9 minutes after having arrived there. It traveled to West End, 4.6 miles distant, at a speed of 9.2 miles an hour. In the afternoon, the truck arrived at the dock at 1:25 and during the next 39 minutes was loaded with a pipe and coupled to a trailer loaded likewise. It took 1 hour, 8 minutes for the truck and trailer to arrive at the point of unloadmg, where the teams spent 38 minutes in unloading the two pipes before starting back.

On the following day the truck upon arrival at the dock was loaded with a pipe and connected to trailer, all of which took 16.5 minutes. After losing 10 minutes on the road, the entire journey took 24 minutes, while unloading took 34 minutes, after which the truck started on its way back.

The men busy in loading and unloading were: One at each drum, the driver to operate the power and place the truck and the trailer and one man to guide the ropes and to superintend the whole work.

Records of Time Spent by 5-Ton Locomobile Truck Used in Building the Easton Line

Truck Without Trailer

May 21	Minutes
From dock to unloading point, 5.6 miles	35
Preparation to lower pipe	3.5
Lowering the pipe	1.5
Getting skids and jacks on truck, etc	4
Get ready to leave the place	.5
Travel to West End (North avenue, 4.6 miles)	30.5

Truck and Trailer

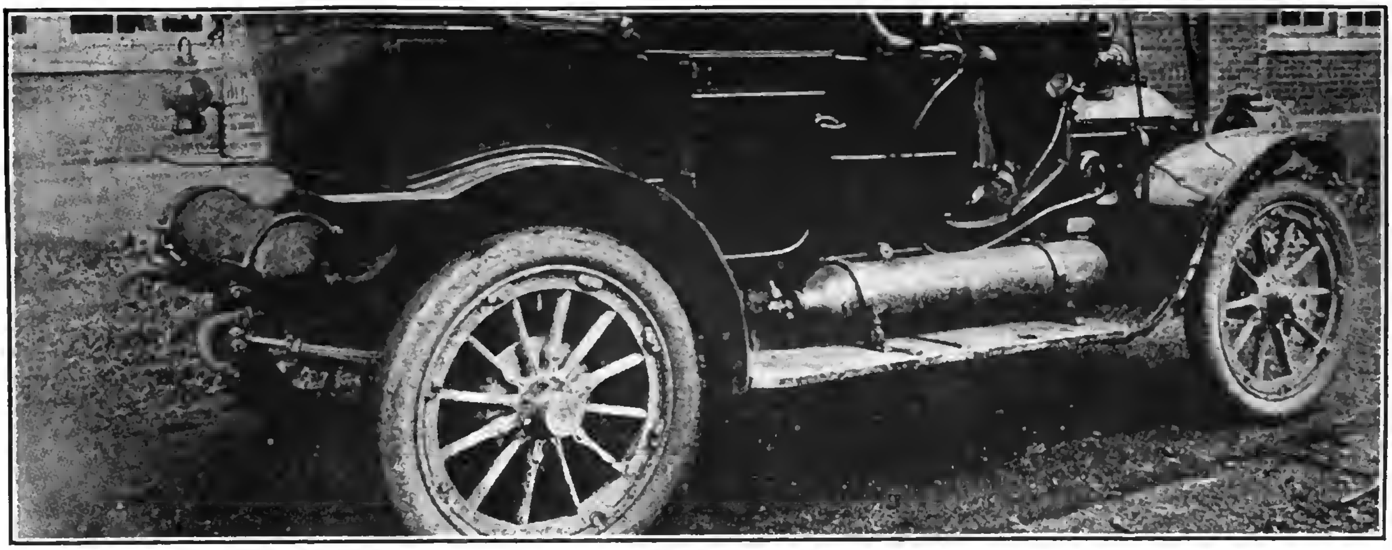
Afternoon: Preparing truck for loading at dock	7
Hoist pipe on to truck	3
Remove skids, jacks, etc., fastening ropes	2
Backing up to trailer and coupling it on	3
Time lost in waiting for coats, etc	24
Travel to unloading point, 5.6 miles	68
Preparations for unloading	7
Lowering the pipe carried on truck	1.5
Getting skids and rope on truck, etc	4
Lost time in inspecting a bridge over which a pipe will have to be transported on May 22*	7
Preparing to unload trailer	1.5
Unloading the trailer from its pipe	2
Pulling the trailer away from the pipe	5
Rolling the two pipes across the road	8.5
Preparing to leave the place	1.5
Travel back to dock, 5.6 miles	45

Truck and Trailer

May 22	Minutes
Preparing to load the truck	3
Load the pipe on to truck	4
Getting skids and jack on truck, etc	2
Backing up to trailer and coupling it on	4
Traveling to unloading point, 5.6 miles, including loss of 10 minutes on the road†	84
Preparing to unload the truck	7
Lowering the pipe carried on truck	3
Getting skids and rope on truck, etc	3
Lost time in getting out of a wagon's way	2
Pulling up the trailer before unloading it	.5
Unloading the trailer of its pipe	5
Pulling the trailer away from the pipe	1.5
Rolling the two pipes out of the way	7
Preparing to leave the place	3.5
Travel to dock, 5.6 miles	28

*As the pipes were unloaded near a feeble-looking wooden bridge, the driver thought it opportune to inspect the latter's strength. The time thus lost proved a good investment: the bridge would have been unable to support the truck and its load.

†In passing some of the pipe-line construction work, a rope was encountered, taut across the road, and the truck had to wait until the workers were ready to slacken it.



Packard car, showing mounting of the compression tanks containing the liquefied natural gas which is used as fuel

Automobile Run on Liquefied Natural Gas

Ford Car Runs 100 Miles on 300 Cubic Feet at a Cost of 1.5 Cents

CHICAGO, ILL, May 21.—To run motor cars on gas carried under pressure on the running board or some other accessible location instead of using gasoline is the prospect offered by a new process of liquefying natural gas. The economy of natural gas as a fuel for gasoline engines long has been recognized; in fact, this is the fuel employed for testing purposes in some of the motor car factories in Detroit. The difficulty has been in utilizing the gas in a power plant that is not stationary.

A system of compressing natural gas to a liquid and storing it in this form in tanks resembling those used for lighting acetylene lamps has recently been developed by Albert M. Schenk, president of the Packer's Motor Truck Co., Wheeling, W. Va. By his process, the natural gas as it comes from the wells is liquefied and stored under a pressure of 50 pounds per square inch in steel tanks. It is found that this liquefaction removes most of the impurities from the gas so that it emerges from the tank practically a pure fuel.

In application, the tank is simply connected with small expansion chamber to the ordinary carbureter and the fuel admitted to the engine and used in precisely the same way as gasoline is used. Several cars have been fitted with the tanks, among them, two trucks, one Packard touring car and a Ford.

At present the cost of liquefaction and storing is 5 cents per thousand cubic feet of free gas, and it is stated that in tests on the speedway at Indianapolis, Ind., the Ford car ran 100 miles on less than 300 cubic feet. Each tank as now arranged holds about 600 cubic feet of free gas at a pressure of 50 pounds, but it is expected to double the pressure and the mileage per tank under improved methods of manufacture.

In general, the expectation of the backers of the new process is to sell the liquefied gas at a price that will make the cost per mile one-half that of gasoline. It is expected to establish refilling stations throughout the country so that empty tanks may be exchanged for full ones in much the same way that lighting tanks are exchanged.

At the present time the regular carbureters are used, but experiments are under way toward dispensing with the carbureter. One of the claims made for the fuel is that it is clean, leaving no deposit and no smoke. Patents for the process have been granted and others are in the patent office for which reason no details of the process of manufacture can be given at this time.

Why Benzol is a Good Fuel

LONDON, ENGLAND, May 31—At a recent dinner given by Lord Montague, editor of *The Car*, Henry L. Doherty, of New York City, made the statement that no less than 12,000,000 gallons of benzol could be recovered annually from the city gas works of London alone by probably handling the gas. Experts in the gas business in New York claim that an adequate substitute for gasoline as an automobile fuel cannot be developed from this source in the United States. It has been pointed out that the introduction of benzol as an automobile fuel has made but little progress thus far, although present indications point to an increasing activity in the popularization of this substitute for gasoline.

Some reports from car owners who have tried benzol in their machines indicate that the refined benzol is superior to gasoline. The motor starts more readily on both the refined and crude benzol and seems to be much more resilient and to give more power than with gasoline. The refined, or water white, benzol is stated to be an excellent fuel for internal combustion engines, but the crude is not as good because it gums up the inlet valves and manifold. The crude material carries some matter in suspension and some in solution, say several cars owners who have given the subject intelligent attention, and this matter precipitates the moment the clear benzol is gasified or vaporized and some of it collects in the intake end.

The new fuel for automobiles, liquefied natural gas, burns freely in the air without danger of explosion

The Rostrum

In which Letters from Readers Are Answered and Discussed

Owners Discuss Location of Gearbox

Coil Not Apt To Go Wrong—Wiring of Michigan Ignition—Pulverized Coal Recommended as a Cheap Fuel—Motor Chokes When Running at Low Speed

EDITOR THE AUTOMOBILE:—I have been reading with considerable interest, the articles about the proper location of the transmission. This is well enough for the engineers to discuss, but they deal with the problem of new cars. Why not invite some of the users to express their opinions? I believe the only test is after the car has been in use a year or two, and the man who has used all of the different kinds is best qualified to speak. I happened to have two cars with each kind of arrangement, and find the rear axle idea altogether wrong. In the first place they are hard to get at for repairs, oiling and adjustment. In the second place, owing to shocks sustained, they give trouble, after 5,000 miles, and will continue to do so. I find that arrangement is hard on tires too. My experience teaches me that for a heavy car, say 3,000 pounds or over, the amidship location is much to be preferred. For light cars, the unit with the motor does very well. The unit with rear axle has proved a complete failure on both of my cars, one of which was heavy, and the other fairly light.

Mina, So. Dak. C. E. BASHL.

—Do you agree with Mr. Bashl? Car owners who have views upon this subject are invited to express them in these columns. Under the heod of the Engineers' Forum, engineers are thoroughly threshing this matter out, now it remains for the car owner to speak his preference.

¶ *In answering this question car owners are directed to the fact that one of the leading arguments advanced against rear axle location is that of increased axle weight and consequent tire damage. Definite information on this line would be in order.*

¶ *Those not in favor of the amidship location have urged against it lack of accessibility.*

¶ *The gearbox os a unit with the motor has been criticised in that it is not suitable for a heavyweight car because of the fact that too much weight is placed in front.*

Coil Does Not Require Much Care

EDITOR THE AUTOMOBILE:—I have had considerable trouble with the ignition on my car this spring which was finally traced by a repair man to a defective coil. The motor would run on battery but would not run on magneto. The system in use is a Splitdorf model N magneto and model N coil. I have sent for a new coil. Can you suggest what may have caused the coil to give out, so that I may avoid trouble as far as possible in the future? The motor does not start as readily as the average and I would like to inquire if it will do any harm to use six or eight cells for starting, instead of the usual battery of four as at present installed? I have used four different sets, but they all required too much cranking, even in warm weather. The wiring from the battery runs through the coil box. While running on the battery, since the failure of the magneto, turning on too much gasoline, or advancing spark too far, seems to cause motor to skip or misfire.

Farmington, Conn. G. E. M.

—Trouble will not develop in a coil very often and it is only occasionally that a defective one slips through the manufacturers' inspection departments and starts to cause trouble. One of the chief causes of coil trouble, and the fault of the car owner, is the use of too high a voltage. This generally causes a pitting of the vibrator points and tends to make them burn away rapidly. The use of four cells would never harm the coil. It would be better to use five cells as long as you are having trouble in starting and thus secure a hotter spark. Six cells are the limit in number, however. Each cell develops about 1 1-4 volts when new but this drops to a volt after they have been in use for some time.

Michigan Ignition on Regal Cars

Editor THE AUTOMOBILE:—We have a 1911 Regal 30 equipped with Michigan magneto and non-vibrating coil under hood with battery for starting. We bought the car which appeared to be in good shape, had no occasion to use it for several days and then it would not start on either magneto or battery and we could not get a spark from either. We took coil and magneto off and showed them to the K. C. Battery people. They told us the magneto was all right but the coil was wrong, and they worked on it. Since getting it back we have been unable to get the engine to run on magneto and only rather poorly on battery. It sounds much like the trouble we had with a Splitdorf coil as published in THE AUTOMOBILE recently. Howevere, the wiring is more complicated when under the hood as in this case. Kindly show a wiring diagram of this.

2—The Moline engine is given 4.125 bore and 6-inch stroke, rated 40 horsepower. The Henderson a bore of 4.12 stroke by 5.5 stroke claimed to have actually 44 horsepower. Where does it come in?

3—Is it an advantage or a disadvantage to have clutch and brake connected?

Bosworth, Mo. BOSWORTH GARAGE.

—1—The trouble with the ignition system is probably in the coil rather than in wiring. The wiring diagram is published herewith, Fig. 1, however, in case you may need it for your guidance. In a case of this kind it is not wise to attempt the repair of the coil yourself, either from a standpoint of securing better work or for economy. The coil should be sent to the maker who will give you the best service at the lowest rate.

2—Both of these motors will readily develop the power at which they are rated when new. The maker's rating is not of any particular value in most instances and is merely used as a method of naming the model. The makers very often will change the apparent rating of a model in putting the same motor in a different chassis. For instance, a car which is called a 40 this season may next be known as a 44 while all the essential features of the motor are the same.

3—This is a matter of personal choice. The advantage of having the clutch and brake operated from the same pedal is that one pedal is eliminated. It is not necessary to remove the foot from the pedal in stopping the car by simply pressing on the pedal and there is no chance to stall the motor by accidentally applying the brake with the clutch engaged. The disadvantages are that it is sometimes difficult to tell when the clutch is just disengaged before the brake is on. It is quicker to press the two pedals at the same time than to press the single pedal through double the distance. It is sometimes necessary in severe work to use the brakes as well as the motor for a brake. This could not be done with the single pedal.

Perhaps you refer to the practice which is followed by many manufacturers of connecting the emergency brake lever with the clutch so that when the emergency brake is applied the clutch is thrown out of engagement at the same time. This is largely a matter of personal preference, most car owners having cars equipped with this arrangement being highly satisfied with it while others do not like it. One of the chief objections to it is that it prevents the use of the motor as a brake when the emergency brake is being used and vice versa. It has the pronounced advantage of adding to the safety factor for the car cannot be started when the emergency brake is on.

Pulverized Coal as a Cheap Fuel

Editor The Automobile:—I have been much interested in the attempts to solve the problem of high-priced fuels. It seems to me that there are yet vast possibilities in the use of coal, especially powdered coal.

I have just re-read with considerable interest the article entitled, "Pulverized Coal a New Fuel," by Prof. William D. Ennis, which appeared in The Automobile for October 12, 1911.

I should like to ask the following questions which the article by Professor Ennis has brought to my mind:

1—Can any kind of hard or soft coal be used when powdered? If not, why not?

2—What is meant by 60 or 80 mesh?

3—The tube mill is mentioned as one of the types which are used to pulverize the coal. How is it constructed?

4—The following statement is made: "A highly volatile soft coal must be employed." Why? Laying aside the difference in cost, why cannot hard coal be used? Are there any pamphlets or books devoted to this subject? Where can I get information concerning types of grinding mills, methods of feeding the powdered coal, etc.?

5—In The Automobile, issue of May 1, 1913, there appears an article entitled, "Flameless Combustion and Automobiles of the Future." Chamot is mentioned as a granular fireproof material. What is it?

6—When using the liquid fuel in this system, is the air preheated or does it go to the burner at atmospheric temperature?

South Auburn, Ind. G. W. R.

—1—Only the soft coals can be used, because they contain the necessary percentage of volatile matter. Experiments have been made with the harder coals, but they have simply burned up in the furnace without producing the necessary gas. Only the softest grades of bituminous coal are satisfactory, because they contain the volatile matter necessary.

2—The mesh refers to the size of the screen through which the coal is sifted, and 60 and 80 are merely specific sizes.

3—The tube mill consists of a large cylinder about 8 feet in diameter and 20 feet long. In this cylinder there are thirty or forty pieces of iron pipe running the full length of the big cylinder. When the big cylinder is rotated rapidly the coal works its way between the pipes contained therein and is broken to pieces.

4—A highly volatile fuel must be employed in order that the gas be given off. Hard coal does not contain these gases. The only books extant on these subjects are in the form of transactions of the Brooklyn Engineers' Club of 4 years ago and some articles on the subject by Professor Ennis which were published in the *Engineering Magazine* about 6 years ago.

5—Chamot is a mixture of fireclay and burnt clay. This is the trade name given this particular combination of materials and its particular property is the fact that it is of exceedingly high fire test and hence valuable in the construction of crucibles, etc.

6—Either method can be used. Preheating the air results in a gain of efficiency.

Voltage at the Spark Gap

Editor The Automobile:—Could you tell me to what voltage the ordinary low-tension coil steps up the current, the current supply being six ordinary dry cells or Edison wet cells? The coil I refer to is the type ordinarily used with make-and-break ignition. Also, would it be practical to start engines with make-and-break ignition from a storage battery of 28 volts, fourteen cells, 40 ampere hours, without the use of a low-tension coil? Is this voltage too low? Would it injure the battery if used without a coil? Engines are six-cylinder, 6 by 8, running at 350 revolutions per minute, and are equipped with magnetos for running. The battery is used only for starting. This battery is installed for lighting but is seldom used and I thought I could save the cost of battery renewals for the engine if I used the storage battery without the coil if the voltage was high enough which I do not think it is. Of course I want to use all of the battery of fourteen cells or none of it, not taking three cells and using the coil, because this would be using the battery unevenly.

Scarsdale, N. Y. E. Hughes.

—The ordinary primary coil used with the make-and-break system of ignition will give a voltage at the sparking point of between 2,000 and 3,000 when used in conjunction with a 6-volt battery circuit. There are really two sparks at the points of such a system when considered carefully, one due to the breaking of the primary circuit by the separation of the points and the other is the induced current which passes through the windings when the primary circuit is broken. The separation of the points connected in the primary circuit really draws an electric arc and would in itself cause a small, weak spark to occur. When the current of the battery is broken, however, the phenome-

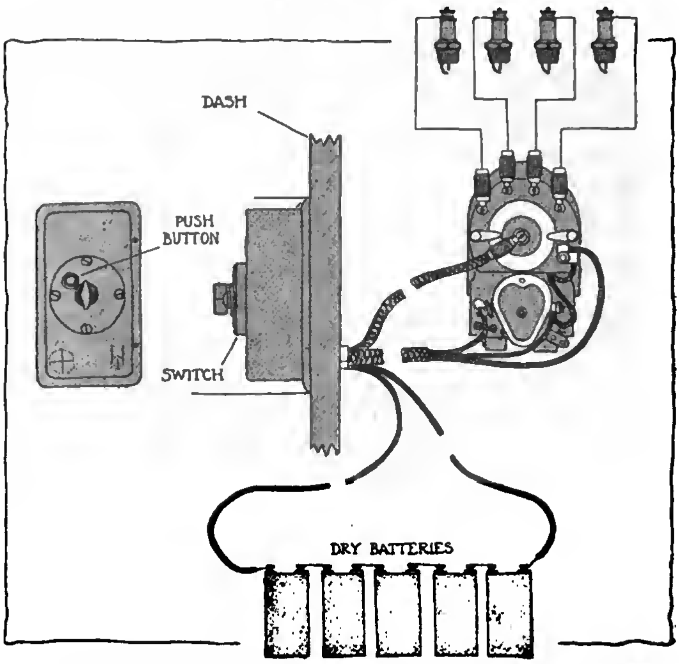


Fig. 1—Wiring diagram of Michigan ignition as used on the Regal

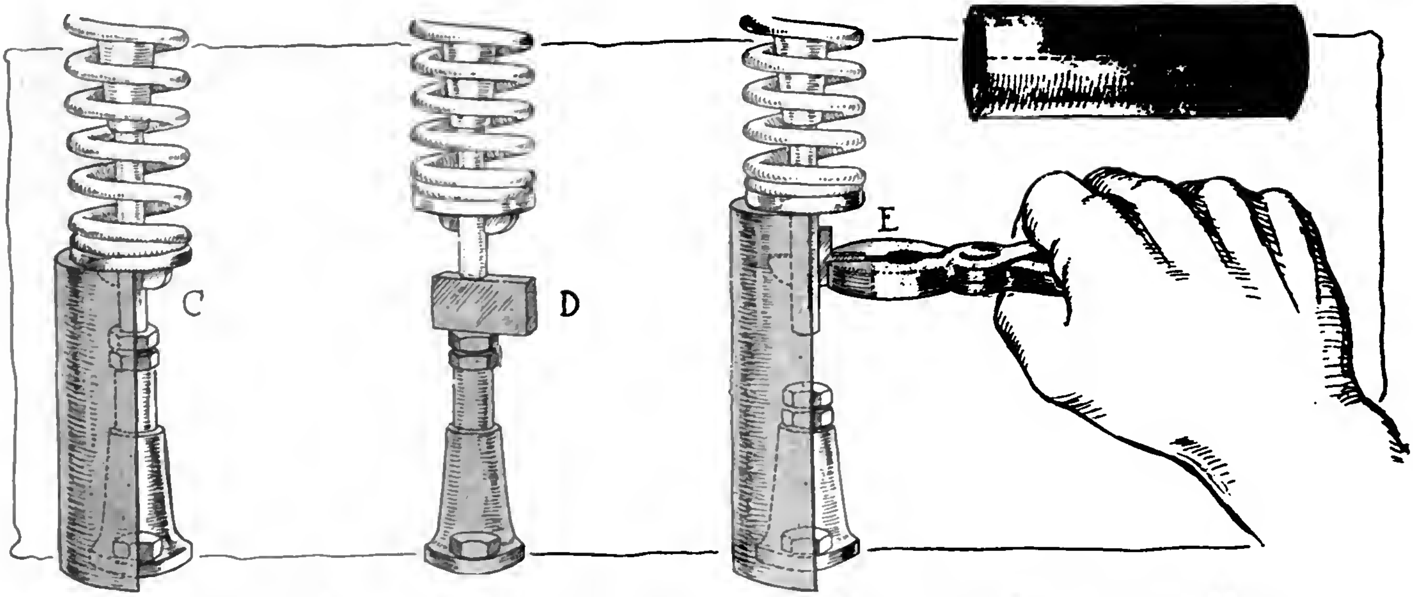


Fig. 2—Home-made valve lifter, pipe cut through A and B to correct length to fulfill steps C and D in lifting valve

non of electric induction occurs. A current of low amperage but of exceedingly high voltage, flowing in the opposite direction, causes the spark to be given the tension necessary to make it hot enough for ignition purposes.

It would not be practical to use your storage battery for the make-and-break ignition without a coil. In the first place, the current is not high enough in voltage to give a sufficiently hot spark and in the second place, to short-circuit the battery at each making of contact would soon put it out of commission altogether.

Another reason why it would not be good practice to use the battery without any coil would be the fact that the points on the coil would soon burn out. The trembler on the coil is designed for the low voltage and if a voltage four times as large were used the trembler points would not stand it even though frequently adjusted.

It would be a perfectly reasonable arrangement to connect the cells of your battery as follows: Take three out for ignition in connection with the coil. The remaining four could be used for lighting on a six-volt lighting circuit. It would be wise for you to connect one of the lighting cells in parallel so that you would not get an excess voltage at the lamps.

Standardizing Truck Tire Sizes

Editor The Automobile:—On pleasure cars, the same size tires are used for vehicles of the same weight. Why does not the same rule follow for trucks? Is there any progress being made for standardizing the tires to be used on trucks of the same carrying capacities? I believe that there is considerable difference now existing, especially in the heavier varieties of commercial cars. Is this not so?

Boston, Mass. Delivery.

—The tire question has progressed considerably the last year, and now seems to be following definite courses. For example, the pneumatic tire is in more general use for vehicles of under 1-ton capacity. The single pneumatics front and rear are the rule. These vehicles are generally intended for speeds of 15 miles per hour or over and in some of them the pneumatic equipment permits of setting the governor to operate at speeds from 20 to 25 miles per hour.

On the larger trucks dual rear tires are general, and the field is divided between the block and plain types with the cushion type occupying the position already mentioned.

There is still wide disparity in the tire equipments of trucks of the same load capacity, and it is apparent that either one maker is grossly undertiring his machine or the other maker overtiring. The position of the motor and the amount of body overhang back of the rear axle are factors which determine tire equipment, but when these are taken into consideration there still remains much variation. The following tabulation shows some examples:

Example	Motor location	Front tires	Rear tires
		One-Ton Vehicle.	
1	Hood	34 by 4½	36 by 3½
2	Hood	35 by 4½	35 by 4½
3	Hood	35 by 5	35 by 5
		Two-Ton Vehicles	
1	Hood	36 by 3½	34 by 4 dual
2	Hood	36 by 4	36 by 4 dual
3	Hood	36 by 4	36 by 3½ dual
4	Hood	36 by 4	36 by 3½ dual
5	Hood	34 by 4	36 by 3½ dual
6	Hood	34 by 3½	35 by 4 dual
		Three-Ton Vehicles	
1	Hood	36 by 5	42 by 5 single
2	Hood	38 by 5	42 by 5 dual
3	Hood	36 by 4	35 by 4 dual
4	Hood	36 by 5	40 by 5 dual
		Five-Ton Vehicles	
1	Hood	36 by 5	37 by 5 dual
2	Hood	36 by 6	36 by 5 dual
3	Hood	36 by 5	42 by 6 dual
4	Hood	36 by 5	40 by 6 dual
5	Hood	36 by 6	42 by 5 dual

Motor Chokes Up at Low Speed

Editor The Automobile:—I wish you could help me out of my trouble which is as follows: I have a late model 1911 Ford open roadster which I bought new 2 years ago and which I have given very great care and the best of oils, etc. I have run it only about 2,650 miles and for the past 3 weeks it has been coughing and jerking which is really caused by a missing of one or more of the four cylinders but I cannot tell which one, as the plugs are all right, being new and clean. Have put in new wiring, taken off the cylinder head, and cleaned out the carbon deposits, readjusted and filed the points on the master vibrator which I am using instead of the vibrators of the regular coil. Have even tried out a different vibrator and also a different carbureter, a Holly. I am using a Kingston floating or ball valve auxiliary air type, but there is no difference in either case on the magneto or on the batteries with either vibrator or coil. The occasional coughing or slow speed continues. Sometimes after adjusting the vibrator points or the needle valve to a different adjustment, the engine will run fine for a short time, and after congratulating ourselves, it begins to cough again, occasionally almost stopping. It sounds as though it did not receive the current and was taking in all air, as you can hear the loud rushing of air through the air intake hole of the carbureter.

Have had the Ford agents here to do the rewiring, adjusting and testing, etc., and it has them guessing so much that they are now trying to tell me that many of the Fords will not run idle or less than 8 miles an hour without occasional missing, but I know that my engine did, and as I am not fond of racing, it annoys me greatly, besides attracting more or less attention, which I do not like. Hope that you can suggest something that will lead to a remedy.

Portage, Wis. L. E. Grant.

—When an engine misses at low speed, suspicion is always directed to the valves. Since you do not mention that you have had the valves ground lately or at all since you have had the car, the trouble will probably be found there. A car, when new, very often exhibits slight signs of valve trouble after it has traveled its first 500 miles. The new seat placed upon the valves does not endure in a great many instances nearly as long as that taken by the valve after its next grinding. It is reasonably sure to assert that if you have the valves ground in, provided you have not done so, the result will be a tight motor that will fire at as low a speed as it is possible to secure good carburetion.

Should you desire to grind in the valves yourself, a few directions as to how to proceed may be of assistance. The first difficulty you will have will be to remove the key beneath the lower valve spring pad. This is generally done with a regular valve lifting tool but the following home-made apparatus works very simply and can be made in a few minutes with the aid of a hacksaw and a piece of pipe.

In Fig. 2 an explanation of the method of procedure in arranging the lifter is given. The motor is turned over slowly by means of the flywheel until the valve is lifted to its highest point. The motor is allowed to rest in this position and the distance from the base of the tappet guide to the lower part of the spring seat is measured. In turning over the motor the petcocks should be open so that there will be no difficulty in this respect. A piece of pipe is then cut down through the middle along the dotted lines shown in Fig. 2 and slipped beneath the spring seat to hold it in its compressed condition. The motor is then turned over again and the valve will follow the tappet through its own weight instead of through the spring action as the spring will be held away from the valve. When the tappet has gone as far down as it will, the space between the tappet and the bottom of the valve stem is filled by a block of metal or other hard substance. A nut filed down to the right thickness will often serve the purpose very well.

Lift Will Be Doubled

When this is in place the motor is again turned over until the valve is once more in its highest position. This will be double the lift that occurred before on account of the addition of the block of metal to the length of the valve stem. The spring will be lifted off the improvised pipe seating and another and longer piece of pipe inserted as shown in the illustration. The motor is then turned over again and the tappet allowed to come to its lowest position. The valve is allowed to drop down and the key can be withdrawn. This will permit of the spring being removed and will leave the valve free for grinding.

Good valve-grinding compounds can be purchased in any of the automobile supply houses. It is better to buy a prepared grinding compound because if you rely simply on purchasing emery the grade that you are given is apt to be irregular and the valve seating could be spoiled quickly. Before putting the valve-grinding compound on the seat of the valve, stuff a piece of waste into the cylinder port so that there will be no possibility of the compound working its way down into the cylinder. This would ruin the cylinder in a very short time.

A thin layer of the compound is spread on the valve seat and the valve brought lightly and squarely down upon it. There are two methods by which the valves can be ground by hand, Fig. 3, one with a brace and bit and the other by means of a regular screwdriver. The brace and bit is the quicker and at the same time the more dangerous because of the tendency to put too much pressure on the valve. If carefully handled with a light pressure it will serve very well. The screwdriver is slow but at the same time is safer for the inexperienced. It is true that with the screwdriver a lame wrist must not be considered too much of a hardship in exchange for a smooth-running car, because unless the muscles of the wrist are accustomed to hard work they are almost sure to feel the effects of the job for a couple of days.

The method of procedure with both instruments is practically the same except, of course, for the method of handling the tools. The valve is revolved about half way and back. This is done about ten times and then the valve is lifted off the seat and turned to a different position and the same operation again gone through. It is easy to see what this will do to an unaccustomed wrist using the screwdriver as it takes about 40 minutes to seat a valve. The valve is taken out and examined and when a polished appearing seat begins to appear, the grinding compound is removed and the finish given to the seat with ground glass. A final test as to the tightness of the valve is to place it in its seat and pour gasoline on it. If none leaks through past the seating valve is tight. If signs of a leak appear, however, the grinding must be continued.

Fig. 3—Grinding work can be done either by a plain screwdriver or a brace and bit

The English engineers posing for a group photograph shortly after their arrival in the United States

S.A.E. and I.A.E. on Lake Trip

(*Continued from page* 1155)

can sing, so it is necessary to recognize all of the essentials of such production before it can be realized. That is a great art—the knowing how to make an automobile.

It isn't being practiced in the making of cars today in Detroit. Old-fashioned common sense is worth more than all of the modern cost-keeping and efficiency methods today employed.

"Don't worry about your competitors," Mr. Leland told the engineers. "Show them the very best product which you are able to produce in your plant and tell them that if they can do better to do so for the good of all concerned. The automobile business is one of the greatest benefits of today and if we can in any way further its development we help all. If anyone wants to go anywhere and get back, he gets in an automobile and does it without the inconvenience of the steam cars or the other older methods of transportation. There is a demand in the United States alone for 30,000,000 automobiles and China is awakening.

Requirements for Manufacture of Ideal Car

"This is the answer to the question often asked as to the ultimate destiny of the automobile business. If you make a good car that sells itself, the public which is aroused by the advertising of all your competitors to the possibilities of automobiles in general, will buy your car. Let them create the demand and you give the public the car. How is the man who knows how going to make this ideal car? First, he must design a car which he believes to be the best to date. Then he must design for best speed over the roughest of roads and for reliability and comfort. Having all of these dissected, it is next necessary to decide upon the very best material of which each piece is to be made. Next comes the best machinery for each use and following that the best obtainable operators. Finally, these operators must be taught how to run this machinery at the best possible speed, so as to get the greatest speed for the accuracy desired, and the coarsest cutting speeds possible. After all this is accomplished there will be no need for inspectors.

"It costs less money to do high-grade work than it does to do cheap and sloppy work. Ideal production methods cannot be accomplished by militant organized workers, whose greatest aim is to see how they can get along without working."

Mr. Leland was not touching upon scientific management in his talk but said that he was dealing with the knowing how. This is the real thing, in addition to which it is necessary to have up-to-date machinery which you know is doing the best that can be done. Thus you get away from inspection, which is in the unproductive class. And you do not get any dividends out of the non-productive class. The right way is just as good as any other way.

In conclusion, Mr. Leland said that the more good automobiles which are made the better for all of the industry in general because the demand cannot be filled. One tour amidst the beauty spots without the handicaps of steam cars or boats is all that is needed to make the 30,000,000 prospects firm believers that they want cars. This is the reason they ought to have them.

"Only make them good ones."

Packard and Timken Axle Factories Visited

DETROIT, MICH., June 3—Today the program of instruction and entertainment for the visiting members of the I. A. E. and the S. A. E. included a trip in the forenoon through the plant of the Packard company and in the afternoon a visit of inspection to the works of the Timken Axle Co.

Leaving the hotel this morning at 9.30, the party was soon busily engaged in an interesting tour through the Packard factory. The works spread over an area of 37 acres. At the present time the factory is turning out twenty-one cars a day. Six of these are commercial cars and the remainder are divided among the different classes of passenger cars. A total yearly production of 3,000 cars is being made at the present time and of this number 1,800 are trucks.

The course through the Packard plant had been thoroughly mapped out in advance both literally and figuratively. Large white arrows painted on the ground showed each guide the route to pursue on the way through.

The assembly room in the building especially set up for jobs peculiar to truck work was the first visited. Here, the usual procedure of sending the chassis along the line was inverted. Instead, groups of specialized workmen went from chassis to chassis, each group doing the particular work to which they were accustomed.

The Packard company employs between 6,000 and 7,000 men and has a payroll amounting to $20,000 a day. There are 350 employees in the administration department alone. The welfare of the men has been taken care of in an extensive manner and the work done in this line was especially interesting to the English guests. A washroom is located in every department and a lunchroom on the grounds has a plant capacity of 1,500.

There is a doctor and an assistant constantly on hand and at the service of the men in case of accident. A hospital is located on the grounds and an ambulance and driver are in constant readiness.

The men work 52.5 hours a week. There is a single shift in all but two of the machining departments where it has been necessary to work nights to take care of the extra output due to the introduction of commercial cars in the line. The men are paid every 2 weeks and work 2 weeks ahead of the pay day. They are paid on the 15th of the month for work up to the first.

It takes 72 hours for a motor to pass through the assembling department. Rotating racks are used so that it is easy to work on the bottom of the motor by simply turning it over. While the crankshafts are being assembled the shaft is turned over at 350 revolutions a minute by belt driver. This is done to assist in spotting the bearings before hand scraping them to fit.

The testing of the motor provoked considerable comment on account of its rigidity before the road test. The motors are mounted on blocks and direct connected to dynamometers. The 38 motors are required to develop from 40 to 48 horsepower at 1,200 revolutions per minute and the 48 motors must develop 60 horsepower at 1,200 revolutions per minute before they are allowed to go on the road test. Inspection tags are attached to the motors running on the blocks and the power developed at 1,200 revolutions per minute is indicated upon them. If they fail to come up to requirements they are sent back to the assembling department for overhauling.

The road test consists of a thorough run until the tester is satisfied with the behavior of the entire car. The test is never less than 4 hours and very often much longer.

The testing work throughout the plant was of extreme interest and many of the groups lingered longest at work of this nature. Hydraulic tests on the waterjackets are made before the cylinders are passed along for assembling. A 30-pound pressure is put upon them in an endeavor to discover any faults in the casting which may have been disclosed by the finish grinding work that each casting is put through.

The men in the machine shops work on the premium system and in general the limits are generous enough on the work so that it is possible for the men to make from full time and a quarter to time and a half. In cylinder grinding work, for instance on the finish grind, time and a quarter is made on a fifty per hour limit. After the trip through the factory was completed the party gathered at a luncheon tendered by H. B. Joy, the president and the other officers of the company; while the Packard band consisting of employees of the concern played on the lawn outside the office building where the luncheon was served. After the luncheon was over cheers were given for President Joy and the Packard company. President Browne, of the I. A. E., made a short speech of thanks and the party fell in behind the band and marched to the waiting cars.

Timken Factory Methods Examined

In a few minutes the visitors again found themselves passing through another factory of absorbing interest, this time that of the Timken axle works. Here, over 175 tons of product are turned out in a day. This part of the plant is solely intended for the axle work. The Timken bearing factory is in Camden, Ohio.

The factory in Detroit covers about 250,000 square feet of floor space.

In one day 130 sets of passenger car axles are manufactured and nine sets of commercial axles, making a total of about 280 axles a day.

A railroad siding which runs the entire length of the factory on one side brings the raw material to the factory, and at the shipping platform at one end of the plant another siding takes away the finished product.

One of the most interesting pieces of work in the factory which was noted by the visitors was the method of hardening just the desired parts of a gear or other part. The whole gear for instance, is electrically copper plated while it is still a blank. The gear is then cut and when put in the hardening bath only the unplated or cut part of the gear will be hardened on account of the protecting sheathing of copper which renders the gear immune at those points covered to the process.

Labor-saving devices are shown all over the factory. One good instance of this is the punching of the holes in the brake bands. This is done while the piece is straight. The machine at work while the visitors were passing through was punching forty-six holes at a time.

Other interesting pieces of machinery at which the English guests spent some interesting moments were the device for grinding the steering arm ball to a perfect sphere, the enormous shears for cutting the heavy stock, the gear cutting machines and hobbers and the milling machine for grinding the springpads and axle faces at one operation lasting about 2 minutes.

The heat-treating work was also a great feature of the visit to those interested in forge work. In a small office the man in charge signals the condition of the furnace to the men tending the fires. Three lights are used one above the other. A red one is placed at the top, a white in the center and a green below. When the temperature is right the white is lit, when too high the red and when too low the green. A log is kept showing how the temperature of each furnace varied during each 10-minute interval of the day.

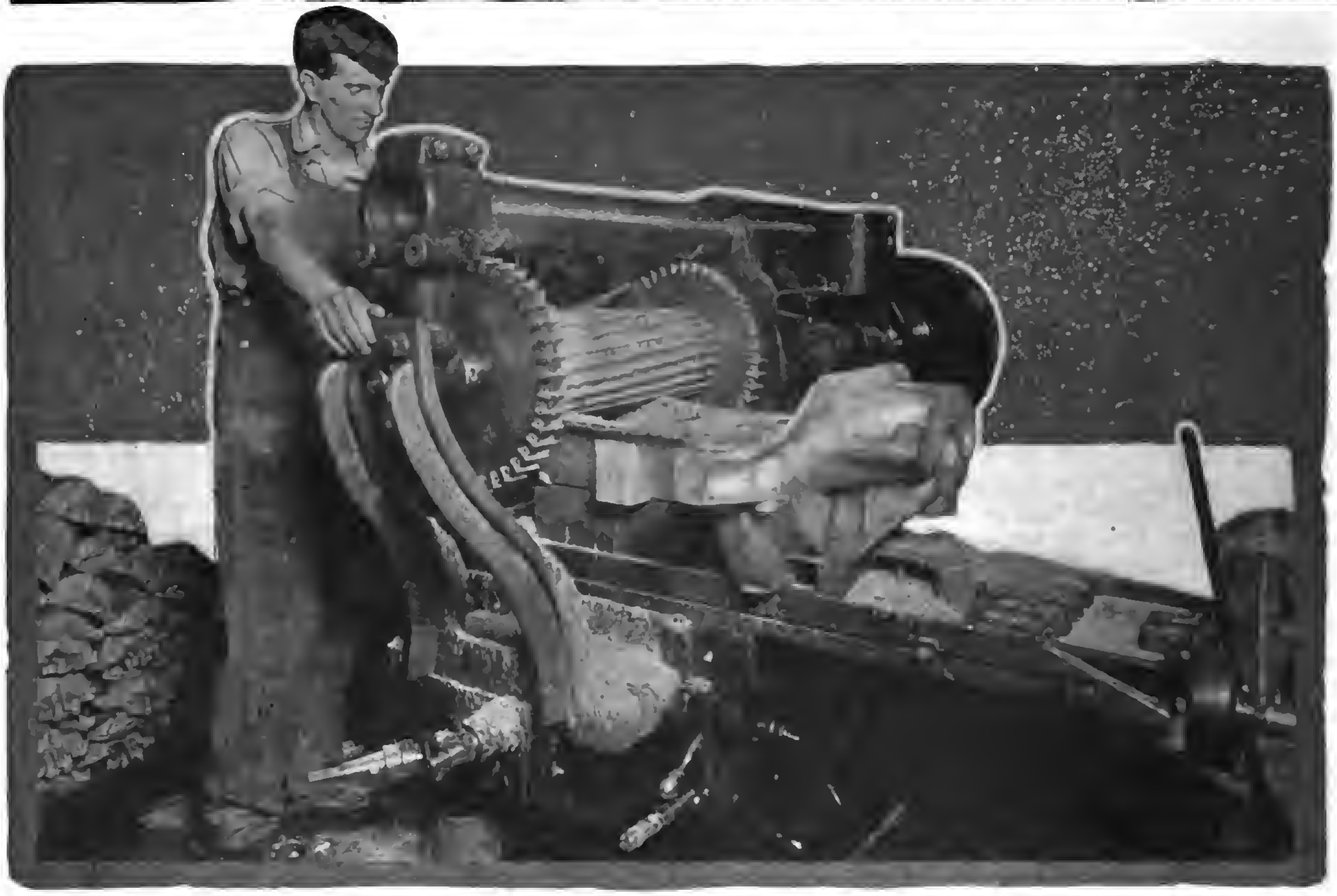
Party Embarks for the Trip Up the Lake

DETROIT, MICH., June 4—*Special Telegram*—Dated on the dock. The party of American and English engineers to the number of 600 are just embarking for their session on the steamer City of Detroit. This morning the program included a visit to the Continental, Hudson and Chalmers plants, at each of which the guests were welcomed by the officer of the respective company. The party terminated at the Chalmers plant, where a luncheon was served and a quick return was made to the hotel and thence to the steamer.

The following 3 days will be spent on the boat, and they will afford ample opportunity for the engineers to take up the principal work, for which they have been called to convention. On Thursday, June 5, business and professional sessions will busy the members of the S. A. E. and their friends from across the pond, and this work will take up the morning as well as the earlier part of the afternoon, while later on the Soo will be reached. At 6 p. m. the boat will leave Sault Ste. Marie and proceed on the lake toward Mackinaw Island, reaching it on Friday at 2 p. m. The morning of that day will again be taken up by professional work, a number of papers being scheduled for reading. After a stop of 4.5 hours, Mackinaw Island will be deserted and the steamer will go on with its return trip to Detroit, arriving there at 3 p. m. on Saturday, after the morning has been spent in a professional session once more. At 10 p. m. another steamer will take the engineers to Cleveland and thence east.

Group of members of the English Institution of Automobile Engineers and of the American Society of Automobile Engineers

Factory Miscellany



Special machine used in the factory of the Hupp Motor Car Co., Detroit, Mich., for milling crankcases and gearboxes

THE machine shown in the above illustration is of special construction and is designed for milling crankcases and gearboxes. The machine is used in the factory of the Hupp Motor Car Co., Detroit, Mich. Hupmobile crankcases and gearboxes are cast in one piece of aluminum. The gearbox shown in the picture begins at the end of the curve surface. The milling of this curve was one time thought to be a very difficult operation, which would require four or five different machinings. The engineers of the Hupp company devised this special spool-shaped cutter which grinds the entire case, curve and all, in one operation. The machine turns out sixty pieces of work a day, one man only being required for its operation. It is continually in use and never torn down. The saving effected is five-fold, the single machining process doing away with five separate machinings. Where time is saved principally in this operation is in having the cutters made as they are, milling the supporting arms of the gearbox, the straight line surface and also the curve section. Without this combination curve it would be necessary to handle the case five different times for the same amount of work. One piece of work is handled at a time. The machine occupies an area of about 36 square feet. It is standard No. 4 miller, the only special feature being the design of the cutters and the method of handling the job.

RUBBER Factories in Brazil—An impetus is to be given the automobile trade in all parts of South America by the establishment of rubber manufacturing plants in Brazil. In Brazil tires will be retailed considerably cheaper than in any other country. Other countries will profit by the lower freight charges. In addition to the Goodrich Tire and Rubber Co., Akron, O., which has a government contract for the erection of a factory and a washing plant, other firms will engage in rubber manufacturing.

Rubber Reclaiming Co.'s Plant—The United States Rubber Reclaiming Co., Buffalo, N. Y., recently filed plans for the construction of a factory to cost $2,000.

Gramm Plant Enlarged—The Gramm Motor Truck Co., Lima, O., will be enlarged this summer. It is the intention to increase the capacity to fifty trucks daily.

Goodyear Advertises for Workmen—The Goodyear Tire & Rubber Co., Akron, O., is advertising in Eastern newspaper for 2,000 working men, for its tire factory in Akron.

Universal Starts Factory Construction—The Universal Motor Truck Co., Detroit, Mich., recently incorporated under the laws of Delaware with a capital stock of $1,200,000, has begun the erection of a new factory adjoining its present plant and fully as large to cost, without machinery, $250,000.

Morgan & Marshall Awards Contract—The Morgan & Marshall Co-Operative Rubber & Tire Co., East Liverpool, O., has awarded the contract for the construction of a plant 90 by 107 feet. The work of construction will be started at once. The company will manufacture automobile and motorcycle tires.

Schachts Looking for Plant—G. A. Schacht and W. C. Schacht, formerly manufacturers of the Schacht automobile, Cincinnati, O., will re-enter the automobile business, and are looking for a factory they can buy. As soon as one is obtained equipment will be installed and work started making motor trucks.

Davenport Firm Is Reorganized—A complete reorganization of the Western Implement and Motor Co., a $2,000,000 concern organized in Davenport, Ia., over a year ago, was recently announced. The company will continue its manufacturing operations at the plant at Davenport until October 1, when the company will move to Cedar Rapids. This city made a flattering offer, which was accepted. The company will be given a $60,000 plant and a tract of 10 acres. The new plant will be completed about October 1.

Gramm to Build—The Gramm Motor Truck Co., Lima, O., will make important extensions to its plant in the near future.

Dominion Tire's $50,000 Building—The Dominion Tire Co., Berlin, Ont., has decided to erect a power house addition to cost $50,000, to be ready for operation in December.

Goodyear Factory in Seattle—The Goodyear Tire & Rubber Co., Akron, O., has commenced the construction of an elaborate factory building in Seattle, Wash. It will have a total floor area of 10,000 square feet.

Cole Doubling Production—The future production figures for the Cole Motor Car Co., Indianapolis, Ind., will double. A $150,000 addition to the present plant on East Washington street will be built, and the organization generally enlarged.

Dreadnought Tire's New Plant—The Dreadnought Tire & Rubber Co., Baltimore, Md., recently incorporated to manufacture rubber tires for automobiles, has secured a plant at Orangeville, Baltimore County, for its factory. The site has four acres of ground on which are seven buildings. Work will be started at once in rebuilding the Wilms plant so that the manufacture of rubber tires can proceed as soon as possible.

Four Wheel Drive's Factory—The Four Wheel Drive Automobile Co., Clintonville, Wis., has awarded contracts for the construction of factory No. 3, the largest addition to its plant, which is to be ready for occupancy July 1. After completion work is to be commenced on factory No. 4, which will be 100 by 120 feet, and similar to factory No. 3. A 40 by 40 foot house is also to be erected soon. The improvements will cost $75,000.

Pierce-Arrow's L. I. Building—The new service building now being erected at Freeman and Fifth avenues, Long Island City, for the Harrolds Motor Car Co., distributor of the Pierce-Arrow automobiles, has been completed as far as the steel work and the filling in of bricks and concrete has been commenced. The front of this building will be of gray brick with red and brown trimmings. The first floor will be 200 feet square owing to a one-story extension, while the remaining floors will be 80 by 200 feet. A smaller building, 50 by 100 feet, is being erected adjoining the main building, which will be used as a tin shop. This building is to be equipped with electrical apparatus the equal of that in the Ford building. The power equipment will total about 175 horsepower and in addition to the lighting and operating there is to be a fire apparatus which will be equipped with a 75-horsepower motor. In this plant at least 200 men will be employed when the building is completed, which will be about the middle of the summer.

Ford's L. I. Plant—The alterations to the Ford Motor Bldg., at Honeywell street and Jackson avenue, Long Island City, are about completed and this concern now has about 100,000 square feet of floor space which will be used entirely by the company for the assembling of cars. Parts will be shipped to that city from the Detroit, Mich., factory and about 150 more men than at present will be put to work in the assembling. It is proposed to assemble from fifty to sixty cars a day. One of the features of this plant is the use that will be made of electricity. Instead of the space given over to boilers and engines and the big smoke stacks that would ordinarily be found in a plant of this size, they are replaced by electric motors totaling 125 horsepower which will be used to drive elevators, air compressors and machine tools. On the roof is also to be erected a large electrical sign. This company recently completed the purchase of the entire block bounded by Honeywell street, Fifth avenue and Jackson avenue, and will shortly commence the erection of a ten-story building adjoining the present plant, which has been raised to eight stories.

New factory addition of the Sanford Motor Truck Co., Syracuse, N.Y.

The Automobile Calendar

Shows, Conventions, Etc.

June 2-7.......... Racine, Wis., "Made in Racine Exposition," J. I. Case Co.'s foundry.
June 5, 6, 7....... Detroit, Mich., Midsummer Meeting of Society of Automobile Engineers.
October 13........ Philadelphia, Pa., National Fire Prevention Conference, Philadelphia Fire Prevention Commission.
December 9-12...... Philadelphia, Pa., Annual Convention of American Road Builders' Association.

Race Meets, Runs, Hill Climbs, Etc.

June 5............ New York City, Orphans' Day Picnic at Glen Island, Orphans' Automobile Day Assn.
June 7............ Philadelphia, Pa., Inter-Club Reliability, Quaker City Motor Club, Automobile Clubs of Delaware County, Philadelphia and Germantown.
June 10........... Columbus, O., Reliability Run, Columbus Automobile Club.
June 14........... Cincinnati, O., Hill Climb, Cincinnati Auto Dealers.
June 14-15........ San Francisco, Cal., Track Races, E. A. Moross.
June, 16, 17, 18... Columbus, O., Reliability Contest, *Ohio State Journal*.
June 19........... Chicago, Ill., Algonquin Hill Climb, Chicago Motor Club
June 21........... Cincinnati, O., Hill Climb, Cincinnati, O., Automobile Dealers.
June 21........... Philadelphia, Pa., Fletcher Cup Run, Automobile Club of Philadelphia.
June 21-22........ San Francisco, Cal., Track Races, E. A. Moross.
June 23........... Des Moines, Ia., Little Glidden Tour, Iowa Automobile Assn.
June 25-28........ Chicago, Ill., Non-Motor-Stop Reliability, Chicago to Boston, Chicago Automobile Club.
July 1............ Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Assn. to the Pacific Coast.
July 1-16......... Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.
July 4............ Columbus, O., 200-Mile Track Race, Columbus, O., Automobile Club.
July 4............ Taylor, Tex., Track Meeting, Taylor Auto Club.
July 4............ Washington, D. C., Track Races, National Capital Motorcycle Club.
July 4-5.......... Sioux City, S. Dak., Track Meetings, Sioux City Automobile Club and Speedway Assn.
July 5-6.......... Tacoma, Wash., Road Race, Montemara Festa Automobile Committee.
July 8-16......... Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager.
July 11........... Twin City, Minn., National Reliability Tour, A. A. A.
July 20........... Seattle, Wash., Track Races, E. A. Moross.
July 27........... Grand Rapids, Mich., Tour, Grand Rapids Auto Club.
July 27-28........ Tacoma, Wash., Tacoma Road Races.
July 28-29-30...... Galveston, Tex., Beach Races, Galveston Automobile Club.
Aug. 5............ Kansas City, Mo., Sociability and Endurance Run from Kansas City to Colorado Springs, Col., Kansas State Automobile Assn.
Aug. 12........... Kansas City, Mo., Reliability Tour, Kansas State Auto Assn.
Aug. 29-30........ Elgin, Ill., Elgin Road Races, Elgin Road Race Assn.
Aug. 30-Sept. 6.... Chicago, Ill., Reliability Run, Chicago Motor Club.
Sept. 1........... Columbus, O., 200-Mile Track Race, Columbus Auto Club.
Sept. 9........... Corona, Cal., Track Race, Corona Auto Assn.
Oct. 4-11......... Chicago, Ill., Around Lake Michigan Run, Chicago Motor Co.
Nov. 24........... Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 27........... Savannah, Ga., Grand Prize Race, Automobile Club of America.

Foreign.

June 3-7.......... London, Eng., Third International Road Congress, Rees Jeffrey, General Honorary Secretary.
June 23-28........ London, England, International Road Congress.
July 12........... Amiens, France, Grand Prix Race.
July 13........... Paris, France, French Grand Prix Cyclecar Race.
July 15-30........ London, Eng., Olympia Heavy Motor Vehicle Show.
July 18-26........ London, Eng., Imperial Motor Transport Conference.
Aug. 28-30........ Ghent, Belgium, Institute of Metals, Annual Autumn Meeting, Ghent International Exhibition.
Sept. 21.......... Boulogne, France, 3-Litre Race.
Sept. 25.......... Isle of Man, International Stock Car Race.
October .... Paris, France, Automobile Show, Grand Palais, 10 days.
November .... London, Eng., Annual Automobile Exhibition, Olympia.

The Week in the Industry

Engineer — Dealer — Repairman — Garage

KisselKar patent combination uniform pressure street flusher and sprinkler, which has a 1,000-gallon galvanized steel tank

Showing the KisselKar sprinkler used as a flusher. Both the flusher and sprinkler are operated by hand levers

New model of the Locomobile Co. of America, Bridgeport, Conn., called the gentleman's roadster

NEW KISSEL SPRINKLER—The Kissel Motor Car Co., Hartford, Wis., is putting out a motor-driven sprinkler, as illustrated above. The vehicle consists of a 1000-gallon galvanized steel tank mounted on a regular 3-ton chassis. Pressure is produced by taking water by gravity from the bottom of the tank into two stage centrifugal pumps directly connected to the motor. Pressure can be had from 20 to 60 pounds, according to the speed of the motor. The water is forced from the pump into distributing pipes and out through two pipes to sprinkling attachments of vehicle type. The same pressure may be had when tank is partially full as when full, making it possible to get the benefit of all the water contained in the tank. The sprinkler will sprinkle the full width of a 60-foot street from curb to curb, or can be closed down to 20-foot streets. One tank of water will sprinkle 7 to 8 blocks of 50-foot roadway, or will flush a distance of 3.5 blocks.

POPE MOVES IN ATLANTA—L. S. Crane, Atlanta, Ga., agent for the Pope-Hartford automobile, has moved to 328 Peachtree street.

SHAW WITH EMIL GROSSMAN—G. E. Shaw has joined the technical staff of the Emil Grossman Co., New York City, as mechanical engineer.

WAITE NEW OAKLAND MANAGER—G. S. Waite has taken up the management of the Oakland Motor Car Co., 1600 Broadway, New York City.

REPUBLIC DAYTON DISTRIBUTOR—The Reliable Tire & Repair Co., Dayton, O., will act as the distributor for the Republic line of tires in that territory.

HARVEY SALES MANAGER—C. H. Harvey has been appointed sales manager of the Eastman Motor Car Co., Philadelphia, Pa., agent for the Wilcox truck.

BARDEN KELLY-SPRINGFIELD SECRETARY—G. W. Barden has been appointed secretary and treasurer of the Kelly-Springfield Motor Truck Co., Springfield, O.

FISK BRANCH IN HOUSTON—The Fisk Rubber Co. of Texas will open a branch in Houston. Three stories at 1305 Main street have been leased. C. B. Johnson will be in charge.

WALLACE FRISCO SALES MANAGER—W. D. Wallace has assumed his duties as the sales manager of the San Francisco, Cal., branch of the Franklin Automobile Co., Syracuse, N. Y.

METZ OPENS N. Y. QUARTERS—The Metz Automobile Co., Waltham, Mass., has opened temporary salesrooms on the second floor at 1700 Broadway. R. L. Rieser is manager.

AUGIER DIES IN PARIS—Albert Augier, general manager of the Paris branch of the Goodrich Tire Co., Akron, O., died at his residence recently as the result of a self-inflicted wound.

BATAVIA'S BUFFALO BRANCH—The Batavia Rubber Co., Batavia, N. Y., has opened a factory branch at 1030 Main street, Buffalo, N. Y., where its pneumatic tires will be carried in stock.

MOTOR OMNIBUSES FOR PHILADELPHIA—The Philadelphia Rapid Transit Co., Philadelphia, Pa., contemplates the installation of motor omnibuses on Broad and other streets not containing trackage.

EAST LIVERPOOL'S FIRE TRUCK—The city council of East Liverpool, O., has adopted a resolution appropriating $5,000 for the purchase of a combination motor-driven fire truck for the municipality.

BUS LINE IN TORONTO—A motor bus line is proposed in Toronto, Ont. The busses would be run as auxiliary to the street railway service as in Montreal, and other large cities. Buffalo, N. Y., also soon is to have the motor bus line.

VESTA ACCUMULATOR'S NEW QUARTERS—A lease for 10 years on a new building to be put up at 3024 Locust street, St. Louis, Mo., was recently made by the Vesta Accumulator Co., Chicago, Ill. The building is being erected and will cost $10,000.

TIMES SQUARE CO. ADDS—The Times Square Auto Co., New York City, has filed plans to immediately erect two additional stories on its present quarters at 56th street and Broadway. Each floor will have an area of 20,000 square feet, which will give it a total space increase of 40,000 square feet.

New Pierce-Arrow Features—The Pierce-Arrow Co., Buffalo, N. Y., is now using an electric self-starter instead of its former air system. It is now placing its headlights on the front and mudguards instead of as heretofore on brackets either side of the radiator.

Peugeot Opens New York Office—The Peugeot car which won the 500-mile race at Indianapolis, Ind., last week is now represented in New York City, A. G. Kaufman having taken the agency for this country with offices at 1620 Broadway. Henry Taylor is sales manager.

By Way of Correction—In the issue of May 29 in the lead article named Indianapolis, a typographical error was made by stating the first electric vehicle built by the Waverley Co., Indianapolis, Ind., was delivered to Charles Finlay Smith in 1907. This should have been 1897.

Potter Severs Vanderwater Connections—M. H. Potter has severed his connection with Vanderwater & Co., Elizabeth, N. J., manufacturer of the Correga cars. He has connected with a new company in Montreal, Que., and will continue along the same lines, but in a broader field.

Large Milwaukee Garage Leased—The garage of the Kopmeier Motor Car Co., of Milwaukee, Wis., considered the largest in the Northwest, and situated at 375 Summit avenue, has been leased for a long term of years by Hustis Bros., representing the Stevens-Duryea and Borland electric.

Five Ambulances Motor Driven—With the installation of the fifth motor-propelled ambulance at the charity hospital in New Orleans the last of the horse-drawn wagons of this type have been withdrawn from the service. In the future only motor-driven ambulances will be maintained by this big institution.

Kissel Service Station in Frisco—The Pacific KisselKar branch is having plans drawn and will soon break ground for a new sales and service building to be located on Van Ness avenue. It is intended to erect a structure that will eclipse in size the service station in Chicago, Ill., which contains 70,000 square feet of floor space..

Yale Mfg. Co. Bankrupt—The Yale Mfg. Co., of Oostburg, Wis., manufacturing automobile accessories and specialties, has filed a voluntary petition in bankruptcy, giving its liabilities at $27,272.76 and assets at $29,326.95. The company was organized about 3 years ago by Milwaukee capital established a workshop at Oostburg.

New Service Stations—The Pope Hartford Co. of Boston, Mass., and the Republic Motor Co. of Massachusetts, the latter handling the Little and Chevrolet cars, have had to get new service stations in Cambridge, the former adding a new building to its present one and the other company leasing 10,000 square feet in the Shoe & Leather Bldg.

Price Dunlop Manager Dies—Hubert Price, general manager of the French Dunlop Tire Co., dropped dead in the streets of Paris recently. He was an Englishman and 41 years of age, came to Paris about 20 years ago to fill a position with the Clement Cycle Co. He later joined the Dunlop Co., and after a short period was appointed general manager.

Orphans' Day, June 11—Secretary Chester I. Campbell of the Boston Automobile Dealers Association, Boston, Mass., has selected Wednesday, June 11, as the day on which to give the blind, crippled and orphaned children an outing. More than 400 cars will be used and the youngsters will be taken to Nantasket beach instead of to Sharon as formerly.

Top Co. in Bankruptcy—Zimmerman & Son, Waupon, Wis., manufacturers of tops, curtains, cushions, etc., and in business for 47 years, have filed a voluntary petition in bankruptcy. The property will be sold June 7 to satisfy the demands of creditors. It is said that the failure of an automobile manufacturing company which owed the Zimmerman concern a large sum for material and finished goods, was the indirect cause of bankruptcy.

Corning Orders Fire Apparatus—Corning, N. Y., placed an order recently with the American-La France Fire Engine Co. of Elmira, N. Y., for a new motor six-cylinder fire pump and new motor combination chemical and hose wagon, two apparatuses to cost $14,500. The Elmira fire engine concern agrees to sell Corning's horse-drawn vehicles and turn over proceeds to the Corning department, which will be used toward purchase of the new motor wagons.

German Sales Increase in Brazil—Increasing sales of German cars in Brazil is declared to be due to the fact that full lines of repair parts are carried in stock by the agents of the German manufacturers. American cars are popular, but parts can be obtained only by sending to the United States. Government statistics for 1912 show that 2994 cars of European manufacture entered the republic, while 783 American cars were received. Those familiar with conditions declare that the proportion could be reversed if the business was intelligently nursed for a year or two by American manufacturers.

Wreck of an automobile caused by Nebraska's second tornado on May 14. Automobile firms and owners in Nebraska are considered lucky, for very little damage was reported to automobiles. Seward was the principal scene of the most damage and loss of life. Here eight people were killed, twenty injured and a property loss of $100,000 was recorded. The automobile in the above illustration was taken from a private garage and deposited about 100 feet, and another machine was blown into its place in the garage without suffering serious damage

Detroit, Mich., branch of the Willard Storage Battery Co., Cleveland, O. This branch is in charge of M. G. Hillman

Ascent of Grassy Alp, about 40 miles outside of Detroit, Mich., made by a Studebaker car

MACNEIL HEADS EXCELSIOR RUBBER—W. N. Macneil is now heading the Excelsior Rubber & Supply Co., Winnipeg, Ont.

NEW BUICK BIRMINGHAM SALESROOMS—New salesrooms have been opened by the Buick Agency in Birmingham, Ala. The new quarters are expensively appointed. The new site is at Avenue D and 20th street.

RACINE ADDS FIRE APPARATUS—The common countil of Racine, Wis., has confirmed the action of its committee awarding the contract for furnishing two motor-propelled fire engines to the American-La France Fire Engine Co., of Elmira, N. Y., at $17,000.

MORE FREIGHT CARS ORDERED—The Great Northern road has ordered 1500 automobile freight cars. Altogether three northwestern roads will spend $25,000,000 for new rolling stock and the Great Northern's proportion is $16,000,000. The company will buy altogether 9,050 cars.

AUTOMOBILE MAIL SERVICE IN ARGENTINA—Mail and passengers are to be carried on a new automobile line from Rosario, Argentina, to several small places in the interior. Four cars will be used in the service, which will maintain schedule. The government pay for the mail is sufficient to cover the expenses of operation. The returns from the passenger business are expected to be sufficient to cover the interest on the investment and leave a fair profit to the owners.

NEW HOME FOR CHALMERS—The last lot of land on Commonwealth avenue, Boston, Mass., between the buildings occupied by motor concerns and the parkway that was vacant has been sold and upon it will be erected salesrooms and service stations, one of which will be occupied by the Whitten-Gilmore Co., that handles the Chalmers line in Boston, as well as the Federal and Standard trucks and the Woods electric, and the other is said to be leased to the Franklin agency.

AUTOMOBILES IN URUGUAY—Few South American cities, in proportion to the number of inhabitants, show as many automobiles in use as Montevideo, yet the number is increasing very considerably. During December and January no less than 115 high-priced cars entered this port and were sold. There are more than 1,300 cars licensed in Montevideo, about 2,000 being the total for the whole republic. Of the machines in use there, those of American manufacture are well represented, numbering about one-half of the total.

CO-OPERATIVE MOTOR BUS SERVICE—A co-operative motor bus service modeled after the system in force at Indianapolis, Ind., is proposed for Milwaukee, Wis., by leading grocers and marketmen. The plan includes the issue of 5,000 shares of stock, with a limit upon the number that may be held by any one member, and provides for an initial service of 12 trucks. It is planned to give the consumer complete control of the service by an arrangement of the sale of stock, and to divide profits equally among stockholders. Merchants along any main thoroughfare may organize a company on the same basic principle, in which every citizen with $10 to invest may become a stockholder and thus part owner of a passenger bus, increasing his or her chances for a dividend every time the person rides on one of the busses. J. A. Bayliss is promoting the scheme in Milwaukee.

NEW LA FRANCE GARAGE—The La France Garage Co., Elmira, N. Y., has completed its plans for the new building and garage at Church and Baldwin streets, and the builders are ready to begin construction as soon as the small buildings have been removed from the property. The new building will be four stories in height, with a basement. The exterior is to be of white brick. The construction will be brick and concrete. The building will be of L shape, 60 feet front on Church street, 116 feet deep on Baldwin street, with a wing extending east from Baldwin street, 41 feet wide and 120 feet deep, extending in the rear of a brick apartment house. The second floor of the building will be used for second-hand cars. The third floor will contain the repairs department, and the fourth floor will be a paint and finishing shop. The basement will be for temporary storage and the charging of electric cars and trucks.

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

BOSTON, MASS.—W. J. Connell Co.; capital, $15,000; to deal in automobiles. Incorporators: W. J. Connell, H. D. Greene, H. J. Cramp, I. E. Thomson.

BROOKLYN, N. Y.—Barber Auto Service Co.; capital, $10,000; to deal in automobiles. Incorporators: William Barber, A. S. Barber, M. F. Barber.

CHICAGO, ILL.—Divine Motor Car Co.; capital, $10,000; to deal in automobiles. Incorporators: E. C. Divine, H. E. Campbell, W. R. Mitchell.

CLEVELAND, O.—H. & H. Auto Co.; capital, $10,000; to manufacture and deal in automobiles. Incorporators: F. M. Fogarty, J. O. Fordyce, A. B. Brackenridge, H. M. Reidel, G. M. Dolan.

DETROIT, MICH.—Universal Motor Truck Co.; capital, $1,200,000; to manufacture motor trucks.

JERSEY CITY, N. J.—Hudson & Bergen Automobile Co.; capital, $125,000; general automobile business. Incorporators: R. E. Fulcher, C. Moller, A. A. Leets.

MANITOWOC, WIS.—L. J. Anderson Co.; capital, $20,000; to deal in farm machinery, gasoline engines, automobiles, tractors, and similar prime movers. Incorporator: L. J. Anderson.

MAYSVILLE, KY.—Brown Auto Co.; capital, $4,500; to manufacture automobiles. Incorporators: Mike Brown, W. B. Tully, S. M. King.

NEW YORK CITY—Asch & Co.; capital, $1,000; to deal in automobiles. Incorporators: B. M. Asch, Leonard Veith, W. M. Goldsmith.

NEW YORK CITY—Gadabout Motor Corp.; capital, $250,000; to deal in automobiles, motors, etc. Incorporators: A. V. Clarke, Charles Vail, D. E. Dealy, Jr.

NEW YORK CITY—H. S. Houpt; capital, $60,000; to deal in automobiles. Incorporators: L. A. Van Patten, I. H. Westervelt, L. W. Bagley.

NEW YORK CITY—Universal Equipment Co.; capital, $50,000; to deal in internal combustion engines and motors. Incorporators: George Gray, T. W. Hatfield, I. B. Owens.

ST. LOUIS, MO.—Grand St. Louis Auto Co.; capital, $4,000; to deal in automobiles. Incorporators: L. B. Scherer, E. A. Stosberg, J. J. Scherer.

SYRACUSE, N. Y.—Syracuse Auto Radiator Co.; capital, $50,000; to manufacture automobile radiators. Incorporators: Max Kalman, Mrs. Minnie Kelman.

WHEELING, W. VA.—Union Automobile Co.; capital, $25,000; to deal in automobiles and accessories. Incorporators: W. T. Shaffer, A. C. Shaffer, A. M. Schenk, G. P. Fahnar, B. J. Smith.

WHEELING, W. VA.—Auto Supply House; capital, $25,000; to deal in automobiles. Incorporators: H. W. Rogers, T. A. Westmyer, J. P. Arbens, Minnie Rogers, Anna B. Westmyr.

GARAGES AND ACCESSORIES

ANTIGO, WIS.—Holland Flexible Auto Wheel Co.; capital, $10,000; to manufacture a new type of wheel for motor trucks. Incorporators: T. J. Holland, J. L. Donahue, J. E. McKenna.

BUFFALO, N. Y.—Easy Starter & Speeder Sales Co.; capital, $1,000; to manufacture automobile self-starters. Incorporators: F. A. Coon, H. J. Schopf, J. E. Schuesler.

CANTON, O.—Reliable Puncture Seal Co.; capital, $25,000; to deal in automobile accessories. Incorporators: L. W. Steinmetz, W. V. Baird, P. S. Wise, J. R. Binns, E. D. Myers.

CINCINNATI, O.—K. Auto Delivery Co.; capital, $10,000; to do a general automobile trucking. Incorporators: Edward Konker, G. W. Bell, Anna Konker, Gus Konker, F. Schmidt.

CLEVELAND, O.—Air Tank Carbureter Co.; capital, $10,000; to manufacture apparatus for the generation or mixing of gas for power or light. Incorporators: Edward Younder, L. C. Loomis, F. Castle, W. J. Engel, James Kelly.

CLEVELAND, O.—Cleveland Ball Bearing Co.; capital, $10,000; to manufacture and deal in ball bearings and other parts for automobiles. Incorporators: Henry Merkel, G. M. Merkel, P. J. Probeck, W. A. Crawford, C. H. Warner.

NEW YORK CITY—Lake Sales Co.; capital, $25,000; to deal in piston rings. Incorporators: H. S. Lake, J. A. Walker, R. B. Wasson.

NEW YORK CITY—Triumphant Tire Society; capital, $500; to deal in tire, rubber goods, etc. Incorporators: E. R. De Tamble, Louise Bennett, E. A. Swanson.

NORFOLK, VA.—Auto Specialty Co.; capital, $25,000; to deal in automobile accessories. Incorporators: T. G. Coburn, F. D. Belote, I. B. Belote.

PHILADELPHIA, PA.—National Tire & Rubber Co.; capital, $50,000; to manufacture automobile accessories. Incorporators: Harry Fisher, Benjamin Haas, Louis Greenhalt, J. G. Hughes, H. W. Davis.

TOLEDO, O.—Babcock Garage Co.; capital, $10,000; to operate a garage and do repair work. Incorporators: C. Wagenhauser, L. P. Wagenhauser, A. G. Der, Bernard Hubert, C. F. Souder.

WICHITA, KAN.—Hockaday Auto Supply Co.; capital, $15,000; to deal in automobile supplies. Incorporators: Ray Hockaday, F. W. Hockaday, C. E. Hockaday, James Pryune, F. W. Martin.

WILMINGTON, DEL.—Bernstein Automobile Accessories Sales Co.; capital, $15,000; to construct, maintain and operate machinery and devices for cleaning windows.

WORCESTER, MASS.—Electro Signal Co.; capital, $50,000; to manufacture an automobile signal. Incorporators: W. M. Waite, J. H. Wheelock, Zella E. Wheelock.

CHANGES OF NAME AND CAPITAL

DETROIT, MICH.—Maxwell Motor Co.; capital increased from $31,000,000 to $37,000,000.

New Agencies Established During the Week

PASSENGER VEHICLES

Place	Car	Agent
Bay City, Mich.	Cole	Miller Auto Co.
Bennington, Vt.	Cole	B. A. Quinlan.
Birmingham, Ala.	Cartercar	A. J. Arrant.
Cedar Rapids, Ia.	Franklin	A. D. Wood.
Danville, Va.	Cole	B. L. Taylor.
Des Moines, Ia.	Chevrolet	Chevrolet Little Motor Co.
Great Falls, Mont.	Cole	Dr. J. A. Niles.
Haverstraw, N. Y.	Franklin	J. W. Gillies.
Houston, Tex.	Apperson	Apperson Auto Co.
Houston, Tex.	Pullman	Apperson Auto Co.
Joplin, Mo.	KisselKar	Lyscio & Walker.
Lewistown, Mont.	Cole	S. C. Weaver.
Logan, O.	Detroiter	Hocking Valley Auto Co.
Mason City, Ia.	Cole	C. J. Murray & F. D. Daniels.
Milwaukee, Wis.	White	White Automobile Co.
Montpelier, Vt.	Cole	Lane Mfg. Co.
New York City	Metz	Metz Automobile Co.
Oakes, N. D.	Kissel Kar	J. E. Bush.
Racine, Wis.	Reo	F. E. Foster & F. H. Weichert.
Salem, Ind.	Cole	C. M. Crim & Son.
San Francisco, Cal.	Ames	Ames Motor Sales Co.
Seattle, Cal.	Metz	J. P. Scearce & W. Matheson.
Setucket, L. I.	Franklin	A. Pfeifer.
Sheffield, Mass.	Cole	A. H. Tuttle.
Stamps, Ark.	Cole	J. M. Hudgens.
St. Cloud, Minn.	KisselKar	Menec & Bisenius.
St. Louis, Mo.	Stutz	Lane-Lynch Motor Car Co.
York, Pa.	Krit	Southern Penn. Auto Co.

COMMERCIAL VEHICLES

Place	Car	Agent
Asbury Park, N. J.	Stewart	Seacoast Garage Co.
Baltimore, Md.	Dart	G. A. Wehr.
Boston, Mass.	Dart	W. F. Magill.
Boston, Mass.	Hercules	M-B-M Co.
Butler, Pa.	Dart	A. C. Hileman.
Colchester, Ill.	Dart	Colchester Auto Co.
Fort Worth, Tex.	Dart	Mayer & Strickland.
Green Bay, Wis.	Best	DuBois, Haevers & Co.
Lockport, N. Y.	Stewart	C. L. Papworth.
Los Angeles, Cal.	Jeffery	W. K. Cowan Co.
Luxemburg, Mo.	Palmer-Meyer	Louis Schnellman.
Mattese, Mo.	Palmer-Meyer	H. J. Jenneman.
Maxwell, Mo.	Palmer-Meyer	C. J. Siedler.
Newark, N. J.	Chase	Chase Motor Truck Co.
Newburg, N. Y.	Dart	C. H. Bellinger.
Salt Lake City, Utah	Dart	Inter-Mountain Transportation Co.
Marietta, O.	Standard	F. R. Hall.
Philadelphia, Pa.	Rauch & Sang	Peerless Motor Car Co.

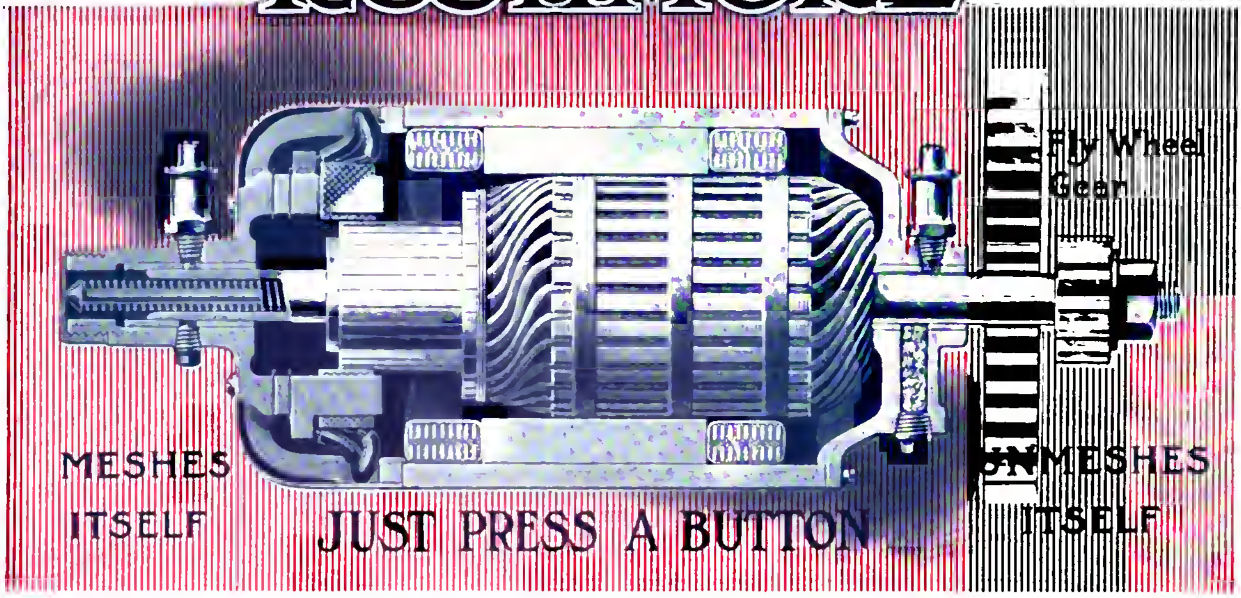
Engl

The AUTOMOBILE

10 cents a copy

June 12 191

RUSHMORE



Not Even the Commutator Needs Cleaning!

Did you ever hear of a starter so totally free from tendency to wear itself out that not even the commutator needed attention?

Probably not; yet that very thing is true of the Rushmore Starter!

If you have the Rushmore System on your car there is literally **nothing** to do to keep it in order except to squirt a few drops of oil into the oil cups once a week.

Like the other sensational Rushmore features, this one has a good reason behind it. The motor is purposely so arranged that a little of the oil from the bearing finds its way to the commutator and lubricates the brushes. The latter are copper, and consequently of negligible resistance. As the Starter runs only when starting, both the wear and the demand for lubricant are at the lowest minimum. Our tests have shown that in thousands of miles the commutator needs absolutely no attention and can simply be forgotten by the user.

Substantially the same is true of the Dynamo. Unlike the Starter, it runs all the time; but the commutator and the current carried are small. The brushes are of graphite and self-lubricating. Besides that, they are absolutely sparkless: there is no arcing or burning to damage the surface of the commutator.

These things did not happen by chance. The Rushmore Starting and Lighting System is the product of a scientific investigation into the entire subject of automobile starting and lighting, and was developed after all other systems had been analyzed and rejected for inherent faults. The Starter operates, and the Dynamo governs itself, without any of the mechanism commonly thought necessary, yet both are completely automatic.

Literature with full description sent on request

Rushmore Dynamo Works, Plainfield, N. J.

LONDON PARIS BERLIN

The AUTOMOBILE

Engineers Close Session

Lake Trip Even Greater Success Than Last Year—Big Program Carried Out—English and Americans Unite in Work and Play

By J. Edward Schipper

DETROIT, MICH., June 7—Today marked the close of the summer session of the Society of Automobile Engineers and Institution of Automobile Engineers of England held on board the steamship *City of Detroit III* while cruising on Lake Huron to the Soo, Mackinac Island and back. Combining business and pleasure the second annual cruise was an immense success both socially and in an engineering way. The long program was almost entirely carried out, the exceptions being the omission of some of the topics for discussion and two papers which were not read owing to the absence of their authors.

The attendance was excellent, 569 passengers being carried, of whom 50 per cent. were engineers and the remainder associates and members of their respective families. At the sessions in the main saloon held in the morning and afternoon of Thursday and the mornings of Friday and Saturday attendance averaged 200.

Among those in the party were the chief engineers of a score of the leading automobile manufacturers, engineers of many of the leading parts manufacturers, and engineering representatives of metallurgical concerns engaged in steel and iron manufacture. A percentage of the party was made up of the selling representatives of concerns holding affiliate memberships. Among the party were Past-Presidents Howard Coffin, Henry Souther and Thomas J. Fay.

Let their varying efforts unite for the best interests of motoring in both nations

Every opportunity was afforded for mixing business with pleasure during the 4 days on the boat. On Thursday there was a 4-hour stop at the Soo, when the American locks were inspected. On Friday 6 hours were spent on Mackinac Island, this being ample time for driving and walking parties to explore the entire island. Naturally nearly all of the party took advantage of the opportunity.

Important developments took place at the meetings, the work done by the various divisions of the standards committee was watched with great interest by both the members of the S. A. E. and I. A. E. Ten divisions were called upon for committee reports. Out of these there were three submitted reports which were accepted, one, that on iron and steel with an amendment. The other two accepted were of the nomenclature and miscellaneous divisions. All the other committees reported progress and many important ones promised reports for the winter session. Among the latter are the ball and roller bearing, commercial car wheel and sub-committees of the electrical divisions. The committee reports will be found on page 1220.

President Marmon opened the meeting Thursday morning with a short speech of welcome to the British guests and members, stating that the greatest and most important works of the society are its efforts along the lines of

One-quarter of a panorama view of the majority of the members of the S. A. E.—I. A. E. party at Mackinac Island

standardization begun some years ago. The society has made immense progress in this and has succeeded in creating standards that have been accepted throughout the entire automobile industry.

President Marmon also dwelt to a large extent on the value of the section meetings. "It is these section meetings," stated he, "that hold the entire society together in a way that would be impossible were we to have only the semi-annual sessions."

I. A. E Honors Marmon

T. B. Browne, president of the Institution of Automobile Engineers of the British Isles, expressed the thanks of the British guests to their host, the S. A. E., and as an expression of gratitude, President Marmon was presented with an honorary membership in the I. A. E. This is a signal honor, as Mr. Marmon is the first and only honorary member of the I. A. E. To Coker Clarkson, secretary of the S. A. E., on behalf of the Britishers, who appreciated his tireless efforts in their behalf was presented with a silver card tray. Alden L. McMurtry, head of the transportation department of the S. A. E., was presented with a silver plate as a token of the visitors' appreciation of his work for them.

City of Detroit III, which was the home of the party for parts of 4 days on Lake Huron. There were 569 in all

The reports showed that the society is not falling off from its rapid growth. It now numbers 1,635 members. Since January the following elections have taken place: New members, 72; associates, 91; Juniors, 7; a total of 170.

Besides these four affiliates were elected.

The treasurer's report showed a balance of $6,557.84 in the treasury. Since the last meeting held in New York in January the total receipts and disbursements of the society have been:

Receipts	$25,637.30
Disbursements	19,079.46
Balance	$6,557.84

An important feature of the session was a resolution of the society against the Oldfield patent bill now pending before Congress. This bill menaces the rights of holders of patents and, in fact, does much to rob the inventor of the fruits of his invention. Milton Tibbetts, head of the Packard patent department, read a paper he had prepared and read the resolution. In this he cited the fact that the progress of the age and the advance in civilization are due to the work of inventors. The society unanimously adopted his resolution, which was "that the president of the S. A. E. appoint a committee on patent investigation on behalf of the inventors and that the progress of its investigations be reported to the society." The committee consists of Messrs. Milton Tibbetts, Herman Cuntz and Howard Coffin.

The committee went quickly and vigorously to work and at the final session furnished its report, which included the following

Resolution:

Resolved: First; that the Society of Automobile Engineers is opposed to the Oldfield bill; second, that it is opposed to any fundmaental changes in the patent law without thorough investigation and fair public hearings; and third, that a copy of this resolution be forwarded, on behalf of the society, to every Senator and Representative and to other engineering societies.

In the professional program the Britishers played an important part, presenting four of the papers read and participating generally in all discussions. President Browne, of the I. A. E., told

Third quarter of the panorama, showing how many of the men came out in comic costume

Second quarter of the panorama of the party, which formed into a circle with the camera in the center

of the growth, development and construction of gasoline omnibuses in London; Thomas Clarkson, the leader in the manufacture of steam buses in London, delineated their advantages and present-day status; Charles Wheeler, head of the motor transport department of the British post office, spoke on calculating efficiency; and E. B. Wood, Bristol, on the measurement of horsepower.

In the program presented by the American engineers twelve pertinent subjects were considered: Paul W. Litchfield, factory manager of the Goodyear company, gave an exhaustive treatise on the pneumatic tire situation of today, his paper being sufficiently elementary to be followed by a layman, yet most up-to-date.

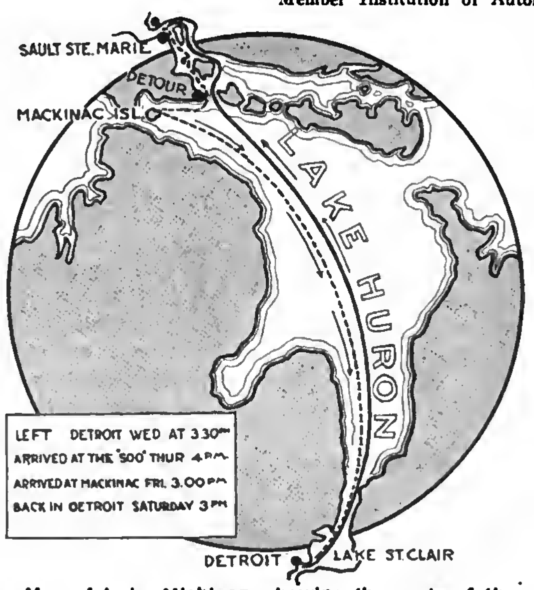
Houk on Wire Wheels

George W. Houk, representative of the Rudge-Whitworth wire wheel interests in America, read a comprehensive paper on wire wheels, drawing attention to their light weight and enumerating their various advantages and disadvantages for passenger car use.

From an engineering viewpoint Enrique Toucedal's paper on malleable iron was of leading interest, in that this metal is coming into more general use in motor car construction and, although more or less ridiculed by engineers to date, it is now arousing great attention, due to improvements in methods of handling it.

The interest of users and makers of commercial motor vehicles were well looked over, an entire day being given over to the reading of papers on relevant subjects and the discussions on same. The entire program follows:

A New Tensile Test-Piece and Holder.—By K. W. Zimmerschied.
Pneumatic Tires.—By Paul W. Litchfield.
Lubricating Oil.—By Harry Tipper.
Manufacture and Physical Properties of Malleable Iron.—By Enrique Toucedal.
Petrol Buses.—By T. B. Browne, President, Institution of Automobile Engineers.
Steam Buses.—By Thomas Clarkson, Member of Society of Motor Manufacturers and Traders.
Calculating Depreciation of Commercial Automobiles.—By Charles Wheeler, Member Institution of Automobile Engineers.
Jackshaft versus Double Rear-Wheel Brakes. By Arthur M. Laycock.
Metal Wheels.—By Arthur J. Slade.
Automobile Production Inspection Methods. —By E. F. Roberts.
Influence of the Sales Department on the Design of Motor Cars.—By F. E. Moskovics.
Wire Wheels.—By George W. Houk.
Motor Construction.—By Claude E. Cox.
The Measurement of Horsepower.—By Prof. W. Morgan, B. Sc. and E. B. Wood, M. A.
Notes on Power Variations with Atmospheric Changes.—By Herbert Chase.
A Consideration of Certain Problems of Carburetion.—By Arthur B. Browne.



Map of Lake Michigan, showing the route of the S. A. E.-I. A. E. excursion from Detroit to the Soo, to Mackinac Island and back to Detroit

Cruise a Delight

The route taken by the boat on its 4-day cruise was a real delight. Steaming up the Detroit River into Lake St. Clair, the shores of Ontario and Michigan are one-half mile distant. The river widens into the lake, the shore on the Canadian side receding until it is no longer visible. At the north end of the lake, a 40-minute sail, the waters again narrow and the boat passes into the St. Clair River and, 30 miles farther on, enters Lake Huron. The course lies lengthwise of the lake, far out of sight of land, to Sault Ste. Marie, familiarly designated the Soo. From the Soo, the return trip was started via Mackinac Island and thence to Detroit.

The steamer left the dock at 4 p. m., Wednesday. The weather was all that could be desired and a large crowd accompanied the members of the party to the pier. As the boat cast off and

The fourth quarter of the panorama shows how many ladies accompanied the party on board the City of Detroit III started up the Detroit River, the members of the party who had tramped many miles through the mazes of the Continental, Hudson and Chalmers plants that morning were glad to seat themselves on deck and take a much-needed rest in the quiet enjoyment of the sail up the river.

After dinner the evening was spent in various ways throughout the different parts of the boat. A dance was in progress on the main deck, while others joined in the songs on the saloon deck.

The boat landed at the Soo at 4 p. m. Thursday. The landing of the boat was the signal for the rapid conversion of a large gathering of dignified engineers into a yelling tribe of Indians. The natives lined the streets of the sober little town, while the engineers marched through them in impossible attire consisting of various disjointed sections of feminine clothing and with their heads protected from the invisible sun by large Japanese parasols of various gaudy colors.

Officers Society of Automobile Engineers on board City of Detroit III. Top row, left to right—Coker F. Clarkson, secretary; Henry Souther, past-president; Arthur B. Cumner, committee on arrangements. Second row—C. B. Whittelsey, council; J. G. Perrin, first vice-president; Russel Huff, second vice-president, and lower left, Howard Marmon, president

Only two hours were allowed at this port, but by the end of that time every visitor to the town felt perfectly at home. The little German band which had been hired for the occasion marched proudly through the main streets at the head of the noisy procession, while the rear was brought up by an enthusiastic mob of small boys.

Some Visit the Locks

A goodly portion of the more sober-minded members took a walk up to the fresh-water locks, for which this place is noted, and watched the heavy freighters go through.

The embarkation of the shore party at 6 p. m. would have broadened the smile of the Sphinx. The ill-assorted chorus of improvised musical instruments, mingled with the hoots of the small boys in one inharmonious squeal, would have shamed the best efforts of the imps of Dante's inferno.

The features of the entertainment of the evening on board were the Gridiron meeting of the Bonnie Boys of Britain and the camp-fire trial of the Indian tribe in full war paint and feathers.

The Britishers, led by President Browne in a long white flowing robe, represented a group of inspectors sent to America to report on conditions in the automobile factories. These inspectors all reported to the leader and told what they had seen. All were dressed in white *robes de nuit* with the words "I am 'ere" inscribed on their chests. E. C. Paskall, one of the visitors introduced each of the inspectors as he made his report.

Great Fun

Basil H. Joy lamented on speed of the 4d factory, Thomas Norton despaired of the Backyard (Packard) car, H. M. Buist criticized the Cadillaqua, which runs on milk. (Employees in the Cadillac plant are furnished milk.) The others told of fearful (?) conditions of other plants. One told of the Riverside (Hudson) factory; another dilated on the Charmers (Chalmers) plant; a third spoke of the 'Opmobile (Hupmobile), and so on. The criticisms were ludicrous but the satire struck home in many cases and provided continuous merriment for the entire audience.

Following the English performance, which brought down the house, the famous tribe of Indiana Indians led by F. E. Moscovics entered the arena with suitable war whoops and brandishing of weapons. An improvised stake had been arranged and the captives, Howard Coffin, chief engineer of the Hudson; David Fergusson, of the Pierce-Arrow; E. T. Birdsall, of the S. A. E.; Charles Wheeler, of the I. A. E., and R. H. Combs, of the Prest-O-Lite company, were all brought and tied to the stake and given various degrees of punishment, which varied from burning all the way down to the compulsory purchase of liquid refreshment for every one on board the boat.

The boat landed at Mackinac Island at 2:30, just at the adjournment of the professional sessions on Friday. Every one immediately started ashore with the idea of exploring the island until 9 o'clock, when the boat sailed.

Members of the British delegation in comic costume used for their humorous entertainment given Thursday evening. J. Inglis Kerr holding the flag

The amusements on shore consisted in roaming over the island, visiting the old fort, a relic of Indian days; watching the deer in the government reserve, admiring the picturesque beauty of Arch Rock, Sugar Loaf Rock, and a study of the old blockhouse.

The feature of the entertainment Friday night was the one-act playlet entitled, "Reverse English on the Heat Treatment," rendered by the Metropolitan Section of the society. The play showed the spirits of the Britishers in the realms of purgatory. The time was A. D. 2000, and each spirit was called upon by the Metal-archangel, Herbert Chase, to explain the reason for his presence.

The engineers with friends inspecting the locks at the Soo. The power house for operating the gates is in the background. The semi-crescent shaped recesses in the wall are the gates for the lock, both being open and the water at low level, or empty dock

A Big Hit

The whole performance made an immense hit, the take-off on the Britishers keeping them as well as the rest of the audience convulsed with laughter. The shade of Father Dunlop, of tire fame, appeared with the original tire carried over his shoulder; Steam-bus Clarkson and his whiskers, were among the condemned ones, as was also Froggy Pollock, the only Frenchman in the party. The chaffing was taken in the best of good nature and every one considered that it was an excellent return for the mischievious gridiron performance of the Englishmen given on the evening before.

Saturday morning was occupied by the last professional session, and once more the engineers, who vibrated rapidly between fun and seriousness, set themselves to work to plow through the heavy program. The session was started promptly at 9 o'clock and at noon most of the work had been cleaned up. The boat landed at Detroit at 3 p. m.

On board the steamer a morning and evening four-page news paper was published. The paper was complete in every way, having an editorial department of five men, consisting of Lee Anderson, Charles M. Steele, W. L. Agnew, F. Ed. Spooner and G. J. Hopcraft, a composing room and an electric print shop. The full news of all the social affairs on the boat were perused eagerly by the entire party. A large supply of cuts taken on board before the boat left livened up the paper considerably.

This marked the close of the midsummer session of 1913. From the boat the party scattered to their various hotels. The Britishers, with a small complement of American engineers, rechecked baggage and prepared for the completion of their itinerary, embracing Cleveland, Buffalo and New England points. Three of them took a midnight train for the Pacific coast on a sightseeing trip of their own, and a few took up their residence in Detroit for a 10-day visit in more leisurely fashion to its factories. A motion was made and carried that it was the wish of the members of the S. A. E. assembled here that the summer session of 1915 be held on the coast. No arrangements were made for 1914. This year the increase in the number of ladies in the party was very marked.

The report on the monument for the late Henry Donaldson, past-president of the S. A. E., was read by H. M. Swetland. The monument is to be erected in 60 days. The amount subscribed by the society was $300, although the cost will be less than this.

Cleveland, O., June 9—The party of English and American automobile engineers, whose numbers had dwindled from 600 to fifty since leaving Detroit, arrived here yesterday.

Today's program included a visit to some of the more important factories in Cleveland. Among these were the works of the Foote-Burt Co., Cleveland Automatic Machine Co., National Acme Mfg. Co., Ferro Machine & Foundry Co., the White Co., and then optional visits to the Perfection Spring, Warner-Swasey, Peerless, Stearns, Winton, Baker and Rauch & Lang plants.

Buffalo, N. Y., June 10—*Special Telegram*—Today the program of the visiting party of engineers called for a visit to the Pierce-Arrow plant in Buffalo and then an afternoon at the Falls of Niagara. The party was met at the pier on arrival from Cleveland at 7.30 this morning and after breakfast on the boat, a tour was made through the Pierce factory, which is now turning out 3,500 passenger cars and trucks a year. The afternoon was spent as guests of the Pierce company at the Falls where a supper was served. The party of English engineers here broke up into three, one-third going to New York, a third going to New England and the rest scattering through the West.

A group of the American engineers and their friends before the monument at Mackinac, in uniforms secured for celebration purposes

Quaker City Team B Wins Interclub Run

Protest Has Been Lodged Against One Member of the Team

GETTYSBURG, PA., June 7—Team B of the Quaker City Motor Club, consisting of Paul B. Huyette, Peerless; S. Leon Gans, Cadillac; R. L. Murray, Packard; I. T. Shoemaker, Ford, and H. M. Lyman, Packard, captured the trophy in the interclub reliability run which was successfully conducted today under the combined auspices of the Quaker City Motor Club, the Automobile Club of Philadelphia, the Automobile Club of Germantown and the Delaware County Automobile Club, from Philadelphia to Gettysburg.

The result is subject to revision, however, as a protest has been lodged against No. 62 of the successful team on a technicality involving the eligibility of Mr. Murray's car. The protest, if sustained, would give the trophy to Team A, also of the Quaker City Motor Club, which finished second with a penalization of 21 points. The team from the Automobile Club of Philadelphia finished third, 28 points being chalked up against it. Neither the Automobile Club of Germantown nor the Delaware County Automobile Club made any entry.

The event, the first of its kind for Philadelphia's motoring organizations, proved very popular and enjoyable. Very few frills and furbelows were attached to the rules for governing the contest. Entrants were divided into teams of five cars each for each club, the team finishing with the least number of points penalization being declared the winner. Only club members who were private owners not connected with the trade were eligible to compete.

No time or place was designated for the start from Philadelphia, contestants being free to leave from any point at any time and to choose any route, the only stipulation being to check in here before 3 o'clock to escape penalization. For each minute or fraction later one point was assessed against the car.

Weather conditions favored the start, and as a consequence all fifteen cars entered competed and came through with nothing more serious than punctured tires. Rain was falling by the time Lancaster was reached, but ceased soon. By the time tops had been hurriedly adjusted it was nearly over, and the run was made more enjoyable by reason of the laying of the dust.

Most of the participants took advantage of an invitation extended by the York Automobile Club to stop over and inspect that organization's cosy headquarters. Lack of time prevented the acceptance of a similar invitation from the Pullman Motor Co.

Headquarters were established here at the Eagle Hotel, and after checking in most of the tourists kept their cars in action for trips throughout the battlefield, which presented a striking appearance with its many tents being erected for the 3-day encampment of the Civil War survivors, starting July 1.

The start for Philadelphia will be made at irregular intervals to-morrow.

Officials of the run were P. D. Folwell, referee and representative A. A. A. Contest Board; manager, Dr. J. R. Overpeck, and B. H. Kirkbride, timer. The summary follows:

QUAKER CITY MOTOR CLUB (TEAM B)

No.	Entrant	Driver	Car	Arrived Gettysburg
63	I. T. Shoemaker	I. T. Shoemaker	Ford	12:00
62	R. L. Murrsy	R. L. Murray	Packard	1:40
61	S. Leon Gans	S. Leon Gans	Cadillac	2:08
60	Paul B. Huyette	Paul B. Huyette	Peerless	2:27
64	H. M. Lyman	H. M. Lyman	Packard	2:59

QUAKER CITY MOTOR CLUB (TEAM A)

No.	Entrant	Driver	Car	Arrived Gettysburg
54	F. C. Dunlap	F. C. Dunlap	Cadillac	2:23
51	A. T. James	Ralph James	White	2:50
50	F. G. Nixon-Niedlinger	F. G. Nixon-Niedlinger	Pierce-Arrow	3:00
53	Frank Hardart	Erma Hardart	Winton	3:07
52	Frank Hardart	May Hardart	Elmore	3:14

AUTOMOBILE CLUB OF PHILADELPHIA

No.	Entrant	Driver	Car	Arrived Gettysburg
1	Thomas Devlin	Thomas Devlin	Pierce-Arrow	12:30
2	Frank Silvers	Frank Silvers	Peerless	12:45
5	R. C. Schworer	R. C. Schworer	Lozier	12:52
4	W. O. Griffith	W. O. Griffith	Pierce-Arrow	2:32
3	Harvey Boyd	Harvey Boyd	Hupmobile	3:28

Mitchell-Lewis Glidden Pathfinder

MINNEAPOLIS, MINN., June 10—*Special Telegram*—Mitchell-Lewis Co., of Racine, has offered a Pathfinder car for the A. A. A. tour which will leave Minneapolis on June 14. Frank Hirbies, the driver, is on his way from Atlanta. The official folder of tour has been issued and mailed to all prospective entrants, and A. G. Batchelder, of A. A. A. will arrive at Minneapolis next Monday night for a mass meeting enlivened by a stereopticon lecture in the commercial club on the subject of the Glacier Park and the route of the tour.

Aitken To Go with Goux

INDIANAPOLIS, IND., June 9—Because of the excellent service he rendered Jules Goux, winner of the 500-mile race at the Indianapolis Motor Speedway, Memorial Day, Johnny Aitken of Indianapolis probably will go to Europe to assist the Peugeot team during the Grand Prix. Aitken may be accompanied by Howard Wilcox, who drove the Gray Fox in the Indianapolis event.

TACOMA, June 4—That Tacoma's dirt auto race track will be in such shape as to offer opportunity for the breaking of all existing dirt track records seems to be indicated by the trials made on it by Felix Magone, driving a Fiat. Magone made the 3.5-mile circuit in 3.14, or better than a mile a minute.

LOS ANGELES, CAL., June 7—It has been definitely decided that the Panama-Pacific Road Race will start from Los Angeles at 1 minute past midnight, July 4, and finish in San Francisco on the afternoon of the Fourth. Entries close June 10 and cars entering after that time will be forced to pay a larger entry fee.

New Sunbeam for Brooklands

LONDON, ENG., June 1—Great things are expected of a new Sunbeam which will shortly be put into operation on the Brooklands track, with the express purpose of cutting out a few world's records. This machine will have a twelve-cylinder engine and will be capable of developing well over 200 horsepower. The cylinders will be 3.15 inches bore by 5.9 inches stroke, set V-fashion at 60 degrees to each other.

The angle at which the cylinders are set has an important bearing on the torque obtained, and the performance of this latest speed machine will be watched carefully to note what effect the almost perfect torque characteristic will have on the speed capabilities of the car. A little consideration will show that with twelve cylinders at 60 degrees there will be an impulse at every 60 degrees, that is, six impulses a revolution, producing an extremely smooth result at the shaft.

Columbus Club's 200-Mile Race

COLUMBUS, O., June 9.—The Columbus Automobile Club through its committee on races and contests will give the third annual 200-mile race at the Columbus Driving Park, July 4. This event is the classic dirt track race of the country and is known far and wide. Twelve entries have been received, which is the largest number that can be started on the track.

The purse for the event is $3,000, which is supplemented by a number of trophies given by manufacturers and business men. The timing will be done by the Baker electric timer. Governor Cox of Ohio is an honorary referee and Mayor George J. Karb of Columbus an honorary umpire.

In order to lay the dust, the committee in charge of the event will spread 30 tons of calcium chloride on the track. Among the cars entered are several Mercers, one of which will be driven by Spencer Wishart, the winner of the 200-mile race last year. The Smada and several foreign cars which participated in the 500-mile race at Indianapolis will also start.

The Columbus Driving Park holds all records on dirt tracks from 75 miles up to 200 miles. It is also the first dirt track in the country to stage a 24-hour race.

The committee in charge of the event consists of L. M. Browne, chairman; Frank J. Girard, F. H. Thorpe, J. C. McIntyre and J. W. Means.

NEW YORK CITY, June 11.—The Long Island Automobile Club has announced a run for its members on June 14, which will start from the club house at 2:30 P. M., and end there at 6:30. The contestants will have to touch four points in lower Long Island, and who ever does this while making a minimum mileage during the afternoon, will be declared winner of the W. C. Bolton trophy.

French Grand Prix Has 36 Cyclecars

Most Are Two-Cylinder Types—Race on July 13

PARIS, FRANCE, June 4—Final entries for the French cyclecar Grand Prix race at Amiens have closed with a total of thirty-six machines. These comprise twenty-five cyclecars of 1,100 cubic centimeters cylinder capacity; one of 750 cubic centimeters; seven cyclecars or sidecars of 1,444; one of 750 and two of 500 cubic centimeters. All these machines will race together, but there will be distinct awards for each class. This is the first occasion on which cyclecars have been united for a pure speed contest on the open road. Doubtless, as the result of this contest this already popular type of vehicle will experience a boom.

Practically all attention has been centered on the 1,100 cubic centimeter class (67.1 cubic inches), showing that this type of machine is the one with the greatest future. Sidecars, which are exceedingly popular in England, and have met with a little favor in France, are allowed to race with the cyclecars. Nevertheless only six of these machines have been entered. A team of four Morgan machines, which are officially placed in the sidecar class are really three-wheel cyclecars. The French regulations, however, do not consider three-wheel machines as cyclecars.

A small number of four-cylinder motors have been entered in the race.

At present the twin cylinder motor holds the greatest amount of favor. The single is not fashionable, and the four-cylinder is either too costly to manufacture or is looked upon as not so efficient as a twin of equal cylinder capacity. A few of the firms make four-cylinder motors but prefer to put a twin in the race.

The cyclecar race will be run on the afternoon of July 13, being the day following the big car race. The course is a triangular one shortened from the big car course, with the same grandstands and tire pit arrangements. Fifteen rounds have to to be covered, giving a total distance of 163 miles.

Complete Entries French Grand Prix Cyclecar Race.

No.	Car	Type and Cooling	Bore and Stroke, Mm.	Driver
1	Bedelia	twin cyl. air	82 x 100	Bourbean
2	Bedelia	twin cyl. air	82 x 100	Bonville
3	Bedelia	twin cyl. air	82 x 100	Contenet
4	Bedelia	twin cyl. air	76 x 82	Prevot
5	Violet-Bogey	twin cyl. water	73 x 130	Violet
6	Violet-Bogey	twin cyl. water	73 x 130	
7	Mathis	4-cyl. water	58 x 100	Mathis
8	Ronteix	4-cyl. water	62 x 80	
9	Noel	2-cyl. air		L. Noel
10	Du Guesclin	4-cyl. water	58 x 100	Du Guesclin
11	Automobilette	2-cyl. water	78 x 130	Ducrusel
12	Automobilette	2-cyl. water	78 x 130	Choudy
13	Super	twin cyl. water	74 x 120	Leveque
14	Violet-Bogey	twin cyl. water	73 x 130	
15	La Roulette	2-cyl. air	85 x 95	
16	Bolton-Precision	2-cyl. air	86 x 96	David C. Bolton
17	G. N.			
18	G. N.			
19	Duo Car	2-cyl. air	85.5 x 95	A. Francis
20	Duo Car	2-cyl. air	85.5 x 95	
21	La Roulette	2-cyl. air	85 x 95	
22	Sphinx-Globe	single, air	108 x 132	Canouel
23	Sphinx-Globe	twin water	90 x 77.5	
24	Marlborough	4-cyl. water	59 x 100	Samuelson
25	Routeix	4-cyl. water	62 x 80	
26	Dew	2-cyl. air	85 x 88	W. D. Hawkes
27	Morgan	2-cyl. air		W. G. McMinnies
28	Morgan	2-cyl. air		N. F. Holder
29	Morgan	2-cyl. air	90 x 77.5	Morgan
30	Morgan	2-cyl. air	90 x 77.5	
31	Rene-Gillet	sidecar		
32	N. S. U.	sidecar		
33	Rene Gillet	sidecar		
34	Clyno	sidecar		
35	B. S. A.	sidecar		
36	Regal Green	sidecar		

Paris Show To Open October 17

PARIS, June 4—Paris will this year open the European show season with its annual exhibition in the Grand Palais, the inauguration of which has been fixed for Friday, October 17, and the closing day for Monday, October 27. The show will thus be open on 11 consecutive days, including 2 Sundays. The date chosen for this year's show is the earliest yet adopted for any motor exhibition in Europe. Henri Cezanne, who will again act as general manager of the Paris show, declares that this early show will allow the factories to gain practically 2 months. In France there is no important fall trade such as the American manufacturers enjoy. Thus, as soon as the active touring season is over there is a slackening off in factory activities and work is not taken up at full pressure until after the Paris show. By changing the show from December to October it is believed that this slack season will be reduced by 2 months.

Owing to the earlier date, there will probably be a smaller number of Parisians at the Paris show, but it is believed that the foreign visitors will be largely increased. Numbers of foreign visitors have not returned home in the month of October, and during this season buyers from business houses in all parts of the world are usually to be found in the French capital.

In its main features the Paris show will be similar to that of last year. It is organized by a joint committee representing the five leading trade associations of France and is run on a profit-sharing basis. Both pleasure cars and commercial vehicles are admitted, but the machine tool section has been abolished for lack of space. Accessory dealers are divided into two distinct classes: those manufacturing the goods they show and agents for other firms' goods. The minimum size of stands has been increased to 107 square feet, this having been done to make the cost of exhibiting too high for small dealers whose goods had but a slight connection with the automobile. The maximum size of stands is 861 square feet on the ground floor and 645 square feet on the first floor. All firms taking part in the Paris show must sign an agreement not to exhibit at any other show during the year in France or Algeria. Formerly this interdiction was only applied to the district around Paris. It has been extended to the whole of France in order to kill the small provincial shows which were springing up in all directions.

This year's show will be as brilliant as any of its predecessors. A very artistic uniform type of decoration will be adopted, and a considerable amount of money will be spent on illuminations. The opening ceremony will be performed by the president of the republic attended by most of the ministers. As the show lasts but 11 days, instead of 3 weeks as formerly, no free passes will be given out on the opening day. This will enable dealers to get to business immediately, whereas under present arrangements the hall has been so crowded with mere sightseers on the first day that no attempt could be made to transact business. The price of admission will be $1 on the opening day and on the following Friday and 20 cents on all other days. Instead of closing at 6 o'clock the show will keep open until 7 o'clock each evening.

The Paris show heading the list, there is every indication that the number of foreign exhibitors will be larger than usual. Naturally the entire French trade will be represented, and it is expected that English makers who have hitherto held somewhat aloof, will be present in big numbers. From inquiries having already been received from across the Atlantic, it is anticipated that American manufacturers will be present in big numbers. The French aviation show, which has previously preceded the automobile show, will this year be held in the Grand Palais during the month of December.

Humber Breaks Brooklands Records

LONDON, ENG., May 28—New figures in the short records of the Brooklands cubic capacity classes have recently been put up by the remarkably fast performance of the little 11.8-horsepower Humber, which succeeded in covering the flying mile in 44.56 seconds, representing a speed of 80.9 miles per hour. The dimensions of the four-cylinder engine fitted to this car are 2.77 inches bore by 5.12 inches stroke, giving a capacity of 123.6 cubic inches, which places it in Class B, for engines not exceeding 125 cubic inches.

The previous holder of the shorter records in this class was the Calthorpe, whose speed for the flying mile was 74.29. The Calthorpe engine, however, was slightly smaller than the Humber, having a bore and stroke of 2.74 inches by 4.92 inches giving a capacity of 115.7 cubic inches, well within the maximum for the class.

The short records captured by the Humber are: the flying half mile in 22.07 seconds, a spurt at the amazing speed for so small a car of 81.56 miles per hour; the flying kilometer in 27.44 seconds and the flying mile in 44.56 seconds. Besides these a new record for the ten-lap standing start was registered at the speed of 76.45 miles per hour, a gain of nearly 10 miles over the speed of the previously standing figure put up by the D. F. P. car with an engine of almost identical dimensions.

Court Upholds Hopewell

Rules That Vehicle Apron and Hood Co.'s Tire Cases Infringe His Patents

NEWTON, MASS., June 9—That the tire cases manufactured and sold by the Vehicle Apron and Hood Co., and handled in Massachusetts by the Linscott Supply Co., infringe patents Nos. 854,215 and 881,411 owned by Frank B. Hopewell of Hopewell Bros., Newton, Mass., was decided by Judge Dodge in the U. S. District Court of Massachusetts. The court stated that the three essential points covered by the two Hopewell patents mentioned were the annular form of the tire cases, the overlapping of the free edges of the sections which enfold the tires carried in the cases and the use of a cord in a longitudinal pocket, dispensing with the necessity of buttons and similar individual fastening devices. The combination of these features is original with the Hopewell patents, the court observed, and whatever evidences of prior art were referred to by the defendant did not embody that combination. There is even but one previous patent describing an endless tire case, that being Sloper's British letter of 1904, but this was considered impracticable by the judge. Other attempts made by the defendant to show that he made tire cases covered by the patents in 1905, while the alleged date of invention of the subject of the Hopewell patents was March 12, 1906, failed to be recognized as valid and convincing by the court, and plaintiff was entitled to an injunction restraining defendant from making and selling cases.

Ford Inforcing Cut-Rate Injunction

DAYTON, O.—A new phase was brought out by the Ford company in their nation-wide fight against the price-cutters today, when contempt proceedings were filed against the Union Motor Sales Co., of Dayton, O.

In the contempt proceedings the Ford people allege that the Union Sales Co. is guilty of violating the preliminary injunction issued in Judge Hollister's court here a few months ago. The petition was filed by Alfred Lucking and William Lucking of Detroit and Alfred M. Allen of Cincinnati, their attorney, against the Union Sales Co., Lucien A. Seward, its general counsel, and O. D. Nobel and H. J. Street, its sales managers.

In support of its charges the Ford Company filed with the court affidavits from residents of Wapakoneta, O., and St. Marys, O., whom the Ford company claim the Union Sales Co. called upon to have them buy cars at a price $50 to $500 lower than the regular retail price. An affidavit was filed from a newspaper at Wapakoneta to prove the assertion that an advertisement had been printed stating the cars would be sold for the low price. The court orders the defendant to appear June 26.

DETROIT, MICH.—While it has been announced definitely in some sources that the Ford Motor Co. is to equip all of its cars next year with wire wheels, James Couzens states that it has not yet been definitely decided to shift to this type of wheel although it is being seriously considered.

Grant Patent Owners Threatened

NEW YORK CITY, June 9—The preliminary injunction recently granted by Judge Ray in the U. S. District Court to James D. Hurd, the Consolidated Rubber Tire Co., and the Rubber Tire Wheel Co. against the James Goold Co., was reversed on appeal to the U. S. Circuit Court of Appeals, Second Circuit, New York. Judges Lacombe, Coxe and Noyes, who heard the case, were of the opinion that the three respondents who were maintaining suits against several New York tire dealers despite an order enjoining them from conducting such suits, were exposing themselves to the possibility of contempt of court proceedings, although the decision given by the tribunal admits the validity of the Grant patent in question. The judges were also of the opinion that the Goold tire infringed the Grant patent.

Court Sustains Prest-O-Lite Injunction

INDIANAPOLIS, IND., June 9—In the federal court here, Judge Albert B. Anderson has denied a petition of the Searchlight Gas Co. that an injunction against it in favor of the Prest-O-Lite Co. be suspended pending an appeal of the case to the United States Court of Appeals.

Judge Anderson at the same time entered a final decree in the case. The Searchlight company is perpetually enjoined from refilling Prest-O-Lite gas tanks before the Prest-O-Lite trademark is obliterated. Judge Anderson held refilling the tanks before the trademark was removed would be an infringement of trademark rights and unjust and unlawful competition.

NEW YORK CITY, June 9—In the Appellate Division of the N. Y. Supreme Court, the Searchlight Gas Co. argued against the Prest-O-Lite Co., against the latter's complaint that Prest-O-Lite tanks had been filled with Searchlight gas and that this action constituted a violation of the New York business law, trademark section.

The argument of the Searchlight Co. was fourfold: First, that the trademark law protects only foods, drugs and medicines, and that acetylene is not included among these; second, that only such products as come in a wrapper of no value are protected, while the law does not refer to products coming in a container sold like the Prest-O-Lite Tank; third, that the words of the Prest-O-Lite trademark refer to the tank and not to the gas in it; fourth, that the Prest-O-Lite Co. is a foreign corporation in the state of New York and as such is excluded from the benefit of the trademark law.

CINCINNATI, O., June 9—When the involuntary bankruptcy proceedings of the Eiseman Magneto Co. *et al.* vs. the Ohio Motor Car Co. came up for a hearing before Judge Hollister today on the motor car company's motion to dismiss and on objections filed to the motion by one of the creditors, the Judge after hearing the arguments denied the motion to dismiss and ordered the company to plead further.

The attorneys in support of their motion to dismiss the case argued that as the creditors of the motor car company had accepted a dividend of 15 per cent. on their claims in the receivership proceedings in the Hamilton county common pleas court that acceptance harred them from maintaining proceedings in bankruptcy.

Automobile Securities Quotations

Securities quotations were without an exception lower than last week. There were fallings off throughout, led by rubber stocks, Firestone common declining 29 and Goodyear common, 15 points. Studebaker and Willys-Overland also suffered severe setbacks. The entire movement was the result of the railroad decision rendered this week.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	110	115	150	..
Ajax-Grieb Rubber Co., pfd	90	97	95	100
Aluminum Castings, pfd	100	..	98	100
American Locomotive Co., com	42	42½	27	28
American Locomotive Co., pfd	106	108¾	100	102
Cbalmera Motor Company, com	..	..	125	135
Chalmers Motor Company, pfd	..	..	98	102
Consolidated Rubber Tire Co., com	15	17	12	18
Consolidated Rubber Tire Co., pfd	55	60	60	75
Firestone Tire & Rubber Co., com	269	271	230	240
Firestone Tire & Rubber Co., pfd	106	108	105	107
Fisk Rubber Company, com	..	..	..	..
Fisk Rubber Company, pfd	..	..	..	100
Garford Company, preferred	99	101	..	97½
General Motors Company, com	34	35	24	26
General Motors Company, pfd	74	75	70	72
B. F. Goodrich Company, com	81½	82	25	26
B. F. Goodrich Company, pfd	108½	109	88	89
Goodyear Tire & Rubber Co., com	269	271	..	302
Goodyear Tire & Rubber Co., pfd	100	105	98	99½
Hayes Manufacturing Company	..	104	..	90
International Motor Co., com	27	32	4	6
International Motor Co., pfd	90	94	10	15
Lozier Motor Company, com	45	55	15	20
Lozier Motor Company, pfd	..	..	..	92
Maxwell Motor Co., com	..	..	2	5
Maxwell Motor Co., 1st pfd	..	..	30	35
Maxwell Motor Co., 2nd pfd	..	..	8	12
Miller Rubber Company	159	161	135	145
Packard Motor Company	104½	106½	95	100
Peerless Motor Company, com	..	..	45	50
Peerless Motor Company, pfd	..	..	..	96
Pope Manufacturing Company, com	30	31	10	12
Pope Manufacturing Company, pfd	75	76½	40	46
Portage Rubber Co., com	..	..	35	40
Portage Rubber Co., pfd	..	..	90	95
Reo Motor Truck Company	8	10	..	11¾
Reo Motor Car Company	23	24	20	22½
Rubber Goods Mfg. Co., pfd	..	..	100	110
Studebaker Company, com	36½	38	20	23
Studebaker Company, pfd	95½	96	82	85
Swinehart Tire Company	100	105	85	90
U. S. Rubber Co., com	..	..	53	54
U. S. Rubber Co., 1st pfd	..	..	100	100½
White Company, preferred	107½	108¼	107	110
Willys-Overland Co., com	..	..	50	55
Willys-Overland Co., pfd	..	..	76	85

Chevrolet Buys Little

To Make 8,500 Cars for 1914—All Cars Now To Be Named Chevrolet

DETROIT, MICH., June 10—*Special Telegram*—The Chevrolet Motor Co. has purchased the entire business of the Little Motor Car Co., Flint, Mich., both being subsidiary to the Republic Motor Co. By the terms of the transfer the Little company goes out of existence as a separate, affiliated concern of the Republic Motor Co., and the cars made in the Little plants will henceforth bear the name of Chevrolet. The factory buildings occupied by the Little company in Flint were formerly the Imperial Wheel Works and the Randolph motor truck plant. The absorption of the Little concern takes effect immediately and the move is due to a plan for centralizing the manufacture of Chevrolet cars in Flint. It is proposed to make a complete line of cars there and the factories are to be in operation by August 1 with a schedule of 8,500 machines for 1914 ranging in five models from the small roadster selling at $690 to a six-cylinder type at $2,500. This will include several new models.

The Chevrolet company controls the sources from which it obtains motors and other parts. Its authorized capitalization is $2,500,000, of which $500,000 is preferred stock and the balance common. Along with the other changes several have been made in the personnel of the Chevrolet organization. N. W. C. Durant, formerly president of the concern, takes the first vice-presidency, while C. M. Begole assumes the duties of president. W. H. Little, who was general manager and second vice-president, leaves the organization entirely, and A. B. C. Hardy, who was general manager of the Little company, takes over the complete general managership and becomes a vice-president. C. R. Hatheway remains secretary, while W. S. Ballenger succeeds Dr. E. R. Campbell as treasurer. T. S. Johnston will be general manager of sales.

DETROIT, MICH., June 11—*Special Telegram*—The machinery, stock and equipment of the Flanders Mfg. Co., Pontiac and Chelsea, Mich., which went into the hands of the Detroit Trust Co., as receiver some time ago, have finally been sold to Harris Bros. & Co., Chicago, Ill., for the lump sum of $225,000. This concern has also secured a 3-months option on the plant and land for $175,000. The receivers will distribute a 25 per cent. dividend to the Flanders creditors next month, while another is expected to be given out in the fall.

Willys Reduces Hours But Not Pay

TOLEDO, O., June 9—John N. Willys has established a precedent in the automobile industry by announcing a general reduction of working hours throughout the Overland factories in Toledo, Lima, Elyria and Elmira, without a reduction of wages. The announcement provides for the substitution of the 54-hour week by a 50-hour week, all wages paid now remaining the same.

New Western Freight Rates

NEW YORK CITY, June 11—The Western Classification Committee which held a session in St. Louis during last April, has made several changes in railroad rates which will take effect on June 30. Below, the alterations as given out by James S. Marvin, general traffic manager of the Automobile Chamber of Commerce, are enumerated:

Article	Present Rate	New Rate
Chains, automobile tires in bbls. or boxes:	Less carloads. 1st class	Less carloads, 2nd class.
Fire apparatus, self-propelling.	Carloads, minimum, 24,000 lbs. Class A. Less carloads, various ratings as originally intended for horse-drawn and hand apparatus.	Specific rating installed on same basis as automobile rates, viz.: Less carloads, D-1. Carloads, 10,000 lbs. min., subject to Rule 6-B, 1st class.
Folding tops:	1½ times 1st class, carloads or less carloads.	Folded flat, in boxes or crates, less carloads 1½ times 1st class. In packages named, carload min. weight 10,000 lbs., subject to Rule 6-B, 1st class.
Automobile springs:	2nd class, carloads or less carloads.	In boxes, bundles or crates, less carloads, 2nd class. In packages, or loose, carload minimum weight 36,000 lbs., 3rd class.
Front axles, mufflers and radius rods:	Axles, 2nd class, carloads or less carloads. Mufflers and radius rods 1st class, carloads or less carloads.	Front axles, in bundles or loose, less carloads 2nd class. Mufflers, in bbls., boxes or crates, less carloads 1st class. Radius rods, in boxes, bundles or crates less carloads, 1st class. Front axles, mufflers and radius rods, in packages, or loose, straight or mixed carloads, min. weight 30,000 lbs. 3rd class.
Rear axle assembly with drive shaft attached:	1st class, carloads or less carloads.	In crates, less carloads, 1st class. In packages or loose, carload minimum weight 30,000 lbs., 3rd class.
Fenders, mudguards, mud shields or running boards, steel finished:	1st class, carloads or less carloads.	In boxes or crates, less carloads, 1st class. In packages or loose, straight or mixed carloads, minimum weight 30,000 lbs., 3rd class.
Frames:	1st class, carloads or less carloads.	Loose, less carloads, 1st class. Loose, carload minimum weight, 20,000 lbs., subject to Rule 6-B, 3rd class.
Dashes and steering gears:	1st class, carloads or less carloads.	In boxes or crates, less carloads, D-1. In packages or loose, straight or mixed carloads, minimum weight, 30,000 lbs., 3rd class.
Automobile wheels:	Without rubber tires: Finished, in boxes, crates, or wrapped, carloads or less carloads, 1½ times 1st class. In the white, loose, carloads or less carloads, 1st class.	Without rubber tires. Finished, in boxes, crates or wrapped, less carloads 1½ times, 1st class. In the white, loose, less carloads, 1st class. In the white or finished, in packages or loose, carload minimum weight 30,000 lbs. 3rd class.

Market Changes for the Week

Another break in tin occurred this week, due to small demand on large lots. A drop of $.75 was followed by lower prices and better demand for small lots, closing on Tuesday at $45.50 per hundred pounds. Lead was quiet and irregular, dropping $.02 1-2 per hundred pounds, closing at $4.32 1-2. The main feature of interest in the copper markets last week was the liquidation of speculative contracts of standard on Tuesday in London with a sympathetic lowering in prices and dullness in New York City. Electrolytic and Lake dropped $.00 1-8 and $.00 1-4 a pound respectively. Linseed oil dropped on Friday to $.47 at a loss of $.01. The situation in the market for petroleum underwent no change last week. The consumption continues liberal and the market retains a firm tone. Cottonseed oil fluctuated throughout the last week, the highest price at $7.22 and its closing price at $7.21 at a gain of $.06 per barrel.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.	.07½	.07½	.07½	.07½	.07½	.07½	....
Beams & Channels, 100 lbs.	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	26.50	26.50	26.50	26.50	26.50	26.50	....
Copper, Elec., lb.	.15⅛	.15	.15	.15	.15	.15	—.00⅛
Copper, Lake, lb.	.15½	.15½	.15¼	.15¼	.15¼	.15¼	—.00¼
Cottonseed Oil, lb.	7.15	7.18	7.22	7.21	7.16	7.21	+.06
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil, Menhaden, Brown	.34	.34	.34	.34	.34	.34	....
Gasoline, Auto, 200 gals.	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime	.95	.95	.95	.95	.95	.95	....
Lead, 100 lbs.	4.35	4.35	4.35	4.35	4.35	4.32½	—.02½
Linseed Oil	.48	.48	.47	.47	.47	.47	—01
Open-Hearth Steel, ton	26.50	26.50	26.50	26.50	26.50	26.50	....
Petroleum, bbl., Kansas crude	.88	.88	.88	88	.88	.88	....
Petroleum, bbl., Pa., crude	2.50	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	....
Silk, raw Italy	....	4.35	....	....	4.45	4.50	+.15
Silk, raw Japan	......	3.70	....	....	3.80	3.75	+.05
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb.	46.00	46.00	46.00	46.15	45.50	45.25	—.75
Tire, Scrap	.10	.10	.10	.10	.10	.10	....

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S.A.E. Keeping Up-to-Date

LAST week's session of the Society of Automobile Engineers and the visiting members of the Institution of Automobile Engineers of the British Isles gave many evidences of the efforts made by the engineers to have their respective organizations leaders in the work of meeting exigencies or engineering conditions as they may arise in the automobile field. Many of the papers had a distinctly up-to-date atmosphere, dealing particularly with current movements in the industry. The paper and discussion on wire wheels, the use of metal wheels for motor trucks, and discussions on batteries for starting, indicated well the society's activity.

This activity might have gone a step or two farther and dealt with other subjects that are of paramount importance today. Time could have been spent to the greatest advantage in a general session on self-starters. At the last automobile show the self-starter was the word on the lips of everyone, and, although there was very general ignorance on the subject then it is equally certain that there is much today to be learned. No topic should have been of greater interest to the engineers in general, and no better opportunity will be afforded before the new models are out for going into this starter situation.

One other movement gives promise of receiving more attention during the next few months, namely, gear-shifting devices in which neither lever nor pedal is used. Not a few makers are looking into the question in an exhaustive manner and a good compilation on the subject, bringing it up to the present, would have been valuable to all members of the society.

The committees of the S. A. E. continue to do their valuable work of standardization as well as research. The work of a committee must always be considered the life-blood of an organization, and no better thermometer of health and activity can be had than the committee work.

One of the visiting engineers gave the excellent suggestion of carrying the standardization work into factory construction, into factory equipment and into factory operation. His plan carries with it the standardizing of all units comprising the factory. It goes further and deals with standardizing overhead shafting for driving machinery, suggesting that all electric motors be of uniform power, that all shafting be in uniform lengths or multiples of a given unit; that hangers for the shafting bearigns be standardized, so that in case any factory rre-arrangements become necessary it is possible to make changes with practically no expense and in a comparatively short time, whereas with a non-standardized factory arrangement each change or re-arrangement of machinery, or of a department from one part of the factory to another means a loss of valuable time and a considerable amount of money expended in addition.

American factories can take up such a movement and such a step lies within the zone of the S. A. E. in that the society has already dealt not only with questions of design and production but also with the merchandising of the product.

While congratulating the society on the excellent work it is doing, on its good financial condition and also on its steady growth in membership it is nevertheless true that more continuity of effort might be displayed in following up topics successively at later sessions. A year ago the question of arranging for some standard form of motor testing was gone into. At the January session a report was made but at the present session this work was largely neglected and the report passed on to the winter session. Motor testing is a most important feature, particularly in these days when higher motor efficiency is demanded. Many of the factories acknowledge how deplorably weak they are in adequate testing equipment. Because of this the subject should be vigorously pushed at each general session of the society.

Another criticism of the program of last week was that there were too many papers and not enough discussion. Every member agrees that discussion is the life of any subject. Discussion analyzes a subject for those who have missed the exact perspective of the question as presented in the address or paper read. When too many papers are read there is not enough time for free discussion. One of the policies of the I. A. E. is that one paper with discussion is sufficient for a 3 or 4-hour session. This is good policy for the S. A. E. to follow. If papers are not of sufficient importance to develop discussion then printing them in the S. A. E. Bulletin is sufficient. Many members are prevented from entering into discussions largely because they are aware of the lack of time. It is generally true that when several papers are read at one session the auditors become too tired to follow with the requisite mental alertness.

To Teach Massachusetts Children Safety

Movement Similar to American Museum of Safety League's Work in New York.

BOSTON, MASS., June 2—Motor accidents in which children are the victims will undoubtedly be decreased in Massachusetts in the near future due to the splendid plan outlined by the officers of the Automobile Legal Association and carried out successfully. It is a campaign of education, one not undertaken with the idea of advertising the organization, but solely to decrease accidents. Already it has cost the organization several hundred dollars, but the money has been well expended, for school children all over the state are now memorizing 10 simple rules for their own protection. Already more than 35,000 copies of them have been distributed upon request and the demand still continues. Miss Ripley of the Boston School Committee proposes to set the rules in rhyme and have the children sing them so that they may be memorized more easily and quickly before the vacation season begins.

Early in April the association sent the following letter to all the superintendents of schools in Massachusetts, and to the editors of various newspapers, also its members:

Dear Sir:—As the automobile season is about to begin and the streets of cities and towns will be soon crowded with that class of vehicles, we desire to inaugurate some sort of a movement by which school children and automobilists may co-operate for their mutual safety and the protection of school children in every possible way. This is a very large problem, which we are well aware will cost a great deal of money, but our association is now in a position to assist in this matter, and we write to ask if you will favor us with your suggestion as to how this best can be accomplished.

We have under contemplation a proposed set of say, six, eight or ten short rules with the idea of sending these rules to the school authorities of the cities and towns of Massachusets, asking them to have the children memorize them and repeat them in school at least once each week, but it seems to us if we go one step further and organize the children in some sort of a protective league, and make them feel that they are part of an organization which exists for their protection and interest, the movement would be more successful. We, of course, do not expect that education is needed by the children alone, and we are well aware that many automobilists need to be aroused to the necessity of greater care on their part, but the greater need of education, in our opinion, lies in the direction of pointing out to children who have not reached the age of discretion, a way in which they can co-operate with the movement. Hoping that we may hear from you at your earliest convenience with any suggestions that you may be able to think of, we remain.—AUTOMOBILE LEGAL ASSOCIATION.

The result was astonishing. The school authorities took it up from Boston to the end of the state. Suggestions came pouring in from many places giving the plan a good impetus. With this state the officials of the A. L. A. began their plans. The wheat was sorted from the chaff and so another letter was sent out this time to the superintendents of the schools. It said:

Dear Sirs:—Recently we mailed a letter to you asking for suggestions as to the best way to decrease the large number of automobile accidents to school children. Two suggestions, among many, have been made by a majority of the superintendents. The first is that an appropriate sign be erected from 200 to 300 feet on each side of school buildings. The second is that it would be well to have from eight to ten short rules printed on light cardboard and distributed to the pupils while in school each week until memorized.

From the replies received and from our own experience, we are convinced the sign should have the word "school" in large white letters on a red background. Such a sign would at once flash on the mind of the automobilist the thought of danger and of caution. In order that the interest of the children in this movement may be aroused at once, the suggestion has been made that we offer prizes to the children in the grammar schools, including all grades, for the best set of rules furnished. As we are looking for the idea rather than for perfect English—grammar and composition need not necessarily be considered. Each rule must not contain more than fifteen words.

We offer for the first prize, $25; for the second, $15; for the third, $10; for the fourth, $5, and for the next fifteen, $1 each, for a rule on each of the following suggestions:

1. What should a child do *before* crossing a street?
2. If playing in the street, what should a child keep in mind?
3. Why should a child not play in a street frequently used by automobilists?
4. What should a child do if standing in the middle of the street and automobiles are coming both ways?
5. What danger is there in stealing a ride upon an automobile?
6. In case a child, or any person is struck by an automobile what is the first thing to do?
7. Should a child throw a stone at an automobile and why?
8. Should an older child look after a younger and why?

These suggestions might be copied on the blackboard by the teachers for the guidance and assistance of the children in writing the rules. It may interest you to know that we shall also publish, at the same time the rules are finally adopted, a number of similar rules for the guidance of motorists. We ask your immediate co-operation in seeing that these rules actually originate with and are written by the children, whose full name and address should be given. Kindly impress upon the teachers that this contest will close on May 1 next.

After the rules received have been finally adopted we will notify you to that effect and give you the opportunity to order as many of them as you like, mailed to you at our expense.—AUTOMOBILE LEGAL ASSOCIATION.

Again the co-operation on the part of the school authorities was such that the suggestions were received and put into practice. Immediately there began the contest for the prizes from all over the state, for the teachers realized what a great benefit it would be to train the children to protect themselves while on the streets, particularly during the summer vacation. The association then took up the suggestion relative to signs and to all the mayors of cities and the chairmen of the boards of selectmen in every town throughout Massachusetts there were mailed letters seeking their co-operation.

Many replies have been received favoring this suggestion. Meanwhile the contest for the prizes offered by the association went merrily on. It was finally decided and the winner was a boy of 10 years of age. The winners represented cities and towns from one end of the Bay State to the other. Second, third and fourth prizes went to girls. The work will be resumed in the fall when the children return to school.

This movement is similar in its aims and purposes to the work being carried on by the American Museum of Safety, which has headquarters at 29 West Thirty-ninth street, New York City. For the past 8 months this organization has been engaged in conducting an educative campaign in the New York schools, endeavoring to instill into the school children an understanding of the dangers of traffic so that they may be persuaded to give up the street as a playground and especially to abstain from such dangerous pastimes as tag, roller skating, pushmobiling and "hitching on behind" automobiles and motor trucks.

Both organizations realize that due diligence in the operation of automobiles is only a casual factor in the situation. The criminal negligence of pedestrians and children is largely responsible for the increasing number of accidents in vehicle traffic. Restrictive legislation aimed at automobile owners and drivers is not the remedy required. The education of school children is the most logical method of approaching the trouble for when handled intelligently the serious side of the matter and the possibility of maiming or loss of life are impressed upon their minds in such a way that they instinctively protect themselves by increased carefulness.

How Children May Avoid Accidents

1—Before crossing a street, stop. First look to the left, then to the right, and if safe, go ahead.

2—If playing in a street remember you have selected the most dangerous place possible, and that the public streets are not made to play in.

3—In playing in the street bear in mind that automobiles come swiftly and silently, and, if they strike you, are very apt to kill you.

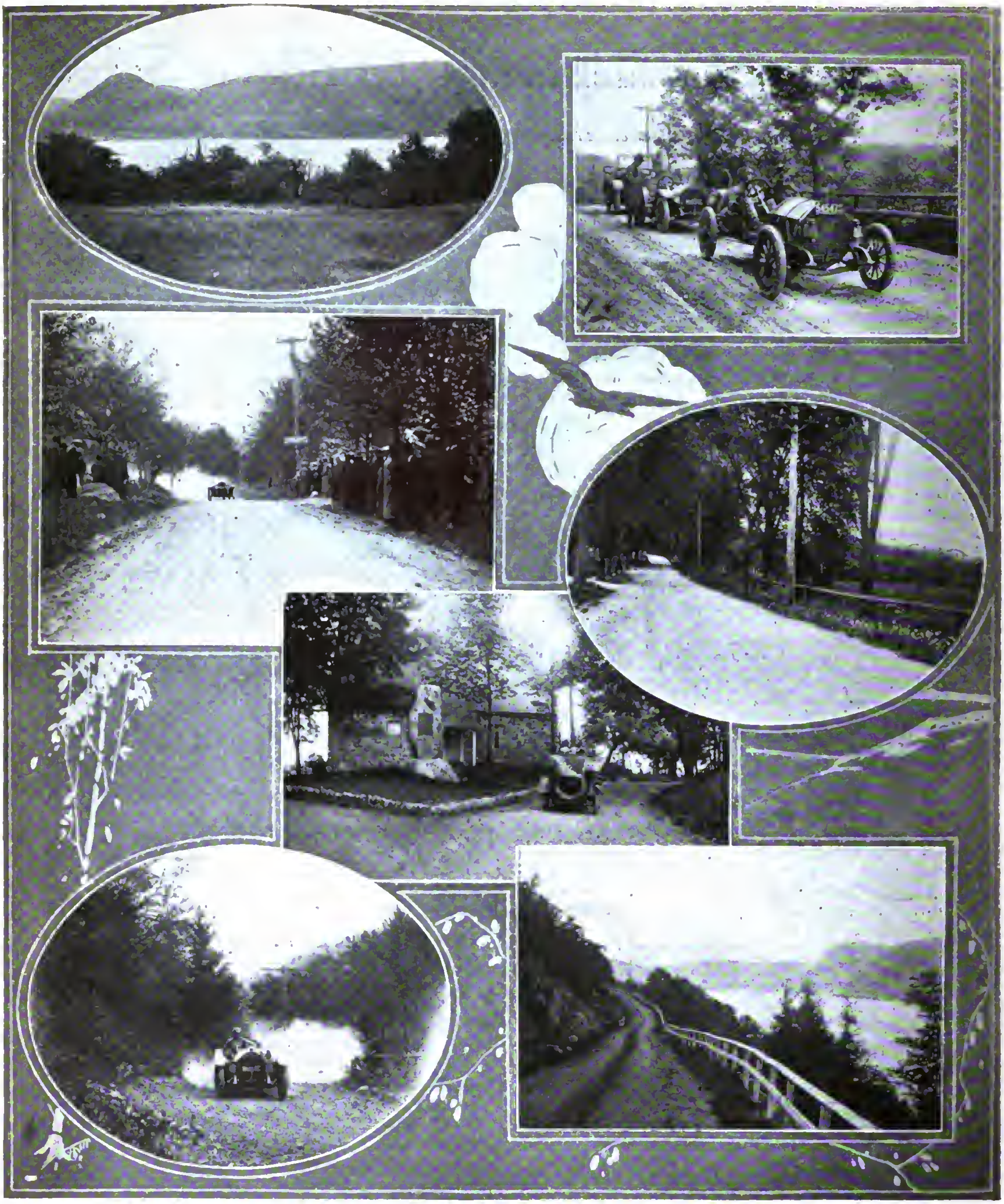
4—If standing in the middle of the street and automobiles are coming both ways, keep perfectly still.

5—The danger in stealing a ride is that if you are not thrown off, you are apt to be run over by another vehicle when you jump off.

6—In case anyone is struck by an automobile, first take the number, but be sure you take it accurately.

7—If you throw a stone at an automobile you may injure the occupants, or cause the driver to lose control; besides it is mean and cowardly. Don't do it.

8—Always look after a younger child because the younger cannot think quickly and does not know the danger.



SCENES along the road on the recent Catskill Reliability Run, held by the Motor Dealers' Contest Assoc. of New York City. The trip was an ideal one and the eleven cars had the best of weather conditions and fine roads on their 262-mile trip. The first afternoon's run to Newburgh was an economy contest and also a reliability run. This was won by the Paige-Detroit. The second day's run was divided into forenoon and afternoon runs. The forenoon run was from Newburgh to Haines Falls in the Catskills. This occupied but a part of the time, the remainder being taken up with a hill-climb, in which each vehicle had to compete, the driver alone riding. The Mercer won this. The afternoon run of the second day was made over good roads back to New York City by way of Newburgh and Tuxedo. At the finish when the eleven cars were checked, eight had perfect road scores. The economy contest proved one of the most interesting, in that the method of determining the winner gave the small car practically an equal chance with the largest machines. It would be difficult to select a better 65 miles for a fuel test.

ABOUT 5,000 children of assorted ages, colors and nationalities, from twenty-five of the city's institutions journeyed in automobiles from New York city to Glen Island on June 5. This was the ninth annual Orphans' Day of the Orphans' Automobile Day Assn. of New York. It required 344 motor vehicles of all kinds and descriptions to transport the children from the lower end of Central Park up Broadway and over to Glen Island, where they had luncheon and also visited all the various amusement places at that resort, returning to town, tired but happy, in time for supper. This outing was the largest of this character ever held. The time and effort which had been expended in making it possible by S. A. Miles, the association's president; Senator W. J. Morgan, W. S. Silver, F. J. Griffin, J. J. Korbel, R. H. Smith, H. A. Bonnell, P. B. Pugh and others of its officers and directors were more than repaid, however, by the delight which the day in the country under perfect June skies brought to the little orphans. The pictures show the little ones in passenger and commercial cars and having a good time generally.

Operators' Licenses Are Revokable in Bay State

Three Speed Convictions Per Year a Reason—Police Officers Report to Highway Commission of Accidents

By J. T. Sullivan

BOSTON, MASS.—In whom should the power of suspending or revoking licenses to operate a motor car be vested? This question has created considerable interest during the recent legislative sessions where there has been an effort made to alter the law. Where the aim has been to vest this authority in one person, there has been general opposition to such a movement; but, on the other hand, where the power rests with a commission there has been a more general feeling of safety on the part of the motorists. In this state the power to control motor vehicles is vested in the Massachusetts Highway Commission, and has been for some years, and up to the present time there has been no complaint about the way it has handled cases. The general automobile law vests the commission with power to do this work, and under certain sections the law operates automatically in the suspension or revocation of a license. Last year the commission suspended or revoked 546 licenses. This was 186 more than in 1911, when 360 licenses were taken up. Some were given hearings, either by requesting them or by being notified by the commission to appear after the investigators had made their report on a matter.

On the question of speeding the law provides for a speed that is reasonably safe and proper at 20 miles on the highways, 15 miles in thickly settled districts, and 8 miles per hour at intersecting ways or where the view is obstructed.

Limited Fines for Park Speeders

Then there are the park regulations as to speed. If anyone is convicted three times in any calendar year of violating these provisions of the state law it provides: "The commission shall forewith revoke the license of the person so convicted, and no new license shall be issued to such person for at least 30 days after the date of such conviction, nor thereafter except in the discretion of said commission." This section is intended to check the speeding motorists, and as the commission may withhold the license indefinitely, why it can rule the motorist off the road as long as it wants to do so. Last year but one license was suspended, and but two in 1911, which shows that after a person has been convicted once or twice he is very careful not to get caught again because he knows it means a loss of his license, which is more of a deterring factor than the fine.

The fines for such speeding is not more than $25 for first offense—the minimum fine being dropped this year—$25 to $50 for second and $50 to $100 for third offense. In some instances cases may be filed, but there is no imprisonment. As the courts send a record to the commission the motorist cannot dodge it unless he gives another name or commits perjury.

It is under section 20 of the state law that the commission does most of its suspension work. Under one part where it may assign as a reason "operating improperly," a driver may figure in an accident that might be avoided if careful, and when the facts become known the commission gets busy and drops the man's privilege. Last year 152 were dropped and 137 the year before. This section of the law reads:

The commission may suspend or revoke any certificate of registration or any license issued to any person under the provisions of this act, after due hearing, for any cause which it may deem sufficient, and the commission may suspend the license of any operator or chauffeur in its discretion and without a hearing, and may order the license to be delivered to it, whenever it has reason to believe that the holder thereof is an improper or incompetent person to operate motor vehicles, or is operating improperly or so as to endanger the public; and neither the certificate of registration nor the license shall be reissued unless, upon examination or investigation, or after a hearing, the commission determines that the operator or chauffeur should again be permitted to operate.

When that section first went into effect some of those who lost their licenses and had some money simply hired a chauffeur who had a license, and then operated as usual, so the commission had a penalty put in so that now it says:

Any person convicted of operating a motor vehicle in this commonwealth after his license to operate has been suspended or revoked, and any person convicted of operating or causing or permitting any other percon to operate a motor vehicle after the certificate of registration for such vehicle has been suspended or revoked, shall be punished by a fine of not more than $100 or by imprisonment for 10 or by both such fine and imprisonment.

So if a chauffeur lets another operate who is not entitled to he is liable to be fined and imprisoned and also lose his license under the other section of improperly operating, etc.

The reckless driver, and the one driving while intoxicated, is the fellow that gets punished, too, both ways. Policemen of late have been making charges of reckless driving where the charge should have been overspeeding, because under the latter the fines were not as large as the reckless driving. This section of the law has just been amended so that a minimum penalty of 2 weeks has been added now. This includes a number of other things, and automatically revokes the license. It reads:

Whoever upon any way operates an automobile or motor cycle recklessly, or while under the influence of intoxicating liquor, or so that the lives or safety of the public might be endangered, or upon a bet, wager or race, or who operates a motor vehicle for the purpose of making a record and thereby violates any provisions of sections sixteeen and seventeen of this act, or who knowingly goes away without stopping and making himself known after causing injury to any person or property, or who uses a motor vehicle without authority shall be punished by a fine of not more than $200, or by imprisonment for a term of not less than 2 weeks and not more than two years, or by both such fine and imprisonment; and if any person be convicted a second time of operating an automobile while under the influence of intoxicating liquor, he shall be punished by imprisonment for a term of not less than 1 year and not more than 2 years. A conviction of a violation of this section shall be reported forthwith by the court or trial justice to the commission, which shall revoke immediately the license of the person so convicted. If it appears by the records of the commission that the person so convicted is the owner of a motor vehicle, or has exclusive control of any motor vehicles as a manufacturer or dealer, the commission may revoke the certificate of registration of all motor vehicles so exclusively owned or controlled. Whenever any person so convicted appeals, the commission shall suspend forthwith the license of the person so convicted, and shall order the license delivered to it, and shall not reissue said license unless such person is acquitted in the appellate court, or unless the commission in its discretion, after an investigation or upon a hearing, decides to reissue it. No new license or certificate shall be issued by the commission to any person convicted of a violation of this section until after 60 days from the date of such final conviction, nor thereafter except in the discretion of the commission.

Highway Commission Watches Mishaps

This is a very strong provision in the law for it reaches the dealer as well as the owner, and, in fact, the manufacturer, and nothing can be done any way until after 60 days from the final disposition in court. Some drivers used to appeal from lower court sentences and get their licenses back until the section was strengthened by making the suspension date from the first conviction. Last year ninety-nine lost their licenses and forty-one the year before for reckless driving; fifty-six in 1912 and fourteen in 1911 for being intoxicated; and seventeen and eight, respectively, for not stopping after an accident. So that it is pretty hard to dodge the law on the matter.

The highway commission has an investigating force that goes out not only in the Bay State, but into other states and investigates accidents, particularly those resulting in serious injury and death. These investigators have police powers, and when they make a report the commission decides whether or not a hearing is necessary. And upon their reports, too, depend the suspension or revocation of licenses to a great extent. The law requires that

The chief officer of the police department of every city and town, and the chairman of the selectmen of such towns as have no regular police department shall notify the commission forthwith of the particulars of every serious accident which happens within the limits of their respective town or city in which a motor vehicle is involved, and as a result of which a death occurs or appears likely to occur, and shall also, if possible, ascertain the name of the operator of such vehicle and notify the commission of the same. Every such officer, upon the request of the commission, shall demand forthwith the license of any operator and the certificate of registration and number plates or seal of any motor vehicle situated within the limits of the city or town where such officer resides when said license or certificate has been suspended or revoked by the commission, and shall forward the same to the commission. Whenever the death of any person results from any such accident, the commission shall suspend forthwith the license of the operator of the automobile or the certificate of registration of the motor cycle involved in said accident and shall order the said license or certificate to be delivered to it; and the commission shall revoke the same unless, upon investigation or after a hearing, it determines that the accident occurred without serious fault upon the part of said operator or chauffeur. No operator or chauffeur whose license is revoked under the provisions of this section shall be licensed again within six months after the date of the suspension, nor thereafter except in the discretion of the commission.

Under this provision when a death occurs the license is suspended automatically and then the burden of proof is placed on the motorist to prove he was not at fault. Last year 115 licenses were suspended for deaths, and ninety-five the year before.

The law also provides that the judges shall not only send in the abstract records of conviction of motor offenses, but it also requires them to make recommendations relative to licenses when they feel it should be done, as per the following section:

A full record shall be kept by every court and trial justice in this commonwealth of every case in which a person is charged with a violation of any provision of this act or of any other act relative to motor vehicles or to the operation of such vehicles, and an abstract of such record shall be sent forthwith by the court or trial justice to the commission. Said abstracts shall be made upon forms prepared by the commission, and shall include all necessary information as to the parties to the case, the nature of the offence, the date of the hearing, the plea, the judgment and the result; and every such abstract shall be certified by the clerk of the court or by the trial justice as a true abstract of the record of the court. The commission shall keep such records in its main office, and they shall be open to the inspection of any person during reasonable business hours. Courts and trial justices shall, upon their own initiative or upon the request of the commission or its agents, furnish to the commission the details of all particularly flagrant cases which may be heard before them; and they may make such recommendations to the commission as to the suspension or revocation of the licenses and certificates of registration of the persons defendant in such cases as they may deem necessary.

Then there is the Safe Roads Automobile Association and the Highway Safety League, both of which comprise motor owners, who make it a business to do what they can to check reckless and dangerous driving by investigating accidents on their own account and notifying the highway commission of any flagrant cases that come under their notice. Other individual motorists also aid the commission, and the Massachusetts Automobile Operators' Association, comprising more than 500 chauffeurs, also report instances that their members see. All these things help to rid the highways of the reckless drivers. This year, too, the commission has got a law passed whereby motorists from other states come under its jurisdiction and they are amenable to our laws now as well as our own motorists.

Drivers Known in 97 Per Cent. Death Cases

Some evidence of the fact that many drivers do not get away after figuring in fatal accidents is shown by the death statistics, where 135 accidents resulting in 142 deaths were investigated. and out of all 135 accidents in but four instances did the driver get away without being found out. That is a remarkable record. The suspensions for not stopping puts a check to that.

The commission sits every Wednesday on motor cases, and at least one member is on hand, and sometimes two. Occasionally all three members are present if the matter is a serious one. Being empowered to summon witnesses and administer oaths the commission sets as a court. It has the power to pay fees to witnesses similar to the Superior Court. At these hearings everyone has a chance to be heard, and motorists may be represented by counsel. When the case is finished the commission announces its decision, usually the following Saturday, in a statement sent out to the press and also posted in the office of the commission, and there is no appeal from it. Usually a hearing is held within a week or two after an accident when a person asks for one, or about the same length of time after the investigators make their report. These investigators do not lose any time getting busy, for they realize first-hand facts are always best. Here is a specimen statement following the weekly list of hearings:

The following tabulation give some idea of the work and the causes of suspensions and revocations for the past 2 years.

	1911	1912
Action Taken on Formal Complaints After Hearing		
Licenses revoked	4	7
Licenses suspended	11	17
Registration certificate cancelled	1	..
Complaints placed on file	8	9
Complaints dismissed	8	6
Operators cautioned	3	12
Totals	35	51
Suspensions and Revocations		
Licenses revoked	95	190
Licenses suspended	254	325
Licenses cancelled	3	...
Registration certificate sus. or rev.	2	6
Dealers' regis. certificate suspended	1	...
Motor cycle registration suspended	5	14
Motor cycle registration revoked	...	11
Totals	360	546
Suspension and Revocations on Convictions		
Suspension and Revocations on Convictions	75	182
After hearings on formal complaints	15	24
After investigations on which hearings were given in some cases	270	340
Totals	360	546
Causes of Suspensions and Revocations		
Reckless operation	41	99
Under influence of liquor	14	56
Not stopping after accident	8	17
Accidents causing death	95	115
Improper operation	137	152
Three overspeeding convictions	2	1
Operating without owner's permission	24	23
Improper person	21	48
Other offenses	18	35
Totals	360	546
Accidents Resulting in Death		
Registration certif. revoked, owner having no license	1	5
Licenses revoked	15	28
Motor cycle registration revoked	2	..
Licenses suspended, reinstated after investigation and hearing	62	64
Licenses suspended, final hearing pending	14	22
Motorcycle suspended, final hearing pending	1	..
No action, no Mass. license	10	10
No action, operator unknown	..	4
No action, death of operator	5	15
Totals	110	143

Advantages of State Law Enumerated

William D. Sohier, chairman of the Massachusetts Highway Commission, expresses his views on this subject as follows:

"I think this is the only state which is doing very much in this line of work. It takes at least 2 days' time of the board every week reading reports, hearing cases, etc. We have hearings every Wednesday from 9 a. m. to 5 p. m. upon complaints, or as a result of reports made by our investigators, and suspend or revoke licenses. We never revoke without a hearing, except in cases where operators are convicted of reckless driving, etc. We do suspend on report of our investigator.

"I regard the automobile law of this state as a model law in very many respects. For instance, when a man is convicted of any of the major offenses in the courts, like operating while intoxicated, or going away without stopping and making himself known after causing injury to any person or property, or taking a car without authority, causing death, etc., upon receipt of the court record his license is suspended if he appeals and revoked if he does not appeal. It can only be reinstated 60 days thereafter.

"In the case of a fatal accident the license is suspended automatically until we have a chance to investigate the case. Unless the board can certify that the accident happened without serious fault on the part of the operator, the board is obliged to revoke the license and it cannot be restored until after the expiration of 6 months from the date it is revoked.

"We have investigators who immediately look into these matters. At the present time there are five employed, and we will probably appoint more at an early date.

"We also investigate accident cases. When we think the operator was to blame in a serious accident we revoke the license. We suspend the license if it is not a serious case, and notify the operator to come in and let us know why it should not be revoked. You will notice in our report that we have a number of such cases a year. In my judgment it has very much more effect in producing sane operation than any number of small fines imposed by the courts.

"A man in this state has to be very careful not to get convicted of operating recklessly or under the influence of liquor."

The Engineering Digest

Body-Builders in Germany Bid for Importers' Business—Steel Wheels and Versatile Carbureters Made Compulsory for Hard-Service War Trucks

Economical Furnace for Isolated Factories—Advice on the Interpretation of Oil Pressure Gauges—A Trend Toward Simplified Wheel-Drives—Formula for Making Steel Parts Look Like Bronze—Tungsten Recommended for Terminals.

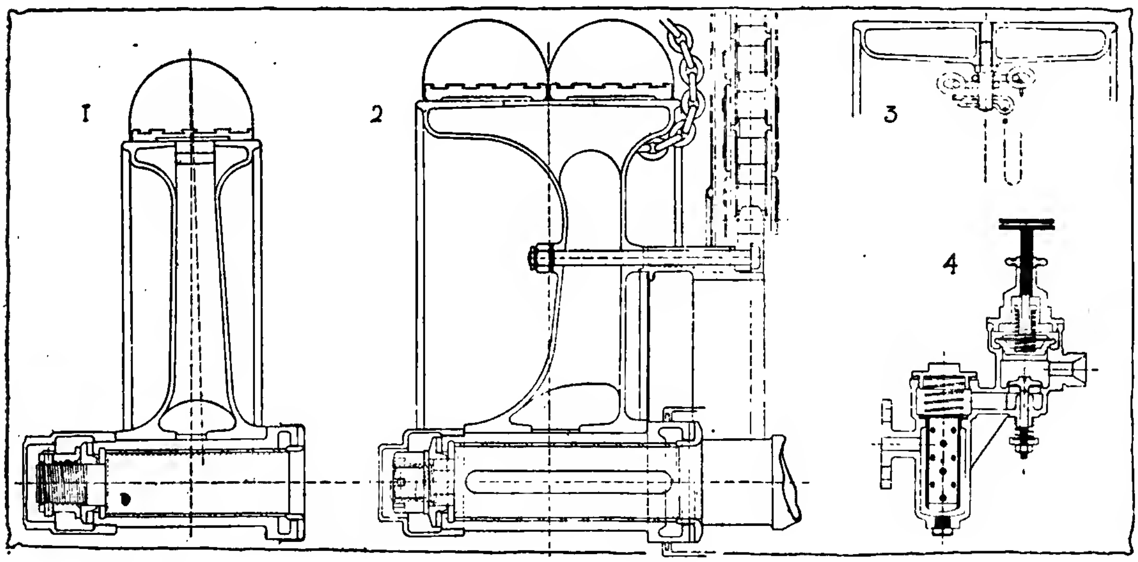
BODIES for Exported Chassis.—A development which may prove of interest to exporters of American cars, either directly or indirectly, transpires in the form of an inquiry from the Prussian Department of Commerce and Trade to the Chamber of Commerce of Berlin. A Prussian manufacturer of automobile bodies applied to the Department for a permit to import foreign-made chassis free of duty, with a view to fitting them with German bodies and then re-exporting the complete vehicles. A similar application had been refused by the Department five years ago, because at that time it seemed inadvisable to facilitate the importation of foreign chassis in competition with those of German make. Now, however, the Department was informed that all German automobile factories were barely able to take care of their orders and also that they were more and more making the bodies for their chassis themselves, with the result that those manufacturers who had made a specialty of body-building had been compelled to reduce their working forces in several instances, especially as orders from abroad for German-made vehicle bodies were only rarely received.

In reply to the inquiry on this subject the Chamber of Commerce replied to the Department that the body-builders and the automobile builders were of opposite opinions. The body-builders reported that automobile manufacturers in France and Italy under the present conditions frequently had their chassis fitted with bodies in Belgium, just because the opportunity to get the work done in Germany was lacking. The granting of the application, and of others of like character, was in their opinion therefore urgently needed. The automobile manufacturers, on the other hand, and especially those who built mainly chassis, feared that foreign chassis-builders perhaps could have bodies built more cheaply in Germany than elsewhere and that the proposed innovation would give them an advantage over German manufacturers of completed cars in the foreign markets. This fear was expressed especially with reference to those American manufacturers who turn out chassis in great numbers.

In one instance it was also mentioned as an objection that foreign concerns would take advantage of the proposed measure to equip their chassis with bodies which have become popular in Germany and would then offer the completed vehicles for sale in the German home market, simply making good the deferred payment of import duty in each case.

The Chamber of Commerce did not consider it proved, however, that foreign builders could not get their chassis equipped with suitable bodies just as cheaply and well in neighboring countries—for example in Belgium—as in Germany, and held that they could therefore probably give German manufacturers the same competition now as under the proposed arrangement. And as the latter would at least benefit the German body-builders, while the present condition did not benefit any German industry, the Chamber of Commerce would recommend that the application be granted. In view of the uncertainty in the commercial development and so as to forestall abuse of the privilege asked for, a proviso should be incorporated in the arrangement, however, calling for the re-export of the imported chassis, together with their German bodies, before the expiration of a stipulated time limit.—From *Automobil-Rundschau*, May 15.

REVISED Requirements for Subsidized German Trucks.—Every year the Prussian ministry of war makes a few changes in the regulations by which those manufacturers of motor trucks must be governed who wish to give their customers the benefit of the subsidy accorded for vehicles which are considered suitable for military transportation service and which are expressly made subject to drafting for maneuvers, mobiliza-



Figs. 1 and 2—Reproduction from scale drawings representing the construction of front and rear cast steel wheels which has been made obligatory for subsidized motor trucks in Germany—giving also their tire equipment

Fig. 3—Section of rear wheel rim between spokes, showing the mode of attachment of traction chains for both rear and front wheels

Fig. 4—Obligatory type of valve for regulating fuel feed pressure derived from the exhaust gases

tion or war. The subsidy consists in a bonus on the purchase amounting to 1,800 mark for a single motor truck and 3,000 mark for a train, composed of one motor truck and one trailer wagon, and in yearly payments of 800 and 1,200 mark, respectively, after the second, third, fourth and fifth years during which the vehicles have been maintained in good order.

The requirements for motor trains have not been changed much since last year, but some features which were declared desirable have been made obligatory in the new set of regulations, the purpose of the army authorities being to standardize the equipment as much and as fast as experience gained during each current year will permit. When definite conclusions are reached with regard to some feature of design or materials, scale drawings embodying these conclusions are made at the experimental department of the army and are provided with annotations from which it can be seen what details still remain optional with the builder. Among the features which have become standardized this year, the wheels are the most important. They must now necessarily be made of steel, and the construction drawings show them as cast steel wheels with hollow spokes and rims. The bearings are plain bronze bushings. In both rear and front wheels, studs for the attachment of traction chains are screwed into the inside of the rim between spokes. Figs. 1 and 2 and 3 show the design with the dimensions and annotations omitted.

Other standardized features are the valve for regulating the pressure feed of the fuel by means of the exhaust gas, which is shown in Fig. 4, the coupling between the motor truck and the trailer (which is similar in design to that of old-fashioned railway car couplings, except that the coupling pin is chained), the connection between the brakes of the truck and those of the trailer, the measurements and nature of tires, which must be of the solid rubber type.

Among other provisions it is noticed that sprags are still required for both vehicles of a train, that the maximum speed of 16 kilometers per hour must be enforced for the empty as well as for the loaded vehicle by means of a governor acting upon the motor at third and fourth speeds, that the service brakes must be water-cooled and the wheel brakes compensated and that the carbureter must be adaptable by adjustment for use with benzol as well as light or heavy gasoline.—From *Der Motorwagen*, May 10.

NEW Recuperating Furnace.—A furnace which seems adapted for a series of work requiring different temperatures, from very low to very high, and in which low-grade fuels may be used, is described by E. Schmatolla in *Der Praktische Maschinenkonstrukteur*. Fig. 8 shows the construction in three sectional views, the second being a vertical section through the low rear portion shown in the plan-section. The pit A, the chamber *f* which serves for the generation of gas and the two heat-recuperators B are built into one piece of masonry. The registers *e* and the sheet-steel slide *t* alone control the direction of the currents of gas, air and flame. The pit A can, according to requirements, be constructed for the heating of stills, vats, crucibles or any other object. When the fireclay plate covering the opening *g* is removed and the registers *e* are closed, the chamber *b* communicates with A, and, if at the same time the slide *t* covers the three canals, *m, n, m*, the gases pass directly from *b* to A by way of *g* and thence along both sides of A through the canals *b*, the recuperators B (which consist in piles of fireclay bricks), the canals *k, l, m*, the slide *t* and the canal *n* to the flue *o*.

When the furnace is started and so long as it is desired to work at low temperatures, only a thin layer of fuel is placed upon the grate in G, and the flames pass by the route mentioned. In order to heat the flue and promote the draft at the beginning, the fireplace can also be connected directly with the flue. Then, if it is desired to increase the temperature progressively fuel is added by successive stages and, likewise, the access of air coming in over the registers *e* is gradually increased; the flame forms in the pit A and passes to the flue by way of the recuperators where the heat of the hot gases is absorbed by the firebricks.

When the slide *t* becomes very hot, or, in other words, when useful heat is escaping, it is better to reverse the direction of the flame and utilize the exhaust heat for preheating the air used for combustion. To this end, the opening *g* is closed, one of the registers *e* (the one to the left in the illustration; not lettered) is opened and the slide *t* is pushed to one side, so that it covers only the openings *m* and *n*, leaving the other opening *m* (to the left) free to permit the arrival of air. The air now comes in through the canal *l-k* to the left, passes through the recuperator B to the left, absorbs the heat there stored and arrives strongly heated by way of canal *b* to A. Before entering, it mixes with the generator gas coming from the canals *c, d, h, f* to the left and produces a very hot flame which traverses the pit A. The waste gases pass through the other recuperator and reach the flue by way of *k, l, m, t* and *n*.

When, after some time, the air for combustion has absorbed all the heat in the recuperator to the left, the direction of the gas currents is again changed by closing register *e* on the left side, opening the other register *e* and pushing the slide *t* to the left.

By this system the temperature can be raised practically to the maximum obtainable with atmospheric air. With very slight changes the construction of the furnace can be adapted for operation with producer gas or natural gas as fuel.—From *Revue de Métallurgie*, May.

READING the Oil Pressure Gauge.—Among the more or less practical hints offered to motor car users by writers for the European press many are double-edged, being more eloquent in pointing out shortcomings which ought to be remedied by the makers of cars and accessories than in designating the best method for getting along with things as they are. The advice given frequently proves more than was intended, and in other cases it suggests a condition which does not exist, as when repairs are described which never should be made, because they cost more than replacements of parts and fail to bring about the alloy-steel strength which is required. Reflections of this order, from which the principal upshot is a sharp realization of the advantages to be gained by making such judicious selections from among the cars and accessories which the market affords that the troubles for which remedies are offered will not arise, are suggested in this instance by the complicated advice on the reading of oil pressure gauges which an expert presents to the French automobile public, and from which the first inference would be that certain improvements of these gauges might be more easily accomplished than the training of the public to the proper use of those to which the writer refers. As the subject is not often treated, the advice is repro-

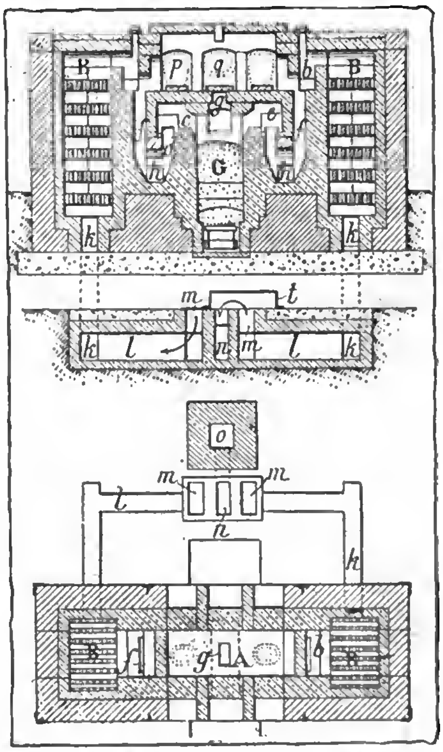


Fig. 8—New recuperating furnace—an element in factory economy and convenience

duced in full—the translation being almost verbatim—as follows:

The hand of the oil pressure gauge does not only indicate the pressure existing in the oil ducts; it is not only the movements of the hand which should be observed but also their nature.

Sometimes, in the morning, when the car is started, the hand rises to the top of the dial. Then, after a few jumps, it suddenly falls back to zero. It is because the oil has thickened, and, though it has been sent into the organs of the motor, it does not return fast enough for feeding the pump; it is accumulated, for example, in front of a filter. The motor should therefore be allowed to turn over slowly.

If this incident occurs regularly, a more fluid oil should be used. If, in spite of all care, the pump frequently runs idle, the filter placed at the entrance to the pump must be very much fouled and should be cleaned.

On the road, the indicator hand remains nearly stationary. If it drops low when the car is slowed up, all is well.

If the hand remains at a high figure throughout all speed variations of the motor, this indicates that the oil is too heavy and meets too great resistance to its circulation. One cannot know in that case whether the oil really passes through the ducts in the crankshaft or only through the safety valve.

If after one or two hours of travelling, and while the car is running at a uniform gait, the hand begins to swerve irregularly, slightly at first but soon fitfully, falling to zero and then again rising, the cause is either an obstruction or lack of oil. A glance at the level will tell which.

It happens that the hand drops definitively whatever quantity of oil the pump has to work with, and if the explanation is not to be sought in a poor quality of oil which loses all its viscosity when heated, the reason is either that the safety valve is not held to its seat by its spring and therefore acts as a bypass or that a tube is bursted.

When the hand rises unusually high during normal operation of the car, some impurity must have clogged the circuit, and there is danger of injuring the tubing. One should stop and investigate. Perhaps only the valve has become glued to its seat by reason of too much resin in the oil. In this case, clean the valve with gasoline, empty the oil reservoir and refill it.

Pressure gauges are sometimes blamed for being flighty and unreliable. It is especially charged that the oil tube leading to it is liable to leak. Many owners of cars would in fact like to have the indicator hand of the dial connected by flexible cable to a piston located in the crankcase, rather than by the column of liquid in the tube.

Inaction of the pressure gauge does not always indicate a disturbance in the circulation of the oil, but if a doubt arises because the hand does not move it is always easy to verify the condition. In all motors there is, in some form, a screw or plug closing an entrance to the circulation conduit. Remove it, while the motor is running, and, if the oil gushes out, the circulation is established.

From this enumeration of possible contingencies it is plain that in case of trouble the fault is always to be found either with the filter or with the safety valve. The remedy is obvious: Demand that these organs shall be very accessible. For, all that is required is that they should be cleaned once in a while.—From *Omnia*, April 5.

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FLOATING Wheel-Drive Losing in France.—Whether it be due to improvement in the materials used for wheel shafts, to the increasing popularity of double ball-bearings or to a desire for simpler and more economical construction forms and readier removability of wheels, the number of new models, among automobiles rated as high class, in France in which the driving wheels are supported on the end of the wheel shafts, seems to be increasing. As examples of the trend there are shown in Figs. 5, 6 and 7 the axle-ends in the latest models of Darracq, Vinot-Déguingand and Chenard-Walcker cars. In the latter the drive is effected by a special shaft to a gear ring inside of the brake drum, so that the floating type is out of question—a construction adopted by this conservative firm many years ago and continued despite contrary dictates of the fashions for pleasure cars. The new Darracq model is one fitted with poppet-valve motor, the concern having apparently been compelled to abandon the idea of relying on its rotary-valve motor alone, in view of the disastrous showing of its last annual balance sheet.—Illustrations from *Omnia* and *La Vie Automobile*.

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SUBSTITUTES for Platinum.—Palladium and tantalum have been proposed as substitutes for platinum for electric contacts and terminals, both mainly on the ground of economy. According to C. G. Fink in *Revue Electrique*, tungsten is more acceptable than either, being superior to platinum in all the applications where continued exposure to very high temperatures is involved and costing only about twice as much as nickel in its usual commercial form and about $25 per kilogram when refined to purity. It has been shown that pyrometers equipped with tungsten-molybdenum couples outlasted—so far as the terminals were concerned—those equipped with platinum and platinum-rhodium, and in small electric furnaces for laboratory use tungsten has been used in the form of thin wire for wrapping the porcelain tube and also for the tube itself, in both cases rendering it practicable to generate and maintain a temperature of 1800 degrees C.—From *Electrochemische Zeitschrift*, May.

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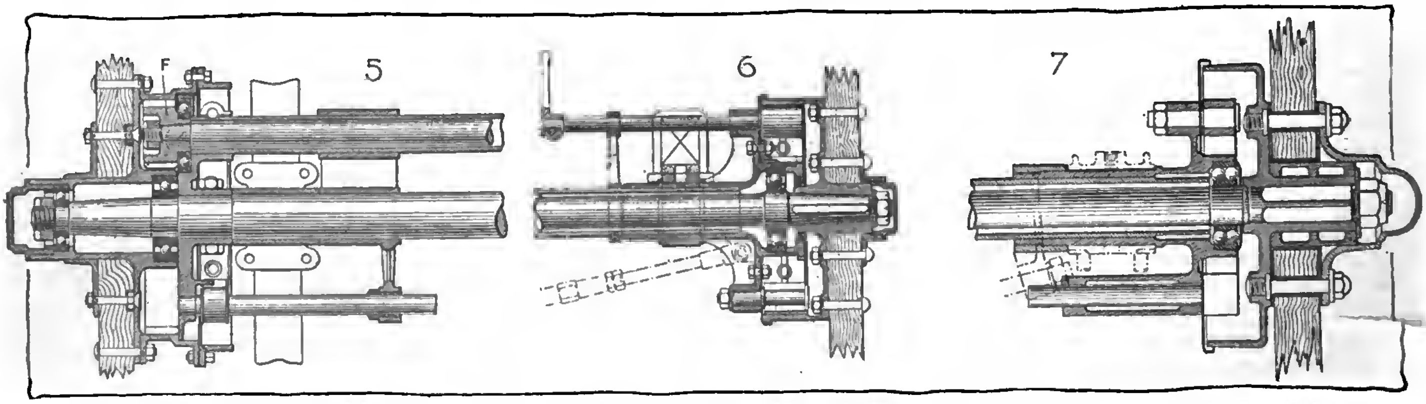
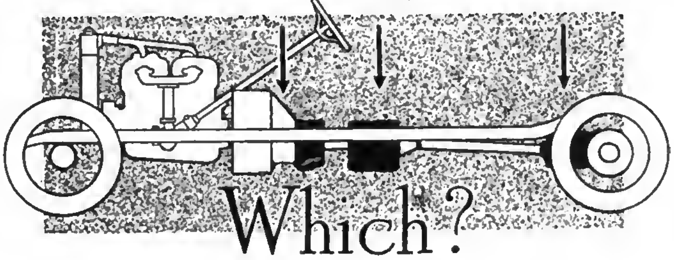
BRONZE Patina for Steel Parts.—After the part has been thoroughly cleaned it is exposed for a few minutes to the action of the vapors of a mixture of HCl and HNO_3 in equal parts, whereafter it is heated toward 300 degrees C. until the bronze-like shade appears. After cooling, the piece is coated lightly with paraffine or vaseline and is then again heated until the fatty matter is decomposed. To deepen the shade, the operation can be repeated. Pretty and unchangeable shades are obtained by this process. By a final exposure to the vapors of *aqua regia* (same mixture as above) a clear brown tint is produced, while a yellow tint can be obtained by adding acetic acid to the original mixture.—From *La Technique Moderne*, May 15.



Figs 5, 6 and 7—Non-floating wheel drives in French Cars—(5) Chenard-Walcker, (6) Vinot-Deguingand, and (7) Darracq

The Engineers' Forum

Gearbox Location



Which?

Part VI.

Another Defense of the Rear Axle as a Gearbox Location

AUTOMOBILE engineers are still manifesting their interest in the question of gearbox location which had its beginning in an article published in THE AUTOMOBILE for April 17. This has been more thoroughly threshed out in these columns by the leading engineers of the country than any other question of design yet brought to the attention of the automobile public. Other topics are also taken up by the engineers in this week's issue of THE AUTOMOBILE, that of the rating of motor horsepower by the manufacturers and by the state registration and taxing officials, and that of tires, whether solid or pneumatic, for light delivery wagons.

Another important question of construction which will be taken up in the Engineers' Forum in the near future is that of automobile springs. Much interest is being taken by both engineers and automobile owners in the article entitled Defects in Springs, which appeared in THE AUTOMOBILE for May 29, and many of them are expressing their views on the subject.

Rear Axle Weight Is Not Important—Bates.

HYDE PARK, MASS.—Editor THE AUTOMOBILE:—After reading the arguments for and against the rear axle gearbox, the only point that seems worthy of consideration is the fact that shifting rods are employed to shift the gears. This should occasion no trouble if the design is carefully worked out in regard to location of centers of oscillation, so as not to cause a pull on shifter rods and levers due to up and down movement of the frame over rough roads.

In regard to extra unsprung weight on the rear tires, there may be a basis for argument on this point, but it seems to be more theoretical than practical, as we have proven by test that our rear axle gearset, torque tube, etc., weighs 54 pounds more than another rear axle of very popular make used on our type of car. If the rear axle weight is such an important consideration, we all should go back to the propeller shaft brakes, cut down the size of the rear wheel brakes, and save every possible ounce, but in practice, our cars of 3,200 pounds with 4-inch tires show an average mileage of 4,500 to 5,000 miles, and quite a number from 6,000 to 7,000 miles, while with 4.5-inch tires, our owners have run, in a number of cases, from 8,000 to 10,000 miles, so that it seems that this point is more theoretical than practical.

Now in regard to the argument that the rear axle gearset is cheaper for the manufacturer. Certainly what is cheaper in the way of simplicity for the manufacturer should be to the advantage of the buyer. If it costs less to manufacture and assemble, certainly when the tire comes for repairs and adjustment, and the time will certainly come, this point must work to the advantage of the owner, as it is a matter only of releasing torque tube ball housing, spring seats, and brake rods, in case the transmission is to come out, and the whole job is ready to do whatever is necessary, a matter of perhaps half an hour's work.

In regard to accessibility for inspection, we find that it is no more difficult to remove tonneau floor boards than the floor boards in front.

In regard to poor weight distribution, we find that our touring cars weigh 20 pounds more on the rear end than the front, so there cannot be any great argument there, while the center of gravity of our transmission is 4 inches lower than with the amidship or motor unit construction, which is certainly a point in our favor.

Then in regard to noise, everybody will admit without argument that the rear axle type is superior to other types in this respect.

In regard to poor riding, this point seems to be more a matter of spring suspension than anything else, as I have seen very good and very bad riding cars of all constructions, and have seen cars of rear axle transmission type ride as well as cars of the other types.

In regard to multiplicity of parts, the rear axle unit has, especially in our construction, no parts such as radius rods, torsion rods, extra universals, etc., to become loose and rattle, such as are ordinarily found in amidship construction, which of course means less wear and tear on the nerves of the owner, and his pocketbook.

In the matter of alignment, this point requires no argument whatever, as the advantage is altogether with the rear axle and motor unit type.

In regard to its being fit for use only on cars of low horsepower, we all remember this same argument upon the advent of the shaft drive; time has proven this construction suitable for any horsepower.

To the mind of the writer, there seems to be no good argument for the amidship transmission, the question in mind being whether the motor unit is better than the rear axle unit, and we have come to the conclusion that it should be the latter.—C. T. BATES, Engineer, Lenox Motor Car Co., Inc.

Thinks All Types Satisfactory—Macksey.

EAST ORANGE, N. J.—Editor THE AUTOMOBILE:—In discussions recently published in THE AUTOMOBILE I have noticed that each location of the gearbox had its good and bad points equally distributed. I noticed that one manufacturer claims that the placing of the gearbox amidships will distribute the weight more evenly so that an undue proportion is not put on the front axle or on the rear axle, to some extent lessening the liability of skidding, while another says that the gearbox placed on the rear axle will give the rear tires more traction, also lessening skidding. Then, too, the unit with the motor has its advantage in that it is most simple and easily accessible. Most of the engineers agree that the weight of the car has a great deal to do with the placing of the gearbox, that the unit with the motor belongs to the small cars. there being less weight; that the gearset mounted amidship should be in a high-powered car; and the gearset as a unit with the rear axle should be used where quietness of operation is wanted and a wide range of choice for the engineer in the location of his control levers which may be set practically anywhere to conform to his particular idea of accessibility with this type of gearbox.—JAMES F. MACKSEY.

Automobiles Pay Enough Taxes Now—Klinger.

DAYTON, O.—Editor THE AUTOMOBILE:—I certainly believe the tendency within the last few years of all manufacturers has been to rate their motors under absolutely ideal block conditions. The motors, it is true, will show considerably greater horsepower under these conditions than they will when actually applied to a chassis and operated on the road. As a matter of fact, it is very seldom that the full horsepower of the engine which it is capable of producing in the chassis is utilized in road service, and our impression is that fully 95 per cent. of the time motors are operated only at from 15 per cent. to 20 per cent. of their rated capacity, and we further believe that there is a tendency in all automobile plants toward a reduction instead of a further increase in the size of motors.

I should very much regret to see any action taken which would increase the tax levy of various states on the automobile, not for its influence directly on the trade, but as a matter of justice, as the average automobile owner certainly contributes his share to the various state expenses.—P. W. KLINGER, Speedwell Motor Car Co.

S. A. E. Rating Is Accurate Enough—Feilicke.

INDIANAPOLIS, IND.—Editor THE AUTOMOBILE:—We agree with you that the present S. A. E. or A. L. A. M. horsepower rating is accurate enough to be taken as a basis for taxation purposes.—KARL FEILCKE.—Motor Car Mfg. Co.

A Consistent Motor Rating Needed—Power.

SYRACUSE, N. Y.—Editor THE AUTOMOBILE:—The formula for horsepower of motors other than the present S. A. E. rating should have a value by which a comparison of different motors can be made, and also furnish a basis of taxation.

The varying bores and strokes, together with other factors, such as valve design, balance, weight of reciprocating mass, etc., have a major influence upon the horsepower. If there is to be any consistency in motor rating, it should be based upon the volumetric displacement of the pistons and a piston speed in excess of 1,000 feet per minute. This would give all reputable manufacturers, who are exercising their skill toward the production of a motor of higher horsepower for the same or less weight, of higher fuel economy and of staying qualities, a deservable higher rating—as it obtains today.

Our 4 1-2-inch by 5-inch motor develops 12 per cent. more power at 1,000 feet per minute piston speed than the S. A. E. rating, while the maximum horsepower is developed at a piston speed of over 1,600 feet per minute.—M. POWER, Engineer, H. A. Moyer.

S. A. E. Formula Is Satisfactory—Lambert.

ANDERSON, IND.—Editor THE AUTOMOBILE:—I am of the opinion that the A. L. A. M. rating is nearer right than any other rule for figuring horsepower of motors.—J. W. LAMBERT, Buckeye Mfg. Co.

Pneumatics Best for Delivery Work—Stewart

BUFFALO, N. Y.—Editor THE AUTOMOBILE:—One of the most important problems that confronts the designer of light delivery trucks is the question of pneumatic tires or solid tires. In an effort to eliminate tire troubles some designers of light weight delivery cars have adopted the obvious expedient of using solid tires. Without exception the results have been most unsatisfactory.

Even where spring wheels of various types have been adopted the use of solid tires has proven a serious mistake.

There are three chief disadvantages to the solid tire for use on light delivery cars—first, vibration; second, tire wear; third, increased gasoline consumption. The light weight delivery car must necessarily be operated at a speed of from 20 to 25 miles an hour in order to accomplish the work for which it is designed. At this speed, no matter how well the car is designed, the constant jarring of delivery service will very soon result in mechanical trouble. This simply cannot be avoided.

Some designers make the mistake of building their truck parts several times heavier than necessary, thinking thereby to make it possible to use solid tires. This, however, is a fallacy, for the excess weight they add causes additional strain.

The second disadvantage is that a solid tire will heat up and deteriorate rapidly if the speed exceeds 18 miles an hour. I do not believe there is a tire company in America that will give a guarantee on solid or cushion tires if they know that the speed of the vehicle will exceed 18 or 20 miles an hour at any time.

The third disadvantage is increased fuel consumption. From our past experimental work we feel safe in stating that the gasoline consumption will be 25 to 30 per cent. more with solid tires than with pneumatic.

With demountable rims the truck user has little to fear from the chance of punctures. A tire can be replaced in a few minutes and the truck is then again in service. But mechanical trouble resulting from the use of solid tires requires hours for repair during which time the car is out of service—to say nothing of the expense of mechanical repairs.

Experienced truck users have learned the fallacy of the solid tires. John Wanamaker has been using motor trucks probably longer than any concern in America. At first Wanamaker demanded solid tires; now he will not buy a delivery rig with anything bue pneumatic tires. He has learned by experience.

The New York *Herald* some years ago bought several Renault trucks. When the first pneumatic tires wore out they replaced them with solid tires. From that time on records show that the trucks were in the repair shop a considerable part of the time. Noting this, the *Herald* people finally replaced the solid tires with pneumatic and at once the trucks resumed their former satisfactory service.

All this is true of every other concern that has had experience with motor delivery wagons. The little bit saved in tires is spent three or four times over in mechanical upkeep.

In my opinion it will be only a year or so till all prudent buyers of light delivery trucks will demand pneumatic tires for their own protection. I should be glad to hear the opinion of other engineers on this important subject.—R. G. STEWART, vice-president and chief engineer, Stewart Motor Corporation.

Make Accessibility Indispensable—Day.

BINGHAMTON, N. Y.—Editor THE AUTOMOBILE:—Although I am not an automobile engineer, I have owned and driven cars of various makes and models for several years and one point has always struck me very forcibly. This is the secondary consideration given by many engineers to the important feature of accessibility and demountability of parts.

With a large number of the cars now on the market, and particularly with the smaller types of cars, when one has trouble with the motor or its adjustments, the suspension, the cooling system, the gearbox or transmission line, or, in fact, almost any part of the car whatever, he has to dig around in the most inaccessible places possible to imagine and generally with a disastrous effect on his clothes. His temper, of course, is usually affected, too, and sometimes his language.

It seems to me that, while the leading engineers are trying to make accessibility a salient selling feature of their cars, they do not go into the matter thoroughly enough to get real results. They had apparently made considerable headway last year when suddenly the electric starting and lighting stampede began and threw most of them off their mental balance, from the mechanical mix-ups into which they converted their motors, so recently worked up into clean designs. Since that time most of them have been trying to recover the lost ground, with varying success.

In my opinion, the only element required to bring about a much more considerate style of design by the engineers is the pressure of public opinion to the effect that accessibility is indispensable in a car. I would like to see some of the engineers' views on this subject published in The Engineers' Forum.—LEE DAY.

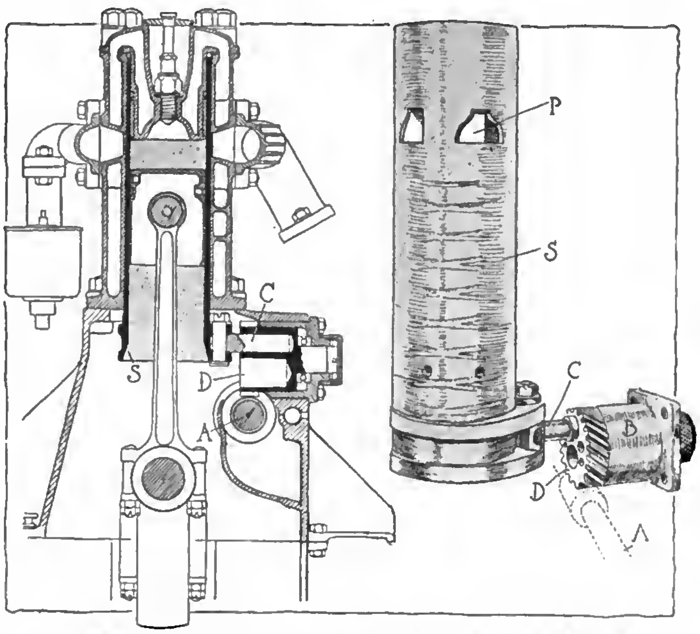
Sleeve-valve Car Makes 14-hour Record

LONDON, ENG.—A remarkable track performance of great interest to automobile engineers in general and non-poppet enthusiasts in particular has recently been made at Brooklands, in which a car with a sleeve-valve engine succeeded in covering 1,016 miles 437 yards in 14 hours at an average speed of 72.52 miles per hour, constituting a new world's record for that time. The triumphant car is an Argyll, a popular British make, and one of the most successful exponents of the single-sleeve school of slide-valve operation.

The record for 14 hours which has been struck off by this latest performance is an old standing one of 6 years by S. F. Edge, who made 980 miles 480 yards on a Napier in 1907.

Much of the value and importance of the test is owing to the fact that it is the first officially observed track trial of any appreciable length of a slide-valve engine, although bench tests and road races in which another type of slide valve has participated have demonstrated the practical value of the double sleeve valve.

The Argyll chassis used was of the standard type as sold on the market, with the exception of two minor alterations which, however, do not detract in any way from the lessons to be learned from the trial. These were the lightening of some of the reciprocating parts and the substitution of a gear ratio more suited to performance on the track for that on the standard model. The engine dimensions are 3.5 inches stroke by 5.12 inches stroke. A Zenith carbureter was used and Bosch ignition. The final drive at the rear axle is by overhead worm, the gear ratio for this test being 3.25 to 1. The body was a single seater of streamline form with a pointed tail, and the total weight 2,726 pounds.



Figs. 1 and 2—Section of Argyll single-sleeve slide-valve engine with detail view, showing sleeve and operating mechanism

No engine trouble of any kind developed during the run, the only stops throughout the entire 14 hours being either for the replacement of tires or the changing of drivers. The wheel was taken alternately in 3-hour shifts by W. G. Scott, works manager of the Argyll factory in Scotland, and L. G. Hornsted, a well-known racing driver.

A remarkable feature of the trial was the regularity of the speed, which was maintained at between 72 and 73 miles per hour throughout the whole performance. The lowest speed took place during the fourth hour, when a distance of 72.04 miles was covered. This speed was well within the power capabilities of the car. The arrangements for the event were very complete and well thought out. At every lap the driver was informed by means of large figures on a board the speed of his previous lap so that he was able to gauge his driving accordingly. Further, there was a system of signals to denote whether the exhaust was smoking or not so as to facilitate the lubrication problem for the driver. A staff of well-trained men were stationed at the replenishment depot and an idea of their speed, even in these days of red-hot work in the tire pits during the big races, can be gathered from the fact that in one of the stops, which was timed to last only 1 minute 41 seconds, all four wheels were changed, gasoline and oil tanks filled, the engine crankcase drained and refilled, and the car restarted. Castor oil was the lubricant used for the rear axle, the casing being kept always filled. At the end of the run the worm gear casing was found to be no warmer than would be the case with bevel gear.

A brief description of the Argyll sleeve valve may be of interest. Fig. 1 shows a transverse section in which the sleeve S will be noted, occupying the annular space between the piston and the cylinder wall. Its action is peculiar in that the motion imparted to it is not merely up and down but is also partly rotational. This will be made clear by reference to Fig. 2, which shows the sleeve and its operating mechanism detached from the engine. The reciprocation of the sleeve is effected by the action of a small crank C which has a sliding fit in the rotating member D. This latter is carried in the bearing B, which is bolted to the crank casing wall. The operating shaft A, which is equivalent to and occupies the same position as the camshaft in the poppet-valve type of engine, is provided with four worms or skew gears, one at each cylinder, which engage with teeth on the rotating member D, driving it at half the speed of the crankshaft. This reduction takes place at the skew gearing, the camshaft itself running at the same speed as the engine shaft by silent chain.

Two revolutions of the engine shaft, therefore, cause a single revolution of the actuating crank C, which in turn imparts such a motion to the sleeve that any one point on its outer surface will have traveled through an elliptical path on the cylinder wall.

This peculiar motion is the fundamental principle of the Argyll valve. It permits a complete register of opening of the valve port P with the corresponding ports in the cylinder wall while the sleeve is traveling in one direction and a complete closing on the opposite stroke. As the sleeve descends, exhaust is opened and during the return stroke the inlet ports open. This cannot be accomplished by a single up and down stroke of a sleeve with the ordinary straight reciprocating motion, where both valves would necessarily be opened twice.

The method of final drive renders the result doubly interesting, for the amount of information regarding the efficiency of worm drive as against bevel is scanty and difficult to obtain. In any case no better way of bringing forcibly to mind the practicality of the worm drive as a means of transmitting the power of the engine to the road wheels could be devised than this establishment of a record in which the worm played a part.

In the Argyll cars the drive is practically in a horizontal straight line from the engine to the rear axle, the worm being located over the worm wheel. The high efficiency of this type of drive with its almost total elimination of work wasted at the universals is generally recognized.

The designer of the Argyll car is a Frenchman, M. Perrot, and it was first introduced to the automobile public at the Olympia exhibition in London at the latter end of 1911.

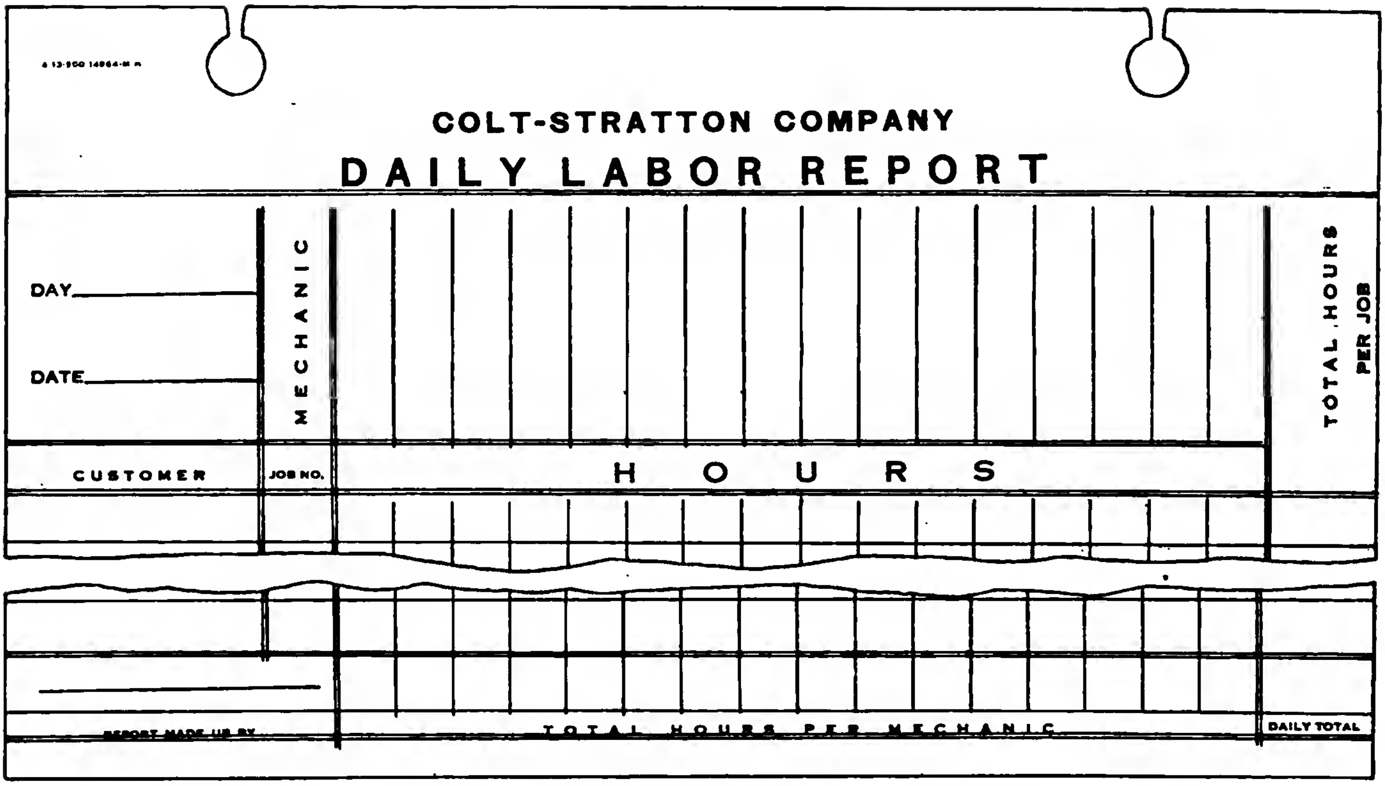


Fig. 1—Daily labor summary, which shows the distribution of the skilled labor used on various job orders

Service System of New York Cole Dealers

Including Twenty Forms Among Which a Number Are Original—Daily Labor Report a Feature

IMPROVEMENT of car construction is only half of the developments made by the industry. The other half consists in the evolution of the means for prolonging the life of the car and increasing serviceability, which means are numerous and of varying efficacy. Among them good roads and prompt, efficient service are of leading importance. To use an illustration, let us compare an automobile to a set of teeth which is gradually depreciated by its work until it is all worn out. If the comparison is carried further, good roads correspond to the proper food which is mechanically and chemically least harmful to the teeth—the automobile; while the prompt attention of the decaying teeth, by means of which they may be saved and their life and service prolonged, finds a parallel in repair work made while the troubles growing in the car are still in their incipient stage. This simple comparison makes it clear that prompt service is a great advantage and necessarily appreciated by the user of a car, and that on this account it is the duty of the manufacturer toward himself and his customer to conduct his service departments as efficiently and economically as he can, which can only be done if all details of the organization are known to the heads thereof.

Complete service systems for automobile agencies and branches are now becoming an everyday thing and, although most of the systems are quite similar in general ways they differ in more than one particular. The latter fact is caused by the differences in experiences of the men who design the system and the blanks used in connection with it and as a further consequence there is hardly a system which does not include several original blanks, or, if they are not original throughout, such that are new in more than óne respect. By this is meant that a given form is either designed in a specially advantageous way to serve its purpose or that it provides for the recording of additional information as compared with blanks used for the same purpose up to the time of designing the blank.

One of the latest service systems which have been introduced in New York City is that of the Colt-Stratton Co., Cole dealers. The forms used in this system are here described and illustrated and the readers interested will find, by comparing these forms with systems already described in THE AUTOMOBILE, that the Cole

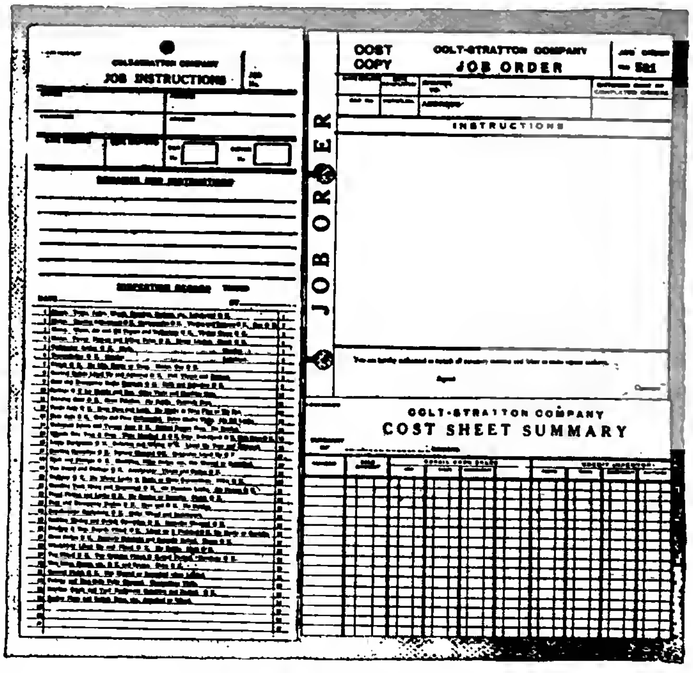
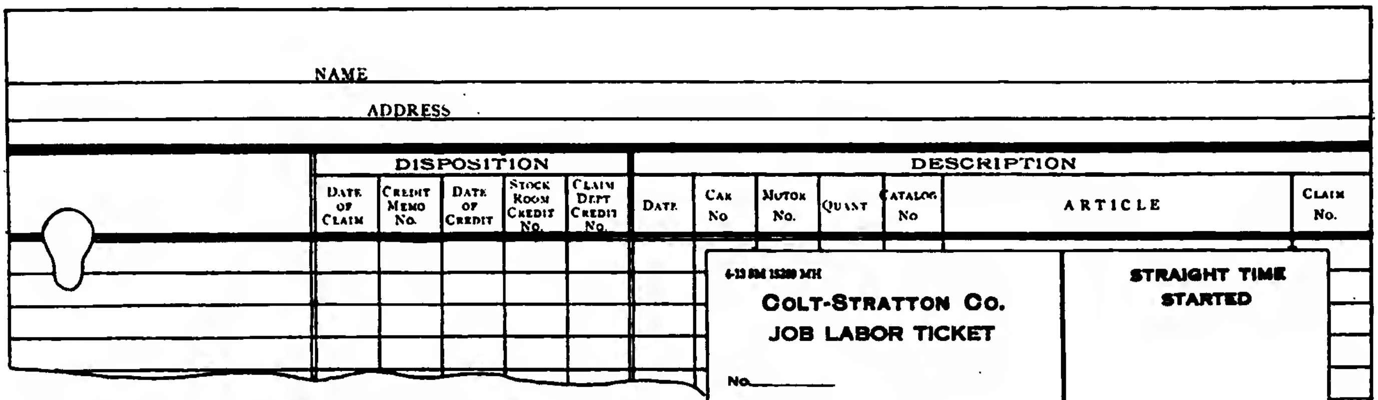


Fig. 2—Instruction tag attached to car. Fig. 3—Job order form. Fig. 4—Orders summary sheet



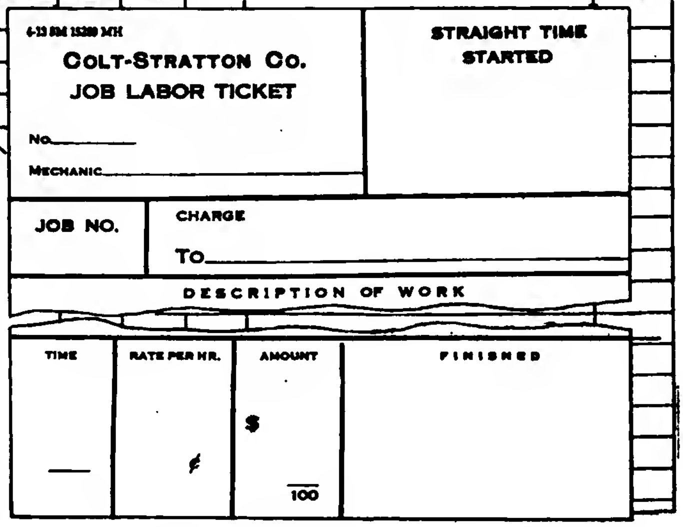


Fig. 5—Record of material received from customers and dealers. Fig. 6—Job-time record card

scheme is original in many ways and therefore worth describing.

1. **Job Order**—The first form, Fig. 3, is 8.5 by 11 inches, one copy being printed on yellow paper and one on white, the yellow copy being marked charge copy and the other cost copy. Both are numbered with the same number, coming in pads which form series. The order is made out in duplicate, that is to say, on both forms when the customer brings in the car. He signs the order for the cars turned over to the shop.

2. **Job Instruction Tag**—Fig. 2 shows the tag used for giving the shop men instructions of the work to be done on the car, for inspecting the same after repairs are completed and for checking the equipment and accessories on the car when it is taken over and before it is delivered. The accessory checking spaces are printed on the reverse of the form, not shown here. The tag, as here illustrated, is 6.5 by 14 inches, printed black on yellow cardboard and fitted with eyelet for the purpose of attaching the card to the steering wheel of the automobile. The upper half of the side here shown is filled out in the office of the department superintendent before the car and the tag go into the shop, while the accessory checking space is first filled out when the car is taken over by the shop and the removable parts are taken off and placed in the locker, marked with the car owner's name and the number of the automobile.

3. **Job Labor Ticket**—The Colt-Stratton Co. uses square labels on thin paper for recording time spent by a man at any

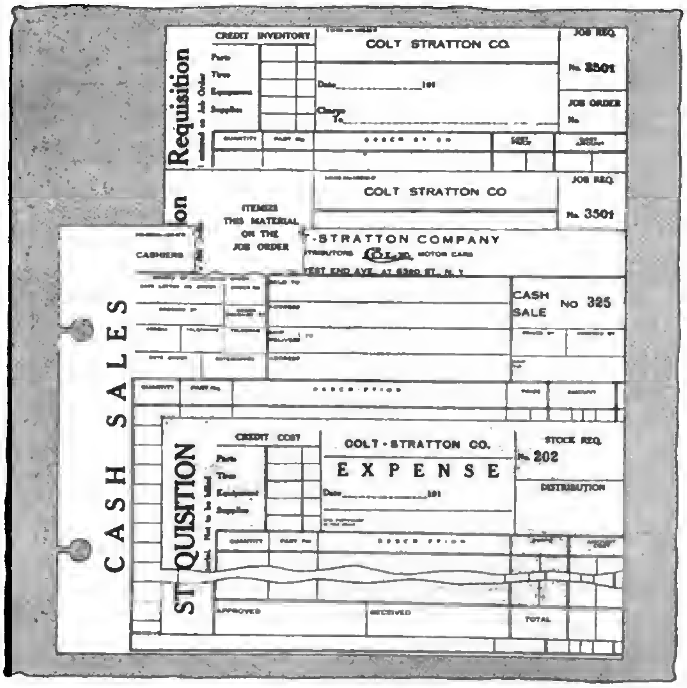


Fig. 7—Requisition on job orders. Fig. 8—Cash sales requisition. Fig. 9—Non-job requisition

given job, this ticket being supplementary to the weekly clock card. Fig. 6 shows the job ticket used during day time, which has spaces for the number and name of the workman, the job number, the party to whom the work is to be charged, the description of the work, time consumed, the wage rate, the total wages due for the work and the time of starting and finishing the job. This ticket is white; if overtime work is done a pink ticket is used which is printed exactly like the white, save for the words overtime in place of straight time. These tickets are turned over to the shop foreman in the evening when the workman leaves the place, being delivered by him to the office, where the payroll is made up.

4. **Daily Labor Report**—The times spent by the workmen on the various jobs during a day are compiled and recorded on the daily report, Fig. 1, which is printed on tan paper, 10.5 by 14 inches, the names of the various workers are entered adjacent to each other at the top portion of the sheet, while the names of the customers are given in the first column of the paper. The spaces formed by the intersection of the horizontal and vertical columns are filled out with the time spent by the mechanic on the car of the customer. The last column at the right of the sheet gives the total amount of time spent on the various jobs, while the last line at the bottom contains the total hours spent by each workman. The clerk who makes up this report from the time tickets sign it before turning it over to the book-keeper.

5. **Job Order Requisition**—Whenever material is needed in the shop for the execution of repair work, the man requiring the material fills out a requisition, Fig. 7, which is 9 by 6 inches, and comes with a duplicate bearing the same number. The original is white and the upper left corner is printed with a space marked credit inventory on which material to be credited to the customer are recorded. In filling out this form the workmen dates it, fills in the name of the car owner, the number of the job order and particulars referring to the material that he needs. Before the latter is drawn from the stockroom the foreman O. K.s the requisition and its yellow duplicate, both being taken to the stockroom, where they are retained after the material has been given out and signed for on the two copies by the person receiving it. At the end of the day the white copy is sent into the office, while the yellow remains with the stockroom foreman to be filed.

6. **Expense Stock Requisition**—Fig. 9 shows a requisition

which is used when material is drawn from the stockroom required for any purpose except a job order. This form is of the same size as Figs. 7 and 8, but is printed on green paper and comes in pads, blanks being consecutively numbered.

7. **Cash Sales Record**—If parts are bought from the Colt-Stratton Co. a special requisition is made out, Fig. 8, which is 11 by 8.5 inches. The original is printed on white paper and is destined for the cashier; a pink duplicate is delivered to the customer when the order is taken; a yellow triplicate goes to the service department office and the quadruplicate, printed on light tan cardboard, goes to the stockroom where it is filed after the goods have been given out. As Fig. 8 shows, this blank affords space for recording a mass of valuable information.

8. **Bill**—Fig. 12, bill used by the Cole dealers in New York City, the duplicate differing only by the distribution space printed in the upper left corner. This space is used to give a comprehensive statement of the distribution of the amount appearing on the bill and what they are for. By striking out the W and R mark, a record is made of whether the goods were sold retail or wholesale. In all other respects this bill is designed along strictly conventional lines. Originals and duplicates are numbered.

9. **Defective Parts Return Record**—When defective parts are returned to the company the office clerk receiving them fills out a record, Fig. 14, which is printed red on white paper, with a duplicate on pink and a triplicate on yellow paper. The original copy is kept by the accounting department, the duplicate is given to the customer or his representative delivering the parts, and the triplicate accompanies the latter to the stockroom. The claim department, which receives the goods when they are brought in, puts down all the data referring to the car on which the parts were used and makes out a credit note to the customer which is numbered, the number being recorded on the form, Fig. 14.

10. **Return to Stock Form**—If new parts or materials drawn from the stockroom for the purpose of a repair job are returned to it without having been used, a form, Fig. 13, which is of the same size as Fig. 14, is made out. The original is printed on white paper and the duplicate on yellow, being filed by the accounting department and the stockroom respectively. This form is also used if parts have been sold to a customer and are returned without having been used. In any case, the date on which the parts were issued and the order on which this was done as well as particulars referring to the party to receive them and to the nature and quantity of the material are recorded on this form. The stockroom clerk signs both copies of the form before the material is put back in the stock.

11. **Credit Memorandum**—Whenever a customer returns parts he is given the credit referred to above, which is illustrated in Fig. 15. The copy given to the customer, however, is printed with the name of the company on top of the paper and is 9.25 by 8.5 inches, while a duplicate, here illustrated, is 11 by 8.5 inches. Both copies, however, are printed on pink paper. The copy here shown is filed by the claim department, which latter takes the matter up with the factory.

12. **Cost Sheet Summary**—It is of special value to the company to have a particular record form for compiling every day the cash sales made and the credits given for return parts. Fig. 4 shows this blank, which is 11 by 8.5 inches, printed on white paper and punched so that it may be held in the binder together with records made in the past. On this form the number of order or the credit memorandum is entered and along with it the amount of the same as well as the distribution of the money on the repair work, tires, parts; or, in the case of a credit memorandum, for what the credit has been extended and how much of it goes to tires, equipment, etc.

13. **Material Received Record**—All material which is received by the company and which has been sold before is recorded on a special form, kept in a binder. This form is shown in Fig. 5, being 11 by 12 inches. It is printed on both sides. The date when it was received, the party by whom it was sent, the number of the credit memorandum, etc., as well as particulars referring to the part itself are entered in detail. The form is large enough to afford space for forty entries on one side.

14. **Claim Sheet**—All parts which have been returned to the Colt-Stratton Co. are sent by it to the Cole factory in Indianapolis with a claim sheet, Fig. 17. It is 8.5 by 11 inches, printed on yellow paper, and is filled out with a complete list of the material sent to the factory. The number of the article, the

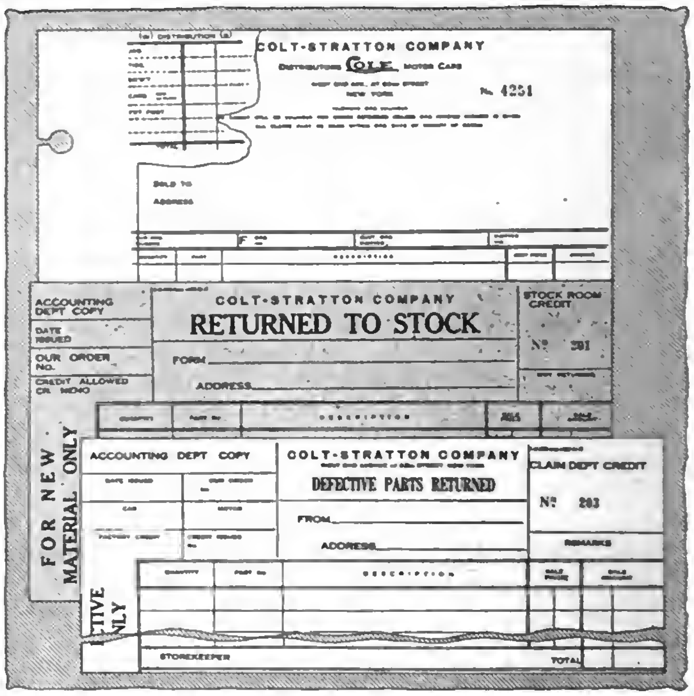


Fig. 12—Bill form used by Cole dealers. Fig. 13—Record for parts sold and then returned. Fig. 14—Record for defective parts returned to stock

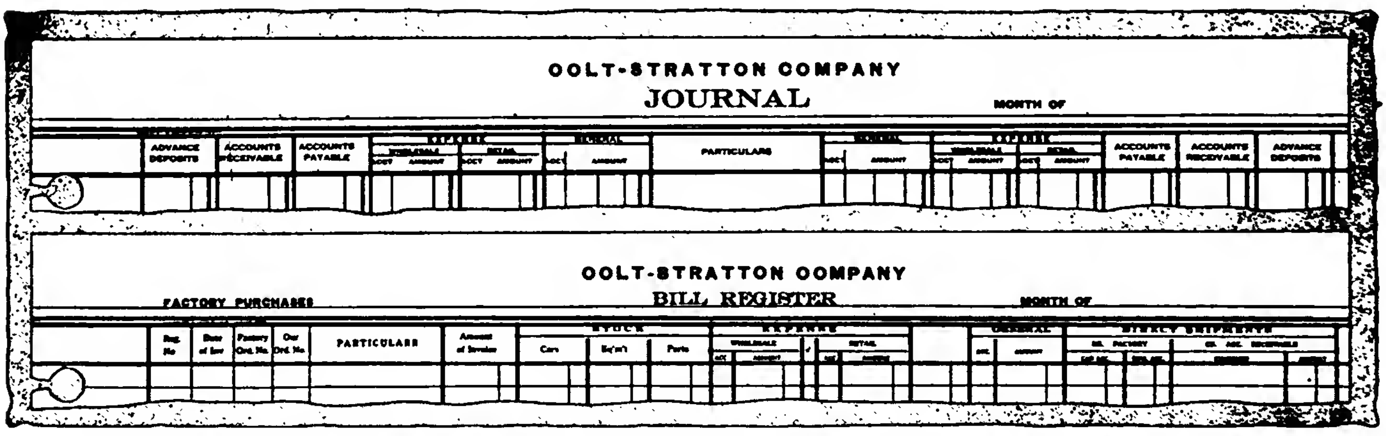


Fig. 10—Top of page from the Colt-Stratton Co.'s journal. Fig. 11—Design of bill register page used by the company

quantity, the car from which it was taken and the description of the article are stated on this sheet, which is signed by the manager of the claim department or technical department before the parts and the sheets are sent to Indianapolis.

15. **Shipping Order**—All materials leaving the service department are accompanied by shipping orders, Fig. 16, which are made out in quadruplicate. The original (white) goes to the accounting department, the duplicate (pink) is packed with the goods, the triplicate is filed in the main office of the service department and the quadruplicate remains with the stockroom, where the order is made out. The form is 11 by 8.9 inches, and every single detail referring to the transaction which results in the shipment is recorded on the order.

16. **Bookkeeping Forms**—Bookkeeping operations are carried out on four forms, which are held in four distinct binders. Fig. 18 shows the form used for recording the influx of money; the blank is designed more or less along lines of ordinary ledger leaves except what specific provisions are necessitated by the singular conditions of the automobile business. Each line has space for taking the name of the payer, date of payment, the amount of cash received, money deposited and where, discounts granted to the company, deposits made on transactions, cash come in on retail sales and the total amount for that cash receipt. Fig. 19 shows the cash disbursement sheet, designed similarly to

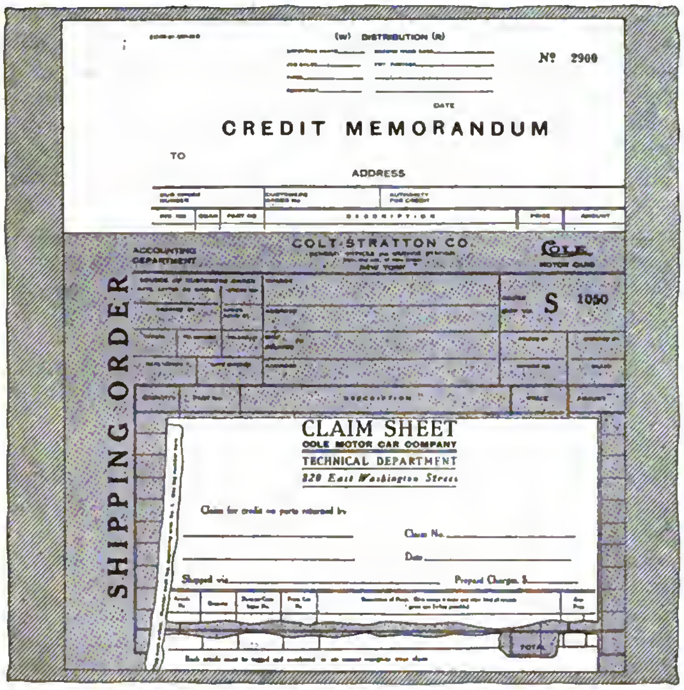


Fig. 15—Credit memorandum for returned and defective parts. Fig. 16—Shipping order used for recording outgoing materials. Fig. 17—Claim sheet

Fig. 19, but adapted to the opposite purpose. It affords space for the date, the name of a payee, the number of the check issued him if the payment was made by check, the amount of cash paid to him if any, the name of the bank on which the check was drawn, discounts paid, retail and wholesale expenses, petty expenses and total of the payment.

Fig. 10 illustrates the company's journal, the sheet being designed quite conventionally. Fig. 11 shows the bill register, on which every bill sent out and the details appertaining to the goods for which it is sent are recorded.

City Electrics Have Advantages

Few people who are desirous of owning an automobile are aware of certain advantages of the electric car for city and near-city service. Silence, cleanliness, and ease of control are features which are seldom reckoned with as worth money; but there is a distinct feature of economy about an electric. The following figures bear this out.

In New York City an electric is garaged, charged, cleaned and generally cared for by any of a number of garages for $40 a month; not forgetting delivery at the owner's house and calling for the car, both once a day. In other words, for $40 a month, or $480 a year, all expenses except car depreciation and tire cost are taken care of. Figuring a set of four tires, guaranteed to last for 10,000 miles, at $280, the cost of operating an electric automobile per year is as follows:

Depreciation (25 per cent. of $2,300)	$575
Garage, current, etc.	480
Tires (27.39 miles on each of 365 days)	280
Repairs, accessories, etc. (high estimate)	100
Total	$1,435
Operating cost per day	$3.94
Operating cost per mile	.143
Operating cost per day per caput (4 persons)	1.31

For less than $4 a day the car can be made to travel over more than 27 miles every day in the year. This means that it will take the owner to business; having been sent back by a clerk or the like; it will serve to take miladi to her places of shopping, and it will furnish a means for both and perhaps a child to get a sniff of fresh air after the hours of business. The cost to each of the three members of the family will be $1.31 a day. But the car will do more than that. If the owner is a doctor or lawyer, it may be necessary to use the electric more than 27 miles a day at a slightly higher cost, on account of the additional current needed; but the ownership and use of a car will result in direct gain of business, as everybody rather deals with a successful physician or attorney—that is, one who can afford such modern equipment as an automobile—than with one who cannot.

There are districts, such as Westchester County in New York State, where a car owner can draw any amount of current for his car at the cost of $10 a month, and such a condition, of course, makes the ownership of an electric still easier and more pleasant. As the radius of action is from 50 to 80 miles on a charge, a nice trip may be taken any day without having to stop during the day for recharging.

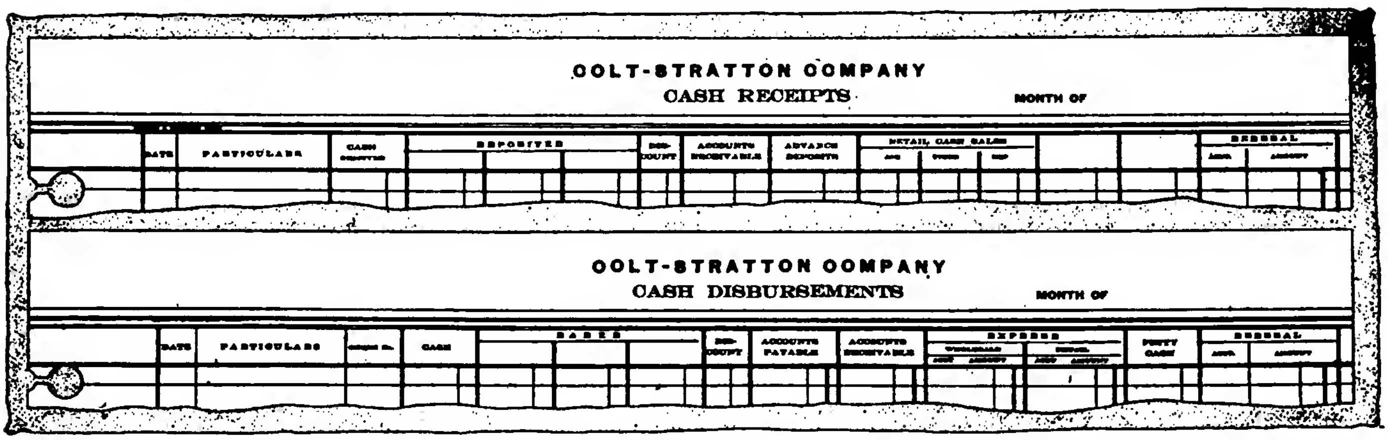


Fig. 18—Head of page used in company's cash-receipts book. Fig. 19—Record blank for cash disbursements made by company.

The Rostrum

In which Letters from Readers Are Answered and Discussed

Owner Uncertain as to Use of Cut-Out

Wants to Know if He will Increase Power by Using One—Another Seeks Road Information—Spring Wheels Advocated—Using Carbon Remover—Cleaning Carbureter with Air Blast—Locating and Remedying Plug Trouble

Effect of the Cut-Out on Power

EDITOR THE AUTOMOBILE:—I am preparing to go on a long tour this summer and would like to know whether I would develop more power if I use a muffler cut-out.

East Orange, N. J. F. E. S.

—Several tests were made on a car at the laboratory of a prominent factory in Detroit, Mich., in order to determine the actual loss of power developed by the attachment of the muffler. The tests showed that the difference in power developed with the muffler on and with the cut-out open was very small. Tests were made by the Packard Motor Car Co. at its Detroit, Mich., laboratory with a 30-horsepower motor without a cut-out, the muffler being merely removed from the line. In this way a higher horsepower is developed than without a cut-out, as shown in the curves, Fig. 1. The results of the test are given in the following table:

Revolution per min.	Horsepower with muffler attached	Horsepower without muffler	Horsepower difference Less	Horsepower difference Greater	Corresponding speed miles per hr.
500	23.7	21.5	—2.2	...	17
600	27.8	26.2	—1.6	...	20
700	31.7	31.2	—0.5	...	23
800	33.8	36.0	.....	.2	27
900	38.9	40.0	.....	1.1	30
1,000	41.6	43.0	.....	1.4	33
1,100	44.2	45.6	.....	1.3	37
1,200	46.6	48.2	.....	1.6	40
1,300	48.1	51.0	.....	2.9	43
1,400	49.2	53.4	.....	4.2	47
1,500	50.7	54.7	.....	4.0	50
Total Ave.		41.0		1.13	

From this table it can be seen that the average difference in power gained by removing the muffler varies between 2.75 and 1.125 horsepower. The removal of the muffler gives the same results as a cut-out having an efficiency of 100 per cent. The differences in power caused by using the cut-out will be less than those shown in the tabulation.

Road Conditions in the Oranges

Editor THE AUTOMOBILE:—I expect to tour New Jersey in the near future and would like to know of the road conditions, especially through the Oranges. I expect to go to Greenwood Lake, and have heard that the roads were not in very good condition last fall to that place. Have they been repaired as yet?

New York City. S. E. F.

—The roads are now in fairly good condition, though a few of the less important are now being repaired. The Newark turnpike is not in as good shape as reported, and we would advise slow going over it. The roads through the Oranges are especially excellent, as are those up to Greenwood Lake.

Says Spring Wheels Cure Bumps

Editor THE AUTOMOBILE:—The pneumatic tire, inflated and on a smooth road, is almost ideal in its action. It absorbs the pebble or throws it to the side. But a tack, jagged glass, or a sharp-pointed stone projecting from the surface of a rut interrupts its usefulness. The dust caused by its passage is an imposition on the residents along the way amounting almost to an injury. On a rough road the rebound is so rapid that the rider is bounced from the seat even to the destruction of his hat against the top. The thoughtful driver is never care-free. Hard work, expense and danger follow in his wake. Ordinary precaution requires that he carry spare parts and that he remedy all faults as soon as discovered. Many times he leaves his car at the roadside to await repair-parts far away.

The automobile is a pleasure-giver beyond compare. If life is worth living it is worth keeping. Question: How can the tire be made safer, more dependable?

The solution may be approached by studying the bump in extreme cases. Bumps, for the most part, are caused by the violent dropping or lifting of the car. Usually the drop and the lift follow each other in one sequence or the other.

The moment before the drop the tire and body spring are both compressed by the load. At the instant of the drop the load is released from both. The tire comes to normal form. The springs, coming normal, throw the axle and wheel swiftly down. When the impact comes the loosened springs and clips rattle, the load meantime falls and its momentum is finally stopped by the joint compression of the tire and springs. This compression is greater than the amount required to carry the load and hence the rebound.

The moment before the lift the tire and springs in normal compression meet a perpendicular obstruction. This presents a small surface to the tire which, therefore, is greatly compressed at one spot so that sometimes the two inner surfaces come together. For an instant the tire is solid noticeably. The springs are again compressed beyond the normal and a rebound follows; at the proper time a rattle.

In both cases the load reciprocates in gradually diminishing traverses until its energy is absorbed. If the time between the drop and the lift or the lift and the drop is sufficient to allow the tires and springs to return to normal compression the bumps are of bearable class. But if the sequence either way is quick enough so that the spring and tire cycles overlap, the bump is violent. This explains the deadliness of the high crossing and the small hole in a pavement. If this last is of correct width and so deep that the tire does not touch the bottom, the bump resulting is the king of bumps.

The cycle of the passenger is always a little behind that of the car. The seat is started up before he stops going down—bump—and the lag of the wheels and the axle caused by the relaxation of the springs does not affect his course. He leaves the seat and on the return falls against the seat, then rapidly rising—bump.

Now what can be done for him?

It is necessary to have something under him to check his course to the blow. So cushion-springs, body-springs and pneumatic tires are provided for this purpose. The greater the distance through which he is checked before he is stopped the less the blow. Anything which curtails the compression of the springs is a positive detriment to him. If the springs and tires could slowly return to normal compression to be ready for the next call for their services the bump would be almost eliminated.

In the case of the springs this can readily be done by a cylinder and plunger working in oil, the plunger valve allowing free compression of the spring but limiting the return to the speed of a leak. This would stop the relaxation of the spring in the drop, the rattle probably at all times, and the lag of the wheels and axles in the rebound. Such a device would hardly be necessary for the cushion-spring, though applicable.

But perfect government of the action of a pneumatic tire has not yet been devised. It seems impossible. The pneumatic tire is too resilient despite regulation of the springs as outlined above. The area of the contact multiplied by the internal pressure is always equal to the load and as the load is augmented by the drop or the lift the rebound must always come. Various designs are existent, placing the tube within the wheel, in which the action of the rim about the hub could be regulated. But heat and abrasion, the destroyers, make this but a sorry makeshift.

Puncture Not a Tire Destroyer

We hear much of punctures. The puncture, although it may deflate a new tube, need scarcely be considered as a tire destroyer. Neither should outside abrasion. Real punctures are exceedingly rare. Abrasion of cotton is the tire destroyer. Do you remember the see-saw of string you made in your youth and how quickly the string cut through? That is the action going on in the shoe whenever the car moves and it cannot be stopped or remedied. Anyone who buys a puncture-proof tire or tube or cover, or who has an old shoe retreaded is a gull.

But, after all, the greatest discontent comes from the interruption. Is there an automobilist who would not welcome a wheel of fair carrying performance, provided he knew it would so carry with all the certainty of his father's carriage wheels? How if it were impossible for a pneumatic-tired wheel to equal its carrying-performance?

In November, 1910, a set of spring wheels, with solid tires, were installed on a certain car. The front wheels have been on the car continually since and have never caused one moment's delay. On two occasions in 1912 one spring was broken in the right wheel and replaced the next day, the car running as required meantime. The original rear wheels were taken off in August, 1912, to make way for an improved set. They had never caused one moment's delay. One spring broke in the right wheel of this pair in August, 1911, on a Friday and was replaced the following Tuesday after running 350 miles. The broken spring made no difference in the riding and did not rattle, though still in the wheel. The rear wheels last installed have had no repair of any kind. They have traveled 5,000 miles, the old rear wheels 7,000 miles, the front wheels 12,000 miles. The front tires, side wire type, are worn .75 inch in diameter, but the corners are mostly there. They will probably give out in the base, as such tires do, but look good for many miles. The present rear tires, wireless, show little wear. If they wear down to the hard rubber, as the manufacturers say they may, 30,000 miles is easily within their life.

The car equipped with spring wheels weighs 800 pounds more than with pneumatic-tired wheels, but without change of engine or carbureter ran 30 per cent. farther per gallon of gasoline in 1911 than with pneumatics in 1910. The dust raised is very much less; steering very much easier.

The wheels are not as resilient as pneumatics. On smooth pavement no difference in riding can be noticed. On rough roads they excel pneumatic-tired wheels; no passenger has ever admitted to leaving the seat. This car, as all single-tired solid-tired cars do, skids very easily. Chains can be used as on pneumatics and, very strangely, the passenger is hardly aware of their presence.

The study of spring wheels was started in 1904; the course is not yet completed. It is easily possible to make springs of long life to carry any load. A truck-wheel combination can be built without rubber which will on any road absorb the full quantity of power delivered to it from the engine.

Buffalo, N. Y. HARRIS T. DUNBAR.

Wants to Tour in New Jersey

Editor THE AUTOMOBILE:—I intend to run down to New York City this summer and would like to tour in New Jersey for a few days.

2—Will it be necessary to have a New Jersey license or permit? CARL E. FOSTER.

Syracuse, N. Y.

—1—It will not be necessary to get a New Jersey license providing you do not stay in the state more than 10 days.

—2—In mapping out a route from Syracuse to New York City and then touring New Jersey, we would suggest that you follow the routes given in the Blue Book (Nos. 321, 330, 497, picking up 455 at Owego, 409, 152-R and 51-R), passing through the following cities: Ithaca, Binghamton, Scranton, Delaware Water Gap, into New Jersey at Easton, thence through Hackettstown, Morristown, the Oranges, Newark, Weehawken and across the ferry into New York City. The roads are in excellent condition. There are many beautiful and interesting tours in New Jersey, the favorites being the run down the coast and that through Lakewood and the hills of the northern part of the state.

Using Liquid Carbon Remover

Editor THE AUTOMOBILE:—I want to use a liquid carbon remover. The directions tell me to put the liquid into the cylinder and leave it there for a couple of hours. As it takes a large quantity for each cylinder and as the stuff is very expensive, I would like to know if, in your opinion, it would harm to use the same liquid for more than one cylinder after it has stayed in there for some time.

Brooklyn, N. Y. READER.

—It will do no harm to use it if you can. In many motors, the piston rings are not tight enough to hold the liquid for a

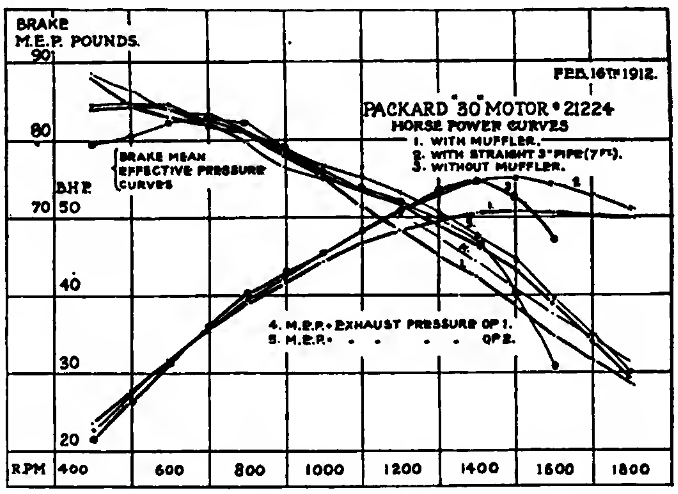


Fig. 1—Curves showing the effect of the use of a muffler cut-out on the power developed by the motor

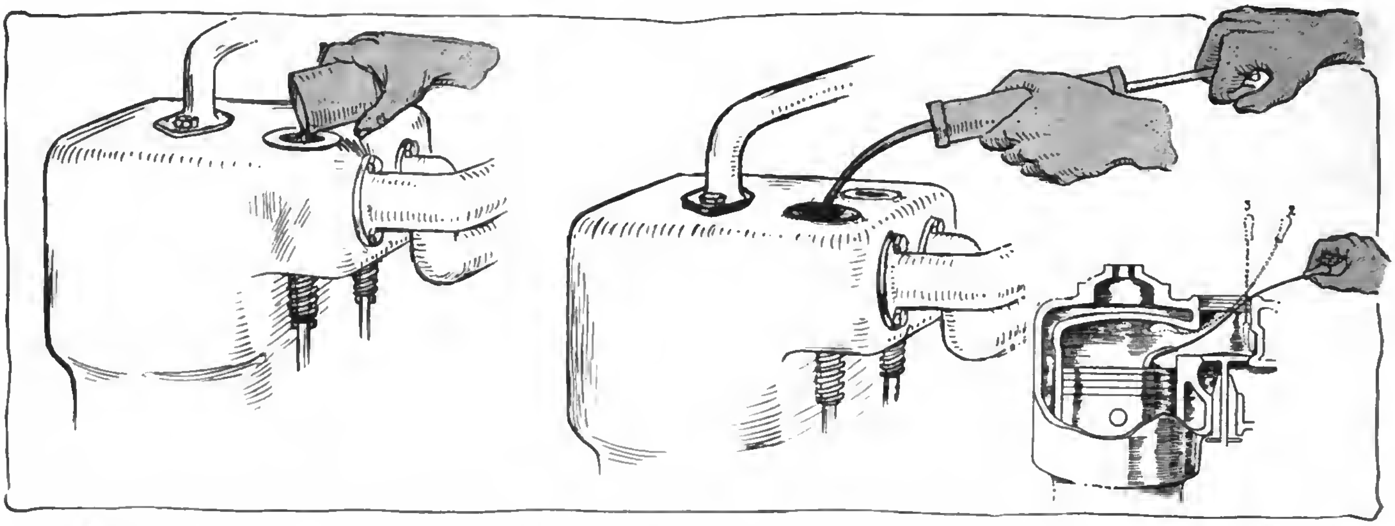


Fig. 2—Showing the steps in the application of a liquid carbon remover to the cylinders. Left, pouring in the remover; center, drawing it out by means of an oil gun; right, using the scraper

long enough time. The liquid can be drawn through any one of the openings in the top of the cylinder by means of an oil gun, as shown in Fig. 2. It is best to remove the valve cover cap and then the opportunity of using a scraper to take out any loose pieces is presented. In the illustration the method of working the scraper around is shown.

Carbureter Cleaned with Air Blast

Editor The Automobile:—My car has suddenly developed a bad case of asthma, or whatever the corresponding disease in an automobile may be. When in good health it will respond quickly to the throttle and will fairly jump forward when the accelerator pedal is pressed. Since it developed the strange malady, however, it has been behaving in a very singular manner. When the accelerator pedal is pressed it will sputter a few times and then the motor will die. If I quickly throw out the clutch and let the car coast, it will start the motor again by the momentum of the car. The motor will then run about a half minute and repeat the performance. What can be the matter with the car? What is the cure?

Williamsbridge, N. Y. R. T. Corry.

—Your gasoline line is dirty and does not allow the fuel to flow through the line as rapidly as it should. As soon as some of the gasoline at the top of the float chamber is consumed, the motor will stop until a sufficient quantity oozes through the line for it to run a short time again. The motor will then stop again and you will have to shut it off for a while. The quickest and best way to cure the trouble is to blow out the carbureter line and the carbureter itself with compressed air. Remove the auxiliary air valve cage or any other removable parts of the carbureter, as shown in Fig. 4, and put the air hose for tire inflation into the opening. Turn on a good strong current of air. Empty out the gasoline tank and then put the air hose against the gasoline feed line and blow back towards the carbureter from the tank end. If you desire to blow through from the other end, disconnect the pipe line from the tank so that any dirt in the line will not be blown into the tank. Take the needle valve out of the carbureter and blow through the jet opening also.

Finding and Curing Plug Trouble

Editor The Automobile:—How do you find out when ignition trouble is in the plugs and not some other part of the electric equipment? I run continually on a high-tension magneto and of late have had a little ignition trouble. It is a perpetual miss in one cylinder at low speed. If the trouble is in the magneto I wont touch it, but will send it to the factory. If it is in the plugs I will renew the plug, but do not intend to buy a new one until I find out if it is possible for a plug to operate at high speed and not at low.

Boston, Mass. Alice Ames.

—You could find out in 5 minutes if the plug was bad and you knew what cylinder was missing by simply changing the plugs around and seeing if the miss still occurred in the same cylinder. You can readily locate the cylinder which is missing by the method suggested in Fig. 3. By means of a screwdriver each plug is short-circuited in turn. When the cylinder that is missing is short-circuited there will be no difference in the running,

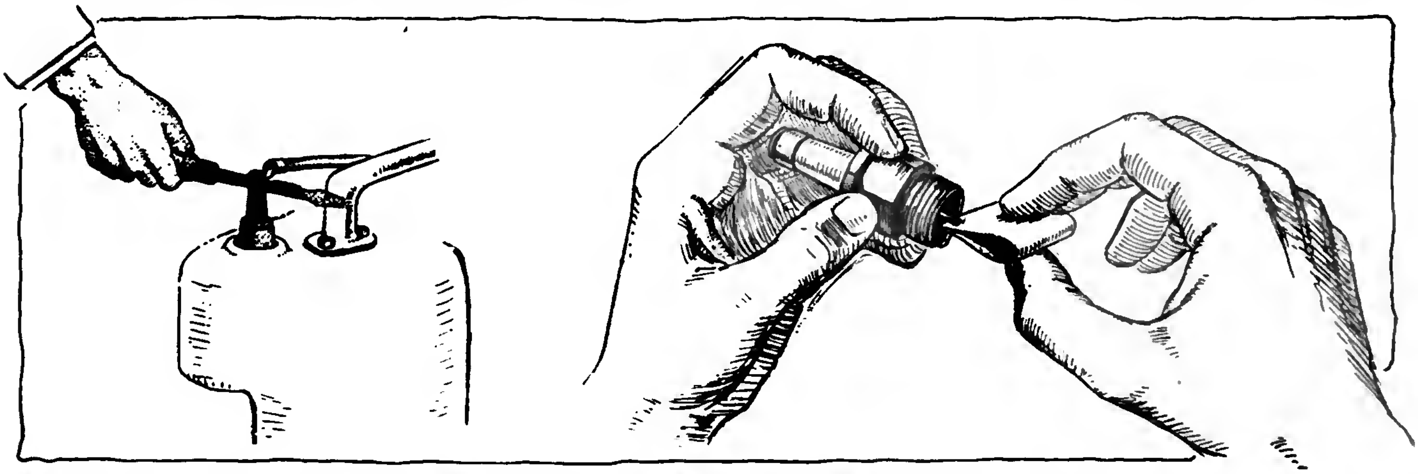


Fig. 3—At the left is shown an easy method of locating a cylinder which is missing fire, while at the right is a handy way of gauging the sparking gap on a plug suspected of missing fire

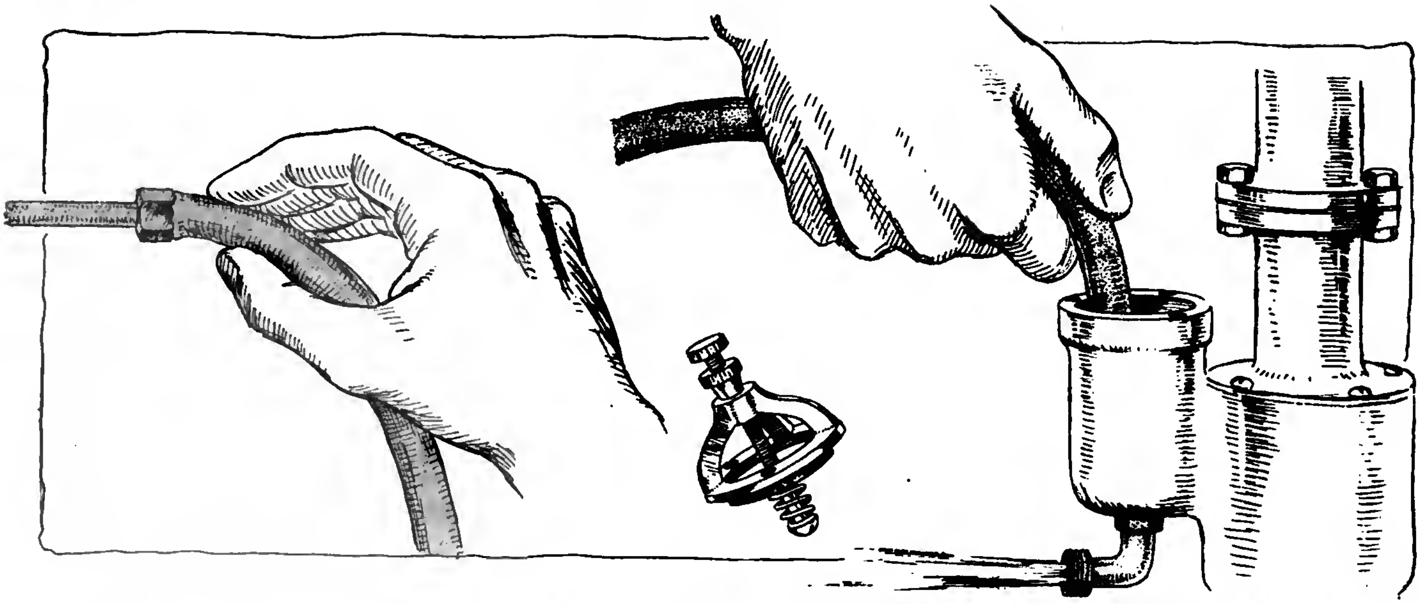


Fig. 4—Cleaning a carbureter with an air blast. Left, compressed air tube with a piece of copper tubing in the end for a nozzle; center, auxiliary air valve cage; right, blowing out the carbureter

while each of the other three will cause a noticeable falling off in power and speed. If changing the plugs around then shows that the miss always occurs in the cylinder that has the bad plug, examine the points and if they seem too far apart, they can be gauged by a card which has been folded over in the manner shown at the right, Fig. 3. The points should not be farther apart than 1-32 inch or closer than 1-64 inch.

Racing Game as a Business

Editor THE AUTOMOBILE:—Kindly inform me why the racing game cannot be put on a basis that would enable a driver (with ordinary means) to buy his car, or cars, and race them as a business proposition as well as the sport. It seems that the promoters of race meets, with the co-operation of drivers and manufacturers, could get together and put the game on a very firm foundation. At any rate, I would like to see the proposition discussed through THE AUTOMOBILE.

Lexington, Ky. WILLIAM B. BROWN.

—There is one reason why the racing game will probably never attain the elevation of a profitable business except perhaps on certain special tracks near large centers. In order for the drivers to earn sufficient money to make them go into the races as a regular calling there would have to be races frequently during the year. Otherwise there would not be money enough in it to pay a large number of men engaged in this work. The tracks on which the races are held are so large that they are exceedingly costly and require an enormous capital. This is especially the case when erected near cities large enough to support them and it has been noted that unless there is a particularly brilliant entry list, public interest is small. In tracks like the Speedway at Indianapolis or many other local tracks scattered throughout the country there will always be motorcycle and automobile racing and it will pay fairly on the investment. This is true where these races are held near an amusement center, such as the Brighton Beach track at Coney Island, New York City. The big national events are few and far between and these attract the main interest.

Waterjacket Leak Can Be Plugged

Editor THE AUTOMOBILE:—Is it necessary to have a welding job done on a cylinder in which there is a small leak due to a blowhole in the casting? This would be more of an expense than I care to stand just now and yet I cannot allow the cooling water to leak, especially at this time of the year.

Englewood, N. J. SUBSCRIBER.

—It is possible to mend a very small leak by plugging it, but if the leak is large or has a crack of any length extending away from it, it would be better to have it welded. On a small blowhole it will probably be possible to make the repair by means of an ordinary iron gas plug. The steps in the operation of making this repair are simple and are clearly shown in Fig. 5. The hole is first drilled to the size of the nearest possible plug. A half-inch gas pipe thread will have an internal diameter of .622 inch and the thread is the regular 1-2-inch taper pipe thread. The plug is dipped in red lead and screwed firmly in place and then sawed off. This will give a neat-looking job and if done right it will be nearly impossible to tell where the repair was made. The plug can be brought down to the level of the surrounding metal by means of a heavy coarse file. If it is desired to make a still neater job than is obtained by sawing off the plug and filing it down, a touch of paint or a repainting of the cylinder block is possible.

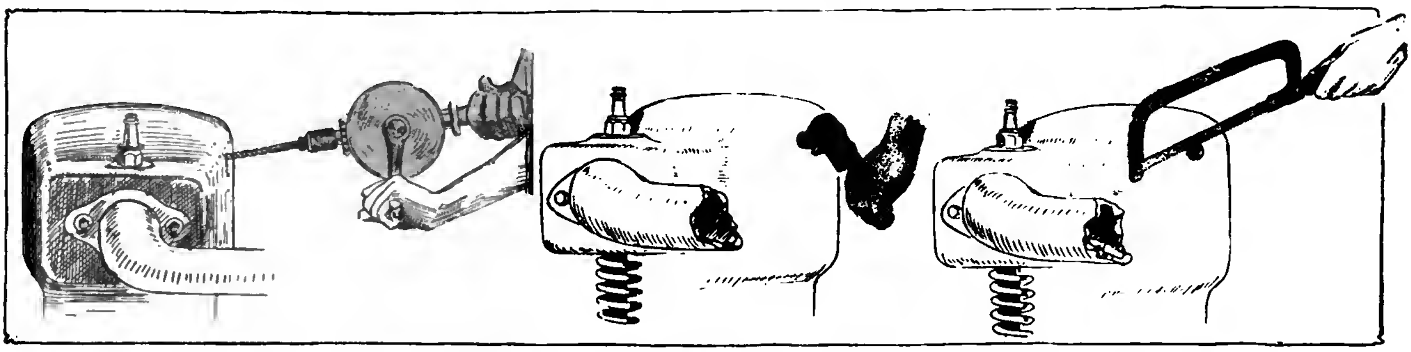


Fig. 5—Three of the steps in the plugging of a leak in the waterjacket. Left, drilling the leak to fit the plug; center, screwing in the plug; right, sawing off the head of the plug

Monarch Has Left Steer and Center Control

Long Stroke and Syphon Cooling Are Features—Car Built Light and Strong—Complete Equipment

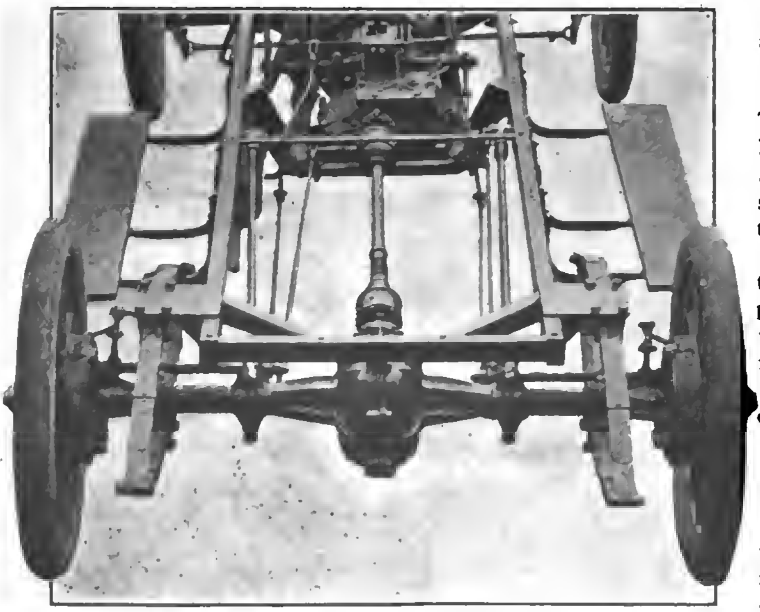
THE Monarch Motor Car Co., one of Detroit's youngest motor car building companies, the announcement of the formation of which was made in THE AUTOMOBILE recently, has made known the details of its product, which is now undergoing road test.

The car will present a very attractive appearance, having a streamline body of the torpedo type with the hood sloping down to the front as found on the Renault cars abroad and on several American makes. Probably the most unusual feature of the new design is the placing of the radiator under the hood, so that when the latter is raised, the cooling device is exposed. The filler cap of the radiator comes through the hood at the front, as shown, making it possible to fill it in the usual manner. Another feature is the placing of the gasoline tank under the cowl at the front of the dash, which is a growing tendency in this country as evidenced by the number of cars which have been designed in this way in the past year.

Considering the chassis in general, it is made up of three principal units, the motor, gearset and rear axle with the conventional methods of connection between these. A view of the rear system is shown herewith.

The motor is of special design for the car and is constructed along European lines in that it has a small bore and a long stroke, making for maximum power with low gasoline consumption. It has a stroke of 5 inches and a bore of 3 3-16 inches, giving a horsepower rating of 25. The cylinders are cast in pairs and are water-cooled, as already brought out. The cooling system is of the thermo-syphon type, eliminating the use of a circulating water pump.

The motor and gearset are mounted on tabular members which parallel the side frame rails and are hung from dropped cross-frame members at front and rear. This is clearly shown in the illustration. The motor has a forged crankshaft, which is carried on three main bearings fastened to the upper half of the crankcase. The connecting-rods are also forged and of light weight, as are also the pistons. The wristpin bearings are bronze bushed, while the wristpins themselves are light and hollow. The aim has been to obtain as light a set of reciprocating parts as possible, to aid in the elimination of vibration and to prevent injury to the motor when running at high speeds.


View of rear axle assembly of Monarch


Left side of five-passenger touring car

The timing gears at the front of the power plant are spirally cut and are accessible on removal of the gear cover in the conventional way.

The carbureter is placed on the right side of the motor and has a very short intake pipe with no pockets which is intended to prevent any condensation of gas. The carbureter feed pipe from the gasoline tank is also very short due to the close position of the tank to the carbureter. The chief advantage of this is that a flow of fuel is assured on grades and as long as there is any in the tank.

The lubrication is of the forced feed type, operated by a plunger pump worked through connection with the camshaft. The oil is pumped from the bottom of the crankcase up to the timing gears and to the main bearings, whence it feeds to troughs under the connecting-rods. These splash the lubricant up into the cylinders, lubricating the pistons. It then flows down into the reservoir at the bottom ready for recirculation.

Springs Under Clutch Leather

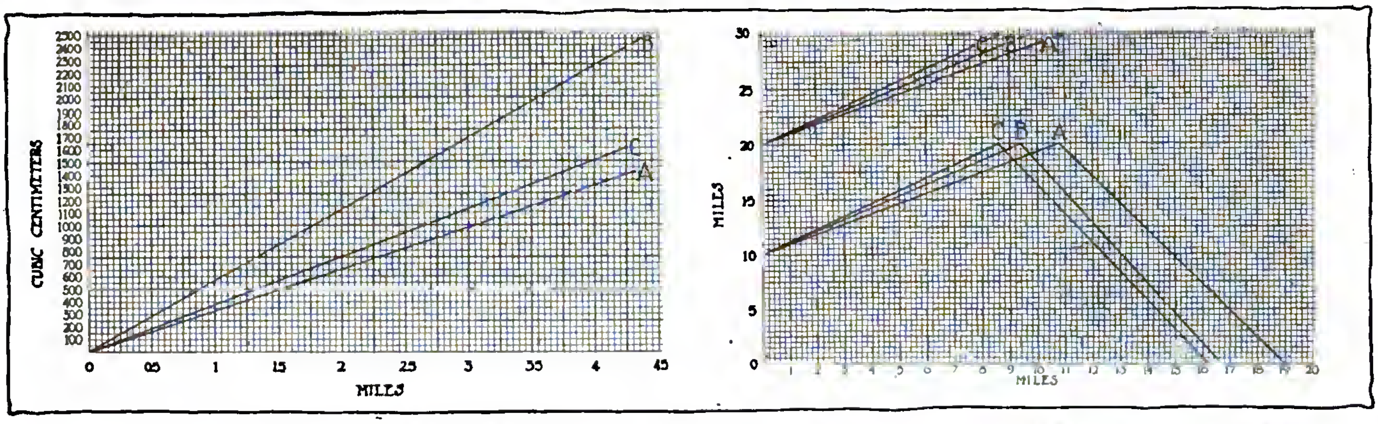
A leather-faced cone clutch is used, the cone having a 13-degree angle. Clutch-facing springs are placed under the clutch leather for easy engagement. The change gearset is of the selective sliding gear type, having three forward speeds and reverse. The power is carried to the rear axle through a substantial drive shaft, which is not enclosed. It is equipped with two universal joints, one at the forward end and one at the rear axle. The drive is carried by two side radius rods, which are attached to the axle and to brackets fastened to the side frame rails at their forward ends.

The rear axle is of the semi-floating variety with bevel drive. The ratio is 4 1-3 to 1. The brakes are mounted on the rear hubs and are external contracting and internal expanding, having a diameter of 12 inches and a width of 2 inches. The rear springs are elliptic, under-slung from the axle and swiveled on the bottom.

Other features are the left-hand drive and center control, electric cranking and lighting. As to equipment, this is most complete, consisting of demountable rims, electric horn, rain-vision windshield, extension top and side curtains, speedometer and full complement of tools.

The wheelbase is 110 inches, and while the price has not been definitely settled, it is thought that it will be $1,050.

EVERY BATTERY BOX has or should have a drain in the bottom. Where the battery is located on the runboard this drain is ineffectual. For that reason the box should be raised a bit above the running board even if the drain hole is carried through the running board. This will permit the electrolyte which may spill out from gathering under the bottom and destroying it. It also can be washed out whenever the car is cleaned.



Left, fuel consumption curve. A, kerosene; B, alcohol; C, gasoline. Right, acceleration curve. A, kerosene; B, alcohol; C, gasoline

Two Fuels from Kerosene and Alcohol

MILWAUKEE, WIS., June 9—A contender for the $100,000 prize offered by the International Association of Recognized Automobile Clubs for the best substitute for gasoline as a motor fuel has appeared in Milwaukee in the person of Prof. Frederick C. Raeth, who, with Kurtis R. Froedtert and William A. Biesmann, of Milwaukee, has perfected two different motor fuels, one using kerosene and the other denatured alcohol as a base.

Common kerosene and ordinary denatured alcohol, chemically treated by a secret process evolved by Professor Raeth, form fuels which in tests on air and water-cooled motor car engines and on small stationary or farm engines prove to be at least as good as gasoline and in some ways much better. Professor Raeth and his associates pursued their investigation in the direction of treating denatured alcohol to make it suitable as a fuel for internal combustion engines with the idea of appealing particularly to Europe, where the denatured alcohol industry has made great strides under the influence of governmental inducements. The cost of treatment adds but .5 to .75 cent per gallon to the price of the fuel.

Comparative tests of gasoline, the kerosene fuel and the denatured alcohol combination were made under the same conditions, and in point of fuel economy kerosene ranked first, gasoline second and alcohol third, as follows:

Fuel	Spec. Grav.	Distance, Miles	M.P.H.	Fuel Consumption, Pints
Alcohol	0.835	4.3	20	5.28
Gasoline	0.70	4 3	20	3.36
Kerosene	0.805	4.3	20	2.24

The test was made on an Auburn five-passenger touring car, carrying a four-cylinder Rutenber motor rated at 40 horsepower and equipped with a Rayfield carbureter, hot-air-jacketed. The course of 4.3 miles through Wauwatosa provided practically every highway condition.

An ordinary aspirator bottle, with a capacity of about 1,750 cubic centimeters, graduated up to 1,500 cubic centimeters was used as a container for the various fuels. A split-second stopwatch was used.

A striking characteristic of the denatured alcohol fuel was the ease of starting the motor. The temperature at the time of the tests ranged between 57 and 63 degrees Fahrenheit. The car was drained of gasoline and allowed to cool for about 10 minutes. The alcohol fuel was then introduced and the motor started as readily as with gasoline. It was immediately noticeable, however, that the motor was being starved, and the fuel adjustments of the carbureter were opened several turns, the air adjustment remaining untouched. The car was then run at a speed of 20 miles per hour over a distance of 4.3 miles, which required 5.28 pints of fuel. More difficulty was experienced in keeping the car at 20 miles per hour than with gasoline.

Then the motor was operated on gasoline. The kerosene was introduced as the alcohol had been previously, and the motor turned over. The motor started readily, but lagged after a few revolutions, when the gasoline vapor in the cylinders was exhausted. It was necessary to do considerable adjusting on both air and fuel valves of the carbureter in order to make the kerosene mixture run the motor smoothly. After the motor became hot, the sluggish action disappeared and the car was run 4.3 miles on 2.24 pints. The motor did not at first show the life and dash that was displayed on the alcohol fuel and on gasoline. It climbed hills with much less labor than on either alcohol or gasoline. The kerosene used in the test was of the lowest grade.

Each time the motor was stopped it was necessary to use gasoline before throwing in the kerosene fuel.

Gasoline came out ahead in the acceleration tests. It required 8.5 seconds to accelerate the car from 10 to 20 miles per hour and 8.75 seconds to accelerate from 20 to 30 miles per hour on gasoline. Alcohol ranked second, the 10 to 20-mile acceleration being accomplished in 9.5 seconds, and 20 to 30 miles, 10.5 seconds. On kerosene, it required 11 seconds from 10 to 20 miles and 11.5 seconds from 20 to 30 miles. The specific gravity of the kerosene used in the formal test was .805, or 43 degrees Beaumé. The boiling point of this mixture was 112 degrees Centigrade.

The alcohol fuel tested for specific gravity at .835, or 38 degrees Beaumé, and had a boiling point of 67 degrees Centigrade. Neither of two Raeth fuels has an offensive odor. At no time was smoke detected at the exhaust while the car was running.

Filling the aspirator bottle with fuel for the test

Henry Souther, chairman of the General Standards Committee, who presented the report of the Iron and Steel Division

Combine Hardness and Elastic Limit

Iron and Steel Committee of Society of Automobile Engineers Furnish First Test Figures

Progress Made in Standardizing Demountable Rims—Nomenclature Division Shows Activity—Other Committee Report

THE healthy condition of all divisions of the Standards Committee of the S. A. E., the work of which is the most important feature of the society, was evidenced from the comprehensive reports of the older divisions and the progress reports of the more recently-formed divisions of the committee.

There were in all ten divisions scheduled to present reports at the session. Seven formal reports were heard and variously disposed of, while three of the divisions, though unable to provide anything definite at this time, stated through their chairmen that they were progressing and would undoubtedly be able to report at the winter meeting. Three were referred back to their divisions for further consideration, these being the fifth report of the Broaches Division, the fourth report of the Ball and Roller Bearings Division and that part of the report of the Electrical Equipment Division which referred to wiring systems.

The following shows the society's disposition of the Standards Committee's work:

Division	Chairman	Disposition
Iron and steel	Henry Souther	Accepted with amendment.
Ball and roller bearings	David Fergusson	Referred back.
Truck standards	Wm. P. Kennedy	No report.
Commercial car wheels	Wm. P. Kennedy	Accepted.
Electrical equipment	A. L. Riker	Wiring systems sub-committee referred back. Insulation sub-committee showed progress. Standard instructions for battery makers sub-committee accepted.
Broaches	C. W. Spicer	
Passenger car wheels	Henry Souther	Referred back.
Nomenclature	E. J. Stoddard	No report. Progress.
Miscellaneous	Arthur Holmes	Accepted. Progress.
Motor testing	J. O. Heinze	Accepted.

The fourth report of the Iron and Steel Division of the Standards Committee was presented by Henry Souther, chairman.

Iron and Steel Division Reports

The materials specified in detail hereinbefore include the most important ones available to the builder of automobiles. It is obvious that there are more kinds of material specified than are likely to be used by any one manufacturer.

The results of physical tests, whether tension tests or otherwise, are largely dependent upon the mass and form of the specimen tested. this is particularly true of heat treated steels. For the foregoing reason, all results of physical tests are comparative, and in order to make the comparison a proper one a uniform test specimen must be used.

The committee therefore decided that recommended practice should be the use of the S. A. E. standard test specimen, this specimen to be treated always in its finished form and not in the rough shape from which the finished specimen might be cut.

The figures for physical characteristics refer to those obtained on specimens prepared from sections common in automobile use, that is, bars from 1 inch round up to 1.5 inches round. The high yield points may be obtained with severe heat treatments, and the lower yields points with treatments less severe.

The yield point is specified rather than the elastic limit. The yield point is measured by the drop of the testing machine beam and may safely be relied upon for material having a yield point not in excess of 100,000 pounds per square inch. With material having a yield point in excess of 100,000 pounds per square inch the true elastic limit should be obtained by means of an extensometer.

In addition to the usual physical characteristics the "hardness" tests have been considered, as obtained by means of the Brinell ball test and the Shore scleroscope. The Brinell test recommended by the committee is the use of the 10 millimeter ball and 3000 kilogram load. It is pointed out, however, that the Brinell test must not be used on soft steels less than .5 inch thick, or an areas small enough to permit the depression to flow toward the edges of the specimen. With hard steels, where the depth of the depression and the flow of metal are less material as thin as .25 inch may be so tested. The Brinell test may be fairly made on surfaces that are free from scale and smooth.

The Shore test (scleroscope) must be used only on surfaces that have been carefully polished and free from all tool marks, file marks or grinding scratches.

The report further gives the specifications for carbon steels, screw stock, steel castings, nickel steels, nickel chrome steels, nickel-chromium-vanadium steels and silico-manganese steel.

For valves, and especially exhaust valves, high-speed tool steel is now being used. The exact analysis of this grade of tool steel is not important, as there are many kinds available, all more or less alike in composition. The chief characteristics of such steels are the tungsten (18-20 per cent.) and chromium (4-10 per cent.) contents. This quality of steel has proven very successful in the case of motorcycle valves, where the heat is intense.

The use of specifications for cast-iron in the present state of the foundry art is not very easy. The foundryman, if he is not accustomed to work to analysis, will object, although his iron may be within the specifications given 90 per cent. of the time. Moreover, if there are any defective cylinders he will be likely to lay it to the composition of the iron, whereas the fault may lie in his foundry methods, apart from composition.

Consequently these specifications should be used as indicating the ideal mixture—something for the foundryman to work to, even though he may not be willing to guaranee the analysis.

If trouble is experienced with cylinders, analysis of samples of the iron will show whether or not the composition is somewhere near what it should be. If the composition is very far from the specification here given, the purchaser will be justified in putting up strenuous objection.

Iron in accordance with this specification will be strong and reasonably close-grained in the thicknesses cast, and one that wears well.

The remarks made in connection with the gray iron specification apply even more strongly to malleable iron. Iron of the composition given, properly annealed, will make a strong and tough casting; but improperly annealed it will not make a good casting.

Castings that are received brittle may be so from two causes: First, unsuitable mixture of iron; second, incomplete annealing. Consequently, if brittle castings are received, they should be analyzed, and if the analysis is correct, then it is certain that the annealing operation was not properly performed.

The following table is a sample of those included in the Iron and Steel Division's report linking the hardness with the other properties of the various steels.

Physical Characteristics of Carbon Steels

Spec.	Treatment	Elastic Limit	Red. of Area	Elong. in 2"	Brinnell Hardness	Shore Hardness
10-10	....	....	....	....	...	..
10-15	....	....	....	....	...	..
10-20	Annealed	36,000	70.3	40.5	100	..
10-20	C-500° F. Draw	77,000	55.5	14.5	189	..
10-20	C-1200° F. Draw	50,000	65.5	32.0	...	..
10-25	Annealed	44,000	56.0	33.5	126	21
10-25	C-750° F. Draw	70,000	61.1	21.5	196	32
10-25	C-1100° F. Draw	58,500	67.0	28.5	170	27
10-30	Annealed	38,500	51.9	30.0	156	27
10-30	C-500° F.	85,000	17.0	7.5	255	38
10-30	C-1100° F.	66,500	51.1	22.0	207	33
10-30	C-500° F.	104,000	54.0	9.5	276	..
10-30	C-1200° F.	58,000	71.4	34.3	160	..
10-35	Annealed	43,000	50.0	27.0	158	..
10-40	Annealed	41,000	46.0	21.0	...	..
10-45	Annealed	48,000	50.6	29.5	143	22
10-45	Annealed	49,000	35.0	21.5	166	..
10-45	C-750° F.	94,000	49.0	17.0	255	40
10-45	C-1100° F.	71,000	57.3	23.0	207	30
10-45	C-850° F.	85,500	34.0	14.5	286	42
10-45	C-1100° F.	76,500	48.5	18.0	241	37
10-45	C-1200° F.	75,000	59.7	23.0	215	..
10-95	Annealed	50,000	37.5	21.5	187	29
10-95	F-750° F.	150,000	19.5	8.5	402	61
10-95	F-1100° F.	103,000	29.0	14.0	277	48

Physical Characteristics of Nickel Steels

Spec.	Treatment	Elastic Limit	Red. of Area	Elong. in 2"	Brinnell Hardness	Shore Hardness
23-10	....	....	....	....	...	..
23-15	....	....	....	....	...	..
23-20	Annealed	57,500	65.0	30.0	143	..
23-20	Annealed	43,000	62.0	27.0	170	..
23-20	H-600F.	140,000	61.0	14.0	330	..
23-20	H-1000F	95,000	72.3	20.0	216	..
23-20	H-600F.	155,000	59.5	13.5	340	..
23-25	Annealed	....	....	....	...	..
23-25	H-600F.	175,000	58.5	13.5	394	..
23-25	H-1000F.	107,000	71.3	21.5	235	..
23-25	H-600F.	180,500	60.5	13.5	405	..
23-25	H-1000F.	115,000	69.8	20.0	267	..
23-30	Annealed	63,000	63.0	27.0	163	..
23-30	H-600F.	187,000	57.5	13.0	405	..
23-30	H-750F.	123,000	57.3	15.0	269	41
23-30	H-1100F.	87,000	67.7	25.0	207	30
23-30	H-1000F.	120,000	62.5	17.5	288	..
23-35	Annealed	62,500	58.0	26.5	165	..
23-35	H-1200F.	101,000	66.9	24.0	220	..
23-35	H-600F.	200,000	57.5	12.3	415	..
23-40	Annealed	65,000	57.3	27.0	168	..
23-40	H-1200F.	104,000	65.4	24.0	225	..

Physical Characteristics of Nickel Chromium Steels

Spec.	Treatment	Elastic Limit	Red. of Area	Elong. in 2"	Brinnell Hard-ness	Shore Hard-ness
31-10	....	....	....	....	...	..
31-15	....	....	....	....	...	..
31-20	Annealed	41,000	54.0	32.0	153	21
31-20	M-600F.	150,000	20.0	5.0	351	56
31-20	M-1200F.	90,000	61.0	16.0	228	35
31-25	....	....	....	....	...	..
31-30	Annealed	57,000	55.0	26.0	172	27
31-30	M-600F.	171,000	25.0	7.5	384	60

Considering the report, the chairman stated that as soon as the physical and chemical specifications for any metal were coupled together in making requisition for any grade of material, trouble for the steel works was likely to result. It was therefore requested that either the chemical or the physical system be adhered to in ordering, and not a combination of both.

The report contains the first data yet published by the division connecting the elastic limits and the hardness of steels. This is but the start of investigation to link these properties.

The specifications for valve materials have been omitted from the present report. In their place reference has been made to what would seem to be the ultimate metal for valves. It is a grade of high-speed tungsten tool steel, which has as much as 18 per cent. tungsten content.

In some cases the yield point of the material has been substituted for the elastic limit, this being regarded as the logical property to specify, as to the trained man the yield point clearly indicates the elastic limit. No attempt has been made to define the elastic limit in these specifications. Of course, for the harder steels there is no yield point and the extensometer is then called into play. In a word, the division is splitting no hairs as to the specification and leaves it up to the trained observer to tell whether the specimen is up to the elastic limits required for his work.

George F. Fuller, Wyman & Gordon Co., objected to the insertion of data in the report which were not borne out by a great many tests. The physical properties of steel he characterized as being the most important feature. Any definition of them should, therefore, be approached with the greatest circumspection. They may be only recommended practice, he said, but in the trade they have become to be regarded as actual specifications which must be lived up to by the steel companies. Mr. Fuller called attention to a number of discrepancies in the tables of physical characteristics of the various steels.

Chairman Souther pointed out that the list of physical characteristics as printed has no relation whatever to the specifications, instructions or notes contained in the body of the report. They are mostly freaks, he said, which have been published to show what results have been obtained in different instances. It was his contention that it is only by the publishing of such figures as these that any results are obtained and any accurate gauges secured.

In these tables an attempt has been made for the first time to incorporate data on the Brinnell hardness tests and on those obtained with the Shore scleroscope. The data of this kind are slowly accumulating and becoming more valuable. They have the advantage that they can be applied to every individual piece without mutilating or destroying the piece in any way, whereas most physical tests ruin the test piece for further use. This information is being gathered at the request of the society, and while there are many discrepancies, the data have been secured from widely divergent sources and under many conditions which accounts for them.

Mr. Fuller advocated that from fifty to 100 tests be made of each kind of steel before the data on that kind be published, stating that they are bound to be used by some.

To close the discussion, Chairman Souther proposed a paragraph be placed over the tables of physical characteristics to the effect that the lists are only possibilities, not for use in connection with the purchase of steels and must not be used as such. He showed that it would be next to impossible to wait for 100 tests of each metal as this would never get the data anywhere. A beginning has been made at least.

With this paragraph inserted over the physical characteristic tables the report was accepted by the society.

Light Wiring Report

The report of the sub-committee on one and two-wire systems for electric lighting was presented by David Fergusson, who stated that they could not recommend the one-wire system, while they favored it, and that the committee had not yet reached a conclusion. The work was referred back to them.

Frank Conrad, Westinghouse Electric & Mfg. Co., read the report of the subdivision committee on insulation. This was a progress report because it had not been referred back through the parent Standards Committee for its approval. It was the belief of the members of the sub-committee, however, that a 600-volt test for insulation on the car wiring was correct, although many thought it was too high for automobile work. He stated that the American Institute of Electrical Engineers would probably co-operate in this standard.

E. T. Birdsall stated that he thought the test should be 1,000 volts alternating current because the insulation might stand the 600-volt test when new and then in the course of a few months might fall off to such a degree in quality that it would not. If the 1,000-volt test were given it would be sure to guarantee the fact that the insulation would withstand the 600 volts a few months later.

William H. Palmer, Jr., Electric Storage Battery Co., read the report of the sub-committee on standard instructions for battery makers. This committee had submitted the instructions to five prominent storage battery makers who had agreed to them. The instructions follow:

1. Put the battery where it can be seen.
2. Make a rigid installation.
3. Put water in it from time to time and then leave it alone.

The report was accepted and unanimously adopted.

W. H. Conant, Gould Storage Battery Co., asked if there was any tendency to standardize the sizes of batteries. He thought

S. A. E. party embarking on City of Detroit III on Wednesday for sessional excursion to the Soo and Mackinac Island that there ought to be some work done by the committee in at least standardizing battery sizes for batteries of given capacity rating. This was put in the form of a motion and the work turned over to a committee.

Miscellaneous Division Report Accepted

A short report of the Miscellaneous Division was submitted and accepted. Further standardization of yoke and rod ends, magneto couplings, etc., was reported.

A sub-committee on carburetion is working to advantage, but was not ready to report.

The second report of the Nomenclature Division was one rather of progress, and in order to show the line along which the division has been working, some correspondence carried on with the I. A. E. was read. That body is co-operating with the S. A. E. in this work, as is also the patent office. Charles Wheeler, I. A. E., of the sub-committee of the standards committee of the I. A. E., assured the society that it has gone on record as proposing to confer with the Nomenclature Division before publishing any accepted terms. The I. A. E. committee also has the co-operation of the various other similar committees of Europe and also of the state department of England.

It has been found that the technical nomenclature of England and that of this country are quite different and it is proposed to eliminate differences wherever possible.

It was also stated that the rubber industry is reducing its nomenclature by some forty or fifty terms relating to the various grades of rubber, which is of interest in this connection.

Long Nomenclature Division Report

Excerpts from the rather lengthy report of the Nomenclature Division by E. J. Stoddard, chairman of the division, follow:

Without some standard, or criterion, confusion and chaos are inevitable.

The general language has an abundant literature which, within its recognised scope, establishes a usage with a particularity and absoluteness that is effective and almost proverbial. Ben Jonson is quoted as saying:

"A man coins not a new word, without some peril, and less fruit; for if it happens to be received, the praise is but moderate; if refused, the scorn is assured." "Supplee's Trench," 249.

In engineering it has seemed to me that the author has relied upon his publisher, and has shrunk before the literary frown as Napoleon before Talleyrand. I have not found engineering books consistent authorities on literary usage.

In automobile engineering we have at best a very scanty and incipient literature.

The nomenclature of the automobile is a part of the English language. Those conversant with the art are the most competent to form a judgment as to it.

The world has a right to ask for a suitable medium of intercommunication.

The profits and prestige of the profession depend upon the public estimate thereof. One might as well try to increase his income at doing piecework for an indifferent and absentee employer, as to increase his prestige and income solely by perfecting himself in the work of his profession. We know that the demand will advance as fast, or faster, than the increase in strenuousness and facility. The result is, of course, inevitably suicidal. The modern Prometheus will also be bound to the rock by his admiring and loving friend.

The public must be led in the right direction. It is willing enough to go.

Some of the arts and professions have a most impressive vocabulary. In the past the coinage of imposing words has had its effect upon the ignorant and unlearned. At present it is more apt to excite prejudice. It is not in accord with the spirit of engineering.

The society should not be characterised by words that express the egotism of the unlearned and indolent, nor the egotistical and selfish pride of the scholar.

Not by the unsupported decree of the society; the prestige of the French Academy was not sufficient for this. There can be no purely "Fiat Nomenclature."

It must be by the resolution of the society expressing, generally, a correct judgment, and this resolution must be consistently backed up and enforced by the influence of the society and each of its members. We must not only be right, we must be effective. I think the automobile engineers have a peculiarly favorable public to appeal to. It is made up quite largely of men of wealth, liberality and intelligence.

It is our duty individually and collectively to see that the reputation of the society is sustained in recommending a correct usage, by our influence making this recommendation effective; and it is also, and equally, our duty as members of society to see that the proper usage which has been recommended is adopted.

A judgment in each instance must be formed in view of, and in accordance with, a large number of facts. These facts must be collected so that they may be used to verify our judgment.

There is a great mass of material, good, bad and indifferent, that must be collected, sorted, trimmed, and its deficiencies supplied. This involves much work, and ability; it should be done largely by private enterprise, and the workman should reap his reward both pecuniarily and in the esteem of the members of the profession. The society as a whole is not adapted to this detail work.

On the other hand, it is very well adapted to record a judgment and distinguish between conflicting usages; or even, by getting the members together and testing them to work on a common line, to bring about a consensus of opinion which shall determine a usage; and this consensus of opinion, through the instrumentality of the society, may be brought about with data and principles in view, which ought to be considered.

The society may fix and record a judgment already existing as a consensus of opinion of its members; first, as to a principle dictated by good taste; second, as to a principle dictated by policy; or, third, as to a particular usage.

I understand that it is the office of the committee to select the matter that should be acted upon by the society, collect the data bearing upon each point and present such points and related data to the society.

One naturally feels a resentment when he is addressed in words he cannot understand. There is hardly any explanation that is creditable to both parties.

Toward the engineering profession the public is generous but ignorant. Knowledge should not be obstructed. Over 465 names for ninety-three parts of an ordinary engine lathe do not seem to invite a public acquaintance with that device.

A man must know more than his own profession or he will not know that. The curse of the Tower of Babel should be mitigated, not increased.

The word "carbureter" has been spelled in half a dozen different ways by good authority, and even now we can find it spelled in two ways, although the Standard Dictionary marks one as falling into disuse.

Shall we say "Jack-in-the-Box," "Balance Gear," "Equalising Gear," "Compensating Gear," "Differential Gear," or simply "Differential?" (The U. S. Patent Office says we should say *gearing* and not *gear* in this connection.)

Shall we say "Drip Pan," "Under Pan," "Shield," "Under Protection," "Dust Guard," "Dust Pan," "Mud Pan," "Sod Pan," "Grease Pan," or "Guard?" ('Dust Guard" and "Under Pan" are used by the U. S. Patent Office.)

Shall we say "Fender," "Wheelguard," "Mud Guard," or "Wing," and if we use "Mud Guard" shall we not be in danger of confusion with "Mud Pan," and if we use "Fender" shall we not be in danger of confusion with two or three other devices that are properly so called.

Besides what shall we do with the approximately vertical parts between the frame and running-board or wheelguards?

SYNONYMS

To the rule that two words for the same thing cannot long exist, a seeming exception is recognised in words expressing a different point of view or shade of meaning. Thus it would seem that "Equalising Gear" well expresses the mechanism that equalises the power of the engine between the two driving-wheels; or "Differential" the mechanism that permits a differential motion of such wheels. So it is conceivable that one term might accurately and clearly indicate a part from an engineering point of view, and another better express the generous enthusiasm of the amateur.

DERIVATIONS

In general literature words have been derived from the ancient languages by the learned who had sufficient prestige to enforce them. To the learned such words expressed a meaning due to their derivation and their derivation has had an effect even in their popular use, which, however, more and more departs from the original usage until often it is quite lost and the derivation forgotten.

In this art words are formed from our own language and therefore carry with them the meaning due to their derivation. The word "caterpillar" does not suggest usually to us a "hairy cat" or an efficient forager, but a "caterpillar-gear" is always suggestive, and to my mind not very happily so.

It was a barbarous age that pictured Vulcan acting as cupbearer to the gods as a droll figure limping from couch to couch while the hall echoed with the laughter of the assembled gods; and it was an abnormal imagination, unable to appreciate the beauty of reality, that personified the sciences as a powerful dwarf that made small what was great and magnified what was small; simply an illustration of the truth that comparisons are relative.

I am fain to admit that I like the smell and grime of the shop, where it is necessary, and the I like the smell of the laboratory, even the sulphuretted hydrogen and nitric oxide, when necessary, but I believe in proper ventilating hoods. Even if there is romance to us in these incidentals, this is not a sufficient reason for imposing them on our indulgent friends. It is not necessary that our nomenclature should carry with it the atmosphere of the shop.

A name in engineering should express the function of the object. The intention in the drivation of words is always to make the term descriptive, even when metaphor is used. The clearer and more definite the description the better.

Report of Commercial Car Wheels Division

(Formerly Wheel Dimensions and Fastenings for Tires Division.)

S. A. E. STANDARD MOTOR TRUCK WHEEL—EDGES OF PERMANENT METAL FELLOE BAND

We recommend that the permanent metal felloe band be rounded on the two outside edges with radius not to exceed 1-16 inch, and that one inside edge of the band have an angle of about 45 degrees, extending about 1-16 inch from the edge.

We further recommend that the previous recommendations as to tolerance in width of permanent metal felloe band be modified to read as follows:

	Plus	Minus
Tolerance in width	1-64 inch	1-64 inch

And, in consequence of the last-mentioned recommendation, that the previous recommendation as to trueness of band when placed on surface plate be modified to read as follows:

Either side of the band when laid on a surface plate must not clear more than 1-64 inch at any point.

TOLERANCE IN CIRCUMFERENCE OF PERMANENT METAL FELLOE BAND

In June, 1911, the division voted that the tolerance in circumference should be:

	Plus	Minus
Before application to wheel	1-16 inch	0
After application to wheel	1-8 inch	0

In February, 1912, the division, in view of the then more extensive manufacture of a rigid-base tires, recommended that the circumferential tolerance should be:

	Plus	Minus
Before application to wheel	1-32 inch	1-32 inch
After application to wheel	1-16 inch	1-32 inch

Both of these recommendations were accepted by the society, the latter, of course, superseding the former after a long discussion, it was:

Voted that the last-mentioned above tolerance in circumference of permanent metal felloe band should be modified to read:

	Plus	Minus
Before application to wheel	0	1-16 inch
After application to wheel	1-16 inch	1-32 inch

MEASURING CIRCUMFERENCE OF BANDS

In measuring circumference of the band, if there is no allowance on the tapeline itself, a correction amounting to three times the thickness of the tapeline should be made.

Below is given a statement summarizing the recommendations made in all (including the above, the fourth) the reports of the Wheel Dimensions and Fastenings for Tires Division; in other words, a complete statement of the matter contained in the three reports already accepted by the society, and representing a complete data sheet on the subject, if the recommendations contained in the above given report are accepted by the society.

Wheel Dimensions for Solid Tires

Demountable and Non-Demountable Rims

Single Tires

Width of felloe and band..........⅝ inch less than sectional size of tire.

Thickness of steel band............¼ inch up to 4½ inch tire; ⅜ inch on 4½ inch and larger tires.

Dual Tires

Width of felloe and band....Twice the sectional size of tire.

Thickness of steel band......⅜ inch for all sizes of tire.

Single and Dual Tires

Sectional size of tire	2	2½	3	3½	4
Minimum felloe thickness	1¼	1¼	1½	1½	1⅝
Sectional size of tire	4½	5	5½	6	6½ and over
Minimum felloe thickness	1¾	2	2	2	2¼

velopment of the Wire Wheel

m the Paper Read Before the S.A.E. and I.A.E. by George W. Houk

... wire wheels, G. W. Houk explained ...iting to discuss the subject from an engineering standpoint but wished to give the history of this type of wheel as he has found it here and abroad. The paper follows:

The object of this paper is to give a brief history of the wire wheel as developed in England and its adaptation to the American automobile for American roads.

Being associated with the motor industry abroad from its inception, I came to America in 1909 to follow the same vocation. Being in a position to draw comparisons between the American and foreign built cars, my attention was first drawn to the enormous tire expense when American road conditions were much in favor of the tire as compared with English and French roads, by reason of the hard and flinty surfaces of the foreign roads compared with the soft springy conditions of the American roads. Rarely I found a tire worn out—in most cases it was a rupture, caused by a blow. thus weakening the fabric of the tire, resulting in a blow-out. Abroad a tire is usually worn down to the last layer of fabric before giving way.

I then began to carefully study the unsprung weights of American cars compared with foreign cars. I found the greatest difference lay in the wheel equipment. I returned to England to find that wire wheels were attracting attention through their merit over wood wheels as tire savers, coupled with their great strength to resist side slips and the ease with which you could change a deflated tire to an inflated one by carrying a spare wheel.

Having known the firm of Rudge-Whitworth, Ltd., of Coventry, for a number of years as a builder of wire wheels, I found it began in 1905 by making a set of fixed wire wheels for a 90-h. p. Napier racing car, these wheels embodying its well-known principle of dishing the wheels; that is, making the outer set of spokes very much coned, the innet set nearly straight and so arranging the tangent that the inner spokes took nearly all the drive. These wheels first proved their efficiency in the Gordon-Bennett trials in Ireland.

In 1906 Clifford Erpe at Ormonde Beach drove the last 60 miles of the 100-mile race with one rear tire and nine spokes missing at an average speed of 99 miles per hour, winning the race. Having found the construction efficient for resisting lateral strains, caused by skidding around corners under high speeds, early in 1906 the company began to manufacture and commercialize the detachable wire wheel. In the hands of the public much useful information was obtained by careful attention to the smallest details during a period of 3 years.

As the wheel business became a factor in the trade many arguments arose as to the superiority of wire over the wood, or artillery type, of wheel. A series of tests was carried out at the laboratories of the Rudge-Whitworth company. The method of testing was by steady pulls to find out the lateral as well as the vertical strain. These showed such overwhelming superiority of wire over wood wheels that makers of wood wheels denounced this method of testing, saying it did not represent anything like the actual conditions to which a wheel was subjected while on a car. So the impact test was suggested by J. H. Lester, a serious student of automobile technology. Until the first series of impact tests were completed it was expected that the intense lateral rigidity of the wire wheel would show worse results than the wood wheel with its elastic yield. This proved quite the contrary, wire wheels showing up much better

Wheel Diameter Over Steel Band

Single and Dual Tires

Nom. outer diam. of tires	30	32	34	36	38	40	42
Wheel diam. over steel band	24	26	28	30	32	34	36
Exact circumf. over steel band; neglecting tolerance	75 25/64	81 11/16	87 31/32	94¼	100 17/32	106 13/16	113 3/32

Allowable Deviation from Precision in Felloe Bands

	Plus	Minus
Tolerance in circumf. of band before application	0	1-16 inch
Tolerance in circumf. of band after application	1-16 inch	1-32 inch
Tolerance in width of band	1-64 inch	1-64 inch
Tolerance of thickness of band	0.006 inch	0.006 inch
Tolerance in radius of band after application	1-16 inch	1-16 inch

Circumferential deviation from precise figure must be uniform across entire width of band.

Radial deviations must not occur at diametrically opposite points, and there must be no flat spots or kinks in band on finished wheel. Either side of band when laid on a surface plate must not clear more than 1-64 inch at any point.

Bolt Equipment for Side Flanges

All bolts to be ½ inch diameter

Outside Diam. tire	bolt diam. hole circle	Number of bolts	Outside Diam. tire	bolt diam. hole circle	Number of bolts
26	18½	6, 9 or 18	42	34½	10, 15 or 30
28	20½	do.	44	36½	12, 18 or 36
30	22½	do.	46	38½	do.
32	24½	8, 12 or 24	48	40½	do.
34	26½	do.	50	42½	14, 21 or 42
36	28½	do.	52	44½	do.
38	30½	10, 15 or 30	54	46½	do.
40	32½	do.			

Edges of Felloe Band

Band to be rounded on the two outside edges with radius not to exceed 1-16 inch, and one inside edge to have an angle of about 45 degrees, extending about 1-16 inch from the edge.

Measuring Circumference of Band

In measuring circumference of band, if there is not an allowance on the tapeline itself, a correction amounting to three times the thickness of the tapeline should be made.. Note—*All of the foregoing summary, so far as pertinent, applies to metal wheels.*

Bearings Data Not Yet Complete

On the recommendation of its chairman, David Fergusson, the fourth report of the Ball and Roller Bearings Division, was referred back to the society without discussion. Mr. Fergusson pointed out that the data at hand were not completed by any means and that the division has been trying for 3 years to collect the data for the limits of tolerances to be specified. The division desires to get all the manufacturers of these products together in order to fix these, but so far has been put off by them. It was suggested that the report of this division which is to be presented at the next winter meeting be a final report, for in this way the manufacturers could no longer put the society off on the matter, as Mr. Birdsall put it.

Chairman W. P. Kennedy was not prepared to submit its report as there is a large amount of research work to be done on account of the rapid progress of the truck industry and the widely-varying designs and practice. It will report at the next meeting.

The fifth report of the Broaches Division was submitted by its chairman, C. W. Spicer. It contains tables of specifications for six and ten-spline shafts. This report was referred back to the committee for further consideration of the proportions for multiple-splined shafts.

Progress on Passenger Car Wheels

The Passenger Car Wheels Division, which was formed at the last winter meeting of the society and which held a meeting with the rim makers in Cleveland in the earlier part of the year, reported progress. It has found the need of data as to the strength of rims. The weight and material of which rims are made are coming more to the attention of the division. In order to obtain data as to the strength necessary for the rims, two rubber companies came forward at the meeting and volunteered to test the force exerted by the tires by blowing them up until they burst. The figures thus gathered will give the committee something to work on.

As a further evidence of the progress of the division, it was stated by Chairman Henry Souther that already several makes of demountable rims have been so modified that they will all go on the same felloe bands.

No report of the Motor Testing Division was presented by Chairman John O. Heinze, although progress is being made. Before making another report the division wished to get the views expressed by the visiting Britons as to testing methods in order than any valuable suggestions might be incorporated in the next report.

George W. Houk, who read the interesting paper on wire wheels

than the first-class wood wheels. When weight was taken into account the wire wheel's superiority was incontestable.

A number of members of the American Society of Automobile Engineers were present at the Rudge-Whitworth works in Coventry in November, 1911. The test carried out at that time was on an English artillery wheel, made from oak. Results were so overwhelmingly in favor of the wire wheel that some of the members did not feel that the English artillery wheel was as strong made of oak as the American wheel made of hickory.

Rudge-Whitworth procured the best American hickory wheel, made by one of the most reputable makers in this country. Both wheels being 34 by 4.5, with tire inflated to 80 pounds pressure; the wire wheel complete with inner hub weigbed 92.25 pounds; the wood wheel 136.25 pounds. The pendulum bob weighed 450 pounds. The pendulum hob was pulled back at different distances up to 6 feet and released.

An equal number of blows were struck, resulting in the complete destruction of the wood wheel, while the wire wheel was still in condition to be used.

Wire Wheels Are Savers of Tires

Wire wheels show a great saving in tires. Many claims are made why this is so. Taking them in the order they would appear to the layman they are:

FIRST—WEIGHT: A 36 by 4.5 R. W. wire wheel with Houk Q. D. rim, weighs 57.25 pounds, inclusive of inner hub, the hub weighing 23.25 pounds, spokes 5 pounds, rim and nipples 29 pounds. The same size American hickory wheel with demountable rim weighs 101.25 pounds, wood felloe, 5 pounds; spokes, 9 pounds; felloe band, 21 pounds; rim, 36.5 pounds; wedges and nuts, 7 pounds; hub, 22.75 pounds. Therefore, the excess weight of the wood wheel as compared with the wire wheel is found at the periphery of the wheel.

This may be said to have a very serious effect on tires; in addition, the double thickness of felloe band and rim, backed by the wood felloe, retains the heat, so detrimental to tires, while the seventy spokes and naked rim of the wire wheel radiate the heat.

SECOND—RESILIENCY: That is, resiliency in the direction in which the load is carried; it may be said to relieve the strain on the tires, both in starting and stopping.

Actual figures showing tire saving are very difficult to obtain, as pneumatic tires are extremely variable in their performances. However, we have a concrete example in the Daimler company's hiring department in London. Fifty tires were tested on wood wheel and fifty tires on wire wheels, attached to identically the same cars. The wood wheels traveled 102,524 miles, an average of 2,050 miles per tire. The wire wheels traveled 172,731 miles, an average of 3,454 miles per tire. This clearly shows an increased mileage of over 70 per cent., or what is equivalent to a reduction in your tire bill of 40 per cent.

The growth in the use of wire wheels in Europe for both pleasure and racing cars is proof conclusive that the wire wheel has come to stay. From the day of the Gordon-Bennett trials in Ireland, to the ruling out of detachable wheel cars by the Grand Prix authorities because of an undue advantage thereby enjoyed, to the subsequent Grand Prix race, in which thirty-one out of thirty-six cars were detachable wire wheel equipped, to the present day when more than 60 per cent. of all Europe and British production of motor cars is detachable wire wheel equipped to the conditions here in the United States to-day, when leading makers of motor cars are offering as optional causing spokes to break and loosen and the wire wheel to be brought into disrepute.

The fundamental reasons for this sure and steady progress may be stated as follows:

1—Saving of weight.	4—Better riding qualities.
2—Increased safety.	5—Improved appearance.
3—Increased tire life.	6—Growing scarcity of suitable wood.

First-class wire wheels, owing to their construction, which not only embodies the most careful selection of materials as well as the highest grade workmanship, cost at the present time from one-third to one-half more than the best wood wheels. Starting with the inner hub, machined from a solid steel bar or a drop forging, it must be accurately machined to take the bearings, as well as to be interchangeable with all five wheels, so that they may be easily detached and attached without allowing the slightest bit of play to cause squeaking or chucking, so common in most demountable rims.

Further than this, we have a great variety of axles in this country, and to produce an inner hub capable of adapting itself to the fixed axle, as well as the floating type with the driving dog requiring at least a 5-inch inside diameter, it was necessary for the company to produce a hub suitable for the smallest to the largest diameter axles, ranging from 2.75 to 5.5 inches, and at the same time to be interchangeable, as well as secure by a locking device that would permit of readily detaching as well as attaching the wheel to the hub. In most practices of attaching the outer shell to the inner hub it was accomplished by a fixed locking device, usually on the order of ratchets and springs. This fixed locking device did not find favor in the hands of the public because the serrations were liable to wear as well as because of the accumulation of dirt and the failure of springs.

This resulted in giving great attention to the development and perfection of the automatic locking device, which in spite of neglect on the part of the chauffeur would not cause harm or trouble.

The 1913 locking device consists of a threaded lock ring with a v-shaped groove. This groove locks on the outer end of the hub. When this nut is slack the pressure on the groove face occurs at a point, by reason of the outer shell being larger than the inner hub. Therefore, the weight of the car produces an eccentric differential creep, whereby the nut lags and so tightens itself against the hub shell. When perfectly tight the nut is concentric with hub shell and creep ceases.

This feature might be more easily explained by taking the opposite view of the nut on a buggy wheel, wherein a left hand nut is fitted to the left hand side of the buggy and a right hand nut to the right hand side; more easily understood by the well-known fact of a ball or roller traveling the reverse way in which the object it carries is going.

Wire spokes were extensively used in connection with the earlier stages of automobile construction with more or less success, but this was due largely to the light weights they had to carry. As the weight of the car increased, the general supposition was they should increase the thickness of the spoke. Experience proved that this theory was entirely wrong. The Lanchester company of Birmingham adopted a comparatively thin spoke of suitable material, but with careful thought given to the bend in the spoke, so that it would leave the hub shell and rim in such a manner that it would allow for elongation without causing the nipple heads to leave the seat of the rim, or the heads of the spokes to leave the seat of the hub shell when the wheel came in contact with an obstruction.

Many months of careful experimenting and road testing served to solve the problem, resulting in the Rudge-Whitworth triple-spoked wheel, which overcame the weakness of the side strains to which a wheel might be subjected in leaving a rut or crossing a car track. Special machinery had to be invented and perfected to depress the rims, as each size of hub shell and rim required a different angle. The same may be said of the bend of the spoke leaving the hub shell.

120 millimeter hub fitted to a 36 by 4.5 rim would require a different bend in the spoke as well as a different angle from

which the nipple seated into the rim, as compared with a 62 millimeter shell and a 36 by 4.5 rim.

We find to-day one or two advocates of the substitution of wire wheels for existing cars, now fitted with wood wheels, urging the local garage men to purchase hubs, rims, spokes and to assemble these to fit the job. This is bound to result in linking together the hub and rim at wrong angles, thereby causing spokes to break and loosen and the wire wheel to be brought into disrepute.

Marmon Opens Discussion

In opening the discussion, President Howard Marmon stated a fact which he had observed in connection with the recent 500-mile race at Indianapolis, and which he would like to have answered by an authority. Although the race was won on wire wheels, two of the teams changed over to wood wheels after practicing and before entering the race, the reason given being that the front wheels in rounding turns at speeds 80 miles an hour, knuckled under so as to interfere with the steering.

J. G. Vincent, Packard company, stated that in his opinion the demountable feature is the greatest advantage of the wire wheel. Next to this there is the tire saving, a wire-wheel-equipped touring car has 78 pounds less weight than with wood wheels, considering two spare tires for the latter and extra wheels in the former case. It is more difficult, however, to carry extra wheels than tires alone, which may be carried at the side. Mr. Vincent has found some difficulty in getting garages to wash the wire wheels except at extra cost. He did not agree with one of Mr. Houck's statements that wire wheels get through mud and mire easier, since he has found that the larger wood spokes give greater surface for traction in deep mud, the wire spokes filling up and giving the wheels the appearance of steel disk types, which then slip in the mud.

The finish coming off the wire spokes, thus allowing them to rust, is a serious disadvantage, according to Mr. Vincent. It is very hard to get the enamel to stay on, but the new process of coating them as touched upon by Mr. Houk may be an effective remedy. As to tire saving, he does not know what that will be yet, and as regards riding, he states that it is impossible to tell the difference between riding on wood or wire wheels.

F. E. Muscovics asked if there were any difference in the accelerating powers of the car equipped with wire wheels provided that the weights were nearly the same. Mr. Vincent replied that he had tried acceleration tests on both wire and wood wheel cars for the purposes of comparison, but got no results which showed a difference in favor of either one.

David Fergusson, stated that the Pierce-Arrow company had also run a series of tests lasting over 18 months in order to determine whether there was any advantage in this respect which could be credited to the wire wheel. He stated that no difference was found.

President Browne, of the I. A. E., stated that he had personal experience with the wire wheel and that he found a decided saving of tires in favor of the wire wheel. He said that, whereas he got about 5,000 miles out of a casing in connection with wire wheels, his mileage on the wood wheels amounted to only 3,500 miles. He stated that the cleaning trouble was not serious and that the enamel did not get knocked off ordinarily. His chauffeur at first disliked the idea of cleaning the wire wheels but soon learned to do it and it took him but little longer than necessary to clean the wood wheels.

Mr. Moscovics stated that he thought the difference in acceleration due to the use of wire wheels might be more noticeable in the lighter cars.

Mr. Hall remarked that as a tire maker his company had carried on a long series of experiments, but as yet could say nothing except that the results were much different than they had expected. This ambiguous statement was the cause of considerable mirth among the engineers present.

Humber to Abandon Wire Wheels

Mr. Benson of the English Humber Company made some remarks that were of the greatest interest, especially since his concern has been using the wire wheels for the past few seasons. He stated that the wire wheels were to be abandoned by his concern and that the 1914 Humber cars would be equipped with artillery wheels of hollow steel construction. He stated that this determination was reached after circularizing the dealers. He stated that out of 150 who had received the letters asking their opinion on the wheel question, 140 replied in favor of abandoning the wire type. The arguments against the wire wheel as used by the dealers were difficulties of cleaning and rusting between the valve hole and rim. Mr. Benson stated that he did not think there was any difference in the accelerating qualities in favor of either type of wheel.

President Marmon asked Mr. Benson if his company would use the demountable type of rim. He replied that his company would use an entirely different wheel of detachable type.

Mr. Clarkson, of the I. A. E., asked Mr. Houk regarding the Sherardising and other processes for preventing the wire spokes from rusting to which Mr. Houk replied that he was not using the process.

Mr. Mott stated that it was his belief that the weight of the wheel depended to a very large extent on the type of rim that was being used. He stated that with some types of rim the wire wheel would be heavier than the wood wheel; or, conversely, that the artillery wheel with certain types of artillery wheel rim would make that wheel lighter than some of the standard types of wire wheels.

Mr. Wheeler stated that rust was not of much importance if the operator knew the processes for rendering the wheel metal rust-proof. The entire matter, he said, could be expressed in the two words used by H. M. Leland, "knowing how."

Mr. Bennett, of the I. A. E., spoke on the decline of the wire wheel in England. He stated that it was gradually passing out. This year, he said, there were 20 per cent. less wire wheels sold than last year. In regard to the American tires he stated that he had noticed that the American tires blew out much more frequently than the English tire. He stated that this was due to the entrance of water through the aperture of the rims, thus rotting the fabrics. He stated further that he believed the wire-wheeled-car to be much more lively than the car using wood wheels. Mr. Bennett called attention to the Victor car tire test which was run in England some time ago wheen steel studded tires stood up well. His mention of the steel studded tire was caused by T. B. Browne stating that in his experience with the steel studded tire he did get a very good mileage.

W. G. Wall stated that in his opinion the entire question of the success of the wire wheel was one of initial design. He stated that the English engineer was working against different conditions than the American. He stated that the strength tests made on the wood wheel in England were made with a poor quality of hickory and that the good second-growth stock would have shown much better results than were obtained with the material tested out in England. A great drawback with the wire wheel as it now stands was stated by Mr. Wall to be the bad locks that are in use. He stated that he knew of one car where all four locks were broken just before the race at Indianapolis. On the whole, Mr. Wall is in favor of the wood wheel.

Henry Souther was then called upon by Mr. Marmon to close the discussion. He stated that at one time he held an absolutely unbiased opinion on wire wheels, but now since he had become interested in them that opinion had become decidedly biased in his favor of them. He liked them, he said, because of the ease in making a tire change. The rust problem is important, he admitted, but this could be easily brought under control by the use of the spare wheel which would allow a wheel that was threatened by rust to be taken off and enameled. The enameling work can be done in a short time, and it is easy and inexpensive.

P. W. Litchfield, who presented the important paper on tires

Pneumatic Tires

From Paper Read Before the S. A. E. and Visiting Engineers by P. W. Litchfield

THE manufacture of pneumatic tires, an industry less than 25 years old, has grown until at the present time the value of its product in the United States alone amounts to about $150,000,000 annually.

It has been the practice of automobile and vehicle builders for many years to make as nearly as possible the entire vehicle, but while the pneumatic tire is a component part of every vehicle, no manufacturer of bicycles, motorcycles or automobiles has ever successfully made his own tires, and the number of tire manufacturers has always been relatively very small compared with the volume of the industry.

If we go back to about the year 1890 and look at the means of transportation in vogue, we find that the hauling by self-propelled vehivles on land was confined to the railroads, two smooth parallel rails being carefully laid to form a perfect road-bed to protect the machinery of the locomotive sufficiently to make it a practical commercial proposition. The millions of ordinary roads throughout the country were used for hauling by means of domestic animals only.

At about this time the safety bicycle and rubber tire were developed. This brought to the attention of everyone the simplicity, speed and healthful exercise to be obtained by abandoning the horse and propelling the vehicle by man-power. While the horse could not call attention to the weaknesses of the vehicle which made his work harder and his progress slower, man, when he assumed the duties of the horse, began to analyze. Then began the study and development of the self-propelled vehicle industry of today.

Let us go back to the man on the bicycle. He soon found out that the solid tire was satisfactory on a smooth road, but when it came to a rough road he could feel the bumps and had to slow down, as the impact of the tire against stones and uneven surfaces was more than he could stand with comfort and more than he could propel the bicycle against with his own power for any length of time. Naturally, his next idea was to get more cushion. This resulted in the introduction of the cushion bicycle tire, which was an all-rubber tire with a hole in the center to allow for more distortion in the rubber itself, the cross-section diameter of the tire being increased from .75-inch to about 1.5 inches. The rider then found he had gained more cushion, but had increased the weight of his vehicle, so that it required more power to propel the bicycle on good roads. It was at this time that

J. B. Dunlop, inventor of the pneumatic tire, who took part in the discussion of Mr. Litchfield's paper

the pneumatic tire was invented to increase the cushion, decrease the weight and lessen the power consumption of the tire on ordinary roads. Since about 1893 the only tires which have been used on self-propelled vehicles are either solid rubber or pneumatic rubber tires; no other type seems at the present time likely to engage the serious attention of engineers.

As both of the above-named types are being used in larger quantities every day, let us (before passing to the pneumatic) analyze the difference between them and see under what conditions on seems to be superior to the other. This brings us to the question: In a self-propelled vehicle, what are the functions of the tire? They are, first, and foremost, a cushion to protect all parts of the vehicle from the shock caused by the impact against inequalities of the road; second, to provide proper traction, avoiding unnecessary slip. These are the two main functions, and, therefore, the principal thing to be kept in mind in tire design is to satisfactorily accomplish them at as low a cost per vehicle mile as possible, with the least possible consumption of power, and with the least amount of trouble and inconvenience to the driver and occupants. The pneumatic tire depends upon the elasticity or resiliency of a gas, *i. e.*, air, for its cushioning effect, while the solid tire depends upon the resiliency of a practically incompressible solid (*i. e.*, vulcanized rubber). It is needless to say that air is the more perfect cushion and the lighter and cheaper, the cost lying only in the air container. No other *solid* body can compete with india rubber in acting as a cushion by being greatly distorted and recovering its original shape again repeatedly with very little fatigue.

Vulcanized Rubber Is Incompressible

One point regarding rubber must be carefully borne in mind, which is, that vulcanized rubber is practically incompressible; its cushioning effect is only possible by distortion and recovery, and it must be allowed by the designer plenty of room for this action. A glance at hundreds of patents on solid-rubber tires shows that this point has been almost entirely ignored by inventors. Another point frequently overlooked is that the shock may come from almost any direction, owing to varying road surfaces, turning corners, running into curbstones, etc. Many tires and spring wheels carefully designed to take up blows acting directly from the ground vertically toward the rim are utterly unfit to withstand shocks in other directions.

Before selecting between the solid and pneumatic tire, the weight to be carried, the speed to be attained, and the character of the road must be considered. The load to be carried can be worked out satisfactorily on either type. In a solid tire it requires a sufficient amount of properly compounded rubber, and in a pneumatic a sufficient combination of air volume and pressure contained in a suitable retainer. The character of the road and the speed have a great deal to with the selection of type, as air being a much better cushion than rubber, allows the pneumatic to give much more efficient cushion and traction on rough roads and at higher speeds than is possible for the solid. As far as the efficiency of the vehicle is concerned, the pneumatic would nearly always be chosen as the ideal tire were it not for the fact that in many cases the roads are sufficiently good and the necessary speed sufficiently slow to make the saving in cost per mile on solid tires, due to their longer life, offset the increased efficiency of the pneumatic. Again, the unreliability of the pneumatic due to injury through punctures or blowouts, making attention to it necessary at awkward places and times, often causes the selection of solid tires, as frequently occurs on pleasure electrics for ladies, fire apparatus, mail wagons, etc. In short, good roads and slow speeds are favorable conditions for solid tires; ordinary roads and high speeds for pneumatic tires. The solid tire having less cushion and less motion requires a lower percentage of pure rubber in its composition than the pneumatic, which tends to lower tire mileage cost.

Three Types of Pneumatics

To go back again to the man on the bicycle. His experience with solid and cushion tires resulted in the invention of three types of pneumatic tires at almost the same time, and these three have been the only ones that have been, or are now, used in any quantities. They are the single-tube, invented by Tillinghast; the clincher, invented by Bartlett, and the wired-on, invented by Dunlop. There was great rivalry between the thre types for 2 or 3 years, resulting in the supremacy of the single-tube in the United States and the clincher and wired-on types in all other parts of the world. The introduction of quick-repair cements, of single-tube repair shops all over the country, and lower cost of production were largely responsible for the success of the single-tube in this country. The wired-on type is still the most popular in other countries.

Following the pneumatic bicycle tire came the pneumatic carriage tire, and each country developed the type of tire found most popular on bicycles. This was a temporary business, however, because the tires were used on horse-drawn vehicles, they did not have to perform the traction or driving functions, and the speed of the horse was so slow that a sufficient amount of cushion could be obtained from solid tires and metal springs without the annoyance of punctures; hence this type of tire gradually gave way to the solid.

Following the pneumatic-tired carriage, about the year 1898, came the automobile with its delicate mechanism and high speed, and with it the demand for a more durable and efficient pneumatic tire. As in the case of the carriage, each country still further developed the type of tire which was most popular and successful on bicycles. American designers went ahead with the single-tube, making it up to 5 inches in size, while England developed the wired-on, and France the clincher, (the clincher was also being made by G. & J. and Goodrich in the United States). It did not take very long, however, to discover that conditions were quite different on the automobile from what they were on the bicycle, and the French clincher tire made by Michelin and others soon had all the other types "on the run," and English and American tires were at a discount. The wired-on type, which proved so successful on English bicycles, disappeared in the large sizes, because the one-piece Dunlop rim, which was so easy to fit with an inextensible-edge tire in small cross-sections, was almost an impossibility in large sizes. The single-tube American tire when made of a size and thickness necessary for an automobile could be repaired only at great expense and at a well-equipped repair shop. Roadside repairs were impossible. The clincher type soft bead tire was the only practical one of the three for an automobile, and soon became the standard of the world and was made in all countries. The weaknesses of this type of tire which developed were principally the difficulty of forcing the tire (in the large sizes) over the one-piece clincher rim; the necessity for several tire bolts to keep it from creeping on the rim, owing to the stretching of the bead; its depending entirely upon air pressure to hold it on properly; and when overloaded, or much underinflated, rim-cutting, and if run wholly deflated, destruction in a very short time. To overcome these difficulties several mechanically fastened side-flange and bolted-on type tires were introduced, but they required special wheels, special widths and diameters of felloe, were more expensive, and, with the exception of the Fisk bolted-on type, did not make much headway against the standardized clincher tire. The Clincher Automobile Tire Manufacturers' Association had wisely standardized the clincher rim dimensions and insisted on carefully inspecting all rims manufactured, saving the automobile owners and tire manufacturers hundreds of thousands of dollars, which would have been lost if the unstandardized condition, similar to that which now exists in Europe, had not been remedied.

During 5 years, from 1900 to 1905, the clincher tire was perfected and standardized. It seemed that it would have no competitor, but the last-named year brought out the invention of two quick detachable rims, the Dunlop and the Goodyear. They were developed to a point that they would fit the same wheels as the clincher rim, and by reversible rings, take either the clincher type of tire or the wire-bead type. These rims overcame, first, the difficulty of stretching the tire over the clincher rim, which was so difficult in large sizes; second, with the removable side ring the tire could be made with an inextensible bead, making it free from creeping by the use of only one bolt on the valve stem, instead of several at intervals around the tire; third, the beads being always against the rim, the inner tube was not so liable to be ruined, in case of puncture, by getting under the beads, and, fourth, a wired-on type could be used with the flanges turned outward, instead of hooked in, making rim injury to the tire less likely in case of overloading or underinflation. The flared-out side ring also made it easier to mount and remove the tire from the rim. This quick detachable type of rim became, a year or two later, the American standard and the wire-bead type of tire began to grow steadily in popularity.

The introduction of this wire-bead straight-side tire met with considerable opposition from the manufacturers of clincher tires, and in meeting it they introduced the quick detachable clincher type.

Vulcanization

I would now like to discuss some of the differences between the principal pneumatic tires now in the market. Let us first take up the subject of vulcanization. Vulcanization is the chemical change which is caused by the action of heat and time upon the mixture of rubber and its chemical compounding ingredients, transforming it from a plastic dough to a resilient and reacting solid. In order to get a properly vulcanized tire extreme care must be used as to the materials used in compounding, in regard to both quality and amount, and also as to time, temperature and conditions under which the vulcanization takes place. A tire revolving constantly along the road, carrying the weight of the car, and each moment changing its shape and recovering, generates a great deal of heat. This action of heat carried on for a considerable time has a tendency toward affecting the vulcanization. Therefore, all high-grade guaranteed tires are usually compounded so that they take a very long time to vulcanize. This increases the cost of manufacture. Many unguaranteed tires are so compounded that they vulcanize quickly, saving from one-half to three-quarters of this time, in order to cut down the cost, but the heat generated along the road tends to overvulcanize these tires and they are apt to separate and blow out after a much shorter mileage on this account.

Another difference in pneumatic tires is in the style of fabric used, there being two distinct types upon the market, the close-woven fabric tire and the cord tire. Nearly all tires are of the close-woven fabric type as they are more durable, easier to repair in case of injury, and can be operated at a much lower cost per mile.

The next point to consider is the size of the tire. In the pneumatic tire the load is carried by an air cushion, and the amount of the load carried depends upon the combination of the volume and pressure of air used. For a given weight of car it follows, therefore, that the larger the volume of air in the tires the less inflation pressure required, while the smaller the tire the greater the inflation pressure necessary to carry the load. Tires should be large enough to carry the load with very little flattening of the tire, say not over 14 per cent. of the sectional diameter at an inflation pressure which will give sufficient cushion to the vehicle.

The use of tire fillers is another question which has commanded the attention of automobilists, owing to the extensive advertising carried on by tire filler companies during the past year. A pneumatic tire casing is designed for use with compressed air; when it receives a blow or shock from an obstruction in the road, the blow is distributed all over the casing, owing to the support of the perfectly fluid air-cushion behind it, the tire absorbing the blow, turning it aside, with very little injury to the casing, except in very severe instances. When a filler is used, the blow is localized in the immediate proximity of the point at which it is received, and the strain falls in one place, thereby weakening the tire. Constant repetition of these blows causes the casing to gradually disintegrate and wear out. The fillers add considerably to the weight of the car, require a great deal more power to drive the car, and do not absorb the shocks to nearly the same extent as is the case of air.

Before closing I would like to touch upon the subject of rims for pneumatic tires, as it is of the greatest importance to the tire that it be fixed upon a properly designed rim. With clincher tires especially the exact contour of the hooks is of great importance, as it takes only a very little variation from the standard to completely ruin the tire. The proper design for the width between clinches on a clincher tire has been standardized at 60 per cent. of the nominal cross-section of the tire. It is the writer's opinion that the proper dimension for the width at the heel of the bead for the straight-side wired-on tire is 66.7 per cent. of the nominal cross-section of the tire, flaring outward

Arthur J. Slade, who brought out some interesting points in the discussion on tire efficiency

from the heel of the bead. The less the required flexing of the casing when the tire is overloaded or insufficiently inflated, and the larger the supporting surface given by the rim to the tire where the flexing occurs, the less the tendency toward rim-cutting. The ideal rim would give continuous support to the tire, especially where the tire leaves the rim on the sides. Split and open side rings should be avoided as far as possible. When split rims are used, it is also absolutely necessary that they be in perfect alignment.

Discussed with Applause

After Mr. Litchfield had read his paper, President Marmon stated that it was very fitting that on this occasion Mr. Dunlop, the inventor of the pneumatic tire, who accompanied the party, should say something on how he came to invent the tire. Mr. Dunlop rose amid great applause to address the interested audience. He said:

"Mr. Chairman and Gentlemen: I esteem it a great honor to be called upon to speak on this subject. Many misstatements have been made in relation to the invention of the pneumatic tire but as we say in Ireland, 'only one-half the lies that we hear going around are true.'

"I have always given great attention to the subject of traction and especially to road traction. I have always wanted something that would flatten out under the weight of the car in order to reduce the unit pressure on the part of the tire that is on the ground by increasing the area of contact. I first thought of flexible steel.

"A good many people have asked me what made me think of the pneumatic tire. I am only surprised that I did not think of it sooner."

Mr. Dunlop then went on to tell some of the details of manufacture of the earliest forms of his tire which was first patented in July, 1888. He stated that everyone knew that speed depends on resiliency, but strange to say the slowest tire that was ever made was the most resilient.

"Radial elasticity is necessary," stated Mr. Dunlop. "The pneumatic tire, although resilient, is rigid both in a circumferential and axial direction. If you take a piece of solid rubber and stand on it, it will flatten out, the sides will be widened and then when the load is removed they will creep back to normal. There is always a lump in front of a solid rubber tire just ahead of the axle center line. This is especially so in ascending a hill. This condition is not true of the pneumatic tire."

When Mr. Dunlop first proposed to make a broad tire that would be fast people said it was absurd as the fast tires of that time for bicycle work were about the thickness of the little finger.

When pneumatic tires were first manufactured, people used cloth cut on the bias for casings, but it was found that after a time the threads cut each other. The material used at that time was linen.

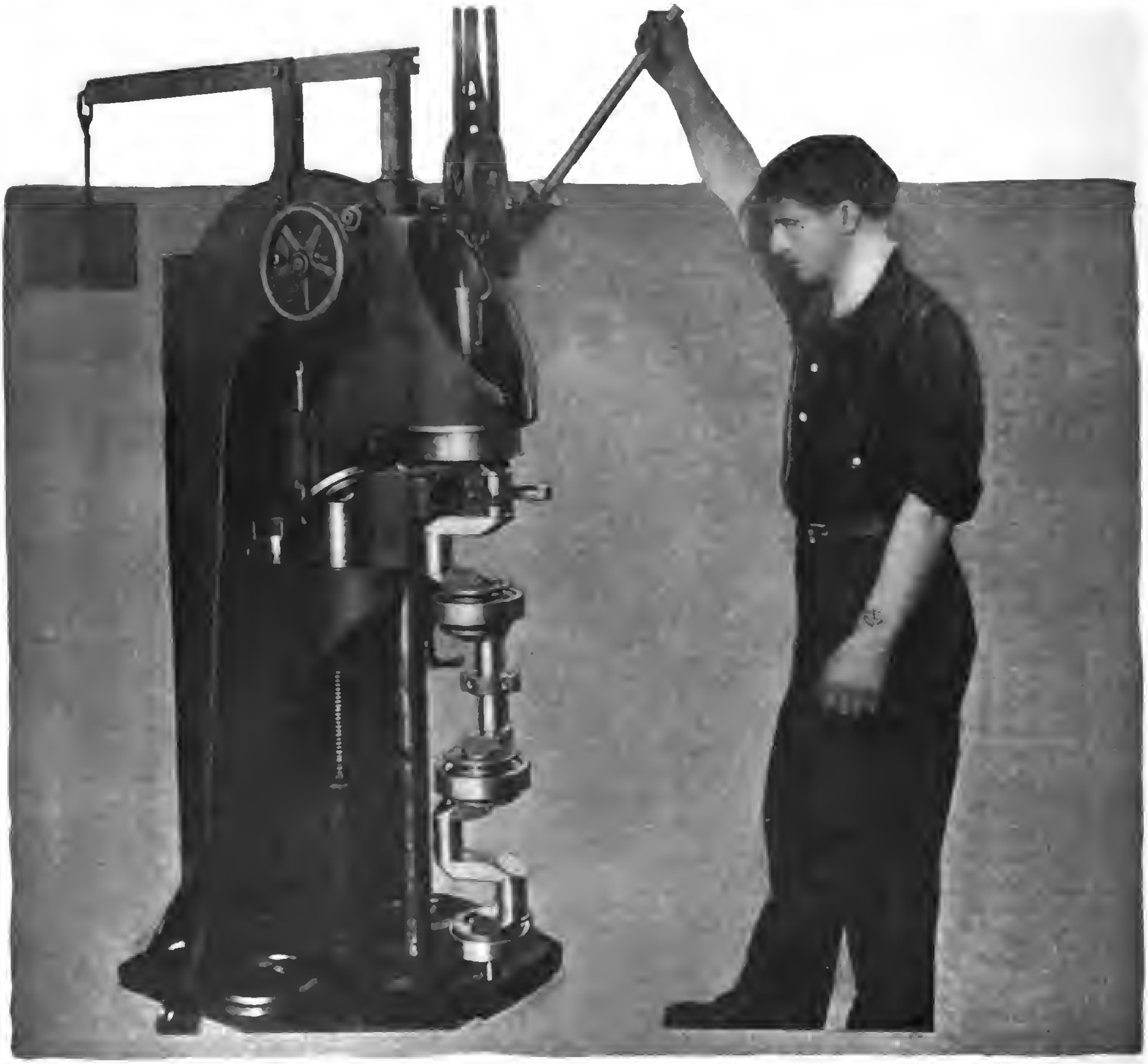
The first tire was made by making disks from a piece of wood cut off a plank and then wrapping the rubber which was secured in strips around the disks. To pump up the tires a football pump was used in connection with a piece of rubber hose from a nursing bottle. The tire tube although built up out of strips of 1-32-inch sheet rubber cemented together was air-tight. This thickness of rubber is still used in inner tube work. The first tire was built February 28, 1888. It was tried out in the moonlight and that night there was a partial eclipse of the moon.

A. J. Slade asked Mr. Litchfield if he were familiar with the different efficiencies of pneumatics, filled and solid tires at different speeds, to which the latter replied that he had no full set of figures although he had valuable data compiled from a long series of experiments. Mr. Slade remarked that he had noticed data sheets in the S. A. E. handbook which did not seem to be exhaustive or up-to-date.

C. H. Taylor asked if the cord tire were any more apt to have sidewall blowouts than any of the other types, to which Mr. Littlefield replied that he believed there was no difference.

Charles Wheeler, of the I. A. E., called attention to that part of Mr. Litchfield's paper which deals with fabric, and pointed out that while the cord tire is a speedier tire and makes for easier riding, it is more difficult to repair and in practice does not work out at as economical cost per mile as the close-woven type. Mr. Wheeler questioned this from the standpoint of the European countries where fuel runs up to 40 and 50 cents per gallon. He wondered from which viewpoint Mr. Litchfield's conclusion had been made.

Factory Miscellany



Special machine used for pressing ball bearings on Lozier crankshafts in the factory of the company, Detroit, Mich.

THE above illustration depicts the operation of pressing ball bearings on a Lozier crankshaft in the factory of the Lozier Motor Car Co., Detroit, Mich. Four annular ball bearings are used and the greatest accuracy is essential in pressing them on the shaft, but .0006 of an inch variation being allowed in the fit of the bearings. The special machine shown exerts a pressure of approximately 1 ton. The ball bearings on the center of the crankshaft are slipped over the crank cheeks, the inner race being large enough to permit of this. A split collar is pressed in between the shaft and bearing with the bearing against one of the crank cheeks. The bearing and collar are then pressed together to the center of the journal and a spacing collar is inserted on each side of the bearing. The rear bearing is put on first and then the others are put on in succession toward the front end. It takes 2 hours to assemble the crankshaft, it passing through only two hands in the process of assembling. The weight of the finished crankshaft complete with bearings is 140 pounds. It would be a very difficult task to press these bearings on the crankshafts without the aid of the special machine which also effects a considerable saving of labor, time and money.

DYNETO'S Four Story Building—The Dyneto recently erected a new factory at Syracuse, N. Y. It is a four-story brick building, with the boiler and engine room in a separate building. The building has a floor space of 30,000 square feet. It is equipped with new machinery throughout and is devoted entirely to the manufacture of electric starting and lighting systems. The capacity is 100 Entz electric starting and lighting systems and 200 Dyneto lighting systems per day.

Miami Plant in Indianapolis—The Miami Cycle & Mfg. Co., Middletown, O., is having a new plant erected at Indianapolis, Ind. The company makes motorcycles and accessories.

Mais Truck Plant Burns—Fire which burned itself out when fire-fighters were helpless for lack of water did $90,000 damages to the plant of the Mais Motor Truck Co., Indianapolis, Ind., recently.

Chicago Firm Moves—The Auto Sheet Metal Works, Chicago, Ill., recently moved into larger quarters at 1532 Michigan avenue, where it has a floor space of approximately 10,000 square feet.

Firestone Adds Four-Story Plant—The Firestone Tire & Rubber Co., Akron, O., has given out plans for the construction of a four-story brick, steel and reinforced concrete manufacturing plant addition.

Anguish Plant in Detroit—The Anguish Mfg. Co., Detroit, Mich., recently incorporated to manufacture metal stampings and automobile radiators, has acquired the plant and machinery of the Farlinger Mfg. Co., 1506 Fort St., that city.

Schram Automobile Plant—A plant for the manufacture of a new automobile to be named the Schram, will be established near Seattle, Wash., in the near future. A company for the manufacture of this machine was recently incorporated at $500,000 by F. J. Carvery.

Ready for Occupancy—The Cleveland Hardware Co., Cleveland, O., has completed its six-story addition and is ready for the installation of machinery. The company manufactures forgings and automobile parts.

Beulah Automobile Manufacturing City—W. W. Bennett, a wealthy Detroit, Mich., automobile manufacturer, has bought the orphanage colony town at Beulah, Tenn., near Nashville and will establish a new automobile manufacturing city.

Winton Workers Get Increase—The Winton Automobile Co., Cleveland, O., has granted an increase of 10 per cent to all its employees, numbering about 1,100. The reason for this increase is because of the fact that there are a considerable number of the employees members of the Automobile Workers' Union.

East Palestine Wants Rubber Plant—The Board of Trade of East Palestine, O., was voted unanimous support in its endeavor to secure a new rubber plant for that city. C. J. Davis and a few associates propose to build and operate a rubber tire manufacturing plant, 50 by 200 feet and two stories high.

Mogul Moves to St. Louis—A long lease that brings a new enterprise to St. Louis, Mo., was recently closed. The newcomer is the Mogul Motor Truck Co., Chicago, Ill. The lease covers the one-story structure, 100 by 165 feet. The company will abandon its Chicago factory and move to St. Louis this month.

Quarterly Output 1,000 Machines—The Crown Motor Car Co., Louisville, Ky., announces that it will turn out 1,000 machines during the next three months. The following year the Crown firm expects to make 50,000 cars. Whether the permanent plant of the company will be located in Louisville has not yet been decided.

Goodyear Cotton Mill—The latest step in the growth of the Goodyear Tire & Rubber Co. is the purchase of a large tract of ground in the heart of the cotton district known as Williamsville, Conn. On the property is a large cotton mill, four stories high and 400 feet long, where will be made a large part of the tire fabrics, hose and belting ducks so extensively used by the company. There are also on the property houses to care for 350 employees, a church, a schoolhouse, etc.

Metz Building—The Metz Co., Waltham, Mass., manufacturer of the Metz car, is building an addition to its present plant containing 90,000 square feet of floor space. Last year this company added 26,000 square feet of floor space to its plant. The present volume of business is the largest enjoyed in the history of this company, as shown by the fact that every department is being operated to its greatest producing capacity at the present time, and both day and night shifts are working.

Showa, Conventions, Etc.

October 13........Pbiladelpbia, Pa., National Fire Prevention Conference, Philadelphia Fire Prevention Commission.

December 9-12......Philadelphia, Pa., Annnal Convention of American Road Builders' Association.

Race Meets, Runa, Hill Climba, Etc.

Jnne 14...........Cincinnati, O., Hill Climb, Cincinnati Auto Dealers.

June 14-15........San Francisco, Cal., Track Races, E. A. Moross.

June, 16, 17, 18...Colnmbus, O., Reliability Conteat, *Ohio State Journal*,

June 19...........Chicago, Ill., Algonquin Hill Climb, Chicago Motor Clnb

June 21...........Cincinnati, O., Hill Climb, Cincinnati, O., Automobile Dealers.

June 21...........Philadelphia, Pa., Fletcher Cup Rnn, Automobile Club of Philadelphia.

June 21-22........San Francisco, Cal., Track Races, E. A. Moross.

June 23...........Des Moines, Ia., Little Glidden Tour, Iowa Automobila Assn.

June 25-28........Chicago, Ill., Non-Motor-Stop Reliability, Chicago to Boston, Chicago Automobile Club.

July 1............Indianapolis, Ind., Tour of Indiana Antomobile Manufacturers" Assn. to the Pacific Coast.

July 1-16.........Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.

July 4............Columhus, O., 200-Mile Track Race, Columbus, O., Automobile Clnh.

July 4............Taylor, Tex., Track Meeting, Taylor Auto Club.

July 4............Washington, D. C., Track Races, National Capital Motorcycle Club.

July 4-5...........Sioux City, S. Dak., Track Meetings, Sioux City Automobile Club and Speedway Assn.

July 5-6...........Tacoma, Wash., Road Race, Montemara Festa Automobile Committee.

July 8-16..........Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager.

July 11...........Twin City, Minn., National Reliability Tour, A. A. A.

July 20...........Seattle, Wasb., Track Races, E. A. Moross.

July 27...........Grand Rapids, Micb., Tour, Grand Rapids Auto Clnb.

July 27-28.........Tacoma, Wash., Tacoma Road Races.

July 28-29-30.......Galveston, Tex., Beacb Races, Galveston Automobila Cluh.

Aug. 5.............Kansas City, Mo., Sociability and Endurance Run from Kansas City to Colorado Springs, Col., Kansas State Automobile Assn.

Aug. 12...........Kansas City, Mo., Reliability Tour, Kansas State Auto Assn.

Aug. 29-30.........Elgin, Ill., Elgin Road Races, Elgin Road Race Assn.

Aug. 30-Sept. 6....Chicago, Ill., Reliahility Run, Chicago Motor Club.

Sept. 1............Columhus, O., 200-Mile Track Race, Columbus Anto Cluh.

Sept. 9............Corona, Cal., Track Raee, Corona Auto Assn.

Oct. 4-11..........Chicago, Ill., Around Lake Michlgan Run, Chicago Motor Co.

Nov. 24...........Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.

Nov. 27...........Savannah, Ga., Grand Prize Race, Automobile Club of America.

New factory of the Dyneto Electric Co., Syracuse, N. Y.

The Week in the Industry

Engineer — Dealer — Repairman — Garage

Test cars furnished by the Henderson Motor Car Co., Indianapolis, Ind., during the recent 500-mile race at Indianapolis

Road scene of the Twin City-Glacier Park Automobile Tour

On the road to the top of Royal Gorge, Canon City, Col.

HENDERSONS HELP INDIANAPOLIS GUARDS.—The above illustration shows the six cars furnished Speedway management at Indianapolis, Ind., at the recent 500-mile race, by the Henderson Motor Car Co. A soldier rode with each tester throughout the day, and after the race started the police cars were put in the infield to keep the crowds well in hand in case of accident. The many automobiles that came to the race congested all the roads to the Speedway, and the guards of the course were placed on the road early in the morning and after the race to keep the cars moving without confusion. Handling such a crowd as gathers for the annual 500-mile race at the Indianapolis Motor Speedway is no small task.

MANITOWOC GARAGE CHANGES HANDS—The garage and repair shop of S. F. Splitt at Manitowoc, Wis., has been purchased by Ullius & Bernstein, of Milwaukee.

IDEAL TRIP THROUGH ARIZONA—The Franklin Automobile Co., Syracuse, N. Y., has recently issued a twenty-page booklet on a wonderful trip made by one of its cars through the Grand Canyon of Arizona.

NATIONAL ORGANIZED IN 1900—In the May 29 issue of THE AUTOMOBILE an error was made in stating that the National Motor Vehicle Co., Indianapolis, Ind., was organized in 1904, when it should have stated in 1900.

BY WAY OF CORRECTION—In the May 29 issue of THE AUTOMOBILE a picture was captioned Massive Exhaust Manifold of De Palma's Mercedes. It should have been Mercer. In the June 5 issue a picture captioned A Snapshot of Jenkins in His Schacht, Taken Just Before the Great Contest Began, should have been, Spencer Wishart in the Mercer which Finished Second.

BUFFALO'S AMPHIBIOUS GARAGE—The Amphibious Garage Co., Buffalo, N. Y., is having plans drawn for the construction of a garage for automobiles and motor boats on the Jones property, between Ontario street and Riverside Park. This company has leased 1,200 feet of water front on the Niagara River and a portion of the uplands facing Niagara street, on which the entrance to the garage will be located.

BOSCH ESTABLISHES DISTRIBUTORS—The following stations have been appointed by the Bosch Magneto Co., New York City: S. S. Marmalee Co., Macon, Ga.; Lackawanna Automobile Co., Scranton, Pa.; Armstrong Auto Co., St. Joseph, Mo.; Electric Mfg. Co., St. Paul, Minn.; Edwards & Dickey, Portsmouth, N. H.; Susquehanna Motor Car Co., Wilkes-Barre, Pa.; J. F. Esser, Flushing, N. Y.; Spokane Cycle & Supply Co., Spokane, Wash.

MOTOMETERS ON INDIANAPOLIS RACERS—The following cars used a Motometer in the recent Indianapolis, Ind., race: De Palma, Bragg and Wishart's Mercers, the two Peugeots, three Case cars, two Masons, Clark's Tulsa, Liesaw's Anel, Pilette's Mercedes Knight, the three Isottas and the Nyberg, Keeton, Schacht and Henderson. The Motometer is manufactured by the Motometer Co., Inc., New York City, and is used as a radiator heat indicator.

CHINA'S AUTOMOBILE TRUCK ROAD—Chinese engineers, under the direction of J. G. Wong, an American-trained engineer, have been in Hongkong for some time making arrangements for commencing the survey of an automobile truck road in Kwangtung Province, which is designated as a feeder for the Kwantung section of the Canton-Hankow Railway and also probably as the beginning of a railway in connection with that truck line. The road will be about 100 miles long. It is planned to give the new road considerable hard surface dressing and to build substantial bridges, though no very important bridges will probably be needed on the enterprise planned at present. No decision has been reached as yet as to automobile or other trucks to be used, the expectancy being that the road as finished will be used for drawn vehicles for the time being. The company undertaking the enterprise is composed of Chinese capitalists who expect to begin operations in the near future.

Spare with Foss-Hughes—R. Y. Spare, formerly sales manager of the Oldsmobile Co., Philadelphia, Pa., has joined the Foss-Hughes Co., that city.

Receiver for Philadelphia Firm—J. M. Lutz has been appointed receiver of the Automobile Service Assn., incorporated with security fixed at $5,000.

Now In New Home—The W. B. Hollander Co., agent for the Metz car in Rhode Island, has just moved into its new salesrooms at 314 Broad street, Providence, R. I.

Mais Resigns from Studebaker—A. F. Mals has resigned as consulting engineer of the Studebaker Corp., Detroit, Mich. He will take a month's vacation before entering upon other employment.

Going Into New Quarters—Bunker & Reopell, now located on Fort street, Springfield, Mass., handling several lines of cars, will move into new quarters in upper State street in a few weeks.

To Fight Gasoline Cost—The Missouri Engine Co., St. Louis, Mo., recently incorporated, which proposes to combat the high price of gasoline, will engage in the manufacture of coal oil engines.

New Ford Building—Dutee Wilcox Flint, who handles the Ford line in Rhode Island, is having built a new service station and salesrooms on Allen avenue, Providence, that will be ready shortly.

Elliott Secretary of Travel Club—F. H. Elliott has been elected to membership on the board of governors of the International Travel Club, New York City, and also as general secretary of the club.

Calderwood Locomobile Assistant Manager—F. A. Calderwood, assistant manager of the Lozier Motor Co. of New England, recently severed his connection with that company to accept a similar position with the Locomobile Company of America at its Boston, Mass., branch.

Seiberling Haynes General Manager—A. G. Seiberling, for the past year factory manager of the Haynes Automobile Co., Kokomo, Ind., has succeeded C. B. Warren as general manager of the company.

Sim Joins Timken—F. N. Sim, formerly of the Burroughs Adding Machine Co., Detroit, Mich., has become assistant advertising manager of the Timken-Detroit Axle Co., and Timken Roller Bearing Co., that city.

Opens Knight Tire Agency—Manager Thomas J. Harris has opened up the Knight Rubber Co., on Madison avenue, Toledo, O. His complete stock of Knight tires has arrived and the machinery and equipment for the repair department has been installed.

Assets and Real Estate Sold—At a meeting of stockholders in Toledo, O., recently a portion of the real estate and assets of the Castle Lamp Co. were sold to J. N. Willys, president of the Willys-Overland Automobile Co. The Castle Co. is still in existence.

Big Addition for Garage—A $30,000 addition to the Norcross-Cameron garage in Springfield, Mass., will be made in the near future. The new part of the building will be 55 by 79 feet and will be four stories in height. It is to be of brick, concrete and steel.

Moves Into New Quarters—The J. C. Brown Co., of Providence, R. I., doing a general accessory business at 17 Washington street, opposite City Hall, has moved into new quarters at 19 Dorrance street, which places it among the dealers in the motor center of the city.

Williams Goes to Providence—The Alco Co. has decided to open salesrooms for its cars and trucks at Providence, R. I., and A. G. Williams, of New York, has been sent there to take charge of the branch. It was formerly an agency there handled by Frank J. McCaw.

Partnership Dissolved—George F. Howe and Wilbert L. Allen, who have been in business together for some years as the Brockton, Mass., Garage Co., have dissolved partnership, Mr. Howe going into the jewelry business while Mr. Allen will continue the motor establishment.

Wintons As Stages—From Northern British Columbia to Montana, Winton sixes are being operated daily on stage runs. Operating between Ravalli and Polson in Montana are three Wintons. They cover 122 miles each day and traverse all descriptions of roads and trails, composed largely of sand and rock.

Ford's New Philadelphia House—The Ford Motor Co., Detroit, Mich., has purchased a plot of ground at the northwest corner of Broad street and Lehigh avenue, Philadelphia, Pa., 370 x 231 feet, on which the purchasers will build one of the largest automobile factories and salesrooms in the city. The ground is assessed at $72,000.

Penniman in Charge Now—L. W. Penniman, for some time in charge of the sales department of the Walpole Tire Co.'s branch in Boston, Mass., has just been promoted to general manager of the teritory to succeed E. P. Weber, who resigned recently. Mr. Penniman was for some years manager of the Portland, Me., branch of the Goodyear Tire & Rubber Co.

Cadillac's Providence Service Station—The Cadillac Motor Car Co., Detroit, Mich., is planning a service station in Providence, R. I., which will be two stories, 65 x 95 feet, of steel beam construction and concrete foundation, brick with copper trimmings and gravel roof. An elevator, 22 x 10 feet, a sprinkler system, electric lights and steam heat will be installed.

Trade Changes in Portland—A number of trade changes took place in Portland, Ore., during the past week. The Gibson Storage Battery Co. moved into its new garage at 12th and Alder streets; the Michigan Auto & Buggy Co. moved to the west side, to 514 Alder street, and E. E. Gerlinger has issued plans for a new garage which will face on Washington, Morrison and Stont streets.

But Four American Cars Shown—At a recent display of automobiles in a fair in Montevidio, Uruguay, there were but four American cars shown. Twenty-three European cars were on exhibition. The dealers in French and German cars featured price lists of their repair parts and asked prospective customers to compare them with prices of other cars. Full stocks of repair parts are carried in stock, which is another advantage claimed over American and English cars.

Packard's May Shipment Large—Shipments of Packard vehicles in May make the largest total for any single month in the history of the Packard Motor Car Co., Detroit, Mich. Motor carriages and trucks representing a value of $3,237,945 were delivered to purchasers. This sum, compared with the best previous record of $2,748,750 made in April of this year, shows an increase of almost half a million dollars. The total business for the two months was approximately $6,000,000.

Automobile Salesroom Leased—Leases have been signed by the Peerless Motor Co., Philadelphia, Pa., by the International Truck Co. and by the Garford Truck Co. for the three large automobile warehouses and salesrooms which are being built on the south side of Chestnut street, west of 23d street. The leases are all for 10 years. The building at 2304 Chestnut street, containing 40,000 square feet, has been leased to the International Truck Co.; 2310 Chestnut street has been leased to the Garford Truck Co., and 2314 Chestnut street, with 105 South 24th street, containing about 35,000 square feet, will be occupied by the Peerless Motor Co.

New salesroom and service station of the White Co., 216 North Broad St., Philadelphia, Pa., which is up-to-date in all of its facilities

Ohio electric, a product of the Ohio Electric Car Co., Toledo, Ohio, recently given by the Canadian legislators to Mrs. R. L. Borden, wife of the present Canadian Premier, as a token of their esteem for her interest in Canadian affairs

The fine points of motor assembly being demonstrated at the service convention at the factory of the American Locomotive Co. of America, in Providence, R. I., recently, where employees from all parts of the country congregated

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

BRITTON, OKLA.—Darling Automobile Mfg. Co.; capital $25,000; to manufacture and deal in automobiles and internal combustion engines. Incorporators: C. P. Stealey, W. A. Hegbe, H. C. Crum.

CLEVELAND, O.—Haupt Co.; capital; to deal in automobiles. Incorporators: H. A. Couse, R. G. Curren, Mary McManus, Alfred Clum.

CLEVELAND, O.—H. & H. Auto Co.; capital, $10,000; to manufacture and deal in motor vehicles. Incorporators: F. M. Fogarty, J. G. Fordyce, A. B. Brackenridge, H. M. Riedel, G. M. Dolan.

GUTHRIE, OKLA.—Stapleton Motor Sales Co.; capital, $2,000; to deal in automobiles.

LITTLE ROCK, ARK.—Arkansas Automobile Exchange; capital, $5,000. Incorporators: Sam Yout, Estelle Yout, S. J. Fecbbeck.

LITTLE ROCK, ARK.—Paige-Detroit Auto Co.; capital, $101,000; to deal in automobiles.

MAYSVILLE, KY.—Brown Auto Co.; capital, $4,500; to deal in automobiles. Incorporators: Mike Brown, W. B. Tully, B. M. King.

NEW YORK CITY—A. Estelmann Co.; capital, $15,000; to deal in engines. Incorporators: H. A. Bell, August Estelmann, P. A. Warnacke.

NEW YORK CITY—Lurie Auto Co.; capital, $1,000; to deal in automobiles. Incorporators C. U. Backer, S. S. Rosen, I. R. Caplan.

NEW YORK CITY—Rich Motor Co.; capital, $2,000; to deal in automobiles. Incorporators: B. A. Rich, G. P. Harvey, De Witt Fox.

OKLAHOMA CITY, OKLA.—Auto Repair Co.; capital, $2,500; to deal in automobiles. Incorporators: F. P. Fisher, J. H. Brennan, W. M. Davis.

PIERRE, S. D.—Gerling Mfg. Co.; to manufacture gasoline engines. Incorporators: F. A. Gerling, J. P. Minick, F. S. Winslaw, John A. Holmes.

RICHMOND, VA.—Alsop Motor Co.; capital, $5,000; to manufacture and deal in automobiles. Incorporators: J. B. Alsop, C. Armentrout.

SHREVEPORT, LA.—Southern Motor Co.; capital, $10,000; to deal in automobiles.

ST. LOUIS, MO.—G. M. Automobile Co.; capital, $5,000; to deal in automobiles. Incorporators: Robert Fritschle, E. E. Schoening, H. F. Glamann.

ST. LOUIS, MO.—Grand-St. Louis Auto Co.; capital, $4,000. Incorporators: Leon B. Scherrer, John J. Scherrer, Jr., F. A. Stosberg, A. W. Michaels.

TOPEKA, KAN.—West Motor Car Co.; to handle automobiles. Incorporators: J. E. Polley, F. Langley, L. Langley, H. G. West.

WAHPETON, N. D.—Canham Automobile Co.; capital, $25,000; to deal in automobiles. Incorporator: Roland Canham.

CLEVELAND, O.—Columbian Hardware Co.; capital, $500,000; to manufacture vises, anvils, automobile forgings and a line of hardware goods. Incorporators: Julius Tuteor, H. F. Seymour, A. V. Cannon.

CLEVELAND, O.—Kouyoumajan Electric & Mfg. Co.; capital, $100,000; to manufacture a generator to supply electrical current for automobile lights and for a self-starter. Incorporator: H. K. Kouyoumajan.

COLUMBUS, O.—Babcock Garage Co.; capital, $10,000; to handle automobile supplies of all kinds. Incorporators: Alonzo G. Duer, C. Wagenhausen, L. P. Wagenhausen.

DENISON, TEX.—Davis Livery & Motor Car Co.; capital, $20,000; to maintain a garage. Incorporators: E. E. Davis, Earl Wood, R. I. Aspley.

DETROIT, MICH.—Anguish Mfg. Co.; to engage in the general metal stamping business and to manufacture automobile radiators. Incorporators: J. M. Anguish, C. H. Talbot, F. C. Arthur.

KINGSTON, PA.—Emerick Motor Bus Line; capital, $5,000; to engage in an automobile bus line.

KITTERY, ME.—Tell-Tale Auto Lamp Mfg. Co.; capital, $200,000; to manufacture automobile lamps. Incorporators: S. B. Harvey, Horace Mitchell, M. G. Mitchell.

NEW YORK CITY—Alhambra Auto Painting & Trimming Co.; capital, $1,050; to paint automobiles. Incorporators: Adolph Horenstein, Max Marcus, Herman Marcus.

NEW YORK CITY—Consolidated Auto Supply Co.; capital, $10,000 to deal in automobile supplies. Incorporators: Paul Knopf, Carl Knopf, Morton Bishop.

NEW YORK CITY—Donnelly Motor Equipment Co.; capital, $5,000; to deal in automobile accessories. Incorporators: W. J. Donnelly, Fordyce B. Caswell, R. F. Ely.

NEW YORK CITY—Keaton Patents Co.; capital, $100,000; to deal in rubber tires and pneumatic cushions. Incorporators: Geo. E. Starr, Harold A. Forbes, Chas. M. Merchant.

NEW YORK CITY—Herlihy-Scales Co.; capital, $2,500; to deal in and let sight seeing automobile companies. Incorporators: Dalton Scales, Richard Herlihy, B. A. Judd.

NORFOLK, VA.—Auto Specialty Co., Inc.; capital, $25,000. Incorporators: T. Gray Coburn, F. D. Belote, I. B. Belote.

SPRINGFIELD, ILL.—Auto Owners' Protective Assn.; capital, $2,500; to form an automobile protective association. Incorporators: H. B. Williams, H. B. Conant, R. J. Eutscher.

ST. LOUIS, MO.—Missouri Engine Co.; capital, $35,000; to manufacture coal oil engines. Incorporator: A. E. Winkelmeyer.

WAHPETON, N. D.—Wahpeton Garage Co.; capital, $25,000; to maintain a garage. Incorporators: Frank Eberly, R. M. Lundey.

WICHITA, KAN.—Hockaday Auto Supply Co.; capital, $15,000. Incorporators: F. W. Martin, James Prynne, Cora Hockaday, Ray Hockaday, F. W. Hockaday.

GARAGES AND ACCESSORIES

BIRMINGHAM, ALA.—Turner Bros.; to do a jobbing business in automobile accessories. Incorporators: Oscar C. Turner, John D. Turner, Wm. M. Bowles, J. G. Fitzsimons.

BLOOMINGTON, ILL.—People's Taxicab Co.; capital, $2,000; to maintain and operate a taxicab garage. Incorporators: J. A. Beck, Chester Montgomery, R. A. Jolly.

BROOKLYN, N. Y.—Auto-Transit Co.; capital, $100,000; to maintain automobile and truck livery. Incorporators: J. J. Lilly, J. M. Battle, C. J. Leslie.

BROOKLYN, N. Y.—R-M Auto Repair Co.; capital, $15,000; to repair automobiles. Incorporators: R. D. Marx, W. L. Marx, G. P. Marx.

BUFFALO, N. Y.—Amphibious Garage Co.; capital, $25,000; to maintain a garage. Incorporators: G. F. Staples, T. H. Noonan, H. L. Hommedieu.

CHICAGO, ILL.—Auto Control Co.; capital, $200; to deal in automobile supplies: Incorporators: Lee Hammond, J. B. Lund, A. F. Johnson.

CHICAGO, ILL.—Bartola Keyboard Sales Co.; capital, $50,000; automobile livery. Incorporators: M. M. Franey, A. J. Goldfine, H. P. Munns.

CHICAGO, ILL.—Electric Maintenance Co.; capital, $50,000; to manufacture automobile accessories and deal in supplies. Incorporators: W. B. Christie, C. E. Winters, W. A. Baehr.

CHICAGO, ILL.—Ferns Motor Livery; capital, $50,000; automobile livery. Incorporators: M. M. Franey, A. J. Goldfine, H. P. Munns.

CHICAGO, ILL.—Marshfield Garage; capital, $1,200; to maintain automobile garage. Incorporators: Charles Keller, Henry Hantover, Maurice Klein.

CHICAGO, ILL.—Modern Auto Starter Co.; capital, $10,000; to manufacture automobile accessories. Incorporators: M. I. Rosenbaum, M. Richardson, Maurice Altschuler.

CHICAGO, ILL.—Modern Garage & Motor Livery Co.; capital, $2,500; to maintain an automobile livery and garage. Incorporators: P. P. Harris, R. W. Warner, John Pfeiffer.

CINCINNATI, O.—K. Auto Delivery Co.; capital, $10,000; to do automobile trucking. Incorporators: Edward Konker, Geo. W. Bell, Anna Konker, Gus Konker, Fred Schmidt.

CHANGES OF NAME AND CAPITAL

AKRON, O.—B. F. Goodrich Co.; capital decreased from $200,000 to $10,000.

CHICAGO, ILL.—Krickworth Motor Wagon Co.; change of name to Mahaska Hotel Co.

CINCINNATI, O.—Queen City Delivery Co.; capital, $50,000.

CLEVELAND, O.—City Auto Tire & Repair Co.; change of name to City Auto Tire & Supply Co.

DES MOINES, IA.—Riddell Automobile Co.; change of name to Clemens Automobile Co.

FORT WORTH, TEX.—Allen-Vernon Motor Car Co.; change of name to Harrison-Vernon Motor Car Co.

FOSTORIA, O.—Allen Motor Co.; capital, increased to $500,000.

GULL LAKE, SASK.—Burgess Patent Tire Co. of Canada; capital, $600,000.

PADUCAH, TEX.—Mayer, Street & Alexander; change of name to Street-Whittington Co.

ROSSLYN, VA.—District Automobile Service Co.; change of name to G. R. Cowie Co.

SYRACUSE, N. Y.—Syracuse Auto Radiator Co.; capital, $50,000; to manufacture and deal in auto radiators. Incorporators: M. Kaman, T. Vickers.

New Agencies Established During the Week

PASSENGER VEHICLES

Place	Car	Agent
Albany, N. Y.	Chandler	C. S. Ransom
Altoona, Pa.	Chandler	Chas. R. Fluke
Baltimore, Md.	Chandler	Cole Motor Sales Co.
Boston, Mass.	Chandler	Chandler Motor Car Co. of New England
Boston, Mass.	Paige-Detroit	Chandler Motor Car Co.
Bridgeport, Conn.	Chandler	J. N. Bulkley
Brooklyn, N. Y.	Chandler	Tanner Motor Car Co.
Cedar Rapids, Iowa	Chandler	Iowa Motor Sales Co.
Chicago, Ill.	Chandler	J. L. Russell
Cleveland, O.	Chandler	Losier Sales Co.
Cleveland, O.	Ohio	Haupt Co.
Creighton, Neb.	Auburn	Hofer Bros.
De Smet, S. D.	Cole	De Smet Auto Co.
Des Moines, Iowa	Chandler	Jenkins & Co.
Detroit, Mich.	Chandler	Grant Bros.
Detroit, Mich.	King	Biell, O'Donnell & Richardson
East St. Louis, Ill.	Chevrolet	H. Harper
Edmonton, Alta, Can.	Cole	Sellick Bros.
Erie, Pa.	Chandler	Stirling Bros. Co.
Farmington, Mo.	Cole	Ed. Klein
Fort Worth, Tex.	King	Overstreet-Loveless Automobile Co.
Freehold, N. J.	Cole	Clayton & Donahay
Grand Rapids, Mich.	Cartercar	L. Phelps
Grand Rapids, Mich.	King	L. Phelps
Grand Rapids, Minn.	Cole	Leon M. Bolter
Hannibal, Mo.	Overland	Chas. Mueller
Hastings, Neb.	Cole	E. A. Brandes
Huron, S. D.	Cole	A. M. Urquhart
Hutchinson, Kans.	Rambler	Eaton Auto Co.
Indianapolis, Ind.	Chandler	Brant Bros.
Jersey City, N. J.	Chandler	Burke Bros. Co.
Kansas City, Kan.	R-C-H	A. Garnier
Little Rock, Ark.	Franklin	Jones & Lewis
Little Rock, Ark.	Paige-Detroit	Paige-Detroit Auto Co.
Los Angeles, Cal.	Chandler	Sparks-Miller Auto Co.
Louisville, Ky.	Mercer	Hougland Bros. Co.
Madison, S. D.	Cole	Abel Mitchell
Matador, Tex.	Franklin	Jack Luckett
Mattapan, Mass.	R-C-H	Mattapan Motor Car Co.
Memphis, Tenn.	Chandler	Blomberg Auto Co.
Milwaukee, Wis.	Chandler	Archambault Motor Sales Co.
Mitchell, S. D.	Cole	H. J. Hooper
Morris, Ill.	Franklin	D. F. Huff
Nashville, Tenn.	Regal	East Nashville Auto Co.
Newark, N. J.	Chandler	Whiting Motor Co.
New Bedford, Mass.	Cadillac	Robertson Motor Co.
New Haven, Conn.	Chandler	Holcomb Co.
New York City	Chandler	Brady-Murray Motors Corp.
Omaha, Neb.	Chandler	W. L. Huffman
Pawnee, Neb.	Empire	W. C. Fellers
Petaluma, Cal.	Cole	S. L. Canevascini
Philadelphia, Pa.	Chandler	Chandler Motor Car Co. of Philadelphia
Pierre, S. D.	Cole	Gas Belt Auto Co.
Pittsburgh, Pa.	Imperial	Klingler Co.
Pittsfield, Mass.	Michigan	Louis Larouche
Plainfield, N. J.	Cole	Laing Machine Auto Repair Co.
Poughkeepsie, N. Y.	Chandler	John Van Benschoten
Providence, R. I.	Alco	American Locomotive Co.
Rapid City, S. D.	Midland	Thomas Roush
Raton, N. M.	Cole	E. J. Love Motor Co.
Rochester, N. Y.	Chandler	Strong Crittenden Co.
Round Lake, Minn.	Cole	Thomsen Bros.
San Francisco, Cal.	Chandler	S. G. Chapman
San Francisco, Cal.	Crawford	E. Stewart Automobile Co.
San Francisco, Cal.	Jackson	Wichita Motor Truck Co.
Scranton, Pa.	Chandler	Conrad-Chandler Motor Car Co.
Seattle, Wash.	Chandler	Clayton Gibson
Sioux Falls, S. D.	Cole	Ellingson Bros.
Spokane, Wash.	Franklin	Franklin Motor Car Co.
Springfield, Mass.	Chandler	R. A. McKee
Springfield, Mass.	Little	Bunker & Reopell
St. Joseph, Mo.	Chandler	E. C. Eads
St. Louis, Mo.	Allen	Mound City Buggy Co.
St. Louis, Mo.	Chandler	Overland Auto Co.
Topeka, Kan.	Herreshoff	Herreshoff Motor Co.
Tucson, Ariz.	Cartercar	Cartercar Arizona Co.
Uniontown, Pa.	Chandler	Standard Automobile Garage
Uniontown, Pa.	Locomobile	George Gans
Vancouver, B. C.	Chandler	Hoffmeister Bros.
Washington, D. C.	Chandler	Miller Co.
Waterloo, Ia.	Chandler	Central Auto & Supply Co.
Waterloo, Ia.	Moline	Iowa Auto Co.
Wilmington, Del.	Chandler	Wilmington Automobile Co.

Export Field for American Cars Grows

THE calendar year 1912 has brought out several surprises in the manufacturing world, especially in the automobile field. In former years the American car was a very small factor in the trade of foreign countries, but with the advent of the cheap car costing around $1,000, the United States has forged to the front and now ranks with the other nations in this field. Our manufacturers are establishing stations in South America and other parts of the world where the owners there will be convenienced with ready parts and service.

Low-priced Automobiles—An American consular officer reports that a firm in his district desires to be placed in communication with American automobile manufacturers, with the intention of importing cars which cost $1,000 or less delivered, duty paid. This firm desires prices c.i.f., city of destination, and states its willingness to undertake the agency or representation of a firm manufacturing a low-priced automobile, being of the opinion that there is a good opportunity for the sale of same if properly introduced. Catalogues, discounts, prices, conditions, etc., are requested. Clear understanding as to granting or representation as agent is also requested by the firm. Correspondence should be in Italian, French or Spanish. Inquiries at the Bureau of Foreign and Domestic Commerce, Washington, D. C. File No. 10851.

Heavy Oil Motors—A report from American consul in a European country states that a local business man desires to communicate with American manufacturers of heavy oil motors. Quotation, etc., should be addressed direct to the inquirer. File No. 10901.

Automobile and Agency—The secretary of an automobile club in a European capital informs an American consular officer that he wishes to buy an automobile for his own use from some company he might represent as agent. The price of the automobile should not exceed $1,300, and the car must be a good hill climber. Correspondence may be in English. File No. 10930.

Electric-motor Ambulances—An American consul reports that the medical officer of a local municipality has left for London on leave of absence, and he has been instructed by the council to examine the different makes of electric-motor ambulances with a view to the purchase of two such vehicles for local use. One of the ambulances is intended for ordinary use and the other is for handling infectious-disease cases. American dealers in electric vehicles who may be interested should send catalogues, price lists, etc., to the London address of this officer, or have their representative call on him. All correspondence regarding the ambulances should be in English. File No. 10984.

Electric-motor Trucks—A foreign municipal engineer is now testing an American electric-motor truck imported by a local firm, in handling city refuse. An American consul reports that the test will last about a month, and if it proves successful the engineer will recommend the purchase of half a dozen trucks of different makes to compare the efficiency of each, after which it is possible that about twenty-five of the make decided upon as the best for the local needs will be purchased. American manufacturers of electric-motor trucks who care to compete in supplying these trucks should send descriptive catalogues to the engineer at the earliest opportunity, and should quote him their lowest possible prices. Correspondence should be in English. File No. 10987.

Motor Cars—A report from an American consul states that a large shipping and agency firm, with branches in several cities, desires to get into touch with American manufacturers of low-priced American motor cars with a view to becoming the agents for such firms. All correspondence on the subject should be in English and should be addressed to the head of the firm whose name is furnished. File No. 10934.

Motor Agency.—An importer and general merchant in an African city informs an American consular officer that he desires to negotiate with manufacturers of motors for the exclusive agency for a certain territory. He is especially interested in the Porto motor, which is said to be an American engine, and he believes that on account of its small dimensions he can handle it successfully on the local market. It is requested that duplicated catalogues, etc., be sent to the consular officer for reference in case the inquirer does not take up the agency. File No. 10937.

Motor Fire Engine—The American consul at Leeds, England, reports that the town council of Pudsey, Yorkshire, England, has appointed a committee to investigate conditions of fire protection. A motor fire engine is among the equipment the committee expects to procure. Correspondence should be addressed to the town clerk, Pudsey, Yorkshire, England, for use of the special committee referred to. File No. 10974.

Gas Motors and Automobiles—A report from an American consular officer in the near East states that a member of a very prominent family in his district, and one of the leaders in the country, desires an agency for gas motors, 2 to 6 horsepower, motor, 16 to 45 horsepower, and an 8-horsepower four-seat automobile specially adapted to hill climbing and one 8-horsepower gas motor for an oil press. Prices should be quoted c.i.f., city of destination, delivery not later than August. File No. 10708.

German Automobile Developments—German automobile manufacturers report that 1912 was an entirely favorable year for them. It brought an expansion surpassing even in percentage that of 1911. According to official provisional statistics now available, the foreign trade grew from $14,268,000 to $21,347,000 in the course of the year, and reports of the home trade, although not yet in statistical form, indicate as favorable a situation. The greater part of the growth in foreign trade is accounted for by increased exportation, especially of passenger automobiles. In 1911 Germany exported 5,154 vehicles of this type, worth $10,099,000, in 1912, 7,948, worth $15,473,000. Motor trucks were exported in 1912 to the number of 694, valued at $1,849,000, as compared with 346 in 1911, valued at $980,000. Germany's imports of automobiles did not increase in the same proportion as her exports. In value they grew from $2,792,000 in 1911 to $3,432,000 in 1912, an increase of only 22 per cent., as compared with 56 per cent. in the case of exports. In number the increase was from 1,823 to 2,267. Germany's importation of motor trucks increased from 134 to 201 in number and from $390,000 to $607,000 in value. The aggregate value of the vehicles produced in 1911, including extra parts and the value of repair work done during the year, is given at $37,300,000, as compared with $26,000,000 in 1910 and $17,300,000 in 1909. The aggregate value of the products of auxiliary and dependent industries in 1911 is estimated at $48,500,000.

American Trade with London—The total import value from London to the United States during 1911 and 1912 was $458,829 and $392,054 respectively. Special attention is called to the importing of American cars into London, from the United States, in 1911 of the aggregate value of $2,253,321, while in 1912 the value rose to $2,867,993. The average price of the American automobile imported in 1912 was $972, as against $762 in the preceding year, showing a growing demand for the higher-priced automobile of American manufacture.

Italy Sells 3,587 Automobiles—Automobiles sold abroad by Italy last year numbered 3,587, having an average value of nearly $2,000. Exports in 1911 and 1910 numbered 2,918 and 2,120, respectively.

Birmingham's Exports to U. S.—The declared exports from the Birmingham district to the United States and possessions, in 1911 and 1912 were $131,642 and $160,075 respectively.

American Trade in Rangoon—During 1912, forty-one automobiles, valued at $32,246, were imported from the United States, as compared with fifteen cars, valued at $12,063, in 1911. During 1912, 120 artomobiles were registered in Burma, of which forty-eight were American.

American Trade in Switzerland—The invasion of Europe by the American-made automobile, which until a few years ago was denounced by the continental manufacturers as cheap and worthless, continues. The demand for American cars in the Swiss market is confined generally to those of medium or low price, as the European manufacturers have given little attention to the production of that class of machines. The American automobile has taken its place beside the best makes of other countries, its efficiency and durability having been demonstrated by the severest competitive tests of speed and endurance. About fifty American automobiles were sold in Switzerland within the past year, and agencies have been established in several places in the Confederation for the exclusive sale of the medium-priced motors of American make.

Accessories for the Automobilist

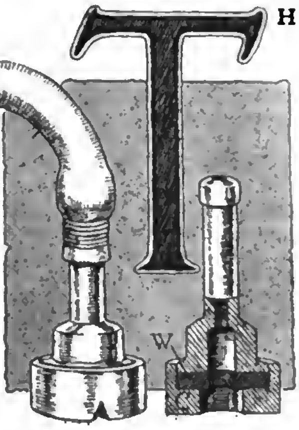


Fig. 1—Carrs B & G connection

THE Crouse Starter—The Crouse Air Crank, made by the Auto Air Appliance Co., Annapolis, Md., is constructed on the compressed air principle and utilizes a rack-and-pinion mechanism for cranking the motor. It consists of a cylindrical casing C, Fig 3, part of which is formed as an air motor cylinder in which a piston P, packed against the wall, is reciprocable, although ordinarily it is pressed against one cylinder end by a spring S. If air is admitted from that end through a pipe A, the piston is moved against the spring pressure and presses the connecting rod Q outwardly. Q is linked to the rack R meshing with a pinion C mounted at the front of the crankshaft. Consequently, the movement of the piston cranks the motor. The rack is in engagement with the pinion only when air enters through A, as then not only piston P is actuated, but some of it passes through the passageway O bored in Q into two small cylinders D containing springs T. The later press against pistons to which the rack is connected, thereby forcing the latter away from the pinion. When the end of the stroke of P is reached, the admission of air ceases automatically, the springs T retract the rack and S returns the P, Q and R to their original position, ready to be moved again if the motor has failed to start.

Johns-Manville Extinguisher—The H. W. Johns-Manville Co., New York City, manufactures a new fire extinguisher which comes in bombs, being composed of a compressed, incombustible gas which is five times heavier than air. One quart of this gas if released develops 4,000 cubic feet of gas at atmospheric pressure, being sufficient to quench any fire at the time of starting. The gas is dry, and as it contains no moisture, it produces no rust nor corrodes metal parts if applied to them. Likewise, it does not injure the skin, fabrics, etc.

Tribune Double Headlights—A novel and exclusive feature of the new Tribune Thirty-Six is a double electric headlight, Fig. 2, combining the functions of sidelight and headlight by means of two bulbs in each. The larger bulb, of 16 candlepower, is located conventionally in the apex of the reflector, while the smaller bulb, of 6 candlepower, is just beneath. It is claimed for this arrangement that greater efficiency is obtained, especially for the smaller lights. The current for the lights is supplied from a storage battery, charged by a lighting generator.

Weed-Chain Plier—The Currier-Koeth Mfg. Co., Coudersport, Pa., make, among other automobile tools, a plier for the adjustment of Weed chain links. The pliers are made of steel and the jaws are so formed as to easily open the link to just the right distance. The tool may be operated with one hand.

Carrs Special Tire Hose Connection.—C. Carrs, of 1777 Broadway, New York City, has begun the manufacture of special connections for tire inflation hose, Fig. 1. This connection, as it is called, simply consists of a specially formed lock which fits in place of the ordinary lock of Acorn and Eclair connections used to produce a sliding joint between the inflation hose and the valve stem. In the case of Acorn and Eclair connections, a rubber washer is in place between the cup and the cap, and the end of the hose, fitted with a metal piece, is shoved into the rubber washer, which keeps the air from escaping. However, when the tire is pumped up to a pressure considerably below that demanded by the maker, the hose frequently blows off, especially when the rubber washer has been used for some time. In order to prevent this in the case of the B & G connection, Fig. 1, the same which forms a cap is threaded to fit over the cup of the ordinary connections replacing the common caps, and the inner surface of the cap is threaded along a thin longitudinal zone, so as to be capable of engagement with the thread formed on the tire valve casing. The latter, as is well known, has two flat surfaces, where the thread is cut away. In puting the connection on the tire valve, the end of the valve casing is pushed into the opening of the cap C, in such a position that the threaded portion of the cap, marked outside by a cut-away in the metal, comes over the unthreaded portion of the valve casing. When the end of the latter has been driven into the rubber washer, the connection is turned, and the narrow thread in the cap engages that on the valve casing, thereby locking cap and casing against relative longitudinal displacement, movement along screw lines given by the casing thread being the only possi-

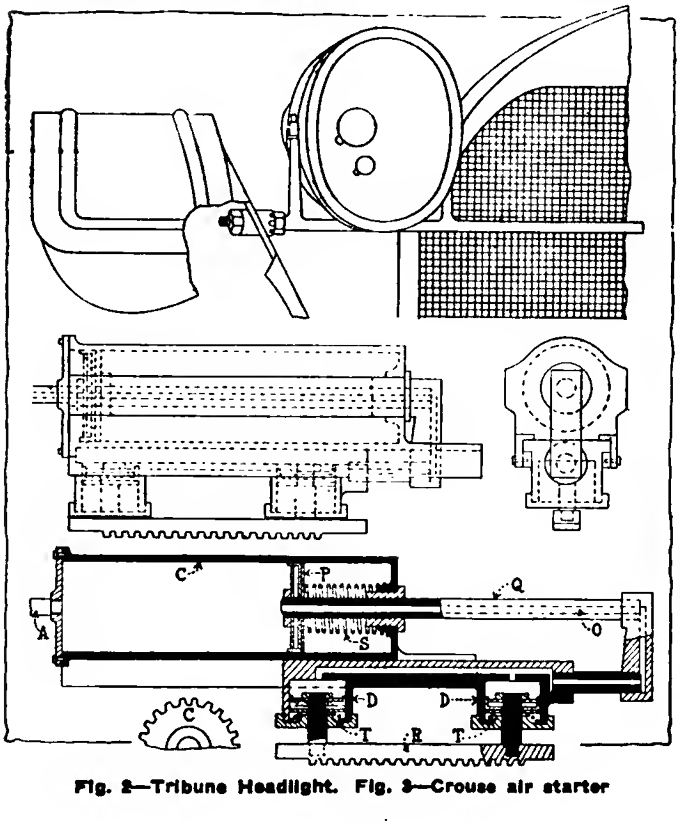


Fig. 2—Tribune Headlight. Fig. 3—Crouse air starter

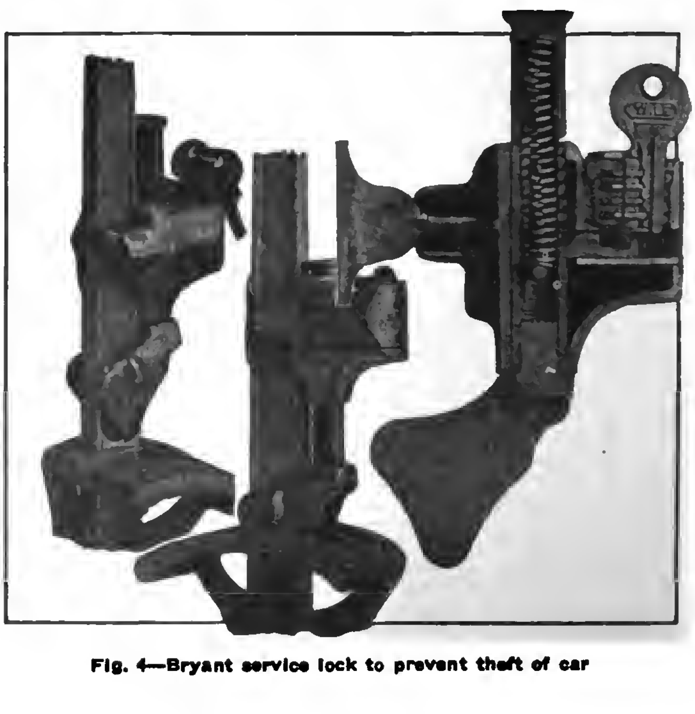


Fig. 4—Bryant service lock to prevent theft of car

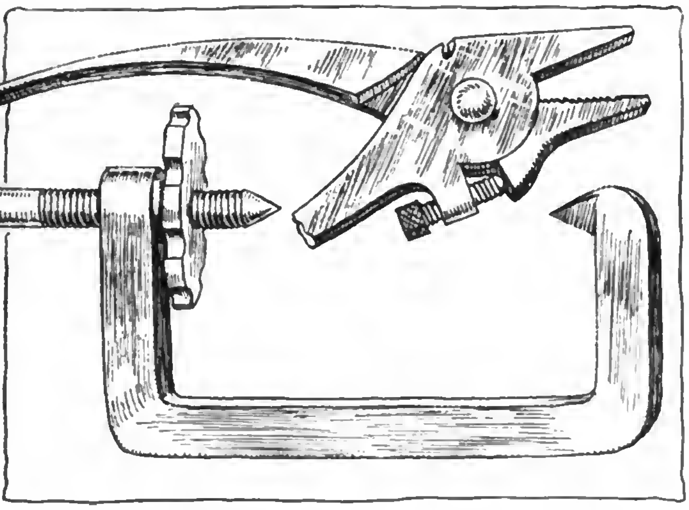


Fig. 6—Westhaven plier. Fig. 7—Townsan spring spreader

ble. Now, of course, the reaction of the air entering through the valve is not strong enough to displace the connection, and, whether the washer is new or old, the connection cannot blow off.

Dean Electric Fordorn—The Dean Auto Devices Co., Chicago, is the maker of the Fordorn automobile signal, which is electrically operated, using the excess current generated by the powerful magneto of the Ford car. The horn consists of a brass trumpet, which is attached to a black-enameled frame. The latter is fastened by screws to a heavy steel ring supporting the motor magneto and the armature which is vibrated by the motor-driven ratchet. The motor magnet is composed of thin iron plates varnished to insulate them of one another. A diagram showing how the horn is to be connected with the ignition circuit is furnished with the device, and control is by means of a button, which is preferably mounted on the steering wheel of the car.

Townsan Leaf Spring Spreader—In Fig. 7 the Townsan spring spreader, made by the Townsan Auto Specialty Co., Mitchell, S. D., is illustrated. It consists of a steel bar shaped as a channel to embrace the spring across its width. A steel wedge is secured to one end of the channel, while the other is formed with a threaded hole through which screws a bolt carrying a conical steel point at its end. By placing the wedge between two leaves on one side of the spring and the point on the other side, and by then working the screw carrying the latter, the two leaves are spread apart and a possibility is afforded to put lubricant between them.

Bryant Service Lock—Fig. 4 shows the Bryant automobile lock which consists of a vertical bar formed as a rack and secured to the gearshift lever so as to not be removable therefrom, and a part slidable upon the same but ordinarily engaging the rack. Engagement and disengagement of the slidable part and the rack are controlled by a Yale lock; so that, unless the tumblers are turned by means of the individual Yale key, the relative position of rack and part cannot be changed. The slidable part carries at its lower end a fork taking up the space between the gearshift lever and the quadrant if the part is lowered when the gears are in neutral. Attachment of the device to the lever is so that it cannot be taken off the same.

Westhaven Patent Plier Wrench—The West Haven Mfg. Co., New Haven, Conn., is the maker of the plier wrench, Fig. 6, which is constructed with an adjustable jaw movable by means of a setscrew. In using the plier as a wrench, the setscrew takes the strain which otherwise would be transmitted by the jaw to the pivot, in other words, half of the working strain. The jaw, which is operated by the setscrew, is formed with serrations along its gripping face, and the plier is therefore made available to act as a wrench in grasping round objects. The second jaw is formed with a slot across which cuts the knife edge of the lever supporting the first jaw, thus making it possible to use the tool as a wire cutter.

Herz Tape Grip Rings—Herz & Co., New York City, have brought out a new device for coupling rubber tubing on to metal pipes, especially for water conduits around the engine. The device, Fig. 8, consists of a metal ring formed along the inside of one edge with an inward rim. A slot is cut through the ring, and the operation is as follows: To obtain a tight connection between rubber hose and the pipe, the end of the hose is slipped over the latter and the ring is then put on top over both. It now remains to take up the slack between the two and to do this white tape or black tailor's tape is slipped through the slot in the ring; then the latter is begun to be turned. As it turns, the friction between the rubber and the tape keeps the latter in close adhesion to the former, and as a result tape is wound up around the rubber hose and inside the ring. The more tape is thus used, the tighter becomes the joint. If enough tape is used, the joint becomes not only waterproof, but gastight as well.

Gurney Solid Ball Retainer—The Gurney Ball Bearing Co., of Jamestown, N. Y., has designed the new retainer, Fig. 5, which is now being used in its ball bearings. The retainer is made of a single piece of anti-friction metal shaped as a ring and formed with a number of cavities for holding the balls of the bearing. These cavities are so dimensioned as to easily accommodate the balls, yet at the same time avoid all lost motion. Thus, they are permitted to rotate freely in the retainer, and due to the composition of the latter—from anti-friction metal—there is very little resistance to the free movement of the balls; incidentally, the chemical constituency of the metal which makes it frictionless, also prevents the generation of noise between balls and retainer, so that the bearing is very quiet. The remainder of the Gurney bearing, not shown here, are chrome steel rings and balls, which are maximum with respect of the circumference.

Woodworth Inner Tire Sleeve—A new inner sleeve or liner, Fig. 9, is being made by the Woodworth Tire Good Co., Niagara Falls, N. Y. It is made of heavy chrome leather and is lined with five buttons and holes into which these fit, a flap overlapping the button line so as to reinforce the inner circumference of the inner tube. If it is desired to apply the liner for the purpose of reinforcing the tube in a weak place. the tube is removed from out the shoe and after being inflated to the correct degree is surrounded by the liner, after which it is replaced in the casing. Each sleeve is made with two rows of buttonholes, making it usable for two tire sizes.

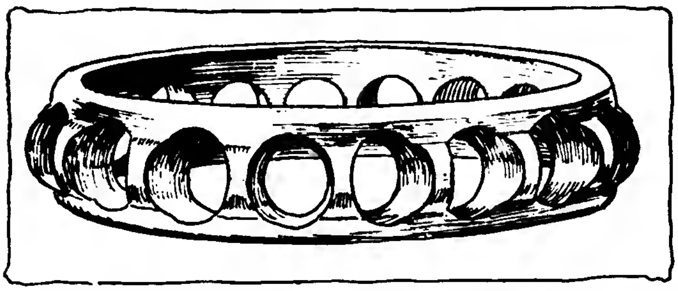


Fig. 5—Gurney anti-friction ball bearing retainer

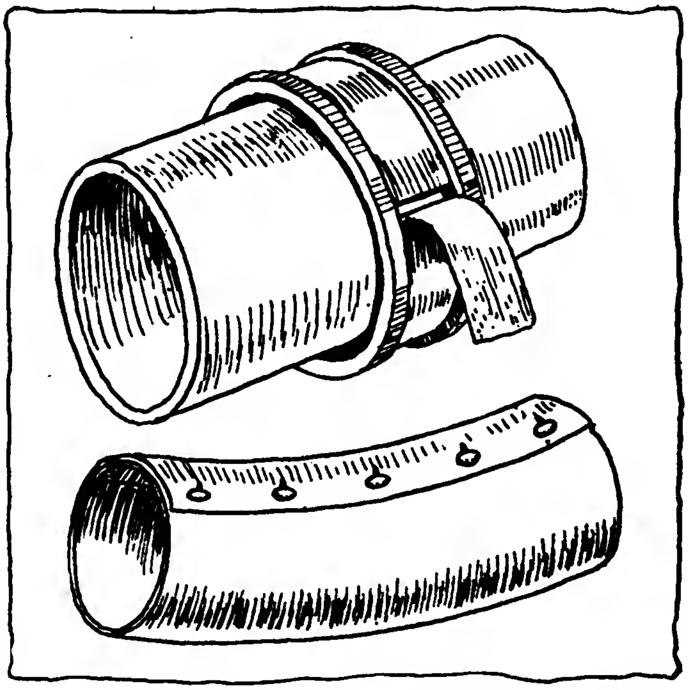


Fig. 8—Herz tape grip ring. Fig. 9—Woodworth sleeve

The AUTOMOBILE

June 19, 1913

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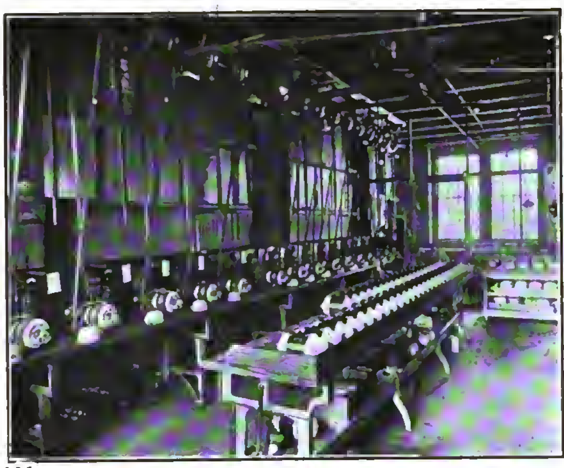

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Vol. XXVIII New York, June 19, 1913. No. 25

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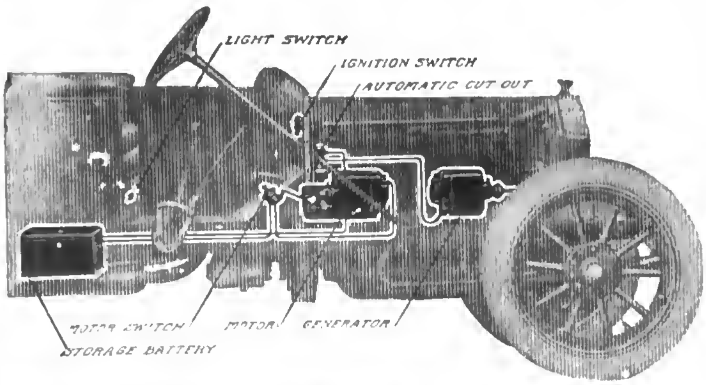

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VOL. XXVIII NEW YORK—THURSDAY, JUNE 19, 1913—CHICAGO No. 25

The AUTOMOBILE

Portable Garage Is a Problem Solver

Private Housing of the Automobile Makes for Economy and Convenience—Garages that Can Be Easily Erected by the Owner

By Sydney Oxberry

WHAT owner making use of the public garage as a storing place for his car has not often allowed his mind to run on the desirability of having his machine transferred to a more convenient place at his own door, where it is ready at a moment's notice, where he is sure no careless outsider is tampering with its mechanism, or joy riding, or appropriating expensive gasoline? A private garage next his own house allows the motorist to proudly display the particular mechanical wonders of his latest speed wagon to every visitor. When a run is suggested there is no long walk to the public garage and no telephoning and the aggravating delay; the car is right at hand. And after a long run with a house party what a much more satisfactory conclusion it is to drive triumphantly up to your own place and deposit your passengers without further trouble.

Nobody would dispute these advantages, but the chary motorist still hesitates to adopt the private garage, sometimes because of the cost, and often because he cannot be sure of the permanence of his residence in one locality, and the expense of erecting a new building for the car at each removal hangs ominously over his mind.

The anxiety is largely without foundation. For the comparatively small outlay of about $200 he can have a firepoof garage with some pretention to good appearance delivered at his home in a few days and erected—by himself if he is at all handy—in a further couple of days, that will house his car and pay for itself in saved storage charges in a few months. The portable garage, as this convenient solution of the housing problem of the automobile is named, is represented by an industry that is already of considerable size, over thirty concerns, furnishing all sizes and types from all-wood, wood and canvas, wood and steel, and all-steel constructions being in active operation. A great variety of styles to suit all tastes are available. The most popular is a plain gable-roofed structure with a floor plan of 12 feet by 18 or 20 feet, provided with an 8-foot door at one end. Many of these are supplied in interchangeable wall sections 2 or 3 feet wide, and are simply bolted together on a framework that is also easily demountable. By these means an erection of any desired length in 2 or 3-foot stages is obtainable. It is the custom of practically all makers to furnish window sections identical in size with the plain side units, so that the number and placing of the windows are at the discretion of the erector.

Fig. 1—View of a typical one-car fireproof portable garage that can be erected without special foundation in a couple of days. Fig. 2—The same en route for new quarters

The size of garage required should receive careful consideration by the prospective purchaser. It is true that a shed 10 feet by 14 feet will accommodate a small runabout, for instance, but to be of really practical use it is advisable to

Fig. 3—Fireproof Rusk garage of gable type with ornamental pressed steel sides and hinged window

Fig. 4—Combined workshop and garage by the Metal Shelter Co. The equipment includes a forge with chimney, as shown

choose always on the roomy side. For one thing it is not at all unlikely that the owner of such a machine may be the possessor of a touring car long before the garage has outlived its usefulness. Secondly, and this is of greater importance, nothing detracts more readily from the philosophic calm with which one approaches a repair job than to be cramped for space. Therefore, see that not less than a 3-foot passage way all around the car is provided for. Wheel repairs, in particular are thereby rendered much easier of execution.

Workbench Is Important Accessory

Another matter affecting the size of the garage chosen is the ever useful workbench that ought always to form part of the equipment of every garage, however small. The many repairs that can be easily accomplished with the aid of a small workbench and vise will surprise the automobilist who has been long accustomed to rely on professional aid at every minor ailment of his car. The handiest location for such a bench is at the end opposite the door where, needless to say, there should be a window for daylight work.

Of the two principal constructional methods, wood and sheet steel, each has its advantages and disadvantages. Wood is of course the cheaper, but it does not lend itself so readily to frequent dismantling, nor is it fireproof, both of which points are the principal recommendations of the all-metal garage, though the latter has a somewhat higher initial cost.

As at present designed neither can claim a superiority in the matter of ease of erection. With the help of a friendly neighbor, a stepladder, square and wrench almost any portable garage can be erected in a couple of days.

It may be as well to point out here that the term portable in connection with garages has a wide meaning. All the steel constructions are portable in the full sense of the term, as well as many of the sectional wood type, that is, they can be put together and taken down an unlimited number of times without any detrimental effect on the parts. But the term is stretched to include those wooden constructions which are supplied in accurately cut pieces of lumber capable of being erected without a permanent foundation. These latter are not really at a very serious disadvantage for the owner who lives any length of time in one place. It is not advisable to take such a garage to pieces for re-erection, though that can be done, and any rate in the case of the smaller models it is an easy matter to lift the entire structure onto a wagon for transportation.

Before deciding on a particular garage the building laws of the locality relative to danger from fire should be carefully looked over, and the size of the available plot with reference to distance from adjacent dwelling houses considered.

With regard to the fixing of the garage on the ground, for the smaller types a common and quite satisfactory method is to drive creosoted wood stakes into the ground at the corners and sides, on which the frame uprights or the horizontal sill extending along the lower edge of the walls are bolted. Another favorite foundation suitable for a more or less permanent erection is a set of cement piers with a foundation bolt imbedded in each to which the sill is anchored.

So much diversity of opinion exists as to what is the most desirable method of flooring that the manufacturers of portable garages prefer to leave that detail to the individual taste and requirements of the purchaser. Much, of course,

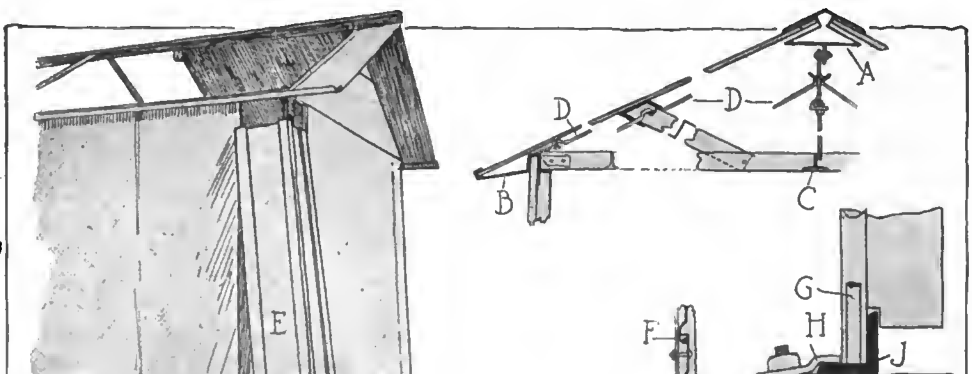

Fig. 5—Fitting of corner and other details of Pruden construction

depends on the nature of the ground, whether it is intended to wash the car inside, drainage facilities available, etc. A cement floor offers perhaps the most advantages, but the trouble and expense of laying one can be avoided by adopting the simple substitution of a couple of wide runboards with a cinder filling. If the soil underneath is at all absorbent this style of floor will be found to allow water to soak easily through the cinders when washing.

Another flooring recommended is a load or two of cinders mixed with cement as a binder. This floor is fireproof, but a means of drainage must be provided or the car always washed out of doors.

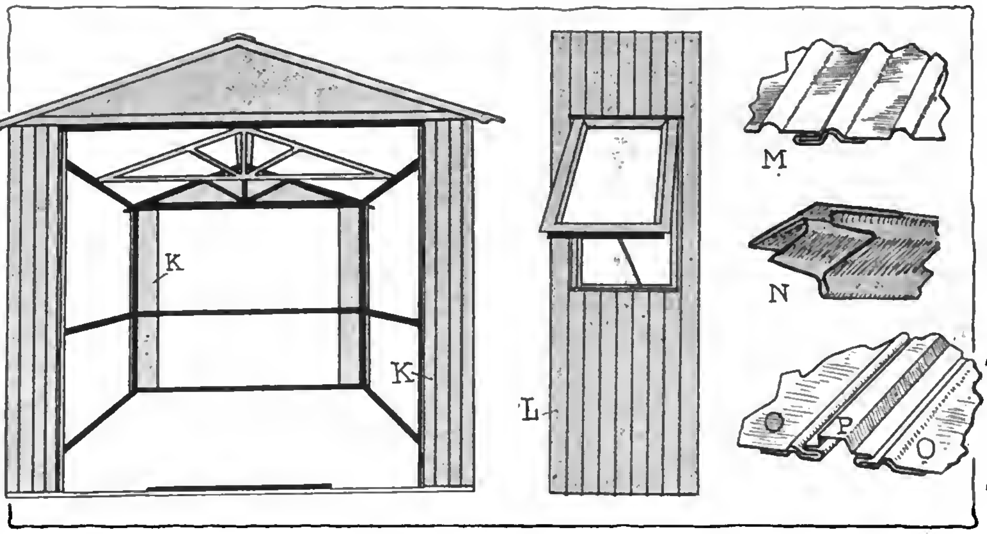

Fig. 6—Framework, side unit and joints in Edwards' portable construction

The constructional features by which the sections of the various portable garages are coupled together to form a watertight joint display much ingenuity. In one metal design the wall units are provided with strengthening webs permanently attached to the inner face, while others receive the required rigidity from the special form of the connecting bar which joins the adjacent sections. A great degree of rigidity is also imparted to the metal sheet either by stamping in ornamental patterns or the more usual corrugations. A popular type of metal siding is that pressed to resemble weatherboards. It is strong and simple and does not offer the same risk of incongruity of appearance with the residence that is the case with the more ornate patterns, though many of the latter regarded alone are pleasing in effect.

In the matter of general appearance a large range of choice exists. The hip roof, an example of which is shown in Fig. 10, always gives a good impression. This style of roof, however, requires a more complicated frame and does not lend itself to the portable feature so well as the ordinary gable roof. The rectangular sides of the gable type of roof facilitate their division into sections in a similar manner to the walls.

The garages shown in Figs. 1 and 4 are two of the many types constructed by The Metal Shelter Co., St. Paul, Minn., which makes structures of any width from 8 feet to 20 feet by any length. The principle of construction is a system of interlocking units in sheet metal, each complete in itself, containing all framework, which when attached to other units completes the structure.

The method of construction is shown in Fig. 5. All the side units measure 2 feet in width by 8 feet high and are made in 24-gauge galvanized steel. Both long sides of each section are formed into tubes or beads in such a way that one section can be rigidly attached to the adjacent section by simply passing a steel rod .375 inch diameter through the junction from top to bottom. At the base these rods pass through and are bolted to a steel angle which forms the sill on which the entire garage rests. This sill is shown in the detail sketch at J, which also illustrates one method of fixing to a cement pier foundation by means of clips H. The vertical connecting bolt is shown at G. After fitting the sides together they are raised to a vertical position and the corner pieces E added. These are bolted to the adjacent side units, the corner itself being supported by one of the vertical rods already referred to.

The windows are 4 feet by 2 feet and are located 4 feet from the ground. They are glazed with .25-inch wire glass or clear glass.

Truss Construction for Roof

Galvanized steel is used for the roof, the sheets resting at their lower edges in special eaves B, Fig. 5. The upper edges meet in a metal ridge A and the whole roof structure is made firm by tightening up the tie rods D. A longitudinal T-iron C extends the entire length of the building to which the cross and oblique members are attached, forming a trussed system.

Prices for the standard one-car garage from $176 for the 10

Fig. 7—Pinyoun wood house with single slope roof. Ample light is afforded by glazed doors and side windows

Fig. 8—Kenyon handy portable of waterproof canvas stretched over wood frame that can be erected in a few hours

Fig. 9—Handsome two-car house with hip roof by Springfield Co.

by 12 feet size, upwards, the 12 by 18 feet being listed at $251. Two-car garages by the same concern and on the same principles cost from $322 for the 16 by 16 feet size to $483 for the largest, measuring 24 feet long by 20 feet wide.

A typical one-car "Pruden" garage is shown in Fig. 1. Fig. 4 shows a special construction in which a workshop is combined with the garage proper. This particular model, measuring 18 by 20 feet, is listed at $403. The equipment includes a steel locker for tools, a steel framework for a workbench, and a 5-foot chimney for forge.

The Edwards Mfg. Co., of Cincinnati, O., has evolved a simple system of unit construction fireproof garages that make up into structures with a distinctive appearance. These are made in two types, the "Steelcote," of galvanized steel sheets mounted on a wood frame, and the "All-steel" type, having a framing of angle-iron and being absolutely fireproof.

The framework throughout is angle-iron 1.25 inch by 1.25 inch, and this is supplied ready drilled for the attachment of the side sections. The sills, that is, the lower angles which rest on the floor, are connected at the four corners by angle plates which brace the structure and insure its perfect rectangular form. The method of erection will be clear by reference to Fig. 6 which shows at the left the building partially raised. It will be noticed that additional strength is given to the walls by the use of a central horizontal angle-steel extending around the sides and back at a height corresponding with the lower edge of the windows. Once the frame is erected the corner pieces K are applied and bolted to the corner pillars.

A particularly ingenious method of connecting the sections so as to form what is practically an air-tight joint is used. This is shown in detail in the same illustration. The edges of the adjacent sections O O are held near together and the connecting strip P inserted between them. The piece P extends from sill to roof and its strong channel section will be noted as well as the method of obtaining a sealed joint by means of the vertical flutings in all three parts. In the roof a similar method of fluted water-tight joint M is utilized. At N is shown a section of the roof ridge also made in galvanized steel.

The doors are each 4 feet wide by 8 feet high, formed from 1.25 by 1.25 inch angle steel, braced at the corners and covered with beaded surfacing as used for the side units. The windows. 27 by 36 inches, are swung on hinges at the top, as shown at L in Fig. 6.

For the roof this concern supplies plain sheets or a special pressed steel imitation of Spanish tiling which is attached with concealed nails. Twelve standard sizes are listed, ranging from 10 feet wide by 14 feet long to 14 feet by 20 feet. The prices are from $92.50 to $127.50 for the "Steelcote" type and from $150 to $200 for the all-steel type. The 12 by 20 feet all-steel garage costs $180 and weighs 1900 pounds.

Reduce Number of Parts

Among the makes of all-metal garages in sections, those by the Anchor Corrugating Co., New York, are unique in that the number of parts is reduced to less than half that usually employed. By this means a much simpler construction is obtained, having fewer joints. Contrary to what might be supposed, no part is unwieldy, the heaviest section weighing 50 pounds. A 12 by 18 foot structure by this concern costs $253.

Fig. 3 shows a Rusk fireproof garage with a floor plan of 12 feet by 18 feet. The construction of these buildings is very simple. A rectangular framework of galvanized angle-iron is erected and on this the side walls are bolted. The same concern also manufactures similar structures with wood frames at a lighter cost. The prices range from $101.50 to $235. The example shown in Fig. 3 costs $175 in all-metal and $136.50 in the wood frame type. The makers are The Fargo Cornice Co., Fargo, N. D.

The garage shown in Fig. 7 is a neat wooden building that

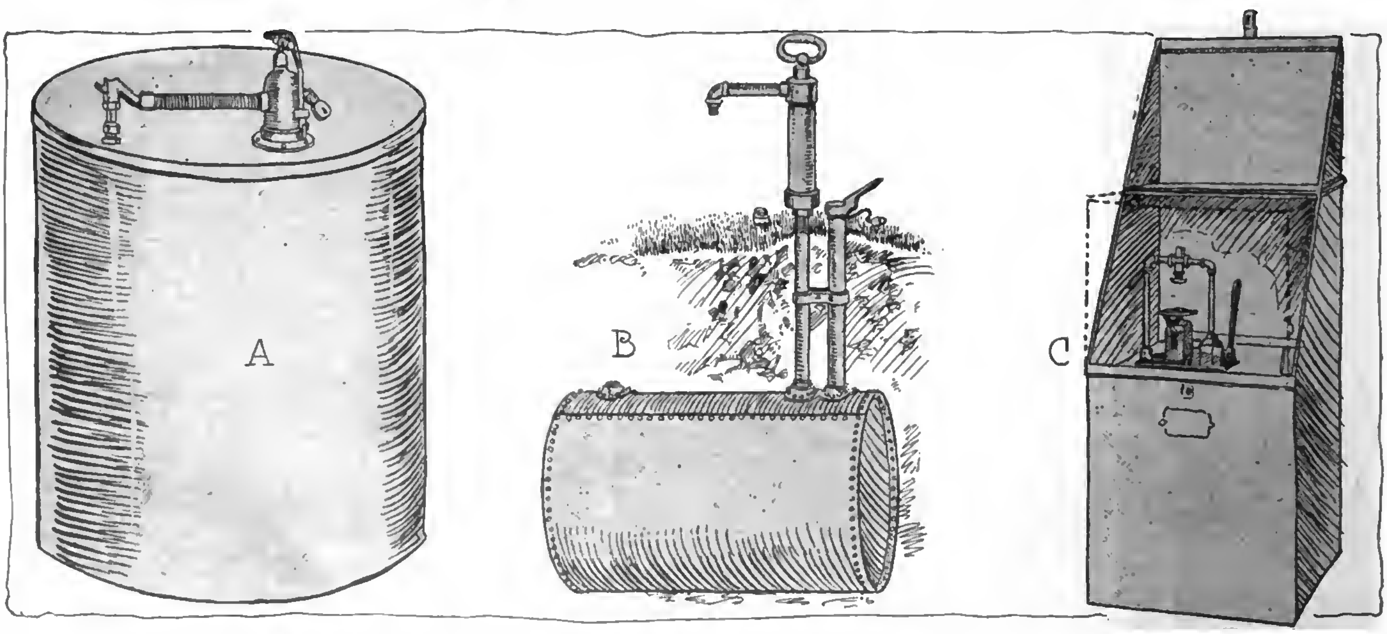

Fig. 10—A, portable gasoline tank with locked pump. B, underground tank for gasoline. C, portable container for oil

can be erected with the help of a wrench and screwdriver. No foundation is necessary, the whole structure being mounted complete on a wood sill at the base. It will be noticed that ample provision for light is made. These garages are made by Pinyoun & Son, Cleveland.

Wood Buildings Look Well

Other wooden buildings of good appearance are shown in Figs. 9 and 11. Fig. 11 is an Aladdin garage by the North American Construction Co., Bay City, Mich. It measures 12 by 20 feet and sells at a net price of $165.30. The other is the product of the Springfield Co., Springfield, Mass. The striking appearance obtained by the hip roof with a slight pagoda dip will be observed. This two-car garage measures 18 by 20 feet and costs $450.

The garage shown in Fig. 8 is an extremely simple affair in canvas and wood. It looks well, can be erected in a few hours, having only slip in joints and thumb screws, and affords ample protection from the weather. It is manufactured by the Kenyoun Co., Waukesha, Wis. The price of a 10 by 16-foot house of this type is $84 without a floor, and the weight only 475 pounds.

A complete list of manufacturers of portable garages follows:

American Portable House Co., Arcade Bldg., Seattle, Wash.
Anchor Corrugating Construction Co., 62 Cortlandt St., N. Y. C.
Berger Mfg. Co., Canton Ohio.
Burnham-Standeford Co., Washington & First Sts., Oakland, Cal.
Chesbro-Whitman Co., 1167 First Ave., New York City.
Craig, David, 70 Broad St., Boston, Mass.
Ducker Co., 277 Broadway, New York City.
Duluth Corrugating & Roofing Co., Duluth, Minn.
Edwards Mfg. Co., 724 Eggleston Ave., Cincinnati, O.
Gordon Mfg. Co., Middletown, Ohio.
O. K. Harry Steel Co., 2333 Papin St., St. Louis, Mo.
E. F. Hodgson Co., 116 Washington St., Boston, Mass.
Ideal Sectional Bldg. Co., St. Johns, Mich.
Illinois Portable House Co., 6331 Evanston Ave., Chicago, Ill.
Karr Portable House Co., 2554 W. Irving Park Blvd., Chicago. Ill.
R. L. Kenyon Co., Waukesha, Wis.
Knapp Portable Permanent Bldg. Co., 111 Broadway, N. Y. C.
Mershon & Morley Co., Saginaw, Mich.
Metal Shelter Co., 3 West Water St., St. Paul, Minn.
New York Portable Bungalow Co., Poughkeepsie, N. Y.
Niles Iron & Steel Roofing Co., Niles, Ohio.
North American Construction Co., Bay City, Mich.
F. C. Pinyoun & Son, 2526 Carnegie Ave., Cleveland, O.
Portable Construction Co., 50 Church St., New York City.
Riverside Mfg. Co., 162 Riverside Ave., Newark, N. J.
J. S. Rogers Co., Moorestown, N. J.
Ruby Mfg. Co., Jackson, Mich.
St. Johns Portable Bldg. Co., 30 Church St., New York City.
Springfield Mfg. Co., 801 Allen St., Springfield, Mass.
Wyckoff Lumber & Mfg. Co., Ithaca, N. Y.

As regards equipment for the garage the safe storage of gasoline is a matter of prime importance.

If the motorist is using a portable garage and does not wish to go to the trouble involved in the sunk tank, a strong cylindrical tank fitted with a pump and strong pipe connection should be obtained and kept out of doors. It should be remembered that insurance difficulties are much more in evidence when gasoline is kept inside the garage.

Fig. 11—Neat Aladdin garage in wood with glazed doors

A gasoline tank that is suitable for the purpose under consideration is shown at A, Fig. 10. This particular tank is supplied in three sizes, containing 65, 110 and 160 gallons.

An underground tank is shown at B. The pump is screwed into the ground pipe and after using can be removed and a special locked cap put in its place.

A handy container for lubricating oil that is portable and convenient is depicted at C, Fig. 10. All three tanks in this illustration are by S. F. Bowser & Co., Fort Wayne, Ind.

Other types of storage tanks are shown in Fig. 12. The outfit B is supplied by the Cleveland Faucet Co. in two sizes. The 66-gallon tank is listed at $21 and the larger size, taking 120 gallons, at $37.50. These tanks are made of heavy steel with welded seams. The pump A is provided with a foot for mounting inside the garage. At B the pump is shown attached to the tank.

The tank shown at C is intended to be located outside the wall of the garage, as shown. Fitted complete, this outfit costs $28 for the 5-gallon size and $35 for the 120-gallon tank. The maker is The Tokheim Mfg. Co.

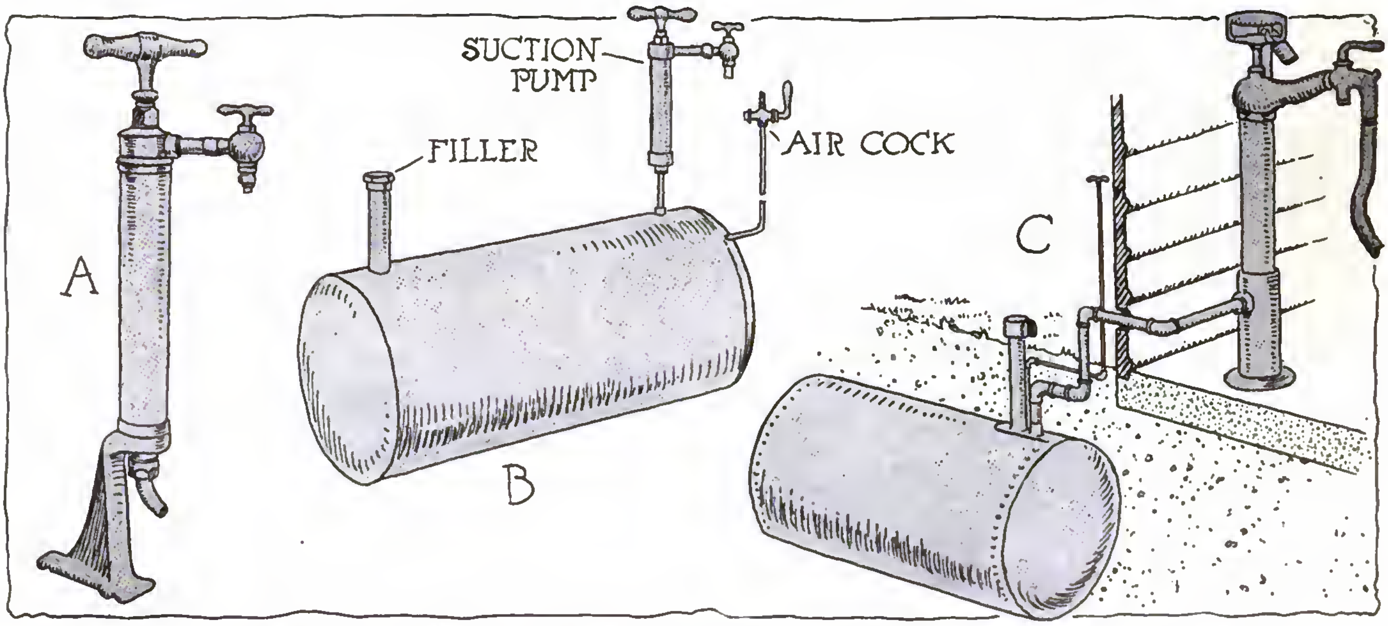

Fig. 12—A, gasoline pump for garage. B, complete underground outfit. C, method of installing tank with inside pump

Chicago Athletic Club Wins Record Run

CHICAGO, ILL., June 16—The sixth annual interclub team reliability match between the Chicago Athletic Association and the Chicago Automobile Club, run Thursday and Friday of last week to Waukesha, Wis., and return, was won by the former, making its record five out of six. The C. A. A. was charged with 57 points penalty, but this was reduced to 22 because of the credit of 5 points for each perfect score. The Chicago Automobile Club was demerited 515 points altogether, but it also had seven perfect scores and in addition was penalized only 9/10 of a point instead of a full point because it had ten contesting cars to the Cherry Circle's nine. This brought the C. A. C.'s final count down to 428.5.

The match brought out the finest example of sportsmanship ever exhibited in these annual matches. The Chicago Automobile Club was unfortunate enough to have on its team a man who totally disregarded the rule which prohibits the participation of women on the tour either as contestants, observers or passengers. Because George G. Greenburg carried two women passengers the first day of the tour the C. A. C. was penalized 250 points through the disqualification of Greenburg. The penalized driver refused to contest the second day unless he could carry the women passengers, so another 250 points were charged against the C. A. C.

Loaded down with this burden, the Automobile Club had little chance to win, but Captain Knisely of the C. A. A. was sportsman enough to offer to scratch two of his cars and take 500 points penalty in order to even up the match. The Automobile Club declined to take advantage of this and continued the contest. At the end of the match when it developed that the Automobile Club would have won if it had not been for the Greenburg incident, the Cherry Circle team pleaded with Referee Beecroft to change his ruling and consider Greenburg as a noncontestant. This that official refused to do, but he did wire the circumstances to Chairman Schimpf of the A. A. A. contest board and telling him of the wishes of the C. A. A. Chairman Schimpf, however, refused to make the change and said that the victory would be credited to the C. A. A., although the two clubs could make any disposition of the trophy they saw fit.

The score in detail:

Chicago Athletic Association

No. Driver	Car	Score
1—C. T. Knisely	Diamond T	Perfect
3—S. E. Hibben	Packard	Perfect
5—W. F. Grower	Diamond T	8 points
9—C. C. Ireland	Hudson	54 points
11—F. H. Judd	Knox	Perfect
15—W. C. Thorne	Locomobile	Perfect
17—Fred Schaaf	Pierce-Arrow	Perfect
19—F. E. Mann	Locomobile	Perfect
21—L. T. Jacques	Peerless	Perfect
Total penalty		57 points
Total credit		35 points
Final score		22 points minus

Chicago Automobile Club

No. Driver	Car	Score
2—G. F. Ballon	Apperson	Perfect
4—F. W. Jencks	Moline	Perfect
6—H. W. Sebl	Cole	Perfect
8—P. E. Ennis	Marmon	2 points
10—J. E. Callender	Edwards-Knight	Perfect
12—W. C. Wilson	Moline	Perfect
16—E. C. Patterson	Packard	Perfect
18—G. Greenburg	Packard	500 points
20—J. Dorsey	Alco	13 points
22—F. X. Mudd	Lozier	Perfect
Total penalty		515 points
Total credit		85 points
Final score		428.5 points

Hemery To Race at Elgin

CHICAGO, ILL., June 9—Participation of Victor Hemery, considered one of the best drivers in Europe, in the Chicago Automobile Club's road races at Elgin August 29-30, is assured by the announcement of E. C. Patterson, the Chicago sportsman, that he has completed arrangements for the entry of two poppetvalve Mercedes cars of 450 cubic inches piston displacement, one of which will be driven by Theodore Pilette and the other by Hemery. These two cars will be nominated for the Elgin national trophy race, which will be run the second day.

Elgin this year promises to be the most interesting of the series of races that has been run over the Kane county circuit. Already many entries are in sight. At Indianapolis it was announced that the three Isottas would be entered, with Harry Grant one of the drivers. Ralph de Palma, holder of the trophy, will defend his laurels, while Ralph Mulford is expected to contest in E. J. Schroeder's Mercedes. There is some talk of Goux's Peugeot being nominated, with some American star driving it.

Fairmount Park Race Is Dead

PHILADELPHIA, PA., June 12—The Fairmount Park race is officially dead. Once again had the hope of seeing automobile racing in the Park been revived only to be crushed to earth.

The action of the Fairmount Park Commissioners on Wednesday, when, by a vote of 7 to 2, the petition of the Quaker City Motor Club to conduct the annual 200-mile road race was rejected, conclusively proves that there is little prospect of restoring the classic to the automobile racing calendar under the present city administration. This is the second year the attempt has been made, but little encouragement attending either effort. Of the 16 members comprising the Commission 5 were absent and President Stotesbury and Mayor Blankenburg did not vote.

More Races for Milwaukee?

MILWAUKEE, WIS.—Rumors are being circulated in Milwaukee that the Milwaukee Automobile Dealers' Association is planning definitely to conduct road races on the Wauwatosa course next fall. The association conducted the Grand Prix, Vanderbilt, Pabst and Wisconsin cup races in October last year and lost about $45,000 in the attempt. It is figured that the remainder of this deficit could be made up by conducting another race meet.

PORTLAND, ORE., June 14—The total registration of motor vehicles in the state of Oregon for this year numbers 11,500, as against 8,411 this time last year. During the first 5 months of the year 11,048 motor vehicles were registered and 933 chauffeurs. The total fees amounted to $44,158.

Milwaukee Clubs to Compete

MILWAUKEE, WIS.—The Milwaukee Automobile Club will engage the Milwaukee Athletic Club in an inter-club reliability tour on Saturday, June 28. Each club will be represented by fifteen cars, instead of ten as originally planned, because of the large number of entries made. The route will be from Milwaukee to Lake Geneva, around Geneva lake and return, a distance of about 115 miles. The rules are lenient, and require that contesting cars must be driven by the owner or a male member of his immediate family. Penalties will be imposed for any work done on the car from the time of leaving Milwaukee until being checked in at night, with additional penalities for taking on water, gas or oil outside of control. The pilot work will be done by M. C. Moore in a White, while a 1913 Mitchell 6-60 will act as pacemaker and official car.

Le Mans Race to Be Run August 4

PARIS, FRANCE, June 11—Known as the Grand Prix de France, the 500 miles road race at Le Mans will this year be run on Monday, August 4, under practically the same conditions as the Automobile Club Grand Prix at Amiens. The course is a triangular one, practically dead level, with perfectly straight roads, passing by the racecourse on which the late Wilbur Wright made his first flights in Europe. Entry has already been received of two Peugeot cars now under preparation for the Amiens race. These cars will be driven by Jules Goux and Paul Zuccarelli.

Twenty-Two Now in Coast Run

INDIANAPOLIS, IND., June 17—There are now twenty-two entries for the Indiana-to-the-Pacific tour to be made under the auspices of the Indiana Automobile Manufacturers' Association and which will start from Indianapolis July 1. The association will have its last meeting before the beginning of the tour at the Claypool Hotel.

Wisconsin Tour Dates August 18-22

MILWAUKEE, WIS., June 16—The fourth annual Wisconsin reliability tour under auspices of the Wisconsin State Automobile Association will be held on August 18, 19, 20, 21 and 22, 1913, over a course of approximately 800 miles. The run will be held under grade 1 rules of the A. A. A., it having been

Inter-State License Bill Introduced

WASHINGTON, D. C., June 17—*Special Telegram*—A bill of importance to motorists was introduced in the House today by Chairman Adamson of the Committee on Interstate and Foreign Commerce. The bill provides that a motorist or operator of any self-propelled vehicle using the public highways in interstate commerce shall be required to take out only one license. If the bill becomes a law the license of one state, district or territory must be recognized by all others.

Cannot Save Privilege Tax Measure

JACKSON, MISS., June 16—*Special Telegram*—With the refusal today of the Supreme Court to grant a suggestion of error in the automobile tax case the last chance to save the privilege tax measure has passed. The $30,000 collected by the state will be refunded by a special act of the next legislature. The Supreme Court recently declared unconstitutional the privilege tax which had been imposed on all classes of motor cars.

Vermont Forbids Red Tail-Lights

MONTPELIER, VT., June 14—Vermont has taken the initiative in legislating rear lights showing a red disk off the highways in deference to the requests of locomotive engineers. Within the past few months engineers on some of the trains when rounding curves have suddenly seen a red light loom up at night, and after jamming on the brakes and stopping short discovered it was a motor car on a highway close to the railroad tracks. This happened a few times with the fast Boston and Montreal express, one of the big trains in New England, and so complaints were made to the Highway Commissioners in some of the New England states. The Massachusetts Highway Commission has promied to take the matter up before the next legislative session so that the example set by Vermont will be followed undoubtedly by all the other New England states next year.

The Vermont legislature also changed the law so that the secretary of state now has more power in the suspension and revoking of licenses, and he is provided with investigators to delve into accidents patterned after the Bay State law. This gives the secretary of state power to rule off the highways such persons as he deems unfit to drive motor cars. It provides for hearings when such drivers ask for them.

The legislature also passed a law limiting the weight of motor trucks. It provides that no vehicle including its load shall be moved over the highways or bridges in excess of 5 tons without first obtaining a written permit. No vehicle that has flanges, ribs, clamps or other objects attached to the wheels that will cut into the roads or bridges to any considerable depth may be moved over the roads. Towns may recover for any damage done by such vehicle unless the driver is relieved of the liability. No steam or gasoline traction engine with or without trailers and no motor truck carrying a weight in excess of 4 tons including the vehicle may be operated on highways or bridges at a speed greater than 15 miles an hour; no vehicle, including its load, weighing in excess of 6 tons may go faster than 6 miles an hour, when such vehicle is equipped with iron or steel tires, or faster than 12 miles an hour when equipped with hard rubber or other substance. The fine for violation of this provision is not more than $200.

Tice Roads Bill Passes in Illinois

SPRINGFIELD, ILL., June 6—The Tice good roads bill, for a system of state-aid highways through Illinois, carrying an intermediate appropriation of $700,000 annually for the next 2 years, was passed yesterday by the house by a vote of 111 to 33.

CONCORD, N. H., June 14—The New Hampshire legislature has passed a law for a new state highway that will cut off 25 miles going to or from Bretton Woods by way of Boston.

SAN FRANCISCO, CAL., June 13—The latest automobile record figures from California show that during the month of May, 1913, $7,596,000 was spent for machines in this state, there being 3,798 licenses issued.

The May registrations were the largest in the history of the state, indicating a flourishing condition in the trade. Since May, 1905, the sum of $215,396,000 has been invested in automobiles in California. Motorcycles are not included in this valuation.

BERLIN, June 13—The opening of the celebration of the 25th year of Emperor Wilhelm's reign, his silver jubilee, was marked by a parade of thousands of gaily decorated automobiles which was reviewed by the Kaiser on the suburban military review field. Prince Henry of Prussia, the Kaiser's brother, led the parade, the occupants of the cars cheering their ruler enthusiastically. Joseph C. Grew, secretary, and William Spencer, second secretary, of the American Embassy, drove their cars in the parade.

deemed advisable to go back to regulations which will insure a strenuous competition rather than a pleasure trip. The first two tours were run under grade 1 rules, but in 1912 it was decided to take a grade 3 run, and while a large entry list was secured, the tour was not as satisfactory from a competitive standpoint as it might have been under the stricter and more stringent grade 1 laws.

M. C. Moore, who has acted as pathfinder and pilot for every Wisconsin reliability run, will start Friday, June 20, on the pathfinding trip in a Mitchell.

A. A. A. Tour Pathfinder Leaves

MINNEAPOLIS, MINN., June 16—The Mitchell pathfinder car for the annual national reliability tour of the American Automobile Association left the Automobile Club in the Hotel Radisson at 2 p. m., June 15. Frank Zirbes was driver.

Algonquin Climb Postponed

CHICAGO, ILL., June 16—The annual Algonquin hill-climb of the Chicago Motor Club, which was scheduled for next Thursday, has been postponed. The reason given is that the hill is not in shape because of a new sewer that has been put in. Lack of entries is another reason for the postponement.

Mulford to Drive Peugeot Racer

NEW YORK CITY, June 16—The Peugeot Import Co., 1620 Broadway, New York City, announces that Ralph Mulford will drive the Peugeot racer, which won the 500-Mile Sweepstakes at Indianapolis, May 30, in practically all the big American speed contests this year. The car has been purchased by a wealthy sportsman who is interested in automobile racing and who has arranged with Mulford to drive it.

Franklin Nearest to Secret Time

SYRACUSE, N. Y., June 16—Edward F. Sparks, driving a Franklin, won the secret time sociability run of the Automobile Club of Syracuse, held Saturday, June 14th. The official time was 2:57:30, and Mr. Sparks was just 12 seconds out of the way, covering the route in just 2:57:18. This gives him possession of the B. E. Watson cup for one year and it is planned to have Mr. Sparks and the three previous winners of the cup hold a contest next year, the winner to have permanent ownership of it. Mr. Sparks also won 5 gallons of Monogram oil by coming in nearest the secret time.

COLUMBUS, O. ,June 17—Owing to inability to secure sufficient entries and also to the bad condition of bridges, due to the recent floods, the Ohio State Journal Reliability contest, which was to have taken place June 10, will be postponed until July 22.

SACRAMENTO, CAL., June 14—An American Scout was the winning automobile in the Sacramento-Tallac endurance contest, held recently under the auspices of a local newspaper.

Hupp Increases Capital

Raises It from $750,000 to $1,000,000—Makes Sixth Increase in Capital Since Incorporation

Action Taken by Company to Provide for Extension of Factory Equipment and Expansion in Organization

DETROIT, MICH., June 17—Papers have been filed with the Secretary of State at Lansing, increasing the stock of the Hupp Motor Car Co. from $750,000 to $1,000,000. This increase was made by a 25 per cent. stock dividend taken out of the surplus and added to the capital account.

This makes the sixth increase in the capital since the incorporation of the company, viz.: November, 1908, $2,500; December, 1908, $50,000; March, 1910, $25,000; June, 1911, $100,000; September, 1912, $750,000; June, 1913, $1,000,000. The last four stock increases have all been made out of the surplus on hand, in every instance leaving a comfortable margin of surplus in the treasury.

"We took this action," explained the president of the company, J. Walter Drake, "to provide for the extension of our factory equipment and the expansion in our organization made necessary by our preparations for the coming season. A conservative estimate as to the requirements of our dealers for the forthcoming season call for an output of 15,000 cars."

Grossman Company Wins Rajah Suit

NEW YORK CITY, June 16—The United States Court of Appeals for the Second District has affirmed the order in favor of the Emil Grossman Co., New York City, in the suit brought against it some time ago by the Rajah Auto Supply Co., Bloomfield, N. J., for selling repair porcelains for spark-plugs. The order issued by the court in the original suit was in favor of the defendant on account of proving that the defendant did not make it a business to sell such porcelains particularly for the complainant's spark-plug. The Rajah company appealed from this order, with a result that the order was affirmed. The original suit claimed an infringement on the part of the Emil Grossman Co. of the complainant's patent number 825,856. The decision follows:

This is an appeal from an order, which the complainant contends is a final decree, denying a motion to punish the defendant for contempt for an alleged violation of an injunction which enjoins the defendant from infringing the claims of complainant's patent No. 825,856 for improvements in spark-plugs. The defendant is not charged with contributory infringement in making and selling porcelain shells which can be used not only in connection with the complainant's spark-plug, but also in connection with many other spark-plugs dealt in extensively by those engaged in furnishing automobile supplies. The defendant asserts that the District Court was correct in denying the motion for the following reasons:

First. The decree appealed from is not final.

Second. There is no pretense of direct infringement and the selling of the conical porcelains with the intent that they be used in the complainant's spark-plugs is not proven.

Third. The evidence of infringing sales, upon which complainant relies, was obtained by letters induced by it which were answered by a typewriter in the defendant's office without the knowledge or consent of defendant.

Fourth. The matter of which the complainant complains is too trivial to justify the drastic remedy which the complainant invokes.

We do not deem it necessary to enter upon an extended discussion of these questions or to decide them. It is enough that the complainant's case is too doubtful, both on the facts and the law, to warrant the court in punishing the defendant for contempt.

The order appealed from is affirmed.

Asbestos Wins on Motobestos

NEW YORK CITY, June 7—The Asbestos and Rubber Works of America announces that after 2 years of litigation with the American Asbestos Co. over the trade marks "Motobestos" and "Motorbestos," the examiner of the patent office has allowed its claim to "Motobestos" as applied to motor car brake band lining and other asbestos-copper wire fabrics.

Managers for Columbus Buggy

COLUMBUS, O., June 16—Thaddeus C. Dunlap, a civil engineer, and George W. Lattimer, a druggist, have been named by the creditors' committee of the Columbus Buggy Co. to have charge of the management of the plant. The creditors' committee recently took over the plant from the receiver, who was discharged. According to the two managers, every effort will be made to save the big manufacturing plant for Columbus. It is the intention of the managers to continue the manufacture of both gasoline and electric cars for the present at least.

Receiver for Hartford Foundry

HARTFORD, CONN., June 16—The Hartford Foundry Co. is in receiver's hands, Edward C. Frisbie having been appointed temporary receiver. The company's trouble is said to have resulted from insufficient capital. The appointment was made on application of the Charter Oak National Bank, which holds notes for $27,000.

Cutting in Receiver's Hands

JACKSON, MICH., June 17—The Cutting Motor Car Co. of this city went into the hands of the receivers on June 2. The Security Trust Co. of Detroit, Mich., has been appointed receiver and the work of reorganization is now under way. It is stated that the receivership is a friendly one and that the reorganization should be in a position to resume business in the course of a few weeks.

Stuart Motor Corp. Retires Bonds

BUFFALO, N. Y., June 14—At a recent special meeting of the stockholders of the Stewart Motor Corporation, makers of delivery trucks, the company decided to redeem the $50,000 outstanding bond issue immediately. The stockholders also voted to convert $75,000 of the $250,000 common stock into 7 per cent cumulative preferred. $50,000 of the preferred stock has already been issued and paid for at par. This clears the corporation of all bonded indebtedness.

Large White Truck Sale

CLEVELAND, O., June 14—A very large motor truck sale was announced recently by the White Co., Cleveland, O., when the firm of Kaufman Bros., a prominent department store of Pittsburgh, Pa., purchased twenty-three White trucks of 1.5 tons and 1,500 pounds capacity.

Automobile Securities Quotations

NO decided recovery from the decline noted last week was apparent during the past 6 days. Rubber stocks still showed a slight falling off although this tendency was not so sharp as the week before, the bigget decline being that of Firestone common which dropped 8 points, making 37 points in 2 weeks.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	110	115	150	..
Ajax-Grieb Rubber Co., pfd	90	100	95	100
Aluminum Castings, pfd	100	..	97	100
American Locomotive Co., com	41½	41¾	28¼	30
American Locomotive Co., pfd	107	108¼	90	102
Chalmers Motor Company, com	..	..	128	135
Chalmers Motor Company, pfd	..	..	98	102
Consolidated Rubber Tire Co., com	15	17	12	18
Consolidated Rubber Tire Co., pfd	55	60	60	75
Firestone Tire & Rubber Co., com	279	281	228	232
Firestone Tire & Rubber Co., pfd	106	108	104	106
Fisk Rubber Company, com	..	..	..	..
Fisk Rubber Company, pfd	..	..	..	100
Garford Company, preferred	99	101	85	95
General Motors Company, com	33	35	26	30
General Motors Company, pfd	75	75½	72	75
B. F. Goodrich Company, com	79½	80½	26½	28½
B. F. Goodrich Company, pfd	108¼	108¾	90	94
Goodyear Tire & Rubber Co., com	..	276	285	295
Goodyear Tire & Rubber Co., pfd	100	102	98	99½
Hayes Manufacturing Company	..	104	..	90
International Motor Co., com	26	29	4	6
International Motor Co., pfd	89	92	10	15
Lozier Motor Company, com	..	..	15	20
Lozier Motor Company, pfd	..	..	..	92
Maxwell Motor Co., com	..	..	3	4
Maxwell Motor Co., 1st pfd	..	..	30	33
Maxwell Motor Co., 2nd pfd	..	..	9	12
Miller Rubber Company	155	160	..	140
Packard Motor Company	104½	106	94	100
Peerless Motor Company, com	..	..	45	50
Peerless Motor Company, pfd	..	..	..	96
Pope Manufacturing Company, com	30	32	10	13
Pope Manufacturing Company, pfd	74	76	40	43
Portage Rubber Co., com	..	..	..	40
Portage Rubber Co., pfd	..	..	..	90
Reo Motor Truck Company	9	10	..	11¼
Reo Motor Car Company	24	24½	..	20¾
Rubber Goods Mfg. Co., pfd	..	..	100	110
Studebaker Company, com	36	38	22	24½
Studebaker Company, pfd	94	96	82	85
Swinehart Tire Company	104	106	84	86
U. S. Rubber Co., com	..	..	56¼	58
U. S. Rubber Co., 1st pfd	..	..	100	102
White Company, preferred	107½	108½	102	104
Willys-Overland Co., com	..	..	53	60
Willys-Overland Co., pfd	..	..	80	90

English Engineers Disperse

Some Return to England while Others Remain To Make Closer Survey of Plants and Methods

One To Go on Indiana-to-Coast Tour and Another Accepts Position with Continental Motor

NEW YORK CITY, June 17—The small part of the members of the British Institution of Automobile Engineers which completed the itinerary as laid down in the official program, arrived here last Saturday. The party began to break up when the boat landed at Detroit after the lake session of the I. A. E. and S. A. E. At this point Messrs. Bennett, Buist and Ker dropped out. The next breaking-up point was at Detroit, where the party separated into three, one-third making the New England trip, a third going to New York and the rest scattering. Those making the New England trip were T. F. Benson, L. A. Bollack, J. B. Dunlop, C. A. Branston, J. B. Ferguson, E. Wooler, R. W. Smith senior and junior, E. C. Paskell, and Mr. and Mrs. E. B. Wood. The Messrs. Smith and Paskell dropped out of the New England party to make the trip to Springfield to see the works of the Hendee Mfg. Co., where Indian motorcycles are made.

One convert has been gained to the ways of America. Mr. E. Wooler has accepted a position in the drafting rooms of the Continental Motor Mfg. Co. and has gone back to Detroit. C. A. Branston is making the Indiana-to-the-Coast tour which starts July 1. T. C. Pullinger has returned to Detroit to make a further study of the plants in that city. J. B. Ferguson, Gilbert Moore, J. B. Dunlop, R. W. Smith and son, Charles Wheeler, B. Wood and wife sailed Saturday for home.

The New England trip embraced the following program:

Arrive Providence via Boston 10:15 a. m., June 11. Breakfast in Boston. The day will be spent in inspecting the works of Brown & Sharpe.

6.35 p. m.—Leave Providence, arriving in Bridgeport at 9.89 p. m. Dinner either in Providence or on the train.

Stratfield Hotel at Bridgeport.

Thursday, June 12

In Bridgeport

Visits to plants of Locomobile Company of America and Spring Perch Company.

Locomobile Company of America host at luncheon.

Motor car drive to New Haven, arriving at 2.80 p. m.

Visit to works of New Haven Carriage Company.

Night at Hotel Taft, New Haven.

Friday, June 13

9 a. m.—Leave New Haven by motor car for Hartford.

Visit to plants of Pratt & Whitney, Pope Manufacturing Company and Hartford Rubber Works.

4 p. m.—Leave by boat for New York.

Indiana S. A. E. Elects Officers

INDIANAPOLIS, IND., June 16—At a meeting of the Indiana branch of the Society of Automobile Engineers held at the Claypool Hotel, Indianapolis, on the evening of June 10, officers were elected as follows: Chairman, R. C. Coombs, Prest-O-Lite Company; secretary, C. P. Grimes, Wheeler & Schebler, and treasurer, John Wood, of the Remy Electric Co., Anderson. George A. Weidley, of the Premier Motor Manufacturing Co., the retiring chairman, was elected vice-chairman.

Calder Heads International Motors

NEW YORK CITY, June 17—An election which has just been announced by the International Motors Co. makes a change in the higher officers of the company. John Calder, former first vice-president, has been elected to the presidency of the concern, and R. E. Fulton becomes the first vice-president. Mr. Fulton was formerly the general sales manager.

Schacht Truck Company Incorporated

CINCINNATI, OHIO, June 16—The G. A. Schacht Motor Car Co. has been incorporated with $25,000 capital by Gustave A. Schacht and Charles Talbott. The company will manufacture motor trucks only. Temporary headquarters have been secured out on Spring Grove avenue, near the Schacht Motor Car Co., of which Gustave Schacht was the former president.

To Raise All Insurance Rates

HARTFORD, CONN., June 16—Insurance premiums for all classes of automobile risks are going to cost more in the very near future. Hartford companies as well as others throughout the country are prepared to raise the price. The contention is that automobile accident insurance is now sold too cheaply and the beneficiary gets too much for what he pays. The rise in price will affect 1914 business.

Walk-Out in Studebaker Plant

DETROIT, MICH., June 17.—More than 3,000 men employed by the Studebaker Corporation, in its local automobile plants struck today. The men said the walkout was the result of repeated demands for weekly pay, instead of bi-monthly. The strikers claim that the employees in the other automobile factories in Detroit will act in sympathy with them. The company states that the strikers merely seized upon its refusal to re-instate a discharged employee as a pretext, several I. W. W. men having been trying to incite a strike in the automobile plants for some time.

Goodyear to Establish Tire Stations

NEW YORK CITY, June 16—C. W. Martin, manager of the motor truck tire department of the Goodyear Tire & Rubber Co.'s New York City branch, states, regarding the company's recent announcement of a chain of motor truck tire service stations to be established throughout the large cities of the country, that the time taken up by tire changes has been found such a handicap by truck owners, whose loss on the investment in an idle truck was heavy, that the Goodyear company adopted the day-and-night service station as the remedy.

Market Changes of the Week

Another break in tin occurred again this week, followed by extreme dullness and caution in the local market. There was scarcely enough trading in the open market to establish prices. Tin was selling at $45.30 per hundred pounds on Wednesday and stearily rose therefrom to $45.85 on Saturday. From then on to Tuesday there was a gradual decrease, closing at $44.66, a loss of $.64. A further sharp decline is expected. Lead was stronger in tone, rising $.05 per hundred pounds. Both Lake and electrolytic coppers declined, the former $.00 1-8 and the latter $.00 1-5. Antimony, beams and channels, Bessemer steel, and open-hearth steel remained constant. Both silks from Italy and Japan rose, the former $.10 and the latter, $.02 1-2. Tire scrap remained steady at $.10 per pound.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.	.07½	.07½	.07½	.07½	.07½	.07½	....
Beams & Channels, 100 lbs.	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	26.50	26.50	26.50	26.50	26.50	26.50	....
Copper, Elec., lb.	.15	.14⅞	.15	.15	.14⅞	.14⅘	— .00⅕
Copper, Lake, lb.	.15⅛	.15⅛	.15⅛	.15⅛	.15⅛	.15	— .00⅛
Cottonseed Oil, lb.	7.22	7.30	7.35	7.40	7.40	7.57	+ .25
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil, Menhaden, Brown	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 gals.	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime	.95	.95	.95	.95	.95	.95	....
Lead, 100 lbs.	4.30	4.30	4.30	4.30	4.30	4.35	+ .05
Linseed Oil	.47	.47	.47	.47	.47	.47	....
Open-Hearth Steel, ton	26.50	26.50	26.50	26.50	26.50	26.50	....
Petroleum, bbl., Kansas crude	.88	.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa., crude	2.50	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	....
Silk, raw Italy	....	4.50	....	....	4.50	4.60	+ .10
Silk, raw Japan	....	3.77½	....	....	3.80	3.80	+ .02½
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb.	45.30	45.75	45.85	45.85	45.45	44.66	— .64
Tire, Scrap	.10	.10	.10	.10	.10	.10	....

Haynes for 1914 Is Out

Line Consists of Four and Six-Cylinder Models, All of Which Are To Be Fitted With Vulcan Electric Gearshift

KOKOMO, IND., June 17—The Haynes Automobile Co., of this city has today announced that it will equip its entire line, consisting of four and six-cylinder models, for 1914, with the Vulcan electric gearshifter, which device the company has tested out on its six-cylinder cars for several months to its utmost satisfaction. This announcement of America's pioneer maker fitting a gear shifter device as stock lends much force to the arguments advanced favorable to some form of gearshift other than the lever. Although the Haynes company has made this equipment stock it will fit the lever shift system if requested, and in which case the gearshifter quadrant will be under the car floor and the lever in the center of the floor board for right-hand operation.

In experiments extending over months the electric gear shifter has given entire satisfaction, the engineering force claiming successive hundreds of operations without a miss. In recent tests it has made over 500 changes in a single day without any difficulty being experienced.

The control of the gearshifter is on a circle above the steering wheel. On this circle are seven buttons for use as follows: Three for forward speeds, one for reverse, one for neutral, one for the electric starter and one for the electric horn. A button takes the place of the gearshift lever.

The Haynes company has had the question of electric gear shift under consideration for some time and was the second motor car concern to sign contracts with the Vulcan people for its equipment. The operation of this gear-shifting arrangement was illustrated and described in THE AUTOMOBILE for April 3, page 778. In this device solenoid coils are employed as the system of control. There is one of these coils for each speed. Two speeds cannot be engaged at once because each speed is governed independently of the others and an interlocking device provides that no two buttons in the control can be down at the same time. Should the second speed button be set and the driver decide that he wants to go into third, he merely presses the third-speed button which returns the second speed one to its normal position. Pressing the neutral button leaves all of the others normal. Specific details concerning the exact method of application will be published later.

The Haynes company will market two 1914 models, a four and a six, both alike in general details of design and using the same cylinder sizes, 4.5 inches bore and 5.5 inches stroke. The cylinders are cast in pairs and have the valves on one side only as introduced on the 1913 six. Ignition is by Simms magneto with one set of plugs. Pressure gasoline feed is introduced, the gasoline tanks being supported on the chassis in the rear. Pressure is maintained by an automatic air pump driven from the camshaft and there is also a hand pump on the dash. Lubrication is by a circulating splash system.

In the motors bearing surface for the crankshaft has been given good attention. On the four-cylinder car, three bearings are used, giving a total bearing length of 11.5 inches. The crankshaft is 2 inches in diameter and the 11.5 inches length is distributed 3.75 in front, 2.5 for the center, and 5.5 at the flywheel. On the six-cylinder model four bearings are used, giving a total bearing length of 14 inches, the dimensions being practically the same as in the four, excepting that an additional center bearing is used.

The chassis details incorporate the standard Haynes contracting type clutch. In the four-cylinder car the McCue axle is used in front and rear, on the six-cylinder, Timkens. An entire new line of bodies has been added, these being die-formed types in which a cowl is used. The cowl curves down and meets the hood which is in reality a continuation of it. A clean-cut appearance is obtained by not using side-dash lamp brackets, rather the dash lights are carried on unions which attach to castings within the cowl. The clean-cut appearance is further accentuated in that there is no visible support for the wind shield on the cowl, but it is, nevertheless, secured to a casting within the cowl. The cowl on all models is alike and is a one-piece, die-formed part.

On the four-cylinder cars open bodies are made with two, four and five-passenger capacity. On the six-cylinder chassis open bodies are made for two, four, five, six and seven-passenger capacity. The six-cylinder chassis is made with two wheelbases, one 130 inches and the other 136 inches. The limousine body is fitted to the latter. On both fours and sixes a line of four-passenger coupé bodies is supplied, these being from the factory of Biddle & Smart.

Externally, all bodies are given a cleaner appearance in that the running boards are entirely free from incumbrances. The battery used for lighting, starting and gear shifting is located under the chassis. It is claimed to have adequate capacity for 1,200 starts and approximately 4,000 to 5,000 gearshifts, the current consumed in gearshifting being very slight. A full electric lamp equipment is used.

Hudson Vice-President Invades Europe

PARIS, FRANCE, June 13—F. O. Bezner, vice-president of the Hudson Motor Car Co., has taken up his residence in this city with the object of directing a business campaign for Hudson interests throughout the Continent of Europe.

Packard Adds Two Truck Models

DETROIT, MICH., June 17—The Packard Motor Car Co. has added two more models to its line of motor trucks, these being of 4 and 6 tons capacity. Heretofore models 2, 3 and 5 tons capacity have represented the company in the commercial car field, and the newcomers will thus broaden the range. The specifications of these two new Packards are along the same lines as the others and show no deviations from the company's truck practice. The motors develop 32.4 and 40 horsepower, respectively, according to the S. A. E. rating. They are T-heads and transfer their power conventionally to jackshafts, the final drive being through side chains.

The wheelbases are 144 inches for the 4-ton and 168 inches for the 6-ton, while a wide range of optional bodies is offered. The prices are set at $3,550 for the lighter of the two and $4,650 for the 6-ton, while in either case an extra long chassis is furnished at $100 extra.

Sanatogen Decision Stirs Manufacturers

NEW YORK CITY, June 14—Manufacturers affected by the Sanatogen decision of the United States Supreme Court have combined in a league to protect the prices of patented articles. No definite action has been taken as yet except the establishment of a permanent organization with Henry B. Joy, of the Packard company at the head of the executive committee. Other automobile men on the committee are A. Erlanger and A. Lucking, both of the Ford company. The remainder of the committee consists of T. F. Murphy, of Mark Cross; E. T. Welch, of Welch Grape Juice Co.; W. K. Kellogg, Kellogg Toasted Cornflakes Co.

New 1,500-Pound Republic Truck

DETROIT, MICH., June 17—The Alma Motor Truck Co., recently organized to take over and continue the truck manufacturing business of the Alma Mfg. Co., of Alma, Mich., recently placed on the market its new 1,500-pound model Republic truck. This company is listing the complete truck with the choice of two standard bodies at $1,425.

DETROIT, MICH., June 17—H. L. Adams has taken over the general managership of the Detroit plant of the Edward G. Budd Mfg. Co., Philadelphia, maker of steel bodies. T. H. Millington has managed this plant up to this time.

Many Americans to Show at Salon

PARIS, FRANCE, June 11.—Paris this year opening the European show season with its salon on Friday, October 17, there will doubtless be a stronger international representation than on previous occasions. Although official applications for space will not be received until next week, there have been several inquiries from American firms and the probabilities are that there will be a big showing of cars from across the Atlantic. The Packard Motor Car Co., which, although having a store in Paris for a number of years, has never been able to secure a position in the show, will put in an application for a central space. The Hudson Motor Car Co. intends to take a big stand. Others to be represented are Ford, Buick, Cadillac and R. C. H. The new Briscoe car, now being produced by Mr. Benjamin Briscoe and a special staff of American and European engineers, will make its first bow to the public at the Paris salon.

The White Co. branch and district managers meet in annual session. Top row, left to right—W. F. Moore, Pittsburgh branch manager; A. R. Warner, secretary the White Co.; W. J. Urquhart, Chicago branch manager; J. A. Bell, retail manager, Chicago branch; E. W. Gans, Atlanta manager. Middle row—J. E. Huggins; Walter C. White, vice-president and sales manager the White Co.; Windsor T. White, president the White Co.; J. Rathbun, New York State district manager. Bottom row—J. A. Howley, Philadelphia branch manager; M. Fellows, Eastern Canada representative; J. S. Hathaway, Boston branch manager; G. A. Urquhart, southwestern district manager; R. H. Johnston, New York branch manager

Entrance to Automobile Show in St. Petersburg

Russia's Great Show

Tsar's Government Favors Rapid Automobile Development and Seeks Type of Vehicles Suited for National Russian Needs

RUSSIA wants automobiles and wants them on a scale commensurate with the extent and resources of Russian territory. The Muscovite empire is the only country where the government is more anxious to have the citizens own automobiles than they are themselves. The transportation problems now arising in connection with the rapid development of agriculture and industry which is taking place in the realm of Tsar Nicholas, are among the most important ones to be solved and must be solved with all possible despatch, and it is the ruling opinion that motor vehicles are to play a decisive part in their solution. The railroads are not numerous, and there is little desire for a railroad development, like that of the United States, which tends to transform all classes of the population into travellers. Russia would rather build highways than gridiron her prairies with steel tracks. It is therefore the intention to give the motor truck something more than a fair field and no favor, so far as the short and the medium length hauls are concerned. The owners of large country estates, in whose domains industrial establishments are also frequently located, take a similar view. They would rather have the railroad station 60 miles away than at their doors, carrying trouble to their little sub-kingdoms. They would like to drive to and from the station in automobiles of their own and at the dizziest clip. The fast automobile suits their average temperament. exactly but so far they have not been able to find cars that would stand the gaff of the by-roads, frozen and rutty as they often are. They are earnestly looking for durable trucks and for fast and robust cars and are willing to improve the roads meanwhile as fast as the economical development justifies. In this search and these intentions their government is with them, being composed of men of the same views and standing in need of the same things for military purposes,

The second international automobile show which was held during the closing weeks of May under the arched glass roofs of the spacious Imperial riding school building in Saint Petersburg was an evidence of the energy with which these desires for promoting automobilism and motordom in Russia are followed up; for no exposition of similar scope and importance has been held in any other non-producing country; and Russia has only two small automobile factories of her own.

This show was opened with pomp and ceremony. The picturesque hierarchy of the Russian church, with processions, ikons, chants and invocations, united with state officials to place upon it the stamp of approval from spiritual as well as temporal authority. The French ambassador improved the occasion to have cemented anew the Franco-Russian alliance. An imbroglio with Germany, whose manufacturers are eager for the promising Russian trade and who view with extreme jealousy all the shrewd efforts of the French at monopolizing it on political grounds, was suavely averted.

In all 65 exhibitors bid for the business. They were distributed, according to nationality, as follows:

Germany	26	Belgium	4
France	17	Russia	2
England	9	Switzerland	2
Italy	6	Sweden	2
United States	6	Austria	1

It is admitted by both German and French exhibitors, in so far as their voices have reached the press, that the number of orders booked at the exhibition left a good deal to be desired. Prospective purchasers were still hesitating. American advance agents, on the other hand, report better luck. The comments of a well-informed French visitor may furnish a clue to the understanding of this discrepancy. He says that vehicles must be furnished with all equipment, that the powers from 12 to 20 are at present most readily sold, that the vehicles must have large ground-clearance and that the body must be made to accord with Russian taste and customs, as the purchasers insist upon having plenty of the home color in their conveyances. Those wishing to establish agencies should remember that Russia has two capitals, Petersburg and Moscow. The latter, while not the seat of government any more, is the home of immense fortunes and of much distributed wealth—the better market of the two cities. The Russian car owner is fortunate, he adds, in not being bothered by speed regulations or exhaust smoke ordinances. He must conform to certain traffic rules, and very strictly at that. The police see to it that he does so, but his ignorance of the rules is no crime. Only if any fault on his part causes an accident it goes hard with him.

Accounts Not Secure

One trouble with the trade in Russia, says a German commentator on the situation, is the insecurity of accounts. The Russian merchant is very remiss about paying them on time or at all. Last winter European importers had sad experience of this nature in southern Russia. The merchants had to carry the farmers over, by reason of crop failures, and in turn simply omitted to meet their own obligations. Local committees comprising the more substantial elements among the merchants have now been formed, however, and in conjunction with banking organizations, expect to remedy this situation. Suitable laws are being passed to the same end. It is characteristic that the total of deposits in Russian banks amounted to 1,800 million rubles at the end of 1911 and had risen to 2,200 million rubles at the end of 1912.

Before the opening of Russia's international show—everything ready

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Europe Demonstrates Trucks

ALMOST immediately after the American truck makers announced in unequivocal terms that they do not want any truck shows in New York or Chicago next winter at the time of the passenger car show, England announces that she is resurrecting her truck show after a 3-year sleep and France has announced its exhaustive trials under the direction of the war office. In Europe, every truck maker is up in arms for shows and demonstrations. At Olympia, in London, all space was sold weeks ago and the exhibition gives promise of being the best truck exposition Europe has ever seen. Across the English Channel the military trials in France are going to be record breakers. Already ninety-six trucks and over a dozen tractors are entered.

To America the question is "Are we on the right track?" From indications it would seem that we are not, rather that we are traveling in the opposite direction.

We have closed the doors on shows. We shut the doors last year on competitive demonstrations. What is the result? Today a few truck makers are working very earnestly to make sales. They find it hard work. They are having the same experience European makers had when they closed the doors on shows and trials. American makers are finding out and will continue to find out that shows and competitive demonstrations are good when sanely conducted.

Leverless Gearshifting

THE announcement made in other pages of this issue on the use of the electric gearshift by the Haynes company, one of America's pioneer manufacturers, together with the fact that one of the other leading companies may adopt it, corroborates what THE AUTOMOBILE stated editorially over a month ago, namely, that leverless gearshifters are bound to come just as soon as they can be rendered commercial from a manufacturing viewpoint. It is now a settled question that two concerns will equip them as stock for next season and it has been known definitely for several weeks that a few other concerns have been submitting blueprints to gearshifter concerns, with the avowed object of making such stock equipment for next season.

The leverless gearshifter is bound to come, it is a natural sequent to the self starter, demountable rims and electric lights as well as lighting devices for gas headlight systems. Of these four the leverless gearshifter occupies perhaps first place from the viewpoint of being a work eliminator. There is a hundred times more gearshifting than there is lighting. There are tens of times more gearshifting than starting, particularly in city driving. There are hundreds of times as much gearshifting as tire changing. Because of the great number of gearshifts the leverless gearshifter will be generally welcomed from coast to coast.

When demountable rims were put on the market, it was then argued that woman would be given an opportunity to drive anywhere. The self starter added immeasurably to her cause; but it is questionable if the gearshifter will not be a greater boon than either of them. Gearshifting has often been a hardship with the woman driver, particularly for city driving.

As previously pointed out in these columns, the leverless gearshifter will do excellent service to the car mechanisms, in that there will be more gearshifting than with the lever system. It is but rational to assume that such will be the case, because the movement has been simplified and practically reduced to the automatic zone. Not a few drivers have not shifted gears sufficiently, partly because they objected to being seen making the shift and often because of the difficulty of it. The leverless system will largely remedy this.

The small-capacity motors that are now being fitted together with heavier bodies demand more gearshifting than in the past. The leverless system, it is hoped, will be a step in the accomplishment of this.

The many arguments that were advanced against self starters because of added weight cannot be brought forward in the leverless starter because little additional weight is needed. The battery for operating the gearshifter is the same as used for the starter and the lighting system, and the leverless system has eliminated a few of the mechanical parts and added lighter ones to take their place.

It is difficult to gauge just what the status of leverless gearshifting will be during the next year. Although the electric type has been most in the spotlight recently, other types are coming to the fore and some interesting developments are promised for the future in electric, pneumatic and other types.

England Has Live Engineer Institution

THE Institution of Automobile Engineers of Great Britain, members of which were the guests of the American Society of Automobile Engineers, is an organization of 783 members made up of engineers in motor car factories, professors in colleges, car owners engineeringly inclined and college graduates interested in motor car work. The institution has headquarters at 13 Queene Anne Gate, the center of the consulting engineering world of London.

The Institution of Automobile Engineers used to be known as the Cycle Engineering Institute, but was changed to its present name in 1907, at which time it was incorporated.

The I. A. E., as it is familiarly known, has four grades of members: These are members, 271; associate members, 251; graduates, 219; and associates, forty-two; a total membership of 783.

The work of the society is under the direction of a council of thirty, but the direction and general management rests with the secretary, which position has been held for several years by Basil H. Joy, who devotes a large part of his time to the work of the institution.

Basil H. Joy, secretary of the I. A. E.

The work of the I. A. E. is accomplished by its monthly meetings, held in London from October to June, at each of which one paper is read and discussed. The majority of the papers are prepared by members, but occasionally outsiders are asked to contribute. These papers are carefully criticized and edited before being printed and circulated through the membership prior to the meetings. The average attendance at these monthly meetings is between 175 and 200 and all sessions are very animated.

Although the distances in Great Britain are vastly less than in America, the I. A. E. has found it necessary to organize branches throughout the country for the convenience of those who cannot get to London for the monthly meetings. The North of England branch, which meets at Manchester, covers a zone of country extending north and east of that city. There is being organized at present the Midlands branch, which will hold meetings alternately at Birmingham and Coventry. In addition, the members in Scotland are at present urging the formation of a Scottish branch, with headquarters in Glasgow.

The class of membership designated Graduates has three branches of its division located in London, Coventry and Birmingham. Meetings are held in these centers once a month and the branches have their own chairmen and honorary secretaries. An example of the work done by these graduates was the recent preparation of a series of eight papers by the London graduates dealing consecutively with the steps necessary in the output of 750 chassis, of a 15-horsepower car to be sold at $1,750. One paper dealt with design, the second with purchasing materials, the third with the drawing office, and the others with various aspects of the production of such a vehicle. The series proved of immense interest and led to the graduates securing a vast amount of information on production and design which is not found in text-books.

Another recent work of interest by the graduates was on the training of engineers. The scope of the paper covered the various practical aspects of the question. How should the courses in technical and shop training be arranged? Which should come first? What studies should be included? Should a student be educated in a motor car shop or in a general engineering plant? Various other questions relative to training were taken up and discussed at more or less length.

During the last few years the I. A. E. has given much attention to the training question and has established a bureau of information for the guidance of parents who wish to have their boys take an automobile engineering course. This bureau has compiled the arrangements from the various factories as to their requirements for under-engineers and also the possibilities for graduates in their plants.

While the major efforts of the American Society of Automobile Engineers have been devoted to the work of standardizing car parts and processes of manufacture, the I. A. E. has not been nearly so active. In fact, it only took this work up actively a year ago. Although the recognized motor engineering institution in England, the work of standardizing motor car parts does not come under the I. A. E., but it is working indirectly to accomplish the same results as the S. A. E. is accomplishing in this country.

In Great Britain the entire work of standardization rests with the Engineers' Standards Committee, a private institution subsidized by the British government and which handles the question of standardizing for the entire nation. It has determined the standard sizes of railroad rail sections, and has gone into the standardization work of all the industries in the land. The committee has been in existence for years. It is divided into sections representing the various industries, one of which is the motor car section appointed last year. The various motor organizations of Great Britain are represented on this section, some of these organizations being the I. A. E., the Royal Automobile Club, the Automobile Association and Motor Union, the Society of Motor Manufacturers and Traders, etc. This section has already met and roughly determined on what parts of the motor car can be standardized. The section then subdivided itself into as many departments as there are car features to be standardized. These sub-committees are collecting data on standard practices of today, so that they can organize these data into a definite report to the Engineers' Standards Committee. The work is progressing much as in America and practically along the same lines, excepting in that the final word on what shall be standardized does not rest with any one automobile organization, but with the main committee of the nation. The 1913 visit to America was the second one of the I. A. E.

Motor Trucks in Cincinnati Strike

CINCINNATI recently experienced one of the most complete street car strikes in the history of the country. Not a car wheel turned for days. Then when efforts were made to revive the service with cars manned with strike-breaker crews the sympathizing public refused to ride on the cars. Yet they did not walk. The solution for the thousands who were thus deprived of street car service was the motor truck. Every motor truck in the city worked either all or part of every day as a street car. Motor truck coal wagons, motor truck beer wagons and motor trucks used for any kind of hauling at once became passenger cars, and some of them were earning for their owners as high as $175 a day hauling suburbanites to and from their homes at from 15 to 25 cents a passenger, according to the distance they wished to travel. If it had not been for these swift, modern motor trucks the problem of how to get to and from home, with thousands of people living in suburbs from 5 to 10 miles from their places of employment, would have been a serious one, for not all Cincinnatians own automobiles. Yet it is estimated that the automobile took care of one-fourth of the people who used the street cars before the strike. Motor truck service sprang up 2 hours after the street cars suspended operation. At first only two trucks appeared for duty. The idea of hauling passengers spread like wild fire among motor truck owners, and business firms suddenly realized that a new and highly profitable business was suddenly thrust upon them. The public was quick to appreciate this as can be seen from the illustrations.

New York City's Big Civic Parade

THE Civic Parade held in New York City on May 17 brought out a large percentage of the city's motor vehicles used by the various departments. A majority of the municipal vehicles are propelled by gasoline, while a few are of the electric type. Eighteen different departments were represented by 557 vehicles, a majority of these being self-driven. The total number of fire department vehicles used by the city is 895. About 16 2/3 per cent. are motor-driven, and the rest are horse-drawn. These motor-driven vehicles are divided into fire engines, hose wagons, hose wagon-combination, chemical engine wagons, trucks, supply wagons, ladder wagons, chief's wagons and the water towers. The hospital equipment includes fifty-five vehicles, sixteen of which are electric and the rest gasoline. Much of this equipment is from the factories of the automobile industry where standard chassis are fitted with bodies suitable to the requirements. The police department is represented by eight self-propelled vehicles, one being motor-driven and the rest of the electric type. These are divided into patrol wagons and passenger cars. The lighting and power department uses four trucks, two of them for the men who trim the lamps and the rest in the transportation of supplies. There are five different makes of trucks in service for the waterworks division. These are used in repair work and the transportation of supplies. The sewerage and sanitation equipment consists of two trucks for the transportation of supplies. A few of the departments pay off the employees in automobiles The government finance division has two wagons in this capacity.

The Engineering Digest

The Making of a Double-Closing Poppet Valve by Near-Automatic Methods—Nervous Motors on Verge of Knocking; Quick Cleaning Saves Them

Cheap Synthetic Acetone Craves Attention of Oil Refiners for Benefit of Motoring Public—Proposed Improvement of Oxy-Acetylene Burners

HOW the Adler Silent Valve Is Made.—Though the clattering noise arising from the opening and closing of ordinary poppet valves plays only a small part in the general mechanical scheme for silencing the operation of a car—now that the camshaft and the valve are both usually inclosed and the sounds they make therefore muffled—suitable methods for having the valves open and close gently and without making any sound that needs to be muffled are considered of some importance in the matter of avoiding wear, vibration, hammering of the conical valve and valve seat surfaces and disintegration of the valve stem at the weld. The poppet valve design which has been most frequently mentioned as notable in this respect is the one originated at the Adler works at Frankfurt-am-Main. The production methods applied in the making of this valve are now also referred to as an example of advanced German mass-production practice, and the subject thus gains a double interest. The different stages in the manufacture are fully represented in the accompanying illustrations, Figs. 1 to 11. With regard to the principle of the design it may be said that the closure effected by the seating of the mushroom is supplemented by a cylindrical fit of that part which forms the special feature of the valve, and four guide ribs are employed to steer this short cylindrical portion, *h* in Fig. 1, safely into the valve bore in the cylinder wall. The preliminary closing by means of *h* admits of reducing the speed of the subsequent valve motion considerably by means of a very gradual drop-curve of the cam, while the first part of the motion can be as rapid as desired. The rising-curve of the cam can also be made gradual, for the same reason.

Fig. 2 shows the blank for the valve proper. It is cut from bar steel on a slicing-lathe. This blank is dropforged, obtaining the shape shown to the left in Fig. 3, and, after removal of the burr, a piece of half-inch round rod is welded to it, the end of the latter being first slightly upset. as shown in Fig. 3, and the welded piece is then turned down, Fig. 4. The roughing is now done on a lathe with a toolholder holding four tools, one for rough-turning the valve stem *a*, a tool shaped as shown in connection with Fig. 5 for forming the tore *b*, another shaped tool for the outer surface *c*, while a side-cutting edge is used for *d*. A vertical milling machine is used for generating the guide ribs. Fig. 6 indicates the method followed. The valve stem is held in horizontal position between the jaws of a vise secured to the table of the milling machine, and to this table there is also secured a template *Sch* which is moved along a guide rod S. By this arrangement the end mill F which works at a constant distance from the guide rod S, mills the guide ribs out of the material and brings them to the shape shown in Fig. 7.

In Fig. 8 the piece is shown turned down on a screw-cutting lathe so as to be ready for grinding. In order to avoid the forming of a fin at the grinding of the stem, the portion of the latter immediately under the mushroom has been designed 0.2 millimeter smaller in diameter than the final measure of the rest of the stem, which is 9 millimeters. Fixed maximum-and-minimum calipers serve for controlling the exact diametrical dimensions, while the lengths are justified by angle rest fences on the lathe bed.

In order to be able to grind the valve cone, a slot is formed in the valve body as indicated in Fig. 9, the tool used being a circular saw chucked in a horizontal milling machine. The slot in the valve stem is formed in a groove-milling machine, the stem being held in a vise as in Fig. 6. Before the grinding, the valve cone receives its final turning down on a lathe in which the stem is mounted in a self-centering chuck, as in Fig. 10. Thereafter the stem is ground to exact measure, the cone portion being mounted in an exactly fitting sleeve which is secured to the face plate and in the bottom of which there is a projecting rib, corresponding in shape to the slot in the cone valve top and acting as driver and, by a similar arrangement on the face plate of a lathe, the valve stem is finished to exact length, the result of these final processes being shown in Fig. 11.—From *Werkstattatechnik*, May 1.

ANALYSIS of Knocking; Its Cause and the Remedy.—The conservatism of American manufacturers in accepting the modern "nervous" type of motor with long stroke and high compression, and placing it in the hands of the motoring public, only with such deliberate slowness that its peculiarities, relating to operation and maintenance as well as to details of construction, may be mastered gradually, frequently receives indirect commendation in the reports of troubles experienced in those foreign countries, especially France, where the transition from the comfortable low-compression motor of relatively low speed, small valves, rapidly declining volumetric efficiency and indifferent fuel economy to the more modern type has been carried into practice with radical and ruthless consistency by a number of firms whose reputations were still to be made—as compared with those of the few *grandes marques*—and who were satisfied to pin their faith to the undeniable theoretical superiority, in the way of power and fuel saving, which the new type has been shown to possess, and even to possess permanently without any serious accompanying drawbacks, provided the design and construction are just right and care and maintenance are bestowed upon it in some proportion to the more delicate adjustment of the working factors in the motor mechanism.

An analysis of the causes of knocking in modern motors presented by Henri Petit bears on this subject in a popular manner. He writes in substance as follows:

The motors with high compression which are fitted to modern vehicles are subject to a malady of which knocking is one of the symptoms. All drivers know what the knocking of a motor is: That dull sound which the ear perceives when the motor is slowed up by its load and when the spark is too much advanced. It sounds like the blow of a hammer on some soft metal, as lead.

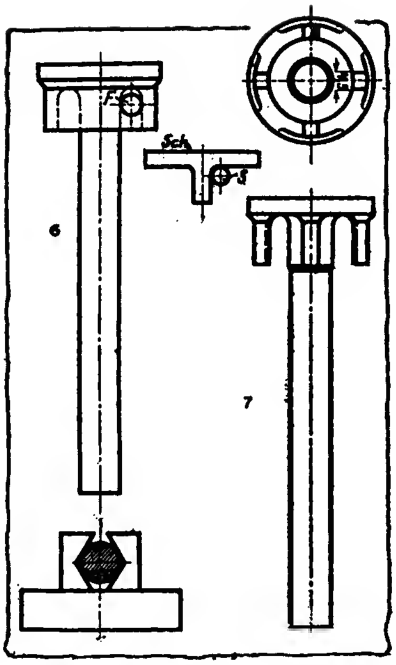
The cause of knocking can nearly always be traced to an abnormal pressure in the combustion chamber at the moment of the explosion and in other cases to abnormal play in the joints of the connecting-rods. Some readers may wonder at the use of the word abnormal with regard to the play. There should, then, normally be some play in these joints, they may say, and yet it has been said and repeated so often that there should be no play at all in the joints of a motor. The fact is this injunction, as may readily be shown, is inaccurate. The movement of two rubbing surfaces is impossible unless there is some play between these surfaces. Imagine, for example, that a solid cylinder A and a hollow cylinder B are made as nearly as possible of the same diameter; say, that the difference in the diameters does not exceed a one-thousandth part of one millimeter. Now, if one tries to insert cylinder A in cylinder B, this operation is found to be radically impossible. If we reduce the diameter of cylinder A until the insertion becomes possible and then measure this new diameter, we find that it is at least 3 to 4 hundredths of a millimeter smaller than it was before. While our senses may not be able to perceive it, there is, then, always play between two perfectly fitted cylinders.

But now, if we coat these two perfectly fitted cylinders with oil, separately, it is again found impossible to insert one in the other. To accomplish the insertion it is necessary to reduce the diameter of the solid cylinder again, this time 6 to 8 hundredths of a millimeter. And if we wish that cylinder A shall be able to revolve readily in cylinder B, lubricated with oil, the play must be still larger.

It is thus clear that the mere fact that the crankshaft can be turned around in the lubricated bearings of an absolutely new motor which never has been worked affords positive proof for the assertion that there is play in all of its joints, but despite of this play one cannot shake the crankshaft in its bushings; by pulling on the connecting-rod, for example. The oil film acts as a veritable cushion and cannot be displaced except by a very violent and prolonged effort. The shock which the rapid combustion of the explosive mixture produces against the top of the piston is not sufficient to shake the joints if the initial play has been suitably calculated and if the lubricant possesses great viscosity.

But if, for one cause or another, the intensity of this shock is increased and if the lubricant becomes too fluid. as will happen when the motor becomes hot, the connecting-rod will be displaced with relation to the shaft, the oil film will be pushed out of joint and the metal of the bearing will be brought in contact, with that of the shaft with a blow. Hence the knocking.

The effects of knocking are decidedly destructive. In the first place, the metals brought in contact are, for the moment, no longer lubricated and turn dry for a certain fraction of a revolution. There is sure to be heat generated, and seizing is possible. Besides, each blow produces a flattening of the relatively soft metal of the bushings, which are thereby ovalized. Play produces play, as it is customary to say. A motor which knocks is therefore doomed to rapid deterioration.

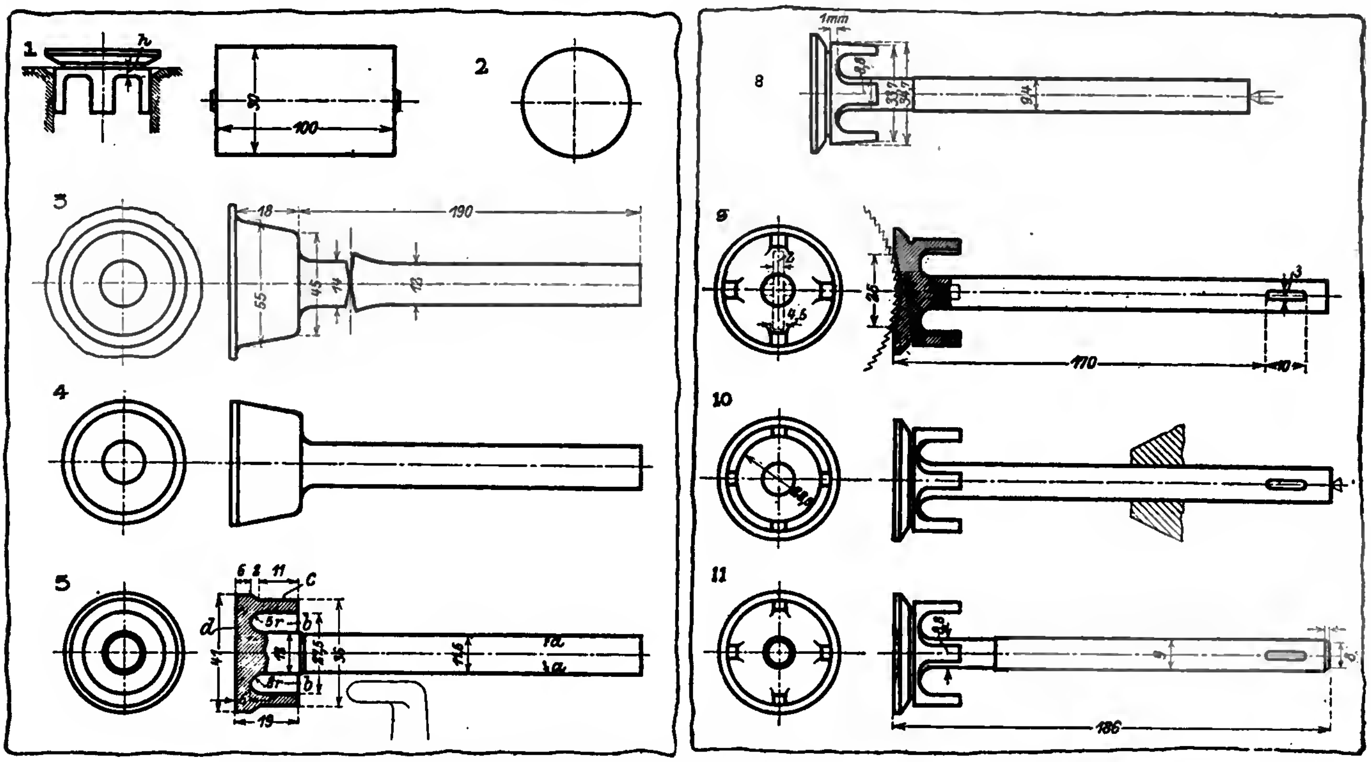


Figs. 6 and 7—An interesting stage in manufacture of Adler valve

It is often ascertained that a motor which does not knock when it is cold, does so when it is hot. In the first place, the pressures in the combustion chambers are usually higher when the motor is hot, but the principal reason is that many lubricating oils lose their vicosity at high temperatures. The film of oil then becomes incapable of resisting the shocks. Lubricants of poor quality are therefore a primary cause of knocking. The oil to be preferred is not the one which is thickest when cold but one which remain viscous when heated. From this point of view castor oil gives remarkable results. [Making it the favorite lubricant for aviation and racing motors, with regard to which it does not matter that the use of this oil necessitates the cleaning of the motor at frequent intervals.—Ed.]

When the play reaches several tenths of a millimeter probably not even the most consistent oil can prevent knocking, and the bearings should be worked over.

It is often found, however, that a motor knocks without any



Figs. 1-5 and 8-11—Type of double-closing poppet valve and progressive stages in the making of it appreciable play in the joints being traceable. The cause of the evil is then to be sought in the exaggerated pressures arising at the moment of an explosion; and this is by far the most prolific cause of the trouble. The lubricating oil, whatever its quality, always rises somewhat above the tops of the pistons and burns together with the fuel gases. If it burned completely there would be no trouble; on the contrary. But unfortunately the oil is decomposed before it burns, and this causes a fatty and carbonaceous coating to be deposited on the colder walls of the cylinders. The volume of the combustion chambers is reduced by this action. The compression ratio is increased. As the pressure created by an explosion is so much more powerful as the preceding compression has been higher, it can evidently reach a figure for which no provision has been made in the design of the connecting-rod bearings and becomes then in itself a sufficient cause by which knocking may be explained.

A motor of 80 bore and 150 stroke, in which the compression is normally 4.5 kilograms (per square centimeter), may be taken as an example. As the volume of one of the cylinders is about .750 liter, the volume of a compression chamber is found (according to the formula expressing the Mariotte law of inverse proportionality of volumes and pressure) from the equation

$$v = \frac{V}{p-1} = \frac{0.750}{3.5} = 0.210$$

to equal .210 liter. And the surface of the walls of such a compression chamber, including the top of the piston, measures at least 200 square centimeters [assuming the most favorable, semispherical shape of the chamber]. If it is now supposed that a layer of carbonaceous precipitate 1 millimeter in thickness has been deposited—which is not exaggerated but often realized in practice—the volume of the deposit aggregates 20 cubic centimeters, and the compression is raised, in accordance with the equation:

$$p = \frac{V+v}{v} = \frac{0.750+0.190}{0.190} = 5$$

to 5 kilograms.

This increase is more than sufficient for making a motor knock which has already run for some ten thousand kilometers, even if its shaft and connecting-rod bearings still appear to be properly adjusted.

The fouling has, besides, too often also another effect. The carbon particles, which are poor conductors of heat, remain incandescent after the explosion, notably in the vicinity of the exhaust valve. They may still be glowing when the piston compresses a fresh charge and may ignite this charge prematurely, thereby causing an energetic knock.

It is perceived from this survey of the factors involved that the gradual fouling of the motor should be attentively watched and, at the first sign of knocking, the trouble should be attributed to this cause rather than to loose bearings. It is easy to ascertain the condition of the compression chamber, if one is in doubt. It is sufficient to unscrew a valve plug and scratch off the black layer which covers the inside. Its thickness is an indication, but it should be remembered that the surface thus brought to light is one of the cleanest in the cylinder head, as it is swept by strong gas currents which counteract the formation of deposits. A much thicker layer will in each case be found on the top of the piston and the bottom of the combustion chamber. The motors with high compression now in use in which heavy fuels can be burned, thanks to their perfected carbureters, need cleaning for every 6,000 or 8,000 kilometers of travel. Formerly the process of cleaning was a serious affair at which one might well hesitate. Time was lost, the cost was high, and the fear that the motor might be remounted defectively was too often justified and made one postpone the operation as long as possible, but now, since it has become established practice to clean by means of oxygen—burning out the deposits—these fears and postponements are no longer in order. In a single hour the motor can be restored to its pristine perfection.—From *La Vie Automobile,* May 31.

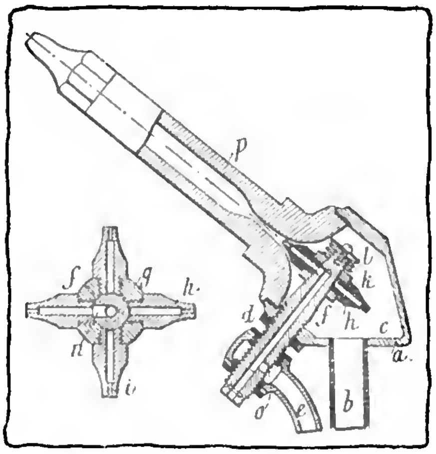


Fig. 12—Burner with variable oxygen feed, for autogenous welding

SUBSTITUTE for Acetone.—The importance of acetone for the automobile industry depends at present mainly upon two of its established properties. In the first place, acetone absorbs acetylene gas in very large quantities, holding the gas in a small volume as if it were strongly compressed and yet yields it up at a very low pressure suitable for the feeding of acetylene lamps and, for that matter, for acetylene motors, if any such were perfected. Secondly, acetone is a solvent for some of the components of lubricating oil, and it has been shown at the Prussian *Materialprüfungsamt* (Bureau for the Testing of Materials) that, when those components are removed from lubricating oil which are soluble in acetone, the remainder is refined and improved to such an extent that the exhaust gases of a motor in which it is used no longer emit nauseous odors.

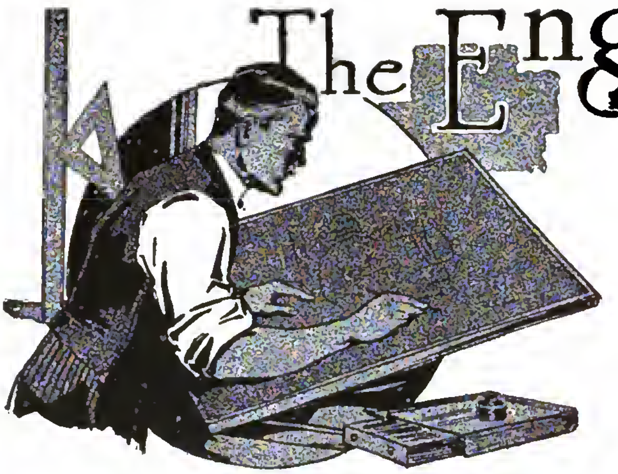
Only the cost of acetone has militated against the more extensive use of it for the refinement of oils and other purposes. Among the latter may be mentioned its application as a solvent for acetyl-cellulose in the manufacture of incombustible substitutes for celluloid, for which a market is also being created in the motor industries.

The announcement that a substitute for acetone has now been found which is offered for as low as 21 cents per kilogram, or about one-half of the price of true acetone, is therefore of considerable prospective interest. It is turned out at the Buckau chemical works at Magdeburg, Germany, and from the detailed description of its properties given in *La Technique Moderne* of June 1 it appears to possess all the qualities which eventually should make it valuable for the automobile purposes referred to.

OXY-ACETYLENE Burner with Variable Oxygen Feed.—It is in some cases useful to be able to modify the proportion of oxygen which is mixed with the acetylene gas in the oxy-acetylene burners used for the quick cutting of metals and for autogenous welding, as usually the modification is effected by means of a petcock placed in the oxygen conduit for this purpose. But this method has the fault of reducing the pressure required at the entrance to the mixing-chamber and therefore also the velocity of the jet which comes out of it. Fig. 12 represents a burner of new design in which this inconvenience is avoided by means of a multiple oxygen jet. The acetylene reaches the mixing chamber *c* of the burner *a* by way of conduit *b*, while the oxygen arrives through tube *e* which ends in a hollow piece *d* from which the cone *f* branches into the mixing-chamber. Upon this cone there is mounted the multiple jet composing a ring *g* (shown separately) in which are inserted the laterally flattened individual jets *h*. This multiple feed device is adjusted upon the cone *f* in such manner that the hole *n* in the latter registers with that one of the jets *h* which should communicate with the nozzle *p* of the burner whose walls it touches: it is held in place by the washer *l* and a spring *k*.

The form of the jets *h* is such that they adjust themselves in the axis of the nozzle *p* automatically, and their flattened form leaves between them and the wall of the nozzle two orifices for the acetylene. As the jets differ in diameter the apparatus admits of modifying the composition of the gas mixture.—From *Maschinenkonstructeur,* April 3.

The Engineers' Forum



Defects in Springs

Never Finds Springs Too Long—Is an Auxiliary Shock-Preventer Necessary?

Downing Thinks Springs Need More Attention
La Porte Believes in Use of Shock Absorbers
Is Problem for Each Car Says Streit

BOTH engineers and readers are taking unusual interest in the discussion arising over the points brought out in the paper by Mr. G. H. Baillee entitled Defects in Springs, which appeared in THE AUTOMOBILE for May 29. Several communications have already been received, three of which follow:

Make All Springs Much Longer—E. Downing.

SAN FRANCISCO, CAL.—Editor THE AUTOMOBILE:—We agree with Mr. Baillee's article in THE AUTOMOBILE for May 29 in which he states that springs have apparently received less attention than any other part of the automobile.

We do a great deal of spring repairing, are said to have the most complete plant for the receiving of machines with broken springs and repairing of them.

As the cars come directly to our factory we have had the best of means to make a study of springs and their weakness in almost every make of car and to apply the same in the manufacture of our guaranteed spring. We find springs too light, too heavy, too short, **but never too long.**

With the carrying of the tires on the rear end of the cars another disturbing element has come into spring construction and from the amount of reconstruction we have done here on the springs of new cars the manufacturers have no doubt had the matter called to their attention long before this.—E. DOWNING, President, Hoover Spring Co.

Shock Preventer Is Necessary—LaPorte.

NEW YORK CITY—Editor THE AUTOMOBILE:—Referring to the article entitled Defects in Springs, published in THE AUTOMOBILE for May 29, we believe the author has discussed a subject which is demanding attention of all motorists as well as automobile manufacturers. As pointed out, the suspension system of the automobile has practically remained the same and has not kept pace with the improvements to other parts, so that with increased speeds, efficiency, endurance, power, we still get the bumps, shocks, and general racking caused by the inherent defects of spring suspension. However, it is not due to lack of attention to these parts that there have been no improvements, but to the fact that it is impossible to control the action of the springs without some auxiliary device.

It is evident that springs designed to permit easy riding over smooth pavements will jounce considerably over rougher roads and springs designed for cross-country roads will be entirely too stiff for smooth roads. It is also impossible to design springs that will be as flexible with one or two passengers as with five or seven people. In other words the difficulty in the problem of spring suspension was this: Stiff springs are not flexible enough to absorb comparatively small shocks. They cause considerable vibration of the car when a light load is carried, as their period of oscillation is short, which means that when compressed and released they vibrate rapidly and return to their normal position so quickly as to cause discomfort to the occupants of the car. Very limber springs, on the other hand, to go to the other extreme: When car is loaded or traveling over comparatively rough roads, they allow the body to bounce up and down, as they have a very slow rate of oscillation, also they permit the wheel to jump, thus inducing tire wear, and general chassis depreciation owing to the motor speeding up when the wheels leave the ground. Hence, the necessity of an auxiliary device or shock preventer to control the action of the springs.

So-called shock-absorbers and preventers that depend upon friction for resistance must by virtue of the principle upon which they operate give the same action regardless of road conditions, as they simply stiffen the springs. As pointed out in the article referred to, these devices soon lose their adjustment and are positively of no benefit, but act as a dead weight, therefore our shock preventer has been designed on an entirely different principle. It consists of a series of inclined planes and expanding and contracting disks of firm but resilient rubber which work on the wedge principle. It is not friction but graduated compression of rubber by thoroughly lubricated inclined planes. These planes ride up on each other according to road conditions. Instead of flying back to its normal position the resistance controls the action of the spring, bringing it back to its normal position gradually and preventing the usual jolt and excessive vibration.—CHARLES LA PORTE, Engineer, The Aristos Co.

Commercial Side Rules at Present—Streit.

SEATTLE, WASH.—Editor THE AUTOMOBILE:—Mr. Baillee's remarks sound very well but I fail to see very much in the subject, as he has treated it. It is admitted by all, that automobile manufacturers have not given the attention to the spring suspension which is necessary to a perfect car, but I question whether this matter can be determined on the lines mentioned by Mr. Baillee. It is an admitted fact that none but the high-grade, double-heat-treated spring is suitable for automobile service but this is a matter which must be worked out by the purchasing agent, engineers and spring manufacturers. The hardest proposition, is to induce the purchasing agent to pay the price that will justify the spring maker furnishing a thoroughly dependable spring. If this obstacle can be overcome the road is an easy one, as between the engineer and the spring manufacturer there is no trouble in arriving at a proper grading to carry the passenger comfortably and when this has been determined the tires have secured all of the relief that the spring constructor can afford them. In other words when you have made a spring that will carry the passenger as comfortably as he is entitled to be carried, your springs cannot be made to afford any additional relief to the tires. The spring suspension is a matter which cannot be worked out as applied to automobiles in general, but must be determined for each particular make and model as no two machines that we know of are precisely alike in their weights.—W. E. STREIT.

Sales Department Influences Car Design

From the Paper Read Before the S.A.E. and I.A.E. Visitors by F. E. Moscovics

F. E. MOSKOVICS' offering to the society of a timely paper on the relations between the sales and engineering departments of the motor car factory was productive of a large amount of interesting discussion among the members. The further unity of these departments and better co-operation was advocated. Excerpts from the paper follow:

A few years ago the design of motor cars was practically dictated by the sales department, the engineering department being merely a way station to put the views of the sales department into such technical form as would enable the factory to manufacture a car therefrom. This was due chiefly to the embryonic condition of the industry and also to the fact that substantially all the real executives and heads of factories were themselves salesmen, as well as to the fact that there was no intelligent public demand. The motor car was new; the man in the street did not know what he wanted; horsepower varied from 4 to 120; gearboxes from belt to direct drive. Technical knowledge was as yet unmated with experience—so, naturally, the views and influence of the sales department was dominant and supreme.

Then, a few cars appeared, which due to their great mechanical advances, made a profound impression on the public. The design of these cars was actuated solely and purely by experience; the result was Renault, with light weight and shaft drive; Mercedes, with selective transmission, mechanical valves, cellular radiator, etc. Coincident with the arrival of these cars appeared the awakening of public demand, and, whereas the early engineer taught the public what it ought to have, today the public is surely telling the engineer and manufacturer what it wishes to have, in no silent voice.

About this time the influence of the sales department in the matter of design began to wane a little, in a large degree from the fact that any car on four wheels would sell. It was not so much a matter of which car was best, as what car could be delivered. Now, if we can assume that the day has passed when a customer considers himself fortunate if he can obtain an early delivery; if we take for granted the absolute necessity for stronger-basic work (sound financing, good engineering, efficient production and economic and effective selling); if we can thoroughly grasp the why and wherefore of inter-department economies, and the need of inter-departmental coöperation, and, with these things in mind, grant the advantages that may be attained, we can approach the subject of this paper from a more intelligent angle.

Purpose of Paper

It is not the purpose to attempt to lay down rules or theories of salesmanship except insofar as they affect the relations of the sales department with the engineering department, and the influence that the sales department may bring to bear on the engineering department. In considering the subject certain definite conclusions must be assumed: What is the object of the organization as a whole? Is it to make the greatest mechanical success, regardless of financial results, or to make the greatest financial success—to pay big dividends? Taking the latter as the most logical and sought-for result, obviously, that relationship of the two departments which will tend to create the greatest efficiency of each and of both as a unit is the desirable and ideal. Obviously, again, the greatest car in the world, from a mechanical standpoint, could not be marketed without a sales organization or sales channel of some sort to present it to the prospective buyer nor could the greatest selling organization under Heaven make a permanent selling success of a thoroughly poor and badly engineered car. Accepting this conclusion, then, let us approach the subject from the viewpoint that each department is dependent for sustenance and success on the other, and that each is quite useless without the other, and that the ideal condition is obtained by taking the best ideas of each and molding them to the greatest mutual advantage. If the sales department were fitted and trained to authoritatively inform the engineering department what the trend of the public demand evinced; if the engineering department were, by virtue of its confidence in the views of the sales department, in the receptive frame of mind essential to the acceptance of these views; and if the blended opinion of these two departments fitted in with the production standard that their particular organization was best fitted to handle, would not this nearly approach the ideal?

Co-operation

In many organizations the sales department wears a halo unwarranted by facts, and bad in principle. This is due to many causes, the main one being that it actually brings in the dollars; it is apparently the department that creates the much-sought dividends. Besides it is the department that comes into contact and mixes with the outside world to the greatest extent. It is, or should be, better fitted to tell of its own importance and greatness than any other arm of the business; its business is the art of selling, and it can, or should be able to, sell itself as well as it praises and sells the product at its disposal. In other words, the sales department is the mouthpiece of the organization, the real point of contact between that final judge, the ultimate consumer, and the factory. Naturally, this condition ofttimes becomes galling, especially to one so little given to the study of environment as the average motor car engineer. The result is lack of regard for the ideas, views and opinions of one department for the other. Of course, no lasting benefit can come from such a relationship. Each department has its functions; each is all-important to the success of the other. Healthy and deep respect for each other's views in everything that pertains to the welfare of the organization as a whole is requisite to permanent success.

In the past the average sales department has had little real knowledge of the art of motor car building; what it gleaned was of a purely superficial and perfunctory character, usually limited to a parrot-like repetition of a few technical platitudes called for want of a better name "talking points." No systematic attempt was made to thoroughly ground the salesman in the rudiments of the profession, nor did he, for lack of initiative and time, obtain the information on his own account. How few salesmen of even today have a real general knowledge of the basic facts of the business. They have been, and to some extent are still chosen for their appearance, glibness of tongue, and

F. E. Moscovics, who presented the important paper on the influence of the sales department on car design personality, rather than with due regard to the adaptability to learn, digest and transmit knowledge in a clean-cut manner.

The day is, however, rapidly approaching, if indeed it is not already upon us, when motor cars must be sold and not bought. The buying public become car-wise and knowing what it wants has little respect for or patience with the man who cannot explain in a clear, concise and logical manner the different points of a car that may come up for discussion. The man buying his second or third car has well-defined ideas of his own, and cannot be talked into an unwise investment, nor influenced by mere talking points. The points must be real points, and be well presented. The public craves information in a rational form. The time has passed when anything less will do. This is a day of facts, not fancies. The merely magnetic talker has seen his day.

As illustrating the kind of salesman who cannot succeed today, the following story of a few years ago will perhaps suffice: Jones, the star salesman of a prominent foreign car, was asked by a prospective buyer what form of ignition was used on his car. "Low-tension make-and-break," he responded. "What is the difference between low-tension make-and-break and high tension?" the customer inquired. Jones was momentarily nonplussed (here was a point that his motoring education had not covered), but only for an instant. "Are you an electrical engineer?" he asked. "No, I can't say that I am," Mr. Buyer replied. "Then, really it would be quite useless for me to attempt to explain it to you," said Jones. When Jones told me the story to show how clever he was, I asked him what he would have said if the prospect had said that he *was* an electrical engineer. "Why," said Jones, "I would have told him, 'Then you ought to know more about it than I do.'"

Salesman Must Know

The day of Jones is coming to an end. Naturally, an engineer, who has been brought up on facts, whose entire make-up should be to take nothing for granted, who wants reason (even to an unreasonable degree) for each change of design or model, whose education and training from the university to the factory has been to accept only laws—not fallacies—is not readily impressed by the desire or opinions of sales departments of the type indicated. He feels immediately, and often correctly, that demands born of such scant knowledge are mere shams to cover up its own weakness and an attempt to shunt to his shoulders a responsibility which his own commercial instincts have not, except in a few rare instances, been developed to bear. If, however, backed up by the chief executive he carries his views and ideas, to the exclusion of the other department, he assumes an enormous responsibility, and only discord can result. If, to support his position, he cites his own experience and quotes from the statements of the few users of his product with whom he has come in personal contact, he is treading on very thin ice, indeed. Right here is the pitfall that lures many engineers. They accept too blindly the result of a few experiments or the words of a few persons. What is needed to intelligently guide them is enormous road experience and a knowledge of the demands of hundreds of people. In other words, the average engineer is too provincial and self-satisfied with his work to be in a position to judge what is the desirable and correct design of the future. Is it then any wonder that we see so many cars whose appearance is far below standard?

The blame for this condition should, however, not be charged to the engineer so much as to the executive, who usually loads the engineer down with a mass of work not rightfully within his province. How many engineers are doing the work of chief inspectors, assisting in the purchasing, service and production departments? Few factories provide the engineering department with adequate help of caliber capable of handling properly the detail which the chief engineer feels must be watched by his department, the result, of course, being that the head of the engineering department, while thoroughly familiar with his own product and knowing in a general way the trend of the industry, simply has not the time to follow those niceties and refinements of design and beauty of detail in small things, which the foreign engineer is teaching us, and which are molding public opinion so strongly.

A Proposed Solution

Could the engineer have at his disposal the concrete views of a trained body of men; could these views be presented to him in time to reasonably allow him to get up new designs; could he be placed automatically in closer contact with the user of his car, is it not evident at a glance that enormous benefits and economies would result? It is clear that the economies so necessary to success in the industry today will not allow an organization to have a specially trained corps of men for this work. Where then should the engineering department get its closer contact with the public? Analysis points plainly to the fact that it is through the sales department. Moreover, the bringing of these departments into closer working relation should serve to raise the sales department to a higher standard of knowledge of its own products as well as of those of its competitors, thus enabling it to become more efficient in its own field and more capable of placing intelligently before the engineering department its views of future necessities of design, including comparison of the products of the particular organization and of competitors in actual service. In addition the sales department should grasp more understandingly the large problems of the production department, deterring it from making suggestions which on their face are out of accord with the policies or possibilities of the organization.

Closer Department Contact

Granted that an engineer has a clear-minded and well-trained sales organization to present his car to the public, one that he knows has a very good rudimentary knowledge of the profession, has he not, when it comes to forecasting the demand of the future, an enormous advantage over his brother, who is in constant discord and conflict with his sales department? Generally speaking, the design of a particular car is based on the theory and reason of the engineer. If he cannot impress those nearest to him with the correctness of his theory or the soundness of his reasoning, there must be fallacy somewhere in the organization. If the views of sales departments be subordinated, the chief executive will receive continually communications giving the best excuses in the world why the product is not selling. If it be the engineering department, either a twelfth-hour change is necessary, or, if the matter has been brought up in time, the engineer will be compelled to lay out something against his will and judgment. If, on the other hand, the points of contact between the two departments were such that during the period of inception of the car, the engineer were kept constantly advised of the views and ideas of the sales department, of the success of his product in the hands of the public, would not the resultant product be very much better? Would it not be easier for the sales department to market such a product enthusiastically? Would not the engineer be given confidence that he was building something that the public demanded, and that he was filling a long-felt want? Would not the sales department assist greatly the technical work of the engineer?

Summed up, the problem has two aspects:

First—In the majority of instances there are entirely insufficient points of contact between the sales department and the engineering department.

Second—There are insufficient points of contact between the engineering department and the ultimate user of its product.

How, then, to cure these apparent defects? Surely, an annual

T. C. Pullinger, who told of his experiences in Scotland in the discussion of Mr. Moscovics' paper meeting where all the salesmen are brought together in a joy-feast is not the place; the chief engineer, let us say, addresses the body; as a whole, the members are known to be gathered merely for the purpose of mutual admiration. The average house organ is not the medium, because truths are not told there; the house organ is usually a means of self-praise rather than self-analysis.

In this paper no consideration is given to the chief executive or the general manager as a factor for the reason that its object is to suggest an automatic means of communication of thoughts and ideas between the two arms of the business, and naturally the supposed superior knowledge of the head of the organization will be superimposed on the hoped-for result of the closer union of these two departments. As there appears to be at present no definite channel through which the two departments can come more closely together, the writer suggests:

First—A weekly engineering bulletin, edited by the chief engineer, taking up in groups the different parts of the vehicle, preferably employing the same nomenclature the factory has given to the various parts, appending the part or piece numbers in question (this will familiarize the salesman with part numbers).

Care Must Be Exercised

Pains should be taken that the bulletin be free from abstruse technical terms and data which might not be easily digested. Care should be taken to inquire whether the salesmen can read simple blueprints; if so, diagrams explaining the theory of the various points should be furnished. The salesman would thus obtain a direct knowledge of the product which he could gain in no other way. In each bulletin a personal appeal should be made to the salesman that he request any information on any point that he does not understand thoroughly, and a further explanation should be cheerfully and gladly given to him. The chief of his department should constantly urge him to correspond directly with the chief engineer on these points, and it should be strongly impressed on his mind that it is no disgrace to come back and say that he does not understand the topic discussed in a certain bulletin. In fact, the writer would urge that upon publication of the bulletin it become mandatory on the part of the salesman to express weekly his view on the topic described.

Although it is argued that the chief engineer be the editor of the bulletin, it is, of course, not necessary that he do the actual work in connection with it. He can lay out topics to be covered, and have his assistant or any other capable person collaborate with him. It is, however, the business of the engineer, to see that the bulletin actually reflects his views and ideas, the object being that the spirit of the organization be built around the chief engineer's conception and theory of the product. He need never be at loss for a topic. If in say twenty weeks he has covered the general points of design, he may then deal with such subjects as economy of fuel, the best means of caring for the clutch, the motor starter, etc. The accessory firms alone could furnish enough data to keep such a bulletin alive for a very long time.

With regard to my second suggestion, contact between the engineer and the owner, the problem is somewhat more simple. The appended form could be sent to every agent and distributor of the factory, with positive instructions that it must be filled out every sixty days. This would give the engineer first-hand information as to exactly how the product is being received. It would enable him to eliminate apparent defects due to local conditions. Let us assume that from the replies it becomes evident that there is considerable noise in the shifting of gears. It is not supposed that the average agent will be able to analyze the clutch problem; that he can tell whether the clutch is too heavy or the gear ratios incorrect. That, of course, remains for the engineer to diagnose. But the replies will place in your hands, without delay, troubles resultant upon design or manufacturing defects. Again, let us assume that the gasoline and oil consumption are very high, much higher than you know should he the case; the service department will instantly get into communication with the dealer and help him to alleviate the condition.

Of course, the theories advanced here, like all theories, are useless, if not used. The object of this article is to point out a means whereby the influence of the sales department on the engineering department can be brought to a stage of intelligent coöperation.

Form for Engineers' Use

It is highly important for your own benefit as well as ours that you give us the following information as accurately as possible. It is our endeavor to make our cars meet the severest general requirements and only by a definite, direct and accurate knowledge of how they act under widely varying conditions can we hope to accomplish this. Please be guided accordingly:

Date:
Agent's name:
Name of territory covered by your company:
How many of our cars are in operation in your territory?
What is mean altitude of territory covered by you?
What is general topography of territory covered by you?
Mountainous
Hilly
Level
Are road conditions good?
If not, please briefly state conditions and about what proportion of roads are macadamized, etc.
What is maximum average temperature?
What is minimum average temperature?

1. Does our line have power enough for your customers? If not, what would you suggest?
2. Is our motor quiet enough for your clientele?
3. Is our line flexible enough?
4. Do our motors accelerate rapidly enough?
5. How do we compare with competitors in our class? Please state which competitors, if any, surpass us.
6. Is the fuel consumption (both oil and gasoline) satisfactory? Please state your experience generally.
7. Are our gears quiet enough for your clients? If not, please state which are noisy.
8. Is the clutch action satisfactory, both as to engagement and holding?
9. Does our spring suspension meet with general approval?
10. Is our steering gear meeting all requirements?
11. Are our gear ratios correct for your territory?
12. Have you heard any criticism of our upholstery, either in material or workmanship?
13. Have you heard any complaint on the accessories we use? If so, please particularize.
14. Have you had any trouble reported on the bearings we use?
15. Is our rear axle construction meeting the requirements of your trade?
16. Please state any general criticism on appearance or general design you may have encountered.

This information is so important to us that we urge it be made out under the direct supervision and he signed by the head of your organization. It will materially help us build better cars.

Marmon Opens Discussion

President Marmon stated that the average engineer is too apt to design a car after his own tastes and in accordance with his ideas of what he would like to ride in.

G. W. Bennett, Willys-Overland Co., said that he has all along advocated a closer relation between the two branches of the business of making motor cars. Antagonism is often found but this is gradually being outlived, a better understanding generally taking its place. The salesman is the connecting link between the factory and the buyer. He teaches the owner and in this way sets the trend of design. Thus, a great influence is wielded by the sales force. If the engineering side will listen to the advice of the sales as to what the future design is to be, the former will get some valuable hints.

J. G. Vincent, of the Packard company, believes that he gets along with his sales department quite well. The engineer will not have any trouble if he is broad minded and always sticks close to the sales and, he believes, it is up to the engineering department to always take carefully the suggestions tendered by the sales department and to analyze these frankly, although, of course, the engineering end must not be swayed too far by these suggestions.

T. C. Pullinger, a leading Scotch maker and a member of the council I. A. E., has also had his troubles in getting the sales and engineering departments to act in harmony. Familiarity breeds contempt, and thus neither department takes much stock in what the other says. The plan adopted by his concern is to get the dealers and agents to meet at the factory and to confer with the organization at regular intervals. The engineering department takes a lot more notice of what these visitors say than they do of what the sales force says.

Once a year Mr. Pullinger's company calls a convention of this kind far enough ahead to give the designers plenty of time to incorporate any valuable suggestion in their new cars. Even earlier than this general dealers' convention, some of the principal dealers come and offer their ideas. These are incorporated in sample cars, which are later shown at the regular dealers' meeting, giving them something concrete to work upon and to criticize.

G. W. Dunham, consulting engineer, Chalmers, outlined the method employed by this Detroit concern in designing according to the public demand. This public "*wants what it wants when it wants it,*" he said. To keep closely in touch with the demands, the engineering department is continually asking for criticisms and suggestions from the dealers. To prevent the dealers from writing lengthy letters expressing their views, the company has provided printed forms in pads which may conveniently be placed upon the dealers' desks. They write on these their ideas and send them in along with other communications for the factory, thus doing away with useless words, and saving the designers' time in perusing them.

Besides this, about ten of the largest dealers send in daily reports of all repairs on the cars coming to their shops each day. If the engineering department receives reports of the same defect from several sources, it immediately investigates the breakage, thus being soon aware of any weak part. In this way the engineering department really works in the field itself, said Mr. Dunham. Circular letters are sent out from time to time to the dealers asking for their opinions as to future design and so on.

Mr. Dunham spoke of a mechanics' convention which his factory held. The men were sent from the various dealers' garages in small groups. Meetings were held dealing with all chassis parts and the men were asked for suggestions as to better ways of designing the various parts and were told why certain features were designed as they were. In this way a closer feeling of working together was engendered tending to make the men more interested in the factory's product.

F. P. Nehrhas, American Locomotive Co., advocated the closer relationship of all departments, also. He stated that his company has recently held conventions similar to those outlined by Mr. Dunham, from which great benefit to all concerned was derived. Though Mr. Moskovics' paper was a very full treatment of the subject, Mr. Nehrhas believes that he has touched upon only a small part of a very large subject.

Among the New Books

Works on Iron Analysis, Syndicalism, Automobile Troubles and Their Remedy and Coal Are Among Offerings

Exporters' Encyclopedia Gives Information on All Details Involved in Exporting Goods to Foreign Lands

THERE are many new books coming from the press this spring which are of interest to the automobilist, the manufacturer and dealer, and, indirectly, to all those affiliated in one way or another with the great and growing army of motorists in the United States. The works reviewed in THE AUTOMOBILE this week are of diversified character, the only one directly interesting to the automobile owner being that on Car Troubles, although the treatises on metals and coal will appeal to many and those on syndicalism and exporting are sure to find manifold uses.

METHODS OF IRON ANALYSIS. By Francis C. Philips. Published by the Chemical Publishing Co., Easton, Pa., 170, 9 by 5.5 inch pages. Boards, price, $1.

The methods employed in the laboratories of the different steel works vary to some extent. In view of this fact the methods in use in the iron and steel laboratories around the regions of Pittsburgh, Pa., were collected and published by the Engineers' Society of western Pennsylvania during the year of 1896. The demand for copies of this paper were such that the supply was soon exhausted, and by a resolution of the Society passed in 1897 it was suggested that the transactions be published and bound in permanent form. In this work are collected the methods of analysis used in each of the laboratories around the Pittsburgh region. The principal experiments are for the determination of the presence of silica, iron, manganese, aluminum oxide, phosphorus, sulphur, etc., in ores and in blast furnace cinders. Exact directions are given for the making of each specific analysis. For the iron and steel laboratory the work of this nature is practically indispensable.

THE IRONMONGER METAL YEAR-BOOK FOR 1913. Published by *The Ironmonger,* London, England, in note book style, 104, 3.7 by 6.3 inch pages. Boards, 2 shillings, 6 pence.

For 7 years the *Ironmonger* has been publishing this annual review of the metal market. The most valuable information that this work contains is the record of the price changes in metal during the year 1912. The closing prices for copper, tin, lead, spelter, pig iron, finished iron, steel, etc., for every day of the year of 1912 is furnished in tabular form. The imports and exports of the principal raw metals are also noted.

AMERICAN SOCIETY FOR TESTING MATERIALS TRANSACTIONS in four languages: English, German, French and Spanish. Full transactions of the 1912 meeting, published by the Society at the office of the secretary, University of Pennsylvania, Philadelphia, Pa.

Standard specifications for Bessemer steel wheels, open-hearth girder and high T-rails, bridge steel, building steel, ship steel, boiler and fire box steel, axle steel, carbon steel, for wheels, castings and forgings are given in these transactions together with notes on workmanship in these transactions which are complete in all four languages.

SYNDICALISM. By J. Ramsay MacDonald. Published by the Open Court Publishing Co., Chicago, Ill. 74 pages, printed on deckel-edge paper. Cloth, 60 cents.

A clearly-put exposition of syndicalism, based upon six articles appearing in the *Daily Chronicle.* This book should be read by all students of labor conditions. Syndicalism is organized unionism, its object being the uplift of the workingman by means of arbitration and the strike, on one hand, and by thorough organization on the other. It is non-political and, although some of its principles are the same, it differs from socialism. As the author states, "Socialism asks that economic power should be put in the hands of the community. Syndicalism asks that each industrial group of workers should control the instruments of production which it uses—the railwaymen, railways; the miners, the mines, and so on." As may be gathered from the work it should not be necessary to so clearly define the program of syndicalism, but, to again quote the author, "* * * the geese, having become so familiar with the 'Boo' of socialism that they are beginning to cease to waddle about when it is shouted in their ears, or being frightened out of their lives by the new 'Boo' of syndicalism." On the whole, it is a book worthy of careful perusal.

EXPORTERS' ENCYCLOPEDIA, 1913 edition, published by Exporters' Encyclopedia Co.. New York City. 1024, 5 by 8-inch pages. Cloth, $7.50, including monthly corrections and the *Exporters' Review* for the calendar year.

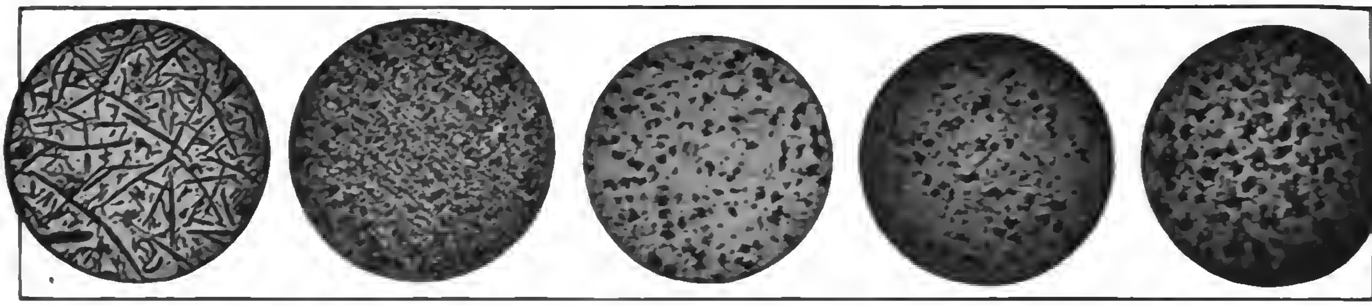
If you export goods to any foreign country and are not positively familiar with the methods of shipping, a work of this kind will be invaluable. The object of the book is to enable anyone to make a shipment to any foreign country in full security against delays, fines, etc. It tells the nearest and cheapest route, the consular regulations which have to be observed and the exact cost of same and also tells what the transportation companies require in the way of bills of lading, payment of freight, etc. When any regulations or prepayments are necessary it tells how to go about making them and in other words it acts as a standard reference work for the purpose of answering any exporter's or importer's questions.

CAR TROUBLES—THEIR SYMPTOMS AND THEIR CURE. By Harold Whiting Slauson, M. E., published by Harper and Bros., New York City. Fifteen 3.75 by 6.75-inch pages. Cloth, 25 cents.

Providing the driver knows where to look for the trouble in a general way this little book should be able to complete his investigation for him. The troubles are arranged alphabetically under the heads of clutch, engine, fuel, ignition, and cooling. If there is a knock in your motor and you know it comes from the cooling system you would be able to find it by looking under the latter head. But if you thought the knock came from a bearing, the location could not be found from the book. However, if there is any indication as to the location of the trouble the exact cause can be found by its aid.

COAL, by Francis H. Wilson, M. Inst. M. E., editor of *Mining Engineering,* published by Sir Isaac Pitman & Sons, London and New York, 129 4.5 by 7 inch pages, with half-tone illustrations. Cloth, 75 cents.

The coal resources of England are carefully studied and analyzed in this little volume. In England more than 1,000,000 people are employed in the coal industry alone. The author deals with the formation and the history of the coal seams, the method of working them, the surface arrangements of the mine and a study of the coal industry. The opening chapter of the work tells of the formation of coal through the decay of vegetation. A thin slice of coal examined under a powerful microscope will often reveal distinct traces of woody tissue and bark. The two theories of how the coal seams happen to form, whether by drift or in situ are expounded. All the varieties of coal are not listed but the different classes of coal are carefully studied. The increase in the economical use of coal is an important feature which the author studies, especially insofar as the use of the coal by-products is concerned. About 35,000,000 tons of coal are consumed every year for domestic purposes and the author quotes Sir W. Ramsay, who states: "We are still utterly wasteful in our consumption of fuel in domestic fires." The book is not too technically written and will make excellent reading for anyone interested in this industry.



Left to right: Fig. 1—Polished section of pig iron. Fig. 2—Polished section of white iron. Figs. 3, 4 and 5—Polished sections of annealed malleable iron

The Use of Malleable Iron for Castings

From the Paper Read Before the S.A.E. and I.A.E. by Enrique Touceda

ALTHOUGH malleable iron, as compared with steel, enters into automobile construction to a limited extent only, the actual amount used in the industry is large. **I believe it will be admitted as a general proposition that the constructing engineer, while very thoroughly posted on carbon and alloy steels, knows less about this material than possibly any other passing through his hands.**

There is a widely prevalent misconception that when any part of a malleable casting exceeds ⅜-inch in thickness of section, the change that normally takes place during the annealing process, whereby the hard and brittle white iron castings that come from the air furnace are converted into soft, tough and ductile ones, is but imperfectly accomplished.

The malleable iron process is conducted in two steps, the first of which consists of melting gray pig iron upon the hearth of an air furnace, when a certain amount of the original silicon, carbon and manganese is oxidized, and thus removed from the iron while it is being melted and subsequently raised high enough in temperature to successfully run the castings. The following three facts are well known to those who possess even an elementary knowledge of the metallurgy of iron and steel:

First, most of the carbon content of gray pig iron exists in the form of graphite; that is, free; if a pig be broken and the fractured end be gone over with a stiff brush, it is easy to thus remove the exposed little flakes of graphite held in mechanical mixture with the iron and always separated from the iron during and for an interval after solidification.

Second, when pig iron is uniformly white in fracture, no graphite is apparent upon inspection; instead of the carbon separating out in whole or in part as graphite, it is all combined with the iron **chemically.**

Treating Pig Iron

Third, a pig iron having most of its carbon in the form of graphite, can be changed into an iron in which none of its carbon will separate out as graphite if this pig iron be melted in such a manner that a certain amount of its silicon content be removed from it through oxidation; for silicon content in excess of a certain amount, prevents the carbon from combining mechanically with the iron; if it be removed gradually from a pig iron in which the carbon would normally have existed as graphite, a point will finally be reached at which its influence in forcing the carbon to separate out as graphite will cease.

It is an easy matter then to start with pig iron that is gray in fracture and in which all or most of the carbon exists as plates of free graphite, and end up with an iron that is white in fracture and in which all of the carbon is combined chemically with the iron; it is a question solely of getting rid of, in the air furnace, such an amount of silicon as will accomplish this end. It thus becomes obvious that the manufacturer of malleable iron castings, by means of his air furnace, experiences no difficulty whatever in converting gray pig iron into white cast iron; which operation constitutes essentially the first step of the process.

Many years ago it was discovered that if hard brittle white iron were surrounded tightly by an oxidizing packing, such as iron oxide in any form, and then raised to and maintained at a temperature of about 1500 degrees Fahrenheit for a few days, it would not only be changed into very soft and ductile iron, but some of its carbon would be removed during the interval. This constitutes the second step in the malleable iron process. Consequently, the first step toward getting soft and delicate castings in the malleable iron process, is to get very hard and very brittle castings, in which all of the carbon is combined chemically with the iron as carbide of iron, the very hardest constituent in either iron or steel. The second step is to break up this hard constituent into carbonless iron and free carbon, both of which are very soft. By the aid of photomicrographs what takes place during the second step of the process, that is, in the annealing ovens where the white and brittle castings are placed to be converted by time and temperature into finished castings, will be explained in a non-technical manner.

Fig. 1 illustrates a polished unetched section of a piece of gray pig iron, the object of which is to show the plates or flakes of graphite that separate from the metallic iron, when the silicon is sufficiently high in the iron to force the carbon thus to separate. It will be noticed that there is practically no regularity of either size or distribution of these flakes; therefore it is not to be wondered at that cast-iron test-bars show great irregularity in strength, even when poured from the same ladle of iron.

Fig. 2 shows a polished section of white iron, white because its silicon content was too low to force any of its carbon to separate out as graphite. The whole of the carbon consequently remains chemically combined with the metallic iron, invariably in the proportion of 6.67 per cent. carbon to 93.33 per cent. iron. This extremely hard carbide of iron is shown mostly in the white areas, but about 12 per cent. of the dark areas consists of this hard constituent also, the reason for which it is not necessary to consider for the purpose of this article.

As previously stated, carbide of iron is the very hardest constituent that can exist in either pig iron or steel, but fortunately, as already indicated, it has been discovered that if it be heated to about 1500 degrees Fahrenheit, for many hours, it can be split into little nodules of free carbon and a mass of practically pure iron, the former being very soft and having no strength, and the latter being both soft and very ductile and possessing high strength. An inspection of the polished sections of annealed malleable iron, Figs. 3, 4 and 5, will show that these little nodules of free carbon (the little

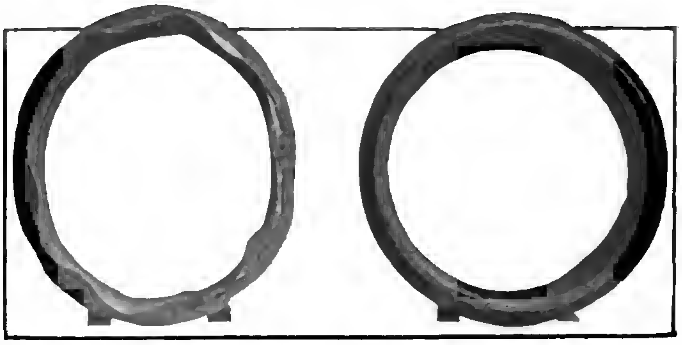


Fig. 6—Malleable iron clutch ring castings tested to prove that carbon particles do not injure the structure of the metal

black areas in the photomicrographs) are very uniformly distributed throughout the entire section and very uniform in size, differing in both particulars from the manner in which the graphite occurs in gray iron.

To contend that white iron castings over ⅜ inch in section cannot be annealed as efficiently as castings of less thickness, is to contend that a piece of white iron over ⅜ inch in section cannot be heated uniformly throughout its entire section to a temperature of 1500 degrees Fahrenheit or over. This is manifestly absurd, for it must be admitted that in many different processes very ponderous pieces of steel are being heated daily throughout their mass to any required temperature. The sole precaution in any case is to see that plenty of time be given the operation. As it happens that in the annealing process in the manufacture of malleable iron castings, some 7 days are consumed from the time the castings enter the ovens until they are withdrawn, if the breaking up of the hard carbide is not complete in the case of thick sections, this is certainly not due to lack of time to allow the piece to heat uniformly throughout. Moreover, there is no trouble whatever in maintaining the temperature of the ovens at any point under 1900 degrees Fahrenheit.

The direct question can now be put:

What is the limit of thickness of section beyond which white iron will not be efficiently and completely annealed; that is, not have all of the very hard constituent completely replaced by little nodules of free carbon and practically pure iron?

The answer is plain. Any thickness of white iron can be thoroughly and uniformly annealed throughout its section that is not so thick that it cannot be heated uniformly throughout, and in which the whole of its carbon content exists as carbide of iron. It has been shown that whether the carbon exists as carbide or as graphite, is simply a matter of how low or how high the silicon may be in the casting. It has also been shown that the adjustment of the silicon is under the complete control of the manufacturer. If the silicon is as low as 0.30 per cent. it is possible to obtain very easily sections as thick as 6 inches, in which all of the carbon will exist as carbide of iron, although in this extreme case, to break up all of the carbide and completely replace it with free carbon and iron, a higher temperature than that normally used during the anneal is required. In sections 3 inches thick, all the carbon will exist as carbide of iron when the silicon is around 0.50 per cent., in which event neither a higher temperature nor a longer anneal than is customary in ordinary practice will be required. I have therefore placed this as the limit of thickness for efficient and complete annealing. The trade, however, does not call for malleable iron in which the sections are this heavy. The statement can be made that if the process is fully understood by the manufacturer, and he will adjust the silicon content in accordance with the heaviness of the work, no trouble from this source should exist, and none ever will.

Referring again to Figs. 3, 4 and 5, I would explain that these photomicrographs were taken from an annealed malleable section 2 inches in diameter and several inches long. The sample was cast at my request from a heat in the regular course of work. While the company makes fairly heavy castings, none of the parts approaches this sample in thickness. Still, as will be seen, the silicon in their white iron was low enough to cause all of the carbon to form carbide of iron in a 2-inch round. This sample was annealed in the oven with their own castings in exact accordance with their regular practice. Fig. 3 was photographed at a spot about ⅛ inch from the surface; Fig. 4, at a spot midway between the surface and the center, and Fig. 5 directly at the center.

A close inspection and comparison of these three photographs should satisfy the most skeptical that this piece was

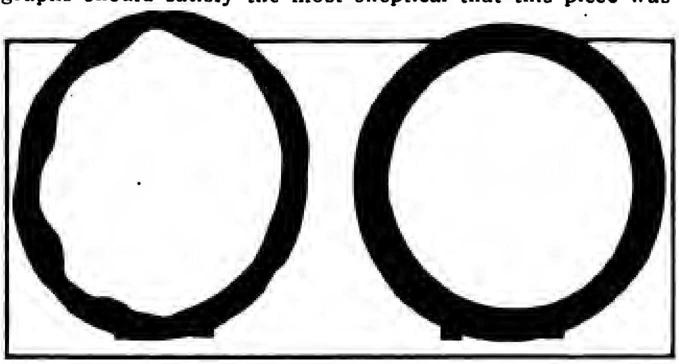


Fig. 7—Clutch ring casting after testing by machining down to ⅛ inch and subjecting to heavy blows with a hammer

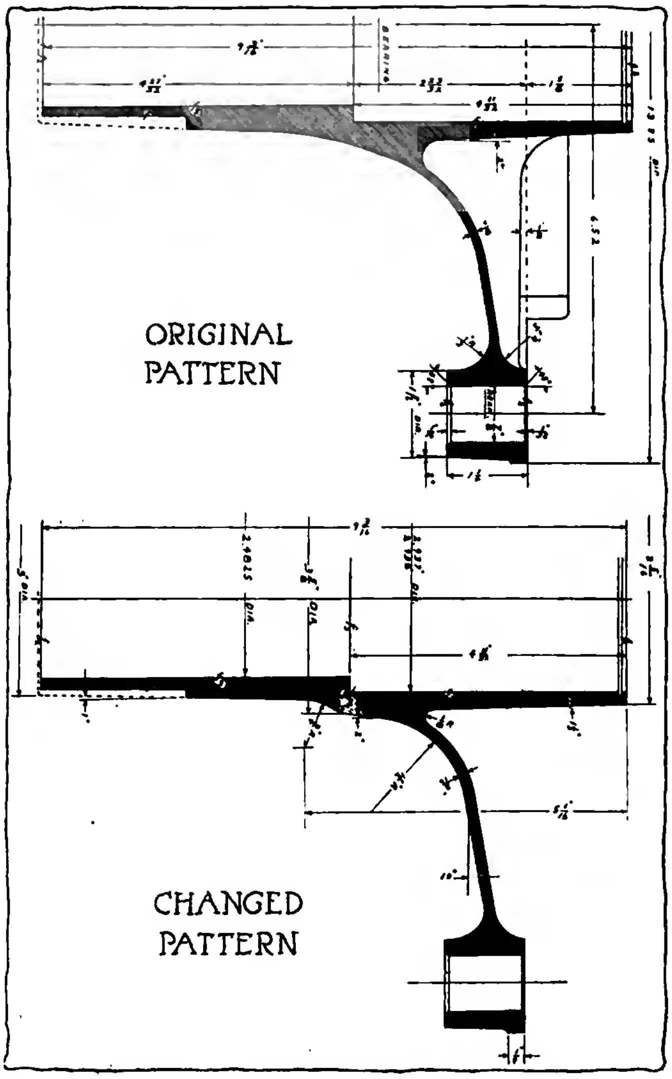


Fig. 8—The slight changes made in the pattern transformed the casting from a failure into a success

annealed with completeness throughout, and that all of the hard carbide was broken up into free carbon and soft iron. Accompanying this sample was another of 4 inches diameter, the central part of which I found contained considerable graphite in the form of flakes, which from their shape could be identified as having resulted from the separation of some of the carbon during the solidification of the white iron, showing that in this case the silicon in the normal mixture was not sufficiently low to have forced all of the carbon to combine with the iron, although had the silicon been somewhat lower, no difficulty in this particular would have been experienced.

Removing the Skin

In connection with the oft-repeated statement that if the skin of a malleable casting be removed, and the core tested, the latter will be found to be more or less worthless and that malleable castings are strong and ductile by virtue principally of the metal in the skin, there is no question whatever that the metal in the skin of well-made malleable iron is slightly superior to that which constitutes the main bulk of the casting, but only in the case of very poor malleable iron can a really great difference in strength between skin and core be noted; the poorer the malleable the more pronounced this difference. Malleable castings are not unique in this particular, for the metal in the skin of most steel castings is stronger than the central part of the casting, although not for the same reason that obtains in the case of malleable iron. The skin of malleable castings is practically decarbonized iron, the structure being uninterrupted by the presence of any little nodules of free carbon. The structure of the core, however, differs from that of the skin, only in that throughout it little nodules of free carbon are interspersed. That in good malleable iron these little particles of free carbon do not act in

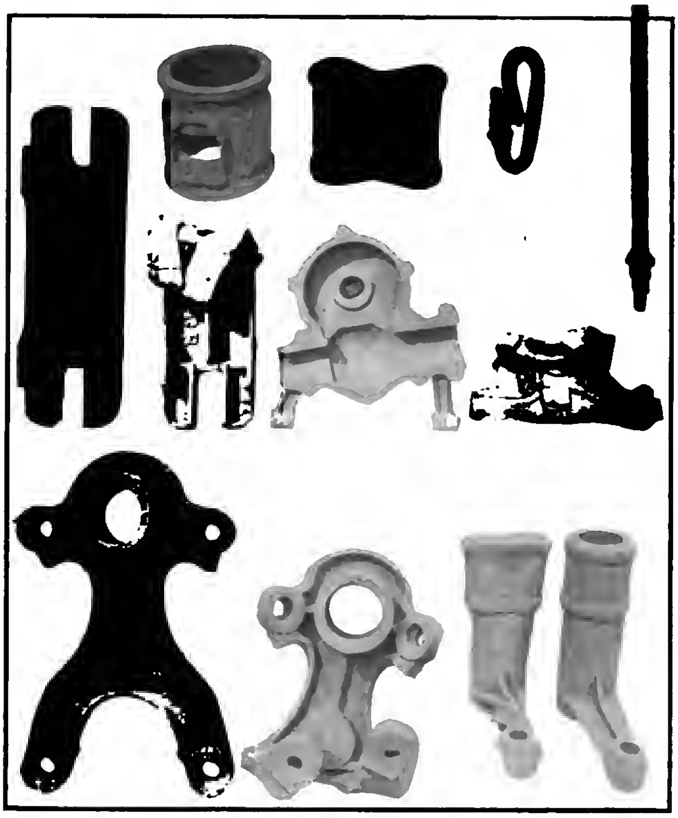


Fig. 11—Some castings which show signs of abuse

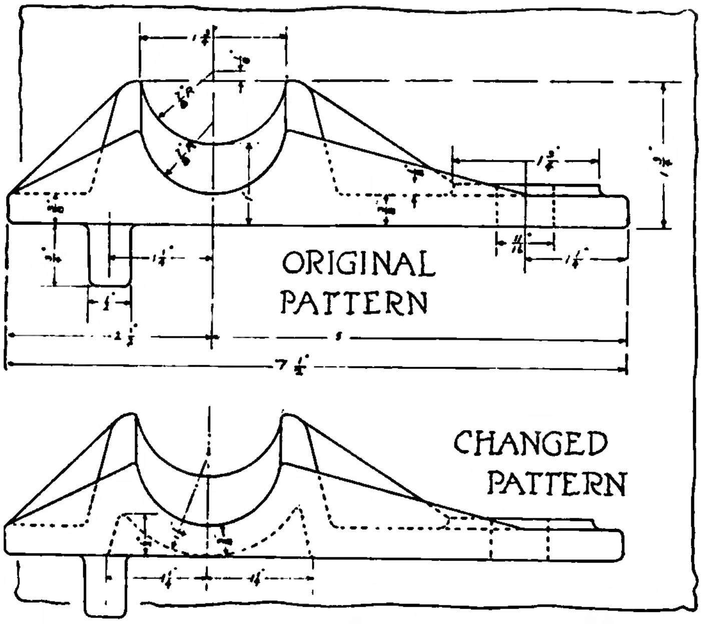


Fig. 9—The changes made in this pattern not only made a better casting but also reduced the amount of metal required

a way to injure the structure to any appreciable extent, I have satisfied myself by numerous tests conducted from time to time.

To illustrate this fact, I have secured two castings of an automobile clutch ring, Figs. 6 and 7. The 7/16 inch thick rim of the casting was machined down to a thickness of 1/8 inch, after which it was subjected to repeated heavy blows with a hammer to test the ductility and strength of the core left after machining. It will be seen that the metal of the core, in this instance, was of great strength and ductility, able to withstand great punishment without developing cracks of any magnitude. It is most likely true that the metal in the skin of this casting was slightly superior to that in the core, but I feel confident that the difference was not great, and I repeat that in good malleable castings, while the metal in the skin is a little superior to that of the core, the difference is but slight. The photographs referred to speak for themselves.

Status of the Industry

Some in the business have not kept pace with the advances made in malleable practice; some do not even understand the rationale of the process, or lack good manufacturing equipment. While fortunately these do not predominate, there are enough of them to throw much undeserved discredit on one of our large important growing industries. I am convinced, however, that the constructing engineer has, owing to improperly designed patterns, contributed unintentionally in numerous instances, to this situation. The worst offenders in this particular are the engineers for the railway car builders.

If the question of shrinkage and contraction be not properly considered, if the apportioning of thick to thin sections be not adjusted in accordance with correct principles, no matter how superior may be the metal *per se*, failure is the certain outcome. The remedy should be obvious. Practically all of the makers of malleable castings have on their staff men who are very proficient in the design of patterns from which to cast malleable. Much delay, much irritation, and a great deal of injustice will be eliminated, and a much stronger casting for the same weight of metal will often be produced, when closer relationship and co-operation exist between the engineer who designs a malleable part for any particular machine and the malleable pattern-maker at the foundry.

Lack of time has prevented my securing more glowing examples than the ones here shown, of how small need be the alteration in a pattern, in many instances, to produce good results where bad ones previously obtained. The changes shown in Fig. 8, although very slight indeed, made the difference between success and failure. The same remark holds good in the case of Fig. 9, the change producing not only a satisfactory casting, but one containing less metal. In connection with the center plate shown in Fig. 10, the following are the facts: Complaint was made by the railroad that these malleable castings were failing in service. The manufacturer of the castings made the request that he be permitted to alter the patterns in accordance with what his experience indicated would remedy the trouble. This privilege was not granted. The road then decided that malleable iron castings could not be depended upon in this particular case; so it was decided to have the castings made of steel. The steel men also objected to the design of the pattern, and, as almost always happens when a change is made from malleable iron to steel, were allowed not only the privilege denied before, but, as can be seen by reference to the drawing, were permitted to thicken the sections by one-quarter of an inch almost throughout. That changes were made in both design and weight is soon forgotten, but not that the steel casting stood up to the work and the malleable casting failed.

Physical Properties of Malleable Iron

As to the physical characteristics of malleable iron, I know that you are all familiar. However, at the end of this paper are reproduced some photographs of heavy malleable castings that you will acknowledge have been severely abused. They very eloquently illustrate the fact that when malleable castings are made by those who understand the process, castings that possess many valuable characteristics are produced. When toughness and ductility, ease of machining and low cost are considered, I do not know what metal can compete successfully with good malleable iron.

The tensile strength of good malleable iron will vary between about 38,000 to 56,000 pounds per square inch. When extreme ductility is desired, it is manifestly incompatible to specify high tensile strength. As in the case with carbon steel, so with malleable iron, ductility goes hand in hand with low ultimate strength; if high ultimate strength is desired, it can be obtained only by a sacrifice of ductility.

The elastic limit of good or of even indifferent malleable iron is equal to that of wrought iron and frequently exceeds it. When comparisons are made between this material and other metals, it would be more fair to consider the elastic limit rather than the ultimate strength, for it is the former upon which the engineer actually bases his calculations. The elongation and reduction of area of malleable are, of course, considerably less than of either wrought iron or soft steel. That both of these properties are high enough to impart great value to malleable castings is impressively attested by the photographs of the abused castings previously referred to.

It is the custom in plants of fair size to run various furnaces on mixtures for different classes of work. The mixture from one furnace is not as well adapted to one class of casting as to some other. If the user of the castings will only take the manufacturer into his confidence and explain the use to which any particular casting is to be put, the work expected of it in service, I know that loss of time will be avoided, and a more superior product had. Some consumers are under the false impression that for competitive reasons they should lighten their castings. This generally necessitates the introduction of more cores in the mold, the result being that the manufacturer is obliged to charge more per pound.

Specification for Malleable Iron

I presume that specification is of more interest to the membership than perhaps any other one question in connection with this material. I have no desire to usurp the duties of the committee having this matter in hand, the work of which in all that has been done has been so commendable, but a few words in connection with the S. A. E. malleable iron specification will I trust be taken in the spirit in which they are intended.* I believe that a mistake has been made in specifying an upper limit for silicon. As a matter of fact, it is well known that the higher the silicon in the white iron casting, provided the totality of the carbon in the casting exists in the state of carbide of iron, and all other conditions are correct, the better will be the finished product. I have shown that the manufacturer is obliged to eliminate his silicon to a point where all of the carbon will remain as carbide, and also that the extent to which he must carry out this elimination depends wholly upon the heaviness of the sections. It is exceedingly rare that he errs in getting the silicon too high, because he does not need a chemical analysis to safeguard this, as all that he has to do is to keep breaking his test sprue until he sees by the fracture that the iron is white, and that there are no particles of graphitic carbon in the fracture. He is more concerned in this particular than the purchaser can ever be, and to this extent the purchaser is protected. To specify an upper limit for silicon is about as necessary as to specify that the manufacturer shall pour his iron in the molds at a temperature sufficiently high to successfully run his castings. You can rest assured that he is going to look after the upper limit of silicon with as much fidelity as he will to be sure that the iron is hot enough to avoid trouble through misruns.

On the other hand, it would be wise to specify a limit beyond which the silicon shall not drop, because not only does the manufacturer err frequently in this direction in the making of black heart iron, but he is handicapped by having no reliable means of telling just when he is on the danger line. Analysis would take too long and the fracture gives no true indication. If the silicon is too low, a very inferior product will result, and still the purchaser if he be held to his specification can be forced to accept the castings.

The S. A. E. specification allows the manganese to be as high as 0.70 per cent. No one ever saw and no one ever will see black heart malleable iron of good quality with such a manganese content. Provided certain precautions are taken, and certain ratios made between certain elements in the product, it is possible to make a good product in which the manganese might be as high as 0.40 per cent., but to do so the manufacturer would have to be a master of his business and to know how to offset the evil effect of manganese on the structure.

Limit for Phosphorus

The upper limit for phosphorus given (0.20 per cent.) is all right, but it is actually the extreme upper limit that should be tolerated. The Society for Testing Materials allows 0.225 per cent. as an upper limit for phosphorus, but this is by far too high. I feel very confident that a good product could not be obtained if this limit were reached.

No mention is made in the S. A. E. specification as to carbon content, or the permissible amount of combined carbon tolerated; nor is any limit placed upon the allowable amount of total carbon.

Were not this paper already too long, I would like to make some comment upon the question of test bars for the determination of physical properties, etc. This can be taken up in a subsequent paper, if the matter proves of sufficient interest.

*The S. A. E. specifications for malleable iron are as follows:

Manganese	.30 to .79	Phosphorus	Not over .20
Silicon	not over 1.00	Sulphur	Not over .06

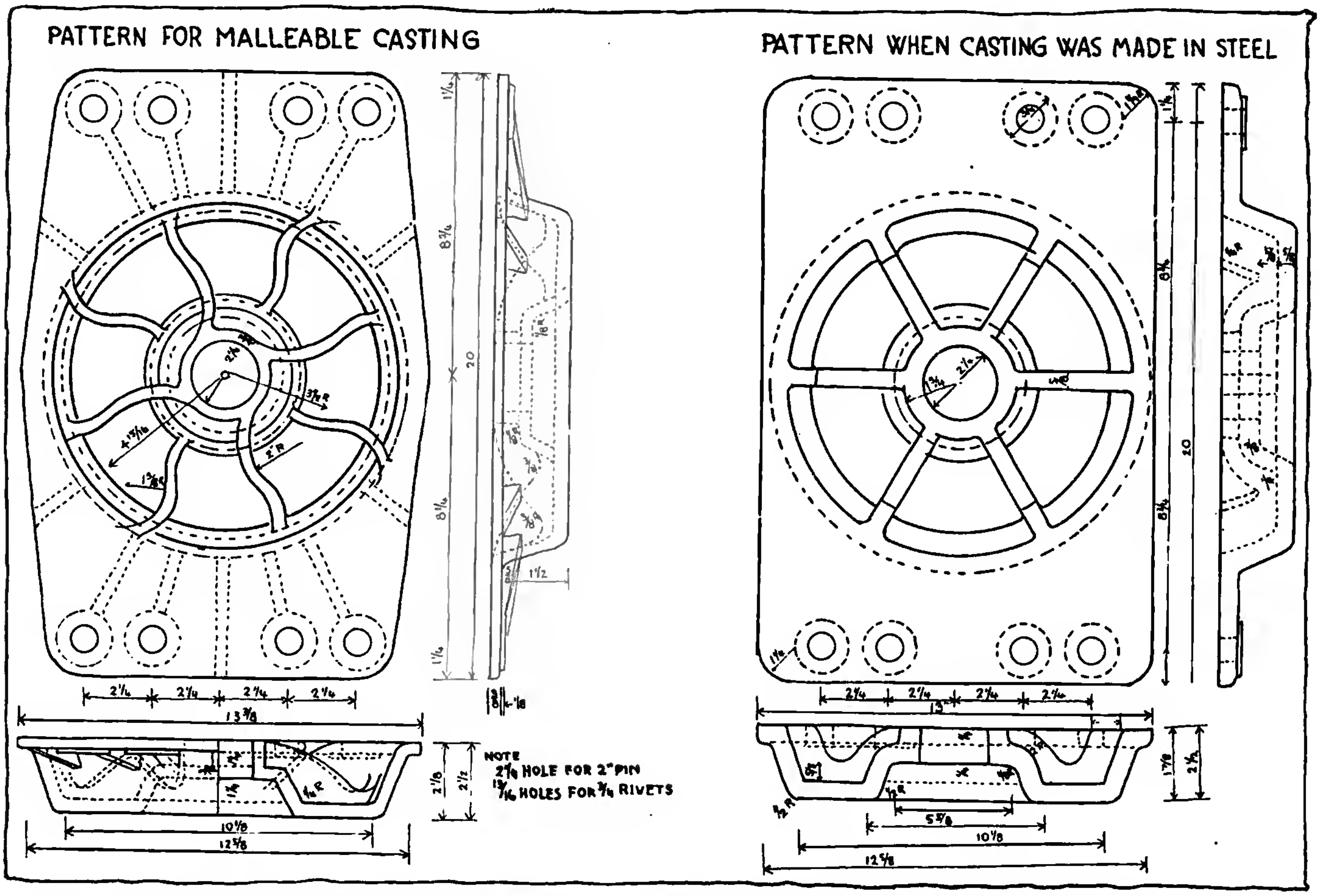


Fig. 10—The malleable iron casting shown above was a failure. The makers wanted to change the pattern, but the work was turned over to steel casting makers who were permitted, however, to change the pattern as shown. The changes are significant

The Rostrum

In which Letters from Readers Are Answered and Discussed

Broken Piston Ring Causes Trouble—Dirty Multiple-Disk Clutch Chatters—Discussing Location of Gearbox—Kerosene Through Intake Pipe—Chokes on Account of Heavy Fuel—Clearance Used in the Piston Rings

Sounds Like Broken Ring

Editor The Automobile:—Recently I overhauled my engine, ground the valves and set it up again. It was very stiff to crank, but I thought that was nothing. The engine ran for half an hour without any knocking, but the next morning when I wanted to crank it I could not. It was locked tight. Now, what was wrong? This is the first one I ever overhauled that has acted like this. I do not want to take the engine down if I can help it. I think a ring is broken or out of place.

Pittsburgh, Pa. G. P. Kistner.

—As you do not give the make of your motor nor mention the condition under which it was run after overhauling, it is somewhat difficult to make a certain diagnosis of the case. It is not likely that the trouble is in the piston rings. Of course, this is possible, but it is more probable that the motor did not have sufficient oil when you ran it after overhauling. When a motor runs dry it does not take long for it to stick. The only thing to do is to try to loosen the pistons by putting a mixture of oil and kerosene, the kerosene predominating, in the tops of the cylinders either through the petcocks or valve caps. Then try to work the flywheel back and forth. To do this you may have to use a large wrench or you may be able to work it loose by hand. If you are unable to loosen the motor by this means it will probably be necessary to rig a block and fall and lift the cylinders off the pistons. Of course, if piston rings are broken or out of place it will be necessary to take down the motor anyway. We should be interested to hear of further developments in this case.

Clutch Needs Cleaning Out

Editor The Automobile:—I have a multiple-disk clutch running in oil on a car of a well-known make. When I let in the clutch it takes hold harshly and causes the car to quiver, jump and jerk and makes an awful noise. I have changed the oil a couple of times. Last time I put in powdered graphite and it seems to be worse. Please let me know a remedy for this.

McKeesport, Pa. Austin Conrad.

—Very often this trouble can be cured by giving the multiple-disk clutch a thorough bath in kerosene and gasoline. Mix the kerosene and gasoline about half and half and pour through the plug in the clutch housing. There will generally be a plug at the top of the housing, as in Fig. 1, through which the cleansing material may be poured. Fill the clutch housing to the top and then let the motor run idle for some time before draining out. If there is any connection between the crankcase clutch and gearbox housing, all three, or as many as are interconnected, will then have to be drained out because the kerosene and gasoline cut the lubricant and would leave the bearings dry if they were not drained out and then refilled with fresh oil.

Where there is any connnection between the clutch housing and the crankcase, heavy grease should never be used because it will surely work up into the cylinders and carbonize.

Likes Gearbox on Rear Axle

Editor The Automobile:—As a car owner, I take pleasure in taking part in the interesting discussion now going on in The Automobile regarding gearbox location.

Let me state first that I favor the rear-axle location. I will take up the various arguments against this location and try to show that they are not well founded.

First, it is claimed that the greater weight of the rear-axle construction causes greater tire wear owing to its being unsprung weight. This I do not find to be the case, a set of tires running as far on my rear wheels as on the front. It think it is a good thing to have an unsprung rear axle heavy enough to hold down the wheels while traveling on rough roads, whereas with a light axle the wheels are in contact with the road only part of the time, thereby causing greater liability of stone-bruise, friction between the tire and road and increasing the tendency to skid. I am an advocate of Charles Duryea's doctrine of "most weight on the rear axle." The idea of a unit power plant seems to me as foolish as would that of putting the driving wheels of a locomotive under the tender and trying to push the heavy boiler ahead of them.

Second, as to accessibility, I find that by taking up the floorboards of the rear seat that the rear-axle gearset is in as "get-at-able" a position as it can possibly be located, opinions of manufacturers to the contrary notwithstanding.

Third, it has been argued that a rear-axle gearset would wear out quickly on account of the strains and vibration to which it is subjected. As to this, I submit that all shaft-driven cars have unsprung bevel gears and differentials. If these can be built to stand the strain of the rear-axle location, why not the gearset also?

To sum up: I find the gearset as a unit with the motor bad, because it puts too much weight over the front wheels where it increases the tendency to skid and makes a hard car to steer. It would be just as reasonable to put on a pair of roller skates and try to push a heavy load in front of you. The amidships position is on the whole to be preferred to the unit construction, but even this position has several conspicuous disadvantages, among which are the necessity for using two or three heavy universals, which use up power and add complication, the necessity for heavy cross-members to support the gearset, and the inaccessibility of the clutch.

As to the control of the rear-axle gearset, it has been stated that long connections are necessary between the levers and gearbox and some designers and engineers seem to think that this is a great disadvantage and a very complicated arrangement. That comparatively long rods are necessary with present-day control I admit, but I can see nothing complicated or objectionable about a couple of light steel rods whose length is unalterable unless they are bent, an accident very unlikely to happen because they are located in the most protected position possible. The brakes of most cars are operated by rods much longer than those required for the rear-axle gearset, yet no one ever thought of putting the brakes on the front wheels for this reason.

This question of gearbox location is one of the greatest importance and is by no means settled, different engineers of the highest reputation holding entirely different views; yet in the long run it is the motoring public, the user and not the creator of cars, that settles such questions, and as one who has been following the sport of motoring since its inception these opinions are respectfully submitted.

East Canaan, Conn. DEWEY C. CANFIELD.

Tough on Tarrytown Canines

Editor THE AUTOMOBILE:—You should without delay publish a warning to all motorists with dogs not to pass through or stop in Tarrytown with them, as a quarantine for rabies is being rigidly inforced here. The deputy sheriffs are taking unmuzzled pups from all vehicles and the process of getting them back from the pound is a long and costly one.

Tarrytown, N. Y. MRS. HARRY MICHENER.

Proper Piston Ring Circumference

Editor THE AUTOMOBILE:—1—In fitting new rings to the piston, should the rings be fitted tight to the cylinder walls or should there be a little play left for expansion? If so, how much would this be at the ring joint or lap?

2—How many degrees past upper dead center should the piston be when engine fires or when spark takes place with spark fully retarded? If possible state distance in inches on flywheel.

Spokane, Wash. NOVICE.

—1—Piston ring circumference will vary with the condition of the ring. That is, when the ring is new and cold it will be different than when new and hot, etc. To make a standard comparison of the proper space between the ends of the ring the standard condition of a new cold ring may be taken. A ring under these circumstances should have a space between the ends as shown in Fig. 1 of from .0025 to .003 inch per inch of diameter. This may seem large but when it is known that the expansion of the rings in a circumferential direction is .00001 inch for every inch of ring per degree raise of heat it will not seem too much. Take, for instance, a 3-inch ring. It will have a circumference of very close to 10 inches. Taking 10 inches as an arbitrary figure for the circumference of the ring, we would have, with a raise of 500 degrees in temperature:

$$\text{Expansion} = 10 \text{ inches} \times .00001 \times 500 = .05 \text{ inch}$$

This would seem to be enough to cause the ring to buckle because the allowance according to the above figures would only be about .009 inch at the split for a 3-inch ring. We must remember, however, that the cylinder also expands, causing the ring to spread to a larger diameter which goes to neutralize a large part of the .05 inch of straight linear expansion.

We have no authority for taking 500 degrees as the working temperature above cold because the heat variations are so complex and the changes so quick that the highest temperature of the ring would perhaps be merely a skin temperature and the interior of the ring would be cooler. These figures, however, are food for thought and your question is answered under the direct statement that practice allows .0025 to .003 inch of clearance per inch of ring.

2—It is very seldom that the full retard on a motor allows the spark to take place later than the upper dead center. As can readily be seen, there is no reason that it should because even if the motor were turning over exceptionally slowly nothing would be gained and some power and efficiency would be lost. If the spark occurs exactly at upper dead center, owing to the appreciable lag due to the commencement of the propagation of the flame, the crank will have turned over slightly and the power will be exerted in the proper direction without a knock.

Needs Larger Gasoline Spray Nozzle

Editor THE AUTOMOBILE:—In regard to Mr. Webb's trouble as printed last week, I have had and am still having the identical experience with a car equipped with a Zenith carbureter. My car (Gregoire 18 horsepower) was built in 1910 and the carbureter was probably built for 1910 gasoline. I have had my cylinders rebuilt as you suggested to Mr. Webb, and did not in any way improve matters. It is my opinion that both of these machines (his and mine) are not getting enough gasoline and that enlarging the spray nozzle in the carbureter will help. If Mr. Webb wishes to know the results of my experience I will be glad to let him know.

As to Mr. De Luke's trouble, if he had a 30 by 4 tire instead of a 30 by 3.5 he would have had an awful job getting it on and a worse one getting it off, as a 30 by 4 tire is smaller on its inside diameter than a 30 by 3.5.

New York, N. Y. GEORGE OPPENHEIMER.

Late Spark Heats Motor Badly

Editor THE AUTOMOBILE:—I would like to know the probable cause of excessive heating of water in radiator and motor, and how to avoid it. I have a 30-horsepower Reo, four-cylinder touring car of late 1911 model, which has been used very little. but I find that when on short runs, say of 15 or 20 minutes, at

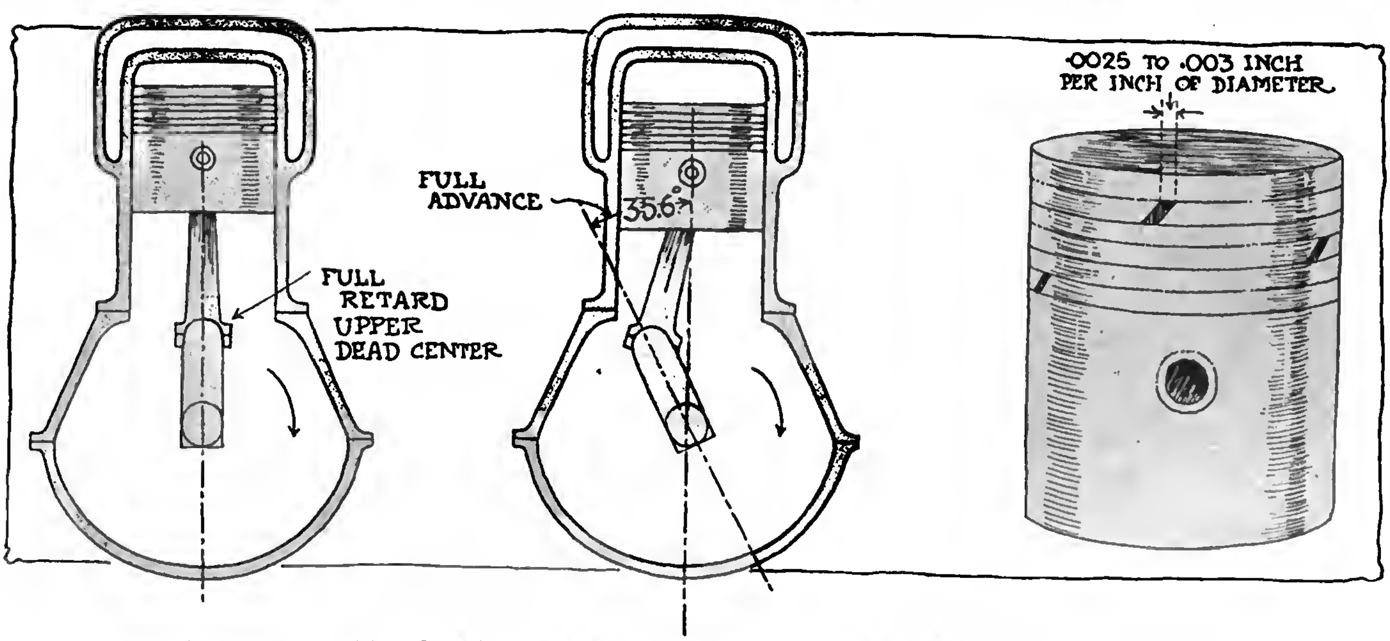


Fig. 1—Proper position of crank at full retard and full advance. Correct clearance at end of piston ring

Fig. 2—Duryea Buggyaut rigged for stationary power purposes

a speed of 10 or 12 miles per hour, the water in the radiator is boiling and the heat uncomfortable for the occupant on the front seat, and another strange feature is that the switch removable handle (National Coil Co.) gets much hotter than the surrounding metal.

Yesterday the car stopped in some loose sand and when I tried to crank it to start again I could not turn it over, and came to the conclusion that the heat was so great that the pistons had expanded so as to bind them; for after the motor had cooled off to a certain extent I had no trouble in doing so.

Now I noticed in The Automobile that on the trial or test of the six-cylinder Packard motor the water entered at 125 degrees Fahrenheit and came out at 145 degrees Fahrenheit.

1—Is not the excessive heat I mention an injury?

2—Does it cause excessive consumption of fuel?

3—What is the ordinary number of miles per gallon of gasoline in such a car as mine, say at 12 miles per hour on ordinary country roads?

4—Are rotary circulating pumps in automobiles liable to get out of order and fail to do their work?

Interlachen, Fla. J. W.

—From your letter it would seem that you were in the habit of traveling with a rich mixture and a retarded spark and that the trouble is in this rather than in any inherent wrong in the car itself. A retarded spark causes the motor to overheat very rapidly and thus will give rise to boiling cooling water. When a retarded spark is coupled with an over-rich mixture the result of the combination of the slow-burning charge with the lateness of the spark makes the motor still hotter. Try adjusting your carbureter to give a little more air and when running advance the spark as far as you can without getting a knock. If the motor tends to speed up too much when you advance the spark, cut down on the throttle. In other words, do not attempt to govern the speed of the motor by the spark, but arrange the spark to suit the needs of the throttle. That is, advance the spark under any circumstances to the maximum possible point and then keep it there until a change in the motor speed necessitates a change in the location of the spark lever. It would be wise for you to clean out the radiator on the possibility that there is an accumulation of sediment therein which prevents it from cooling the water. To perform the cleaning operation, two or three handfuls of soda are dissolved in a pail of boiling water and this solution poured into the previously emptied radiator. Run the motor for a minute or two and then drain out. Repeat this performance about three times, and then another three times with pure clean water until you get the water coming out fairly clear with very little white matter.

The temperature of the water in the Packard test at the Automobile Club of America was as you state. It must be remembered, however, that this was a block test and cannot, therefore, be considered a parallel to road conditions. Cooling water on the road will average in temperature between 180 and 190 degrees Fahrenheit with a correctly-designed and sized radiator.

Another point you must look for when a motor that seems to be in good condition overheats is the fan belt, which may be slipping. The fan bearing bushing sometimes becomes jammed and as a result the fan is so difficult to revolve that the belt just slips around without turning the fan.

Regarding the numbered questions:

1—The heat is dangerous in that the lubricant is working at such a disadvantage that it cannot perform its work properly and some of the bearings or the pistons themselves are likely to seize.

2—The high working temperature does not cause a greater consumption of fuel in itself, although it may be partially due to the admission of too much fuel through the use of a rich mixture. That is, the heat will not cause the use of too much fuel, but too much fuel may cause the heat.

3—Your car is not working at its best economy at 12 miles an hour as far as fuel is concerned, although as far as the rest of the car may be considered it is. That is, although you may not secure so many miles to the gallon of gasoline you will find the wear and tear on your car to be much less. At 12 miles an hour on high gear you should get about 14 miles to the gallon of gasoline.

4—Trouble with rotary or centrifugal pumps as used in automobile work is so scarce that it need hardly be considered. When cooling trouble develops, though, the pump should be examined as well as any other points in the cooling system. Sometimes a leaky hose connection or one which has a loose piece of fabric in the interior is responsible for overheating.

Explanation of Argyll Motor Wanted

Editor The Automobile:—Kindly let me know whether the Argyll engine has a rotary sleeve or not. In the description of the engine that appeared in The Automobile some time ago it was stated that the sleeve was operated by a worm mechanism and the motion was constant, but was somewhat vague as to how the ports were opened and closed.

Yonkers, N. Y. R. A. Fines.

—The Argyll motor was depicted in The Automobile for June 12, and also described. As the motor is important, however, the repetition may be valuable and is herewith reproduced from the previous issue. Fig. 3 shows a transverse section in which the sleeve S will be noted, occupying the annular space between the piston and the cylinder wall. Its action is peculiar in that the motion imparted to it is not merely up and down but is also partly rotational. This will be made clear by reference to

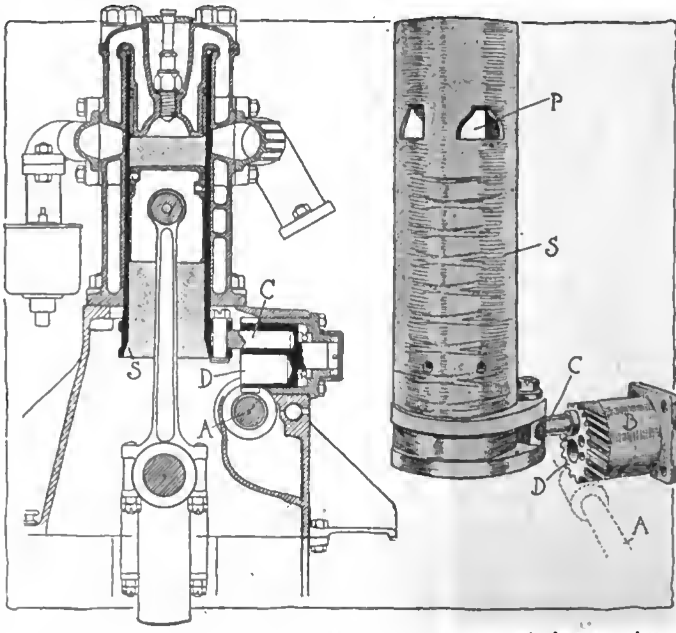


Fig. 3—Argyll sleeve motor, showing operation of sleeve valve

Fig. 3, which shows the sleeve and its operating mechanism detached from the engine. The reciprocation of the sleeve is effected by the action of a small crank C which has a sliding fit in the rotating member D. This latter is carried in the bearing B, which is bolted to the crank casing wall. The operating shaft A, which is equivalent to and occupies the same position as the camshaft in the poppet-valve type of engine, is provided with four worms or skew gears, one at each cylinder, which engage with teeth on the rotating member D, driving it at half the speed of the crankshaft. This reduction takes place at the skew gearing, the camshaft itself running at the same speed as the engine shaft by silent chain.

Two revolutions of the engine shaft, therefore, cause a single revolution of the actuating crank C, which in turn imparts such a motion to the sleeve that any one point on its outer surface will have traveled through an elliptical path on the cylinder wall.

This peculiar motion is the fundamental principle of the Argyll valve. It permits a complete register of opening of the valve port P with the corresponding ports in the cylinder wall while the sleeve is traveling in one direction and a complete closing on the opposite stroke. As the sleeve descends, exhaust is opened and during the return stroke the inlet ports open. This cannot be accomplished by a single up and down stroke of a sleeve with the ordinary straight reciprocating motion, where both valves would necessarily be opened twice.

Using Buggyaut for Stationary Work

Editor THE AUTOMOBILE:—Your reply to Mr. Mathais regarding the best way to utilize a car for power has been noted. If Mr. M. can apply his belt to the flywheel of the engine he will save the needless wearing out of his transmission, propeller shaft, differential and rear-axle bearings. The Service truck you show has a pulley at the rear end, but the Avery truck is equipped with one on the crankshaft at the front end of the vehicle.

Fig. 2 gives an illustration that may interest you, showing a Buggyaut having one wheel removed and a pulley substituted on the end of the crankshaft for the driving roller. This gets power directly from the engine, and the change can be made in 5 to 8 minutes. This is being used not only for shelling corn, as shown, and chopping feed, but for sawing wood and similar purposes where a small power suffices. In the Duryea system it is, of course, understood that the motor lies at the rear of the vehicle with its shaft crosswise, so, although this pulley protrudes from the side, it is actually on the motor shaft directly, just as in the Avery truck mentioned.

Your reply to C. G. F. as to the spelling of "carburetor" is all right, but a good authority like Webster gives preference to the ending "or," and this coincides with many words used in the industry, such as compressor, generator, conveyor, lubricator, distributor, motor and ignitor. It seems, therefore, good business to use a similar ending in this entire "bunch." In fact, if we could as a nation agree that the ending "or" means the "thing which," while the ending "er" means the "one who," it would better our language materially.

Saginaw, Mich. CHAS. E. DURYEA.

Chokes When First Starting

Editor THE AUTOMOBILE:—As I was about to start out this morning at 6 o'clock with my White gasoline "30" I found I could not give the motor much gas on the accelerator without its choking. It started without any trouble, but refused to take the accelerator until I had it running about a minute, after which it worked well. It was rather cool this morning and since it was the first occasion I had to use it that early in the morning, I blame the cool air for the trouble. Although the car is used only about once a week I find it chokes for about a second each time it is started and then it is all right. I have the water turned off around the carbureter because I only use the car during the summer months. I now have the adjustment screw at the lower side of the carbureter turned down or closed because when I open it any more the motor becomes very slow in picking up.

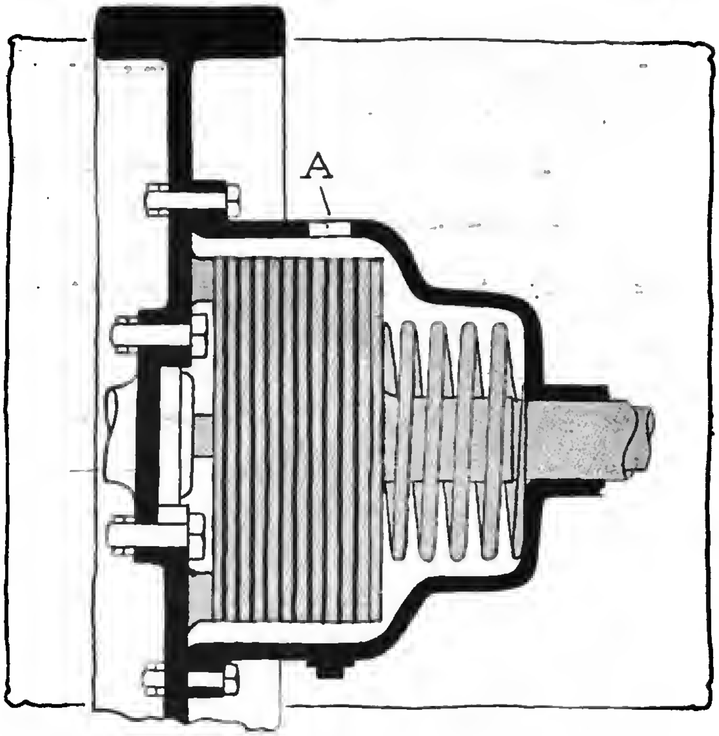


Fig. 4—Clutch should be cleaned by introducing kerosene through A

1—Could you please tell me if the adjustment should be opened and how many notches for good results in summer?

2—What is the small nut near the top of the carbureter marked X there for?

3—Is it necessary to put oil in the crankcase when oil runs freely from the oil level, which is visible by pulling out a rod from the front, beneath the radiator leading to the crankcase?

Richmond Hill, L. I. P. B.

—Bad gasoline, or rather gasoline which is not so volatile as that sold some time ago can be blamed for much of the trouble of this nature that now exists. The gasoline will not vaporize without the application of heat at a sufficiently rapid rate to permit of securing a good homogenous mixture in the cylinders. It is sometimes possible to cure the trouble by admitting a little more air at low speeds, but you stand that chance of having a motor which is harder to start. If the carbureter acts well after the motor has been running a few minutes and pulls well on the hills it would be very advisable to let it alone and to blame the gasoline and not the carbureter. The only real cure for a condition of this kind where it is not desired to have the choking action at all is a dash air control whereby more or less air can be admitted at the will of the operator. To answer your questions specifically:

1—On the average White car, the best results are obtained when this screw, which is the air adjustment, is backed off about twelve or fourteen notches. The screw is first closed down as far as it will go and then the adjustment is made by turning back on it for the distance mentioned.

2—The nut you speak of is one of the hot water cannections.

3—No, as long as oil runs from the level when you pull on the rod it shows that there is enough oil in the crankcase. This is merely a safety level.

Please Sign Your Inquiries

The Editor of the Rostrum is in receipt of several letters which offer no clue to the identity of the sender because they are signed Subscriber, Reader, by initials or noms de plume. These letters are held and will be published as soon as the senders identify them. If your letter is among these you can have it published by writing this office describing the letter and giving your name and address. If you desire that your name be not published just mention this in your letter.

Testing Flow of Fuel Through Nozzles

From a Paper Read Before the S. A. E. and I. A. E. by R. M. Anderson.

A STANDARD flow of fuel was first established in order to make comparisons and judge of the accuracy of such laws as have been set forth. The standard flow was secured by means of special apparatus wherewith the various heads could be easily duplicated and accurately measured. This consisted of a vertical brass pipe A, Fig. 2, having an area 500 times the area of nozzle to be tested and of sufficient length to give any desired head. Into the walls of this pipe were soldered thin-walled overflow tubes .3 inch by 1 inch at intervals of 3 inches. These tubes were inclined at a slight angle. The nozzle-holding member B, Fig. 2, consisting of shutoff cock, elbow and drain basin, was so located as to bring the tip of the vertical nozzle 1.25 inches from level of gasoline as determined by outlet tube No. 1. Gasoline was supplied by electrically driven pump C, Fig. 1, keeping a quantity of fuel in tank D. From D the quantity was regulated by valve D1 and flowed into open end of pipe A. Some difficulty was experienced with large flows disturbing level A until the supply from D was slightly damped.

In operation the procedure was as follows: All overflow tubes were plugged except the one corresponding to the head desired. Gasoline was turned on at D1 and at the nozzle until a steady even flow was secured through the overflow tube in operation. This surplus was returned to the pump tank. The gasoline draining from the nozzle-holding member B in a unit of time will be the quantity flowing at the head taken.

To get accurate readings the following precautions were observed:

(1) Gasoline kept at uniform temperature, 60 degrees to 62 degrees Fahrenheit.
(2) Specific gravity of the same, 54 degrees Baumé.
(3) Pump started and run a sufficient length of time to insure uniform flow.
(4) After each reading the nozzle was carefully cleaned. The flows at maximum and minimum heads were checked after the test was finished to make sure the area had not changed.
(5) All readings taken by the same person.
(6) A standard primary nozzle was used and checked with standard gage before commencing test.
(7) All quantities of gasoline measured by the same graduate reading, CM³.

The purpose of the experiments is to determine from a carefully calibrated nozzle the relation of flow to head. Such data will at least give us a better understanding of the flow of gasoline in carbureters and consequently their adjustment. The heads were maintained as outlined and every opportunity was given for the flow to assume characteristic variations. It has been known that at relatively low heads the flow of fuel is subject to slight diminution. The quantities flowing at the various heads represent faithfully an average performance.

The following quantities of fuel and their respective heads are taken as the average of five readings:

Nozzle, No. 57. Diameter, .043 inch. Area, .0014502 square inch. Gasoline, 54 degrees Baumé at 60 degrees Fahrenheit.

TABLE 1.

Reading	H = Head Ins.	Q = Quantity per min. CM³	Q = Quantity per min. Cu. Ins.	Q² Cu. Ins.	Q² + Q	Differences
1.	1.25	27.30	1.67	2.78	4.45	
2.	4.25	50.50	3.69	13.61	17.30	11.85
3.	7.25	81.47	4.96	24.60	29.56	12.26
4.	10.25	99.00	6.04	36.48	42.52	12.96
5.	13.25	114.50	6.99	48.86	55.85	13.33
6	16.25	127.00	7.76	60.21	67.97	12.12
7.	19.25	138.50	8.46	71.57	80.03	12.06
8.	22.25	149.60	9.14	83.54	92.68	12.65
9.	25.25	160.50	9.81	96.23	106.04	13.36
10.	28.25	171.80	10.49	110.04	120.53	14.49
11.	31.25	180.50	11.02	121.44	132.46	11.93
12.	34.25	190.25	11.62	135.02	146.64	14.18
13.	37.25	198.00	12.09	146.16	158.25	11.61

In Fig. 3 the above values of Table 1 are plotted. Q, as might be anticipated, takes the parabolic form. Applying this value in the general formula

$$Q = CA\sqrt{2gh}$$

and solving for C, gives the following:

TABLE 2

H	C	H	C
1.25	.614	13.25	.794
4.25	.750	.....	....
7.25	.766	22.25	.803
10.25	.779	37.25	.822

The above brings out the erratic flow at small with respect to large heads. Any attempt to proportion Q to $\sqrt{h}$ would introduce a variable difficult of determination. This curve is, however, plotted as $Q^2 = H$ and plainly shows its characteristic, viz., a fairly straight line when H is greater than 7 inches.

Realizing this characteristic, Lauret has applied Rummell's water experiments with interesting results. Here the simple addition to Q^2 of the quantity Q gives values more nearly approaching the straight line. In Table 1 these values and their differences are given. The average difference 12.70 cubic inches may be taken as the increment for a No. 57 nozzle where the change in head is 3 inches. Thus

$$\frac{Q^2 + Q}{4.23} = H$$

may be taken as the expression characteristic of the flow of fuel through small orifices with large variations in head.

In general this may be expressed

$$\frac{Q^2 + Q}{C} = H$$

where C is the constant changing for the various diameters of nozzles. Thus with this formula it is only necessary to determine the value of C at maximum head, since this fixes the angle of the slope for the remaining values.

It is necessary, however, to correct the lower values of Q at small heads, since the surface tension under these conditions is quite effective in holding the fuel back. Thus if

$$(Q^2 + Q) = y$$
$$C = A$$
$$H = x$$

we may write the expression taking B, the effect of surface tension from actual tests, as:

$$y = Ax - B$$

Solving for B when $y = 4.45$, $x = 1.25$; $A = 4.23$, $B = .8375$

Thus B and A determine the characteristic of the flow of fuel rough such a nozzle as shown in Fig. 1.

When, therefore, these two constants have been determined and the quantity per minute is given, it is simple to solve for H.

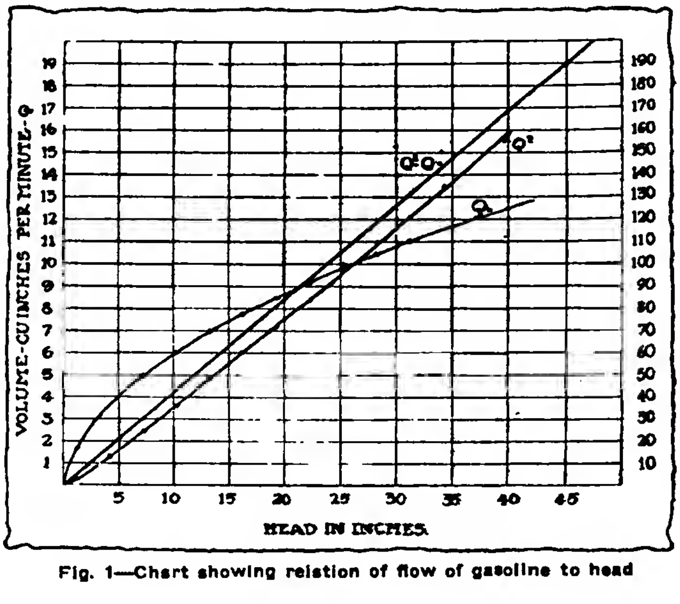


Fig. 1—Chart showing relation of flow of gasoline to head

The Superiority of the Steam Omnibus

From a Paper Read Before the S. A. E. and I. A. E. by Thomas Clarkson.

IN order to avoid misconception with respect to my attitude toward the internal combustion motor using spirit fuel, permit me at the outset to state that I fully appreciate the enormous utility of this type of motor in certain departments of automobilism—that my strictures upon it as applied to bus work should not be regarded as the outcome of a prejudiced judgment but rather as an impartial scientific analysis of the special conditions applicable to bus work and heavier automobilism. This to the end that other fuels besides spirit should be utilized such as kerosene, crude oil, coal or coke, thereby easing the demands upon the spirit motor and its fuel supply, and leaving it greater freedom of development along its special lines of utility.

Passenger Transport Facilities

Increased facilities for passenger transport in cities are constantly in demand. Transport by electric rail motors, both on the surface and underground, has, to some extent, met this demand. But the automobile public service car, or as it is generally called, the motor bus, has already demonstrated its superiority over the rail car or tram.

The main points in favor of the bus over the rail car are its

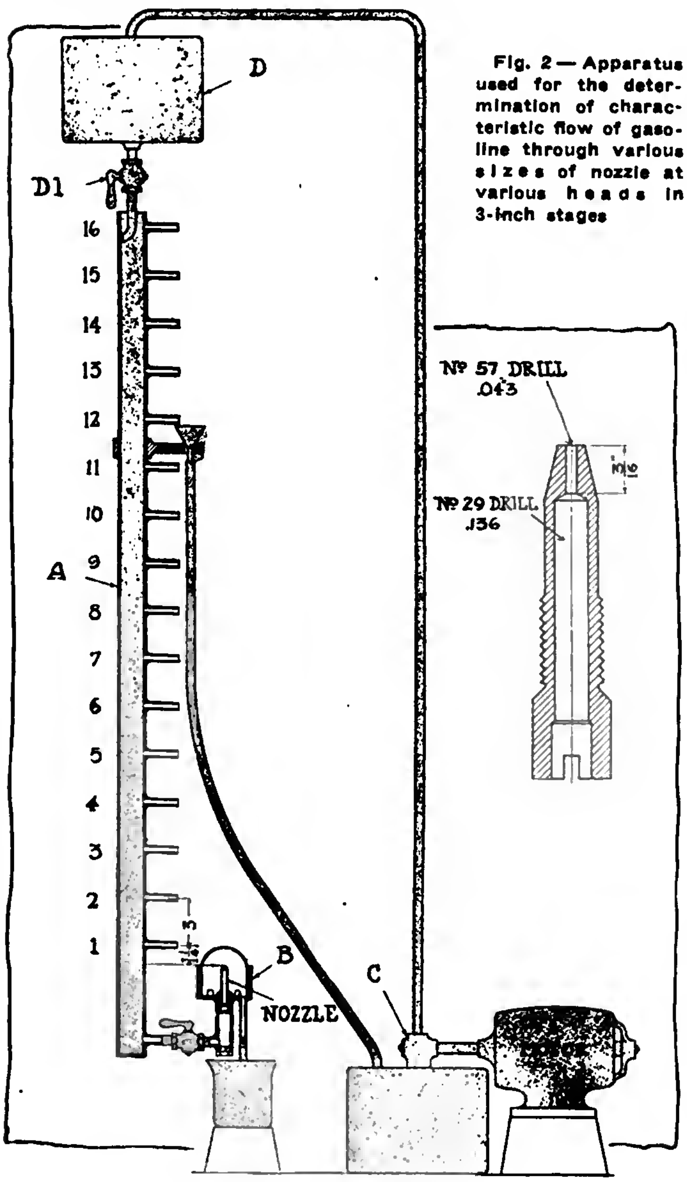


Fig. 2—Apparatus used for the determination of characteristic flow of gasoline through various sizes of nozzle at various heads in 3-inch stages

flexibility and independence of action. Flexibility is the dominant feature, flexibility of route, both as to deviations, extensions and modifications according to traffic conditions, and also flexibility of control in traffic, especially rapid flexibility of speed so as to accelerate promptly in response to traffic conditions whether congested or otherwise.

Complete flexibility is obviously impossible so long as the motors are dependent upon an extraneous power station. The vehicles must be self-contained and the power generated from within. Flexibility I regard as the keystone to the successful solution of the street traffic problem in cities, and I submit that the type of motor which gives most flexibility with the least trouble and expense is the type which will make good. Hence my preference for the steam motor bus in its present perfected form.

A properly constructed steam motor possesses a reserve of energy which is immediately available for a spurt, and acceleration can be speeded up smoothly and without jerk or inconvenience to the passengers.

The control by the driver of a steam motor is simplified and the demands upon his energy and nerve force are reduced to a minimum. This last has an important bearing upon the prevention of accidents and loss of life. The speed is entirely controlled by a foot throttle and no change gears are used.

Reduction of Weight

The weight of a fully laden standard London bus is 13,440 pounds. The unladen weight is 7,840 pounds. This is about 2,000 pounds less than the former weights of both internal combustion and steam buses of the same carrying capacity (thirty-four passengers) which were common a few years ago. This substantial reduction in weight has vastly improved the breed of the bus, for which thanks are due to the police authorities for insisting upon a lighter construction in order to obviate damage to adjacent properties consequent upon severe road vibrations. It was prophesied that this police demand would rule out the steam bus as it did the storage battery electric bus. But it is significant that the first bus to be licensed under the new régime as to weight was a steam bus, a No. 5 National. This was nearly 4 years ago. I claim that the steam bus is still the best, the most efficient and popular, and this view is shared by some of the leading traffic men who control internal combustion motor buses. It is noteworthy that every one of the companies running internal combustion buses in London have been unable to stand the competion of their largest petrol omnibus rival, and have all been absorbed. Today the only omnibus company able to maintain its independence of the great omnibus combine in London is the company running steam omnibuses. The advent of the motor omnibus appears to sound the death knell of the street rail car. The public shows a decided preference for the motor bus and the reason is not far to seek. The bus, owing to its greater freedom and flexibility of action, is easily able to beat the rail car in carrying passengers to their destination in the shortest possible time. Another advantage of the bus is that it can pick up and set down at the edge of a sidewalk instead of requiring passengers to walk in the roadway to or from the car. As a rival to the street rail car the motor omnibus has become a very serious proposition, and the perfected motor omnibus should be of immense value in solving the street traffic problem of cities. The presence of rails in the surface of a common road all automobilists will agree is detrimental to the efficiency of the road surface, and to the vehicles using the road.

The following summarized description will explain the leading points of the National steam bus:

The fuel is kerosene which is vaporized, mixed with air and burned beneath a water-tube generator. The generator is entirely of steel and works at a pressure of 300 pounds (test pressure 1,000 pounds). It is inclosed in a vertical cylindrical case under the bonnet of the chassis, and has a central drum which is closed at the lower end, and fitted at the upper end with a lid for cleaning. This drum is furnished outside with generating tubes of horseshoe form which permit free expansion without strain.

The steam is manufactured in four successive stages:

(a) A preliminary heating of the water to about 140 degrees.

(b) A secondary heating of the water under pressure to about 400 degrees.

(c) Conversion of the heated water into steam at 300 pounds pressure.

(d) Superheating of the steam to about 800 degrees.

The steam is utilized in a simple two-cylinder double-acting reversible engine which drives the rear wheels of the chassis direct through worm gearing at a ratio of about 7 to 1. There is no clutch and no change gears.

The exhaust steam is condensed, filtered and returned to the tank for further use.

The fuel consumption is regulated automatically by steam pressure. The success of the National steam buses is doubtless due in great measure to the excellent "fool proof" generator.

Time does not permit me to refer to the spring, steering, axle construction or brakes of the chassis which are upon standard lines, but there is one detail of the construction of this bus which calls for special notice, *i.e.*, the wheel.

The life of a motor bus is extremely strenuous, probably the most strenuous of any automobile. Its annual mileage is about 30,000. Most of this is done on roads teeming with other traffic; consequently a bus has to stand hard knocks and rough usage. Wooden artillery wheels have proved unequal to the duty. Wheels constructed of cast steel have proved troublesome and uncertain. The National bus road wheel is constructed entirely of forged steel. The spokes are solid drawn tubes welded to a hub which is machined out of a solid forging. The outer ends of the spokes are welded to flanges which are afterwards machined before the rim is shrunk on. The perfect balance of this wheel and the reduction of about 170 pounds in the weight of the four wheels of a bus have materially reduced the wear on tires, and the absence of any internal stresses in the wheel is a great factor in reliability and public safety.

Illumination of the Bus

The proper lighting of a bus has been a troublesome problem, neither oil nor acetylene having proved satisfactory. Electric illumination gives best results. The problem has been to devise suitable electric equipment. This problem has been solved on the steam bus in a very simple and satisfactory manner. About 10 years ago I experimented with electric light for bus illumination. The first equipment was worked from a storage battery, but it did not pan out and electric lighting was discarded. Subsequently a scheme was devised whereby a small storage battery was used in combination with a special dynamo driven by the car and with cutouts similar to lighting systems now used on some pleasure cars. After running this combination in service for several years I abandoned it in favor of a dynamo of the ordinary type directly attached to a small steam motor and without batteries or cutouts. This steam motor runs at a constant speed of 900 revolutions per minute, and the equipment provides current for 150 candlepower per bus. The arrangement has proved completely satisfactory. The cost and weight of the installation have been reduced as well as the cost of maintenance; at the same time greater brilliancy of illumination has been secured. Excellence of illumination has proved a strong point in popularizing the steam bus and in helping traffic receipts.

Some steam buses of the earlier type have been in regular service for the past 10 years and are still running. But the steam bus of today has been evolved during the past 2 or 3 years since the designer and manufacturer took up the business of running buses and maintaining them.

In the short time available for this paper it is impossible to give a history of the evolution of the modern steam bus upon which I have been engaged for nearly 20 years, and as the main object of this paper is to promote a discussion on the relative merits of steam and internal combustion buses, I will briefly summarize a comparison between these two types of motor.

Summary of Costs

The First Cost of the bus appears to be about equal for the same quality of material and workmanship and with a similar rate of production.

Cost of Maintenance—It has so far been impossible to obtain figures which are strictly comparable as to the relative maintenance costs of the two systems. The only way to obtain them would be for the same auditor to examine and analyze the books of both a steam bus and an internal combustion bus company, and to treat both in precisely the same manner as to depreciation, annual overhaul, establishment expenses, etc. Experience shows that the steam bus is in the garage for maintenance a much shorter time than its rival. It is the practice to withdraw an internal combustion bus from service 1 whole day in 10 for maintenance, apart from the withdrawal from service for annual overhaul, which usually takes about 2 weeks. On an average during the year the internal combustion bus loses more than 15 per cent. of its total possible mileage. Total possible mileage means every bus that is licensed doing every journey every day for 7 days a week throughout the year. During the year ended October 31, 1912, the National steam buses lost only 2.847 per cent. of the total possible mileage, and of this only .877 per cent. was due to mechanical failure. That it has been possible to run steam buses under the extremely strenuous conditions prevailing in London so as to give over 97 per cent. of their total possible mileage, whereas the internal combustion bus is not able to do 85 per cent., speaks eloquently both for the superior reliability of the steam bus and its cheaper maintenance.

Points of Superiority

Tires—There is less wear on tires with the steam bus owing to the smooth drive.

Rapid and Smooth Acceleration—In this respect the steam bus is easily demonstrated a winner. The extra steam pressure which accumulates at each stop gives an extra "push off" at re-starting.

Flexibility and Speed—In this respect also a superiority of the steam bus is demonstrated daily.

Illumination—The steam bus is admittedly the most perfectly illuminated.

Popularity—The public shows decided preference for the steam bus.

Vibration and Jerk—There is less vibration on the steam bus. The engine does not run when the bus is stationary for picking up or setting down passengers, and there is no uncomfortable jerk at starting.

Depreciation—Steam buses which I started in regular public service over 9 years ago are still running. I cannot find any internal combustion buses which have been in service so long. My rule for estimating depreciation is to give a 6 years' life, and at each annual overhaul to bring the bus right up to date.

Fuel—A steam bus uses kerosene fuel and so helps to relieve the pressure on the spirit market. With equality of ratio between

$$\frac{\text{price of kerosene}}{\text{price of spirit}} \quad \text{and} \quad \frac{\text{mileage on kerosene}}{\text{mileage on spirit}}$$

there is nothing to choose between either type in cost of fuel. The great increase in the demand for spirit and the absence of a like increase in the demand for kerosene favors the kerosene-fired steam bus.

Drivers prefer the steam bus on account of less fatigue in operation and greater certainty of completing the journeys.

I will conclude the summary by giving the actual figures for lost mileage from all causes during the year ended October 31, 1912, for the fleet of National steam buses in London.

	Per cent.
Buses withdrawn from service for annual overhaul	1.844
Buses withdrawn from service for passing drivers	.045
Buses withdrawn from service for police stops	.023
Buses withdrawn from service as a result of accidents	.058
Buses withdrawn from service in consequence of mechanical failure	.877
Total, from all causes	2.847

I think it will be agreed that these figures are remarkable, especially in view of the fact that the loss of service due to mechanical failure was well under 1 per cent., having regard to the exceptionally severe conditions of the service.

Final Note

It must be obvious that a steam motor which gives such results, under the abnormally severe conditions of public omnibus service, should have useful work to do in other departments of commercial automobilism, say for net loads of 3 tons and over. And it is important to note that for this work the steam motor can use coal or even coke fuel. In this manner a large section of commercial automobilism can be placed right outside the range of the oil trusts which now dominate the fuel supply, and commercial transport of first-class reliability can thus be supplied at a lower working cost than is possible under present conditions with the internal combustion motor.

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AUTOMBILE SHAFTS SELDOM FAIL—Although it seldom happens that automobile shafts fail, yet cases have occurred under circumstances which lead to the conclusion that the failure has been due to running the shaft at the critical speed of speeds so close to it that vibration has been the cause. As an instance, in one case of failure the critical speed calculated from the dimensions of the shaft was 1,030 r. p. m. The shaft speed under service conditions was limited to 1,000 r. p. m. As might have been expected, had the critical speed been calculated when designing it, the shaft failed in service, though amply strong to transmit the maximum torque developed by the engine.

Trucks in British P. O.

Motor-Driven Vehicles Will Have Superseded Horses in United Kingdom in 3 Years

By Charles Wheeler, Controller of Stores Office, G. P. O., London.

IN 3 years we will have no more horses in the service of the postoffice of Great Britain. At the end of that time the service will be divided among motor trucks, motorcycles, tricycles and bicycles.

There is not a bouse in the British Isles to which mail is not delivered at tbe door. Like a large spider web with its center in London the postal service covers the entire country and includes every habitable spot.

To get an idea of the postoffice organization in Great Britain it may be stated tbat the mail is carried by rail or motor truck from one large postal center to another. Next in order are the smaller wagons which are now to a large extent drawn by horses. Below these are the carrier bicycles and tricycles. The mail is carried by contract, the contracts being let by the government.

The contracts run for periods of 3 years. At the end of this time they are renewable if the service has been satisfactory or if no cheaper metbod of carrying the mail has been discovered. Tbe postoffice has found that one motor truck will replace three horses and still be more economical and hence those now bolding contracts for mail carrying will find that when it comes time for renewal the government will not accept bids on any but motor service.

Now Have 1,000 Trucks in Service

There are now 1,000 motor trucks in the British postal service. These bave proved their economy and money-saving talents very extensively on inter-city parcels post service. A concrete example of this is the run between London and Birmingham. This is a run of close to 100 miles and is now being made by motor trucks instead of by rail. The amount of money saved can be realized when it is understood that the railroads get a little more than one-half tbe face value of the postage, regardless of the distance the matter is carried. On a load of 1,000 pounds with an average charge of 12 cents per pound, the face value of the load would be $120 and of this the railroads would get more than $60 according to the contract with the government. This $60 would go a long ways into the expenses of the run by motor truck.

One of the great advantages of the motor truck is its ability to drop the mail not only at the door of the terminal postoffice of its destination, but to do the same all along the run. Each intermediate postoffice is served at its door and thus all sub-terminal charges are saved. There is no expense connected with bringing the mail from the railroad station to the postoffice in addition to the regular inter-postoffice carrying charge.

All through the interior of the country there are many small towns that have their postoffices some distance from the nearest railroad station. In the past these postoffices have had their mail brought to the station or dropped off the train and then an independent concern has carried the mail over to the postoffice. This adds an appreciable amount to the large percentage collected by the railroads.

In England the direct competition of the motor trucks with the railroads on runs up to 100 miles has now reached such a condition that the railroads will either have to come down in their charges or they will find that the shorter runs will all be taken up by the automobiles.

On the 100-mile run, say such a run as that between London and Birmingham, the London driver goes 50 miles, meets the truck from Birmingham and then drives it back to London. In this way each driver goes 100 miles, the length of the entire run, but is able to sleep at his home every evening.

The automobiles which are in service have been adopted only after a rigorous test. Tbe test for the British postal service extends over a period of 12 months. Every 3 months the data collected are carefully checked up and the results analyzed to determine if the article tested is coming up to requirements. If not it is rejected at once. At the end of a year the whole test is carefully gone over and the figures and costs calculated out to a farthing. If satisfactory the article is accepted as standard. The laboratory test, though extensive, is not relied upon except as a check to the road test. The motor trucks which are now in service are the Wolseley, Dennis, Alldays, Maudsley, etc.

In making the tests the users of the motor truck, motorcycle or whatever it may be, are not informed that it is out on test. It is merely served out to the driver and he uses it as he would any other new piece of equipment. The department, however, keeps a keen eye on these new vehicles or accessories and the drivers' troubles as well as defects in construction are noted. In the motor truck the greatest trouble which has developed, and one which we are still wrestling with, is the tire question. The main trouble with these is the fact that they leave the iron felloes. The postoffice, after exhaustive tests, has abandoned the clincher type of tire and taken up the band type. Only solid tires are used in the service.

One point which has already been learned from experience in the test work is the necessity of over-tiring. Even beyond the limits laid down by the manufacturers the department believes that it is true economy to add extra weight to the tire.

Under test at the present time scattered about different parts of the kingdom are a score of motorcycles. These are reported favorably tbus far and will no doubt become a fixed part of the equipment before long. The motorcycles will do the work of tbe smaller trucks and will be fitted with side cars having a large carrying capacity. These motorcycles are fast and will perform the work in the rural districts to great advantage as far as both the parcels post and the regular post are concerned. A very interesting point regarding the tests carried on by the department is the attention given to new inventions. Every inventor is sure of a fair hearing and scarcely a day passes but someone is not suggesting some time or labor-saving device. These are first passed on in the office and if they seem reasonable are sent out for the 12-month road test.

A most elaborate bicycle service is used for distributing local mail. The aggregate annual bicycle mileage in the postoffice service in the British Isles exceeds 150,000,000. This is attended to by 16,000 bicycles with 50-pound capacity baskets. To give an idea of the efficient service rendered by these an example may be given. We have in the service a bicycle which has covered 160,000 miles and still has the original frame, handlebars, etc. The bicycle tires are 28 by 1.375 inches and are of the double-tube clincher type. The average bicycle tire will give 15,000 miles service.

U. S. Post Office Buys Alcos

Representing an investment of $225,000, one of the largest truck purchases on record has been effected by the Alco company for the purpose of carrying mail in the city of New York. Eighty 3.5-ton trucks were purchased.

The battery of vehicles will have a capacity of 4,300 tons of mail in a day, which means an annual capacity for carrying 1,550,000 tons or 3,100,000,000 pounds. In terms of volume hauled, the array of machines on each trip can transfer 24,000 cubic feet of mail. Figuring on the basis of 18 trips which will be required in a day, the total daily capacity is 432,000 cubic feet of mail, and the annual capacity is 157,680,000 cubic feet.

It is estimated that the trucks will cover a mileage of 1,000,000 miles in a year. The average haul is two miles so that the annual total number of trips will mount to 500,000.

Lined up, one against the other, the 80 trucks will reach a distance of 1,310 feet, or approximately a quarter of a mile.

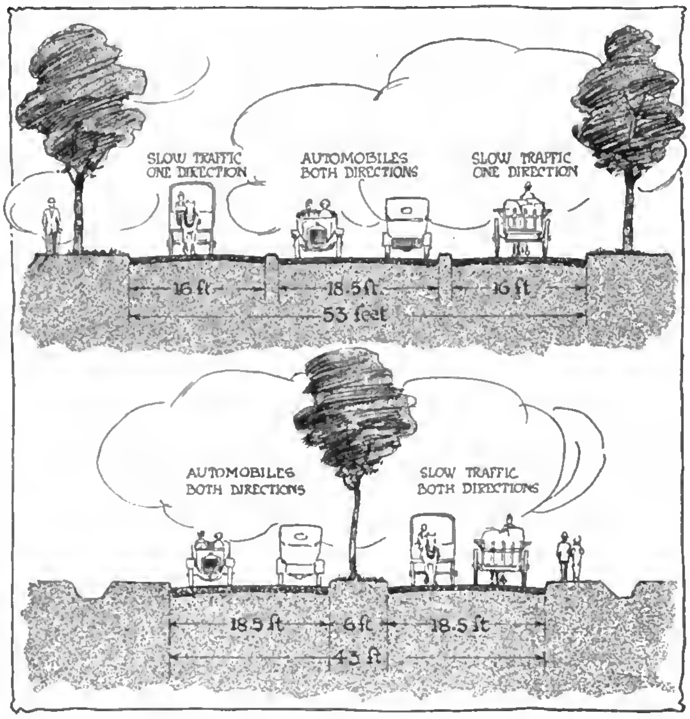
The fleet of trucks was purchased by the Postal Transfer Service, Inc., which has the government contract for carrying U. S. mail in New York.

Special Tracks for Different Vehicles

Suggested schemes to relieve traffic congestion and reduce road dangers

IT is not generally realized how enormous is the loss incurred every year in and about large cities by the congestion of road traffic. Even the cost of living, so much in the air at the present time, is becoming increasingly dependent upon the cheap and easy transport of merchandise.

Before the automobile made its appearance the speeds of the various vehicles using the roads were sufficiently near to each other to render traffic blocks of almost negligible frequency. Nowadays, however, not only has the total number of vehicles in city and suburban roads increased tremendously but there is in addition the aggravating factor of delay caused through the greater differences of speed between the slow and the fast sections of traffic. The higher speed capabilities of the self-propelled vehicle has had the effect of increasing congestion by producing a less regular flow of traffic. This is not entirely the fault of the automobile. It can be more correctly attributed to the fact that there still is, and must ever be present, a considerable proportion of really slow vehicles, making it necessary for the faster ones, in the narrower roads at least, to waste a great deal of time in waiting for opportunities to pass.



Dimensioned cross-sections of roads, showing alternative methods of distributing fast and slow traffic

Since it is the various speeds which apparently produces the undesirable feature of congestion it would appear that a remedy must lie in the establishment of separate roads or tracks for each class of vehicle.

This brings in the questions of increased expense of construction and upkeep, availability of land of the necessary width, and finally, granted these requirements, there is the question of classification, this latter not being the simple matter it might seem at first sight. There are, for instance the passenger automobile which maintains a fairly steady fast speed, and the horse-drawn delivery wagon which travels slowly and makes frequent stops. This would suggest two broad divisions of traffic.

But there are also light fast horse-drawn vehicles of the pleasure type and automobile delivery wagons, the latter stopping frequently along roads bordered by houses. Each of these classes, if the traffic divisions were simply automobile and horse-drawn vehicles, could more suitably be classed with the other division.

To come to practical application of the special track principle a good example is the Avenue des Champs-Elysees in Paris. The arrangement here is shown in the upper illustration on this page. A center track 18.5 feet wide is reserved solely for the use of automobiles traveling in either direction. On each side is a slightly narrower track 16 feet in width for slower traffic, each direction keeping to its own side. Such a road requires a minimum total width of 53 feet. but where this is available no better arrangement could be adopted. The positive raised divisions would, of course, be broken at every crossing and at additional points also, in a residential district where there are few cross roads. It is extremely difficult to say whether a plain road of the same total width, if the same rule regarding divisions were strictly observed, would not be almost as convenient, as it would permit a momentary overlapping in exceptional circumstances. But the human element is then introduced and the careless driver would have a more serious effect on the safety of other road users.

Two other arrangments suggest themselves. That of dividing the road width into two as shown in the lower cross section, and reserving each side for one direction of all kinds of vehicle, or, alternatively, confining one track to automobiles and the other to slow vehicles. A good example of the first of these alternatives is seen in the northern sections of Broadway, New York, and where the road is bordered by houses on both sides this is certainly the better system as it requires less crossing over of vehicles making stops at the houses. If the road runs alongside a railway or river, however, the disposition of traffic shown in the illustration would perhaps prove more convenient, reserving the side next the river for automobiles, since a large proportion of these vehicles are out for plasure and need seldom stop.

A point of some importance brought out by the division of the road into special classes is that of simplifying the problems of the road engineer. It is well known that one of the greatest obstacles to the correct construction of roads has been the necessity of providing a surface that would be suitable alike to the fast rubber tired vehicle and the iron shod hoofs and iron tired wheels of the horse drawn. By confining each class to a special track the surface can be made to suit the requirements of that class.

With the advent of the automobile the old type of water bound macadam road was found inadequate owing to the dust. The dust had always been present, the pounding of the horse being in a large measure responsible, but the rubber tire of the automobile raised it to the standing of a nuisance.

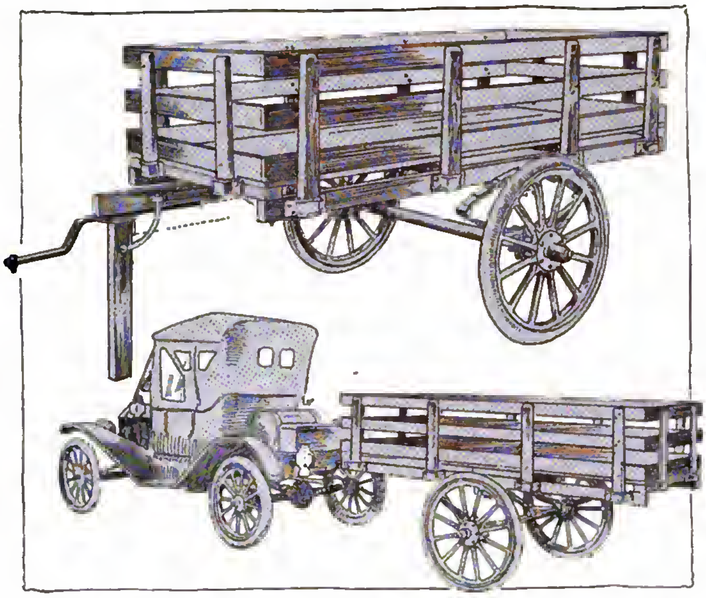
During the past decade efforts have been made to reduce dust by the application of various sprinking mediums, oil being the most successful. But it was soon found that the real solution lay in the entire construction of the road. This has brought about the bituminous road which is more nearly perfect with regard to dust prevention than any previous constructions.

In this type of road, which is growing rapidly in favor, the various layers composing it are bound into a solid mass by the application of a tar or oil-asphalt preparation.

Delivery Trailer for Passenger Cars

Two-wheeled attachment affords facilities for light delivery at small cost

WHILE the passenger automobile is not looked upon as a delivery car, it may be temporarily converted into such a vehicle by the use of some form of trailer. This utilization of motor cars has been made by several of the automobile manufacturers, in Detroit at least, who have put some of their factory cars to freight use by constructing two-wheeled contrivances from surplus parts, such as frames, extra axles and wheels and towing these trailers, putting them to the same service as they would light delivery vehicles.



General view of Detroit two-wheeled trailer Model A, and sketch showing attachment to runabout

Recognizing the demand for such vehicles, the Detroit Trailer Co. has brought out a trailer of this type, constructed entirely of standard automobile parts, as a solution of the light delivery problem. The method of use and the general appearance of the Detroit Trailer is shown in the accompanying illustration, which also shows its attachment to a small runabout.

In enumerating the many uses to which such a contrivance may be put the concern states that it is of special interest to contractors, grocerymen, hardware men, dry goods houses, farmers, summer residents and tourists. The last two types of users may appear rather doubtful to many, but the concern points out that summer residents will find it very convenient in transferring different articles and baggage to and from the city, while tourists are assured that the trailer may be attached to the machine to carry the always great amount of extra baggage needed on a tour, thus leaving the automobile unhampered and not loaded up with baggage.

These trailers are made in two types, models A and B, the former being a two-wheeler and having a capacity of 1,200 pounds. It has a standard I-beam axle and the wheels are of the artillery type of second growth hickory, provided with standard solid rubber tires, size 32 inches by 2 inches. These wheels are mounted on Bower truck type roller bearings, while the frame is suspended from the axle by regular full elliptic automobile springs. The dimensions of the stake body for model "A" are 96 inches length by 42 inches width. The sides are 18 inches high. This smaller type is also furnished with a canopy top, either with a square or round bow, for camping or fishing parties. The makers convey the further information that the vehicle can also be furnished with special springs for sleeping in the trailer, while an ice box attachment fastens directly under the rear end, at extra cost.

The Model "B" trailer is a four-wheeler. It is also constructed of standard truck parts and the body is suspended by semi-elliptic springs from standard I-beam axles, the wheels of artillery type being carried on Bower roller bearings. This heavier model has a wheelbase of 130 inches and a capacity of 3 tons. It is suitable for use in connection with any standard truck of 1-ton capacity or over and is intended for the delivery of coal, lumber and so on. It is claimed to be really a 3-ton truck, minus the engine and transmission. The overall body dimensions are 16 feet length by 54 inches width.

The use of such a trailer for commercial purposes suggests that one of lighter build capable of carrying a few hundred pounds load might prove an exceedingly useful accessory for the private owner. It frequently happens that the touring car, though generally capable of providing space for the assortment of bags and other impedimenta of a touring or camping trip does so at the inconvenience of the occupants. A great deal of the comfort of traveling, for instance, is lost if one's feet are confined to a space limited by carrying luggage inside the tonneau. To avoid this many things that would be found useful during the trip are left at home.

This is where the utility of a light trailer might make itself evident. Desirable constructional features of such a vehicle would be low build, and so made that it could be brought up fairly close to the rear of the car in order to avoid possible trouble when turning sharp corners. A narrow tread would also lessen the danger of accidental contact with the curb or passing vehicles when turning sharply.

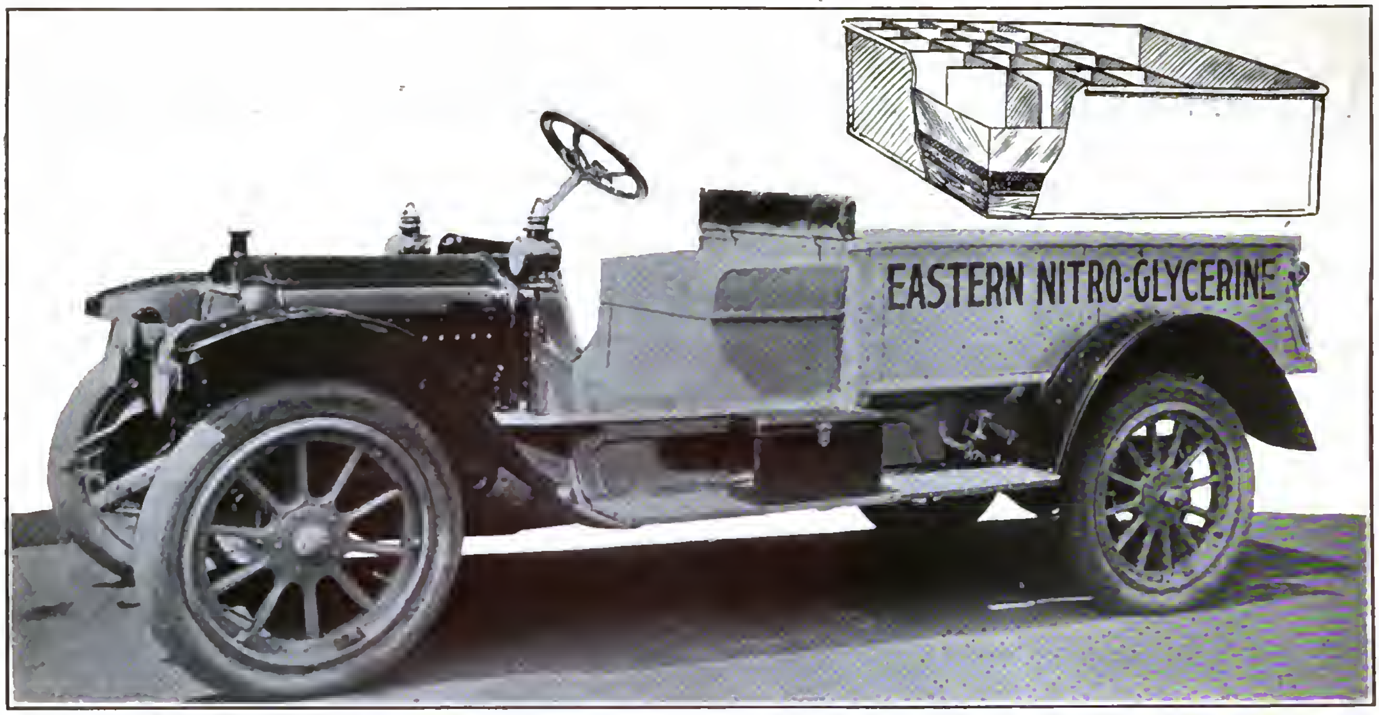
Coal Delivery by Trailer

The high cost of transportation in the retail coal trade has prompted at least one company, the Citizen's Coal Co., of Waterbury, Conn., to adopt the tractor method of delivery in that town. The results are entirely satisfactory, the increased efficiency due to lowering the transportation cost and the greater promptness of delivery obtained, being very marked.

This firm uses a Knox-Martin tractor in connection with three detachable body trailers of 7 tons capacity each. These trailers are of the two-wheeled type and are provided with a pair of hinged jacks at the forward end which support the body when the tractor is withdrawn. On arriving at a residence at which the load is to be delivered it is only necessary to drop the two jacks in place, remove the king pin of the coupling, and the tractor is then available for other service while the trailer delivers its coal.

It takes from 30 to 50 minutes to carry in one of these loads of coal, so that while this body is being emptied the tractor has time to go back to the yard and haul out another body which has been loaded in the meantime, subsequently returning and taking back the other empty body to the yard for refilling.

In this manner the expensive part of the outfit, namely, the tractor, can be kept constantly at work with a high earning capacity, whereas with horses or the conventional motor truck, a large amount of time is necessarily wasted during the loading and unloading, with consequent increase in cost.—*The Carriage Monthly.*



Special White truck used by the Eastern Torpedo Co., Bartlesville, Okla., for the transportation of nitro-glycerine in the oil fields

Special Truck Carries Nitro-Glycerine

Novel Body Designed To Cushion Jolts and Protect Explosive Fluid from Leaks and Heat

IN Oklahoma they "shoot" the oil wells just about the same as a New York subway contractor would blast his way through a wall of rock except that nitro-glycerine is used in the wells and dynamite is used in the subways. In either case, the use of great quantities of a powerful explosive has been accompanied by a ticklish transportation job and periodically the vehicle, the horse and the driver go aviating in atoms and are never seen again—all of which has taught the necessity of protecting the load to the greatest possible extent.

To guard against these events a number of interesting types of conveyance have been developed and a few motor trucks have made single hauls now and then but the Eastern Torpedo Co., Bartlesville, Oklahoma, is the first distributor of explosives to regularly use a motor truck in this kind of hauling. The company is not only using a motor truck but is planning to motorize its entire delivery.

A special body of novel design was built on a standard 1,500 pound White truck chassis and the truck is now in service in Bartlesville, being piloted by a driver who is cheerfully indifferent as to the nature of his load. It was not such an easy task, however, to demonstrate and deliver the truck, none of the White drivers being willing to take the wheel when the truck was loaded. It was therefore delivered but not demonstrated.

The mid-continent oil fields in which the truck is operating cover a vast area south of Bartlesville, including such well-known oil-producing sections as Tulsa and Muskogee counties. The roads run fair to very bad and this fact alone creates difficulty in general hauling to say nothing of the added responsibility of carrying a cargo of explosives big enough to blow Bartlesville off the map.

The Eastern Torpedo Co. sells most of the nitro-glycerine that is used in "shooting" the wells and the company delivers it to some almost inaccessible places. The hauls vary from 3 to 50 miles. When a well has been drilled and the usual 8-inch pipe is in place, it is necessary to quicken the flow of oil by sub-surface explosions and the customary method is to attach a can of nitro-glycerine to a cable and lower it by means of a reel through the 8-inch pipe. When the can reaches the bottom, the simple expedient of dropping a rock on it ignites the charge.

Crosswise and lengthwise of the frame is built a series of sills of heavy, long-leaf yellow pine. This understructure spans the entire loading length. The latter is only 47.5 inches long, leaving an open platform in the rear for the carrying of the reels that are used in lowering the cans into wells. The understructure is covered with a layer of asbestos and on top of the asbestos there is a solid floor of pine. A rubber mat tops the pine floor and on this mat there is a copper pan of full width and length, having sides which rise 5 inches all around.

The asbestos is intended to prevent heat being conducted to the load from either the engine, exhaust pipe or muffler; the rubber mat helps to reduce jolts, and the copper pan is to prevent the fluid from reaching the chassis in case a leak should occur in one of the cans. Each can is placed in a compartment 7 inches by 7 by 17 and there are thirty of these compartments dividing the copper-bottomed loading space. They are formed by poplar boards dovetailed together and running lengthwise and transversely of the frame. These compartments, or cells, have a poplar cover which is divided into two sections, the forward section hinged at the front and the rear section hinged in the rear with a lock in the center.

To facilitate loading and unloading—particularly when the driver alone does the unloading—the right rear fender immediately above the wheel is converted into a step and running board on which cans of nitro-glycerine may be rested while the driver is in the act of jumping down from the truck platform.

To IMPROVE a good automobile calls for more specialized and differentiated positive knowledge than the original construction of it. For a few years yet, untiring study must be the price of prominence in the automobile industry, and it is doubtful if the work can be hired done.

New Warner Motor Is of Block Type

Applicable to All Kinds of Installations Without Serious Alteration—Thermo-Syphon Cooling Is Used

WHEN H. L. Warner severed his connection with the Warner Gear Co. and the Muncie Gear Works, Muncie, Ind., he came to Detroit and organized the Warner-Detroit Motor Works for the manufacture of a motor of his own design. The announcement of this was made in The Automobile some time ago, although no details of the new power plant were given at that time.

The details have now been secured and sectional views of the four-cylinder type to be manufactured are shown herewith. These Warner-Detroit motors have been designed to be applicable to all types of installations without fundamental change. That is, the motor may be suspended either at the front or back of the cylinders on a cross bar, giving a three-point suspension in either case; the flywheel is machined to fit either a cone clutch or a multiple-disk design; the rear end of the crankcase is made to carry a flywheel housing or this may be dispensed with, leaving the flywheel exposed.

The four-cylinder model which is typical of these new Detroit engines is a monoblock type giving a compact design. It is water-cooled by the thermo syphon system, the water jacket running completely around the cylinder casting in the usual way. The water outlet connection extends completely across the top of the cylinders, giving a very free outlet passage for the cooling water. The diameter of the hose connections to and from the radiation is 2 1-2 inches, insuring an adequate flow of cooling water to and from the water-jackets.

The motor is of the long-stroke type, having a bore of 3.19 inches and a stroke of 5.5 inches. This bore was adopted principally so that the engine would come within the foreign requirements. The valves are all on the right side, springs, valve tappets and so on being completely inclosed by cover plates. The crankshaft has two main bearings, while the camshaft is provided with three.

The principal dimensions of the four-cylinder model follow:

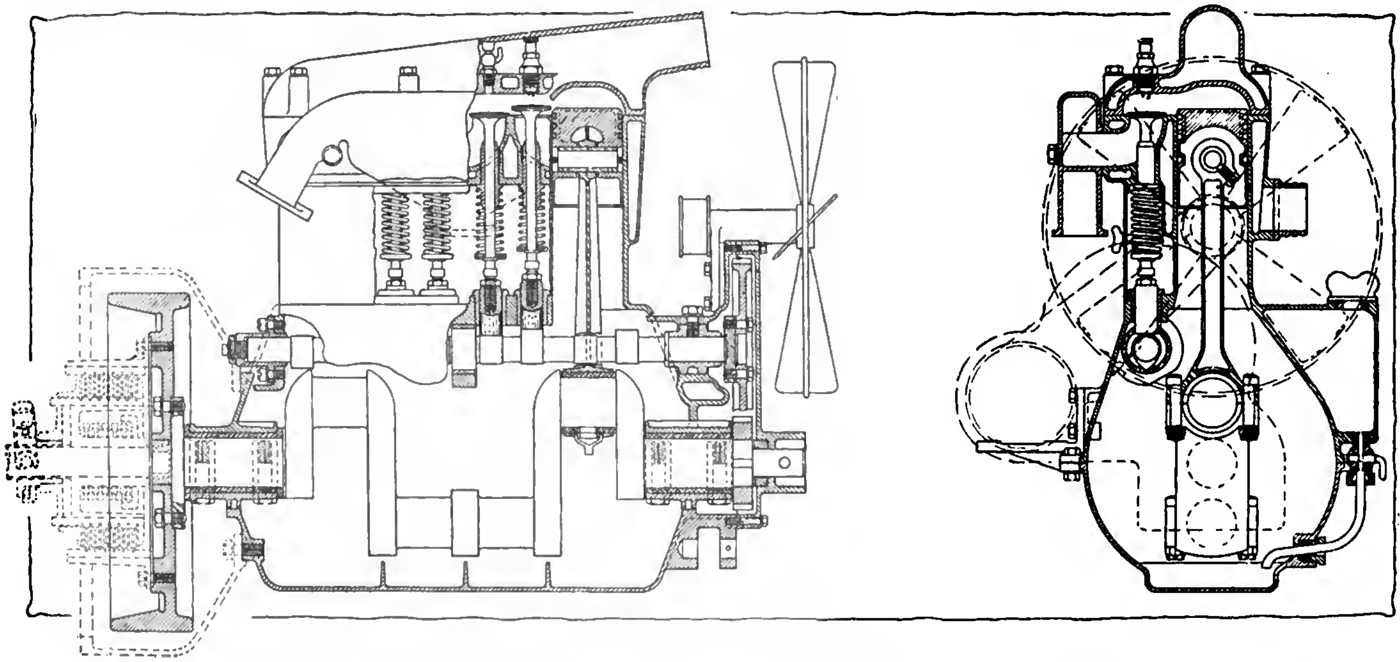
	Diameter	Length
Front main bearing crankshaft	2.25 inches	4 inches
Rear main bearing crankshaft	2.25 inches	4.5 inches
Connecting-rod bearings	2.25 inches	2.5 inches
Camshaft diameter	1.125 inches	
Diameter valves	1.5 inches	
Diameter magneto or timer shaft	1 inch	
Width of cams		1 inch
Width of timing gears		.88 inch
Overall length of motor		31.56 inches
Overall width of motor		19.06 inches
Number of piston rings		3

The motor is made with an integral base on the right side of the crankcase which is machined to take any standard magneto, while either a 1, 1.25 or 1.5-inch carbureter may be equipped.

Lubrication is by means of the conventional splash system, there being individual troughs to contain the lubricant under each connecting-rod, which troughs are cast integral with the lower half of the crankcase. The connecting-rod ends dip into these troughs of oil as they travel around and throw the lubricant up into the cylinders to oil the pistons. The oil reservoir is cast integral with the left side of the upper half of the crankcase, the oil flowing from it down through a pipe into the troughs.

With its long stroke, the motor will develop considerably more power than that accorded it by the S. A. E. formula. This gives the four-cylinder model a horsepower of 16.2, while if the stroke is considered, it figures to about 17.5 at 1,200 revolutions a minute and 24 at 1,600 revolutions.

A very frequent cause for the rut-worn tire is traveling on a surface which has not been frozen solid, but is in such a condition that a thick crust has been formed. At such times the car will be supported from time to time and then will break through, shearing off such pieces of rubber as the knife-like edges of the broken crust will strike. This cannot be avoided unless it is possible to travel by another road, but where the ruts are likely to cause damage this can often be avoided by just simply not getting into the ruts. Many of the roads are posted with signs instructing drivers to be careful in not traveling continuously over the same path in the road. This is especially the case of newly constructed state roads. Despite these warnings, however, drivers of heavy trucks and other horse- and motor-driven vehicles persist in following the ruts made by previous drivers. In the case of passenger automobiles using pneumatic tires this is not only detrimental to the roads but to the tires of the vehicle, as has been explained. It is very easy in many cases to straddle the ruts.



Part sectional views of side elevation and end of the new four-cylinder Warner motor, showing the compact design

SPRINGFIELD, O.—Editor THE AUTOMOBILE—Interchangeable parts rather than standardization of motor trucks is the answer to the question now confronting the United States Government. This solution will not only benefit the government, but will work to the advantage of all big business concerns using large fleets of trucks.

The United States recently asked for the opinions of the leaders of the leading motor truck engineers on the practicability of standardizing a truck for the use of the army.

After considerable thought I believe that the time is not right to attempt the standardization of trucks. The time is ripe, however, for the leading truck manufacturers of this country to get together and agree upon a definite working plan which would help the government and themselves.

The leading motor trucks are designed upon sound conventional principles along the lines of conventional type mechanism.

If the amount of business to be secured would warrant it, we believe that a considerable number of the leading manufacturers could get together and change a few main dimensions on their machines so that the units of different machines could be interchanged.

The main points to be decided are:

1. Uniform width of frame.
2. Uniform length of wheel base.
3. Uniform loading space back of driver's seat.
4. Uniform size of wheels and tire equipment.
5. Uniform sprocket centres.

The simplicity of these changes can readily be seen when it is considered that the last three items are optional in the equipment of most manufacturers.

A glance at the detailed workings of the plan also shows its extreme simplicity.

The hub bearings on certain trucks are practically interchangeable today. It would be a simple matter to standardize the width and length of springs. This would make both axles interchangeable in units without any further changes as the threads are now standard.

The jackshaft and transmission units need to be interchangeable only as to their seats in the frame angle. This could be done easily after the width of the frames has been made standard. To do this, of course, would make it necessary to consider the driveshaft and universal joints units with the transmission and jackshaft.

It would be necessary to standardize the cone clutches only as to diameter and width of face, and as to the length of the clutch between the flywheel and the front end of the drive shaft, or transmitting unit. This would also mean the standardization of the bore of the flywheel for the clutch seat.

Practically all the carbureters, magnetos and wiring and gasoline connections can be standardized with little trouble as the majority of manufacturers are now using standardized articles for these purposes. The only details remaining to be worked out in this connection would be the sizes of the union connections. The length of pipes are very much alike, and other things would make little difference as connections could be bent or coiled up in case of emergency.

It would not be necessary to make such things as pedals, gears, brake and clutch control parts standard, as if these were made of a good, reliable grade of drop forgings there would be hardly any necessity to replace them.

The principal advantage of the plan submitted here lies in the fact that each maker of motor truck could retain his individuality and independence of opinion and judgment in design and construction. To change the point suggested would be comparatively simple as the bulk of the tool equipment of the motor truck manufacturer would not have to be changed in any way.

The new parts that would be necessary, if this plan were put into operation, could be independently tooled up and treated as any other special equipment. These changed parts could be produced with economy if they were ordered in sufficient quantities.

I believe that a board of engineers representing the leading truck manufacturers could work this proposition out to mutual satisfaction. If the government were willing to divide their purchases equally among the companies represented in this mutual plan, the details could be satisfactorily worked out.

Especially in the case of trucks for use of the War Department would this plan be beneficial. In times of real war, or even during maneuvers there is so much haste that it would be impossible for the soldier-mechanician to make any small or delicate adjustments. It would be far simpler to interchange entire units of construction from trucks which are out of commission to other trucks with little delay.

It appears to the writer that it would be impossible to put a new gear in a transmission or a new differential in a jackshaft, or even a new piston in the motor. It would be much simpler, and could be done with little delay by the placing of entire units into the remaining trucks. This would mean only the taking out of bolts and nuts and would require little or no real mechanical skill and adjustment.

To my mind this plan possesses all the advantages of the standardization of motor trucks without any of its disadvantages. I firmly believe that it is practical, and would effect a great saving for the government and the motor truck manufacturer interested if it were put into operation—CHARLES BALOUGH, Kelly-Springfield Motor Truck Co.

Interested in Spring Development

LOS ANGELES, CAL.—Editor THE AUTOMOBILE:—The excellent article in your number of April 17, 1913, by Prof. Dr. Riedler of Berlin, Germany, on springs for automobiles, and his opinions on shock absorbers which are hereinafter quoted, may make it of interest to the readers of automobile literature to follow the progress of automobile spring suspension to its latest development.

From Dr. Riedler:

> "In running over a ridge or furrow the wheels no longer hit the road l[illegible] but tbe higher or lower surface of tbe obstacle, and the vehicle spring, a[illegible]ing compressed by the first impact, has no chance to rebound toward t[illegible]d but must spend its stored energy upward against the heavy v[illegible]y, which is thrown upward until the springs are entirely extended. [illegible] this action the vehicle body is unavoidably thrown up so high that when it comes down again by gravitation it compresses the springs till the frame comes down hard against the axle. Such excessive oscillations of springs can only be avoided by cautious driving. Dampers on the spring action can be justified only when they guard against excessive upward movements of tbe vebicle body. They should therefore take effect only at the moment when such movements begin, but not before. Most dampers, and particularly all the elbow-joint dampers, work on just the opposite principle and are therefore valueless. Hydraulic dampers can be made to operate correctly, but are too complicated (umständlieb)."

It is unquestioned by Dr. Riedler or any other authority that there is only one weight of body and passenger load for a given spring suspension, which will give ideally comfortable riding, for with a heavier load the axles will be hit sometimes by the frame, and with a lighter load the springs will be stiffer than are comfortable, and in consequence, automobile manufacturers build for the heavier, not the lighter load, as pounding on the axles is ruinous to both body and gear.

If reliable devices to control recoil were available, which would allow lighter springs with 10 or 12 inches of clearance over their axles to nearly close on an excessive bump, without allowing excessive overthrowing on its recoil, they could improve materially on present day practice of striking a rubber bumper upon closing 4 or 5 inches in order to keep the passengers in the car, the theory being that with slight compression there will be slight recoil.

Most manufacturers of so-called shock absorbers (dampers) have assumed that retarding means to keep the springs from closing or hitting the axles, and is desirable and necessary. They have not profited by their study of the forces which are acting or they would know that when the excessive opening, or recoil, or overthrow of the springs, as it is variously called, is stopped by some frictional dampening means, not by spring means, there is no downward acceleration of the vehicle body due to the back-pull of the vehicle springs, hence only the force of gravity is acting on the automobile body, and if the springs are of proper weight, the axles will not be hit by the frame. Any friction which retards the closing of the spring, injures the resiliency of the same and makes for harder riding and that chattering motion so undesirable.

The action of vehicle springs on a rough road with reference to the comfort of the passenger is as follows:

As the wheels surmount an obstacle in the road the springs are compressed, and before final descent over the obstacle, the recoil has projected the automobile body and passengers upward. This momentum of the body opens the springs above their normal without load, and at about the moment when the wheels have rolled over the obstruction, still further opening the springs, the body is pulled back to earth by gravity plus the back-pull of the overthrown springs, while the passenger is pulled back to earth more slowly because by gravity alone, and this is the reason he is left in the air, and when he strikes the seat, it is on its secondary ascent to meet him, and the contact is never pleasant.

Now let us analyze the effects of the different types of dampers, up to this time available:

The elbow type is a friction damper having equal friction in both directions and if tightened enough to effectively overcome recoil above the normal, it so injures the spring resiliency upon compression as to destroy its usefulness as a comfort device.

The elbow type in which the friction is obtained by a cam, which upon being turned compresses springs, enclosed in the device, injures resiliency of the vehicle springs, and is also a fixed neutral position device which allows free movement of the axles for slight road variations, without frictional retarding effect upon the opening or closing, but if set for the neutral position when two passengers are riding, upon the load being increased to seven passengers it is in the jammed position when the car is at rest instead of in the neutral one, which is most undesirable.

The spring recoil check, in its various forms, whether a spring on the end of a strap, in the form of a spring-controlled toggle, or a spring directly connected between axle and frame. only adds to the back-pull of a vehicle spring when it has [illegible] thrown above the normal, and therefore assists the s[illegible] in pulling the automobile body to earth before the passen[illegible] has started to descend.

The strap can be made to keep the spring at or slightly below normal and therefore do away with back-pull, but on the recoil of the spring, if the body is so suddenly stopped, the passenger is projected upward and comfort is not added to, although strains on the mechanism are undoubtedly somewhat modified.

The hydraulic device, of a piston and piston rod, descending freely through its stuffing box, cylinder and contained liquid when the spring closes, and on the recoil forcing part of this liquid through an adjustable opening, thereby giving the desired amount of friction, will undoubtedly operate satisfactorily, but with the leakage of the liquid through the stuffing box, and the pressure being upward of 200 pounds per square inch against it, with the consequent admission of air to take the place of the liquid so lost, the device becomes elastic on its back-pull, for what is more elastic than compressed air, and in addition, this spring recoil check is obtained with much attendant and cumbersome weight.

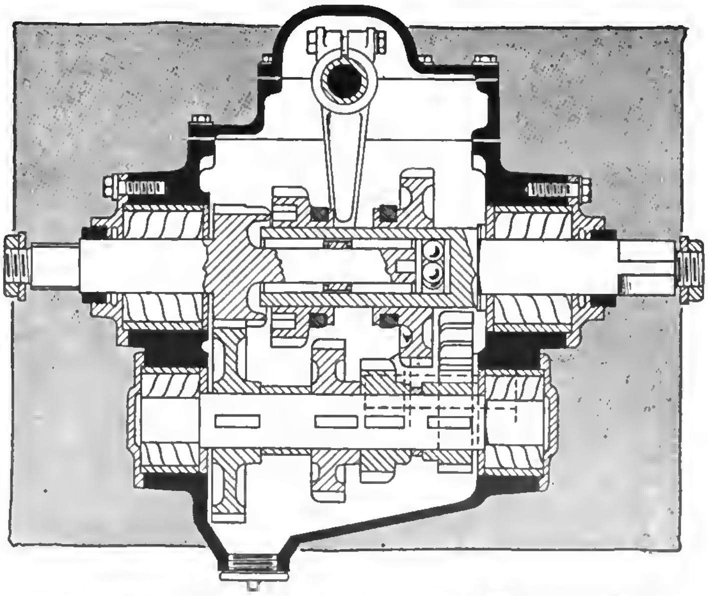
A Spring Controller—The writer is the patentee of a device which is designed to overcome the several faults enumerated above in connection with the various forms of shock absorber and in particular to overcome the secondary back-pull of the vehicle springs after passing over a lump in the road surface. In this device a series of friction plates is arranged in conjunction with a rachet connected to an outer lever in such a way that on the upward throw of the axle the rachet slips and the friction plates remain stationary but on the return stroke the plates are put into action with a retarding effect on the spring motion. This virtually eliminates the rebound of the vehicle spring and therefore only the force of gravity is acting on both the automobile body and passenger after a sudden lift. Hence they descend together and the shock is absorbed by the long throw of the vehicle spring.

Many of these devices are in use in this city and one set has traveled around the world.—H. C. TURNER, Vice-President Turner Oil Co.

Testing the Factor of Safety

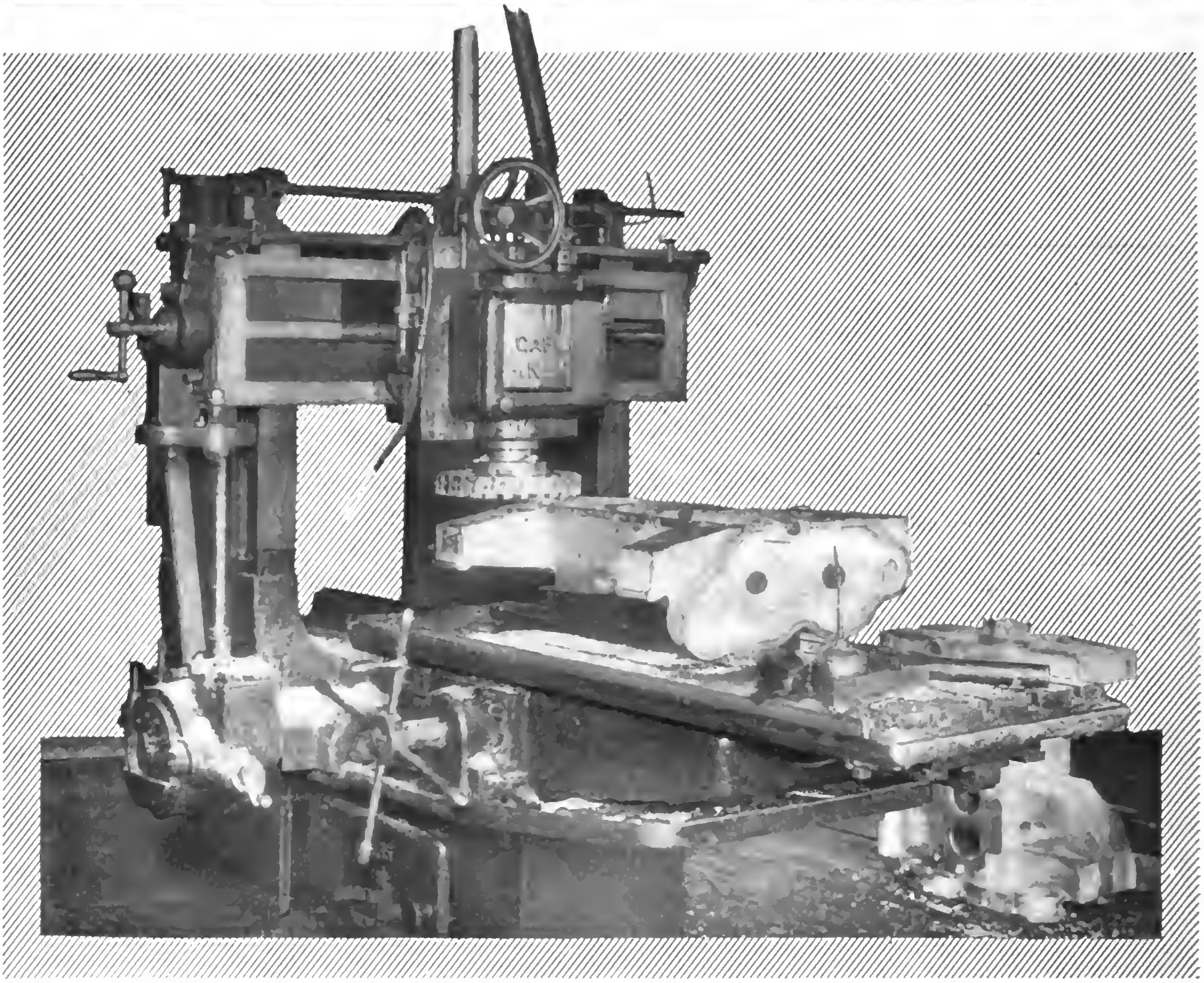
KALAMAZOO, MICH.—In order to prove conclusively that the factor of safety in their transmission set was high enough to insure long life the Fuller & Sons Mfg. Co., of Kalamazoo, Mich.. recently subjected one of their standard 25-35 horsepower gearsets shown in the accompanying illustration, to a severe test as follows:

A standard transmission taken from stock, was securely bolted down to a solid foundation. A large steel bar held the rear mainshaft square end from turning, and the gears were shifted into the low speed. Next a heavy steel bar, 8 feet long, was placed on the front end and a man of average size placed his weight on the long bar at different positions, moving out toward the end of the long bar in steps of 3 inches. This was done repeatedly until a twisting movement, equal to 229 horsepower was exerted on the gears, shafts, bearings and case, before any fracture occurred. In other words, the transmission stood a twist equal to a 229 brake horsepower load, a sufficient indication that the 25-35 rating is conservative and the factor of safety such as to meet all possible conditions of use in the automobile. Tests of this character are especially interesting nowadays that manufacturers are finding the public more intimately acquainted with automobile construction than in the past. The factor of safety is a most important consideration in any part.



Sectional view through the gearbox of Fuller & Sons Mfg. Co., tested recently

Factory Miscellany



Crankcase milling machine used in the factory of the Moon Motor Car Co. at St Louis, Mo.

IN the factory of the Moon Motor Car Co., St. Louis, Mo., a special milling machine of the type shown in the above illustration is used for milling the aluminum crankcases used on Moon engines. This machine carries a 16-inch diameter inserted tooth cutter, the teeth of which are made of a special steel costing over $1 per pound. The milling of either the top of bottom of the upper half of crankcase is accomplished with only two cuts, the first cut removing .125 inch of metal. After this cut is taken, the crankcase is removed from the machine, put in a special chemical bath and allowed to set for several days in order to remove any strains that may be in the metal. It is put back in the machine and a finish cut of .012 is taken.

The bottom of the upper half of the Moon crankcase is 21 by 33 inches and the first cut requires 17 minutes. The second cut requires 11 minutes. The top of the upper half of the crankcase is 12 by 24 inches and the first cut here requires 12 minutes and the second 8 minutes. This also includes the milling of the magneto brackets and the self-starter bracket. This machine is operated entirely by one man and although several days elapse between the time the first and scond cut is taken on each crankcase no time is lost, as each crankcase is numbered, dated and put in its chemical bath, thus allowing one to be taken out as fast as a fresh one is put in. As may be imagined, the saving effected over the old methods by the use of this machine is very great.

FACTORY GROWTH IN QUEENS—The Goodyear Import Co., which is constructing an eight-story $225,000 factory at Jackson and Honeywell streets, Long Island City, recently made application to build a five-story $35,000 addition to the plant. The Ford Motor Co., which is about completing an eight-story building at Jackson avenue and Harold street, also has purchased an entire block adjoining and bounded by Honeywell street, Fifth and Jackson avenues, and will erect a ten-story building at a cost of nearly $1,000,000. The Neptune Motor Co., which recently took out permits for the erection of a five-story factory in addition to its present plant at Jackson and Crane streets, applied also to erect an $18,000 one-story brick foundry on a plot 100 by 123 feet.

Mather Spring Addition—Plans are being drawn for an addition to the factory of the Mather Spring Co., Toledo, O. The business of this concern has grown so rapidly that the additional space is necessary.

Palmer Starts First Factory—The Palmer Motor Car Co., Detroit, Mich., recently organized, has begun the construction of the first unit of its plant which will be located at Ecorse, a Detroit suburb. The structure will be of reinforced concrete construction, one story, and 80 x 355 feet.

Apperson Taking Bids—The Apperson Automobile Co., Kokomo, Ind., is taking bids for the erection of a three-story factory building to cost $20,000.

Plant for Bellefonte—The recent incorporation of the Bellefonte Automobile Mfg. Co., maker of the Bellefonte automobile, has bought a factory at Bellefonte, Pa.

Fire in Automobile Plant—Fire was recently discovered on the second floor of the three-story brick building occupied by the Ohio Electric Automobile Co., Toledo, O. The flames originated from spontaneous combustion in waste matter.

Ford's Seattle Plans Finished—The plans and specifications for the Ford Motor Co., Detroit, Mich., assembling plant to be built at Seattle, Wash., at a cost of $400,000, are finished. Bids were received on the building on June 10. Considerable machinery will be bought.

Cole's $175,000 Plant—A contract has been let by the Cole Motor Car Co. for a large addition to its plant in Indianapolis, Ind., and work has been started. The contract price, exclusive of machinery, etc., is $175,000. The structure will be four stories high and of brick, steel and reinforced concrete construction.

Iron Foundry for Lewis Electric—A new gray iron foundry to supply castings used in the construction of motor parts manufactured by the concern is to be built by the Lewis Electric Welding & Mfg. Co., in West Toledo, O. A specialty of medium and light-weight high-grade iron castings will be made.

Oakland at Full Capacity—The Oakland Motor Car Co., Pontiac, Mich., is running its plant at capacity to fill orders and more than 1,100 men are employed. During May the daily shipments averaged fifty cars. There are over 1,200 dealers. The total business for the season will be approximately $15,000,000.

Amplex Building 7,000 Motors—The Amplex Motor Car Co., Mishawaka, Ind., is building 7,000 motors for the Empire Automobile Co., Indianapolis, Ind. Mr. Mead, president of the Amplex company, said the company would make 50 motors in July, 150 in August and after 500 motors per month until the present contract is completed.

College Men in Factory—Many college men from all over the countrty are planning to work during the summer vacation in the factory of the Goodyear Tire & Rubber Co., Akron, O. The company recently requested the college men in the company to write to their colleges asking for men, and the responses have been numerous.

Overland Planning More Buildings—The Willys-Overland Automobile Co., Toledo, O., is having plans drawn for $200,000 worth more of new buildings. A brick testing track is being constructed. The Kinsey Mfg. Co., a branch of the Willys-Overland Co., is arranging for the construction of a warehouse which will approximate 300 feet in length.

Explosion in Goodyear Plant—A gas explosion in the basement of the six-story office building of the Goodyear Tire & Rubber Co., Akron, O., recently started a fire which caused $10,000 damage. The explosion ripped a hole in the first floor of the building, and the fire which followed caused four hours' vigorous fighting by the fire department before it came under control.

Newark Secures Pharis Tire Factory—By an agreement entered into recently by officers of the Pharis Tire & Rubber Co. with the Board of Trade, Newark, O., secures an industry which Columbus and Chillicothe have each sought. The rubber concern agrees to employ not less than forty men at an average yearly salary of not less than $700 during the first 6 months, and will at once install a plant requiring nearly $30,000 worth of machinery at the outset.

Automobile Plant for Meriden—President C. B. Schoemehl of the Waterbury Battery Co., Waterbury, Conn., is the prime mover in the plan to establish an automobile factory in the idle plant of the Meriden Woolen Co., Meriden, Conn. It is expected to employ 300 men at the start. Outside capital will have about 75 per cent. of the investment of $200,000, and Meriden men will invest the remainder if the scheme goes through. The car to be made is a $1,000 car and has been manufactured on a small scale in New York.

New Timken Roller Bearings Factory—Officers of the Timken Roller Bearings Co. announce that they will erect an addition this summer which will provide for the employment of 200 additional men. Plans for the buildings have not been prepared and will not be commenced until negotiations for additional land are concluded. The company, however, will try to have the plant completed by fall. Either two or three buildings of reinforced concrete will be constructed. J. G. Obermier states that the improvements will adjoin the present plant.

The Automobile Calendar

Showa, Conventions, Etc.

October 13........Philadelphia, Pa., National Fire Prevention Conference, Philadelphia Fire Prevention Commission.
December 9-12......Philadelphia, Pa., Annual Convention of American Road Builders' Association.

Race Meets, Runs, Hill Climbs, Etc.

Jnne 19...........Chicago, Ill., Algonquin Hill Climb, Chicago Motor Clnb
June 21...........Cincinnati, O., Hill Climb, Cincinnati, O., Automobile Dealers.
Jnne 21...........Philadelphia, Pa., Fletcher Cnp Run, Antomobile Club of Philadelphia.
Jnne 21-22........San Francisco, Cal., Track Races, E. A. Moross.
June 23...........Des Moines, Ia., Little Glidden Tour, Iowa Automobile Assn.
June 25-28........Chicago, Ill., Non-Motor-Stop Reliability, Chicago to Boston, Chicago Automobile Club.
July 1............Indianapolis, Ind., Tour of Indiana Automobile Manufacturers" Assn. to the Pacific Coast.
July 1-16.........Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.
July 4............Columbus, O., 200-Mile Track Race, Columbus, O., Automobile Club.
July 4............Taylor, Tex., Track Meeting, Taylor Anto Club.
July 4............Washington, D. C., Track Races, National Capital Motorcycle Club.
Jnly 4-5..........Sioux City, S. Dak., Track Meetings, Sioux City Automobile Club and Speedway Assn.
July 5-6..........Tacoma, Wash., Road Race, Montemara Festa Automobile Committee.
July 8-16.........Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager.
July 11...........Twin City, Minn., National Reliability Tour, A. A. A.
July 20...........Seattle, Wash., Track Races, E. A. Moross.
July 27...........Grand Rapids, Mich., Tour, Grand Rapids Auto Club.
July 27-28........Tacoma, Wash., Tacoma Road Races.
July 28-29-30.....Galveston, Tex., Beacb Races, Galveston Antomobile Club.
Aug. 5............Kansas City, Mo., Sociability and Endurance Rnn from Kansas City to Colorado Springs, Col., Kansas State Automobile Assn.
Aug. 12...........Kansas City, Mo., Reliability Tonr, Kansas State Auto Assn.
Ang. 29-30........Elgin, Ill., Elgin Road Races, Elgin Road Race Assn.
Aug. 30-Sept. 6....Chicago, Ill., Reliability Run, Chicago Motor Club.
Sept. 1...........Columbus, O., 200-Mile Track Race, Columbus Auto Club.
Sept. 9...........Corona, Cal., Track Race, Corona Auto Assn.
Oct. 4-11.........Chicago, Ill., Around Lake Michigan Run, Chicago Motor Co.
Nov. 24...........Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 27...........Savannah, Ga., Grand Prize Race, Automobile Club of America.

Foreign.

June 23-28.......London, England, International Road Congress.
July 12...........Amiens, France, Grand Prix Race.
July 13...........Paris, France, French Grand Prix Cyclecar Race.
July 15-30....... London, Eng., Olympia Heavy Motor Vehicle Show.
July 18-26........London, Eng., Imperial Motor Transport Conference.
Ang. 28-30........Ghent, Belgium, Institute of Metals, Annual Autumn Meeting, Ghent International Exhibition.
Sept. 21..........Boulogne, France, 3-Litre Race.
Sept. 25..........Isle of Man, International Stock Car Race.
October ....Paris, France, Automobile Show, Grand Palais, 10 days.
November ....London, Eng., Annual Automobile Exhibition, Olympia.

Warehouse, assembly and finished parts department of the new factory of the Duff Mfg. Co., Pittsburgh, Pa. The photograph was taken prior to occupancy.

The Week in the Industry

Engineer — Dealer — Repairman — Garage

View of a day's output of the Hupp Motor Car Co., Detroit, Mich. Cars are lined up for inspection

Circus tent in yards of Hupp Motor Car Co.'s factories, Detroit, Mich., used for a temporary test department

CANADA RECIPROCATING ON PASSPORTS—In view of the fact that the United States government has agreed to recognize membership cards in the Ontario Motor League as passports, and that automobiles entering at one part are allowed to make clearance at another, the Motor League has decided to petition Hon. J. D. Reid, Minister of Customs for the Dominion, to allow a similar privilege to the United States motorists.

DAHL TIRE IN PORTLAND—The Dahl Punctureless Tire Co. has settled in Portland, Ore.

HIGHWAY CONVENTION IN VANCOUVER—The annual Pacific Highway Convention will be held in Vancouver, B. C., August 11 to 13th.

NORMAN FORD PORTLAND MANAGER—F. B. Norman has become manager of the Portland, Ore., branch of the Ford Motor Co., Detroit, Mich.

BOULDEN WITH SERVICE RECORDER—H. T. Boulden has been made vice-president and general manager of the Service Recorder Co., Cleveland, O.

MURDEN KNICKERBOCKER MANAGER—H. H. Murden has been appointed factory manager of the Knickerbocker Motor Truck Mfg. Co., New York City.

MACDOUGAL HAYNES SALES MANAGER—J. E. MacDougal has been appointed sales manager of the Pittsburgh-Haynes Automobile Co., Pittsburgh, Pa.

THATCHER OAKLAND TREASURER—H. H. Thatcher has been appointed treasurer of the Oakland Motor Car Co., Pontiac, Mich. He will also continue as supervisor of Michigan sales.

J-M ABSORBER BRANCH OPENED—A sales branch for the J-M Shock Absorber Co. has been opened at 425 North Meridian street, Indianapolis, Ind. M. Matthews is manager of the new branch.

ADDING TO GARAGE—The Seguin Auto & Cycle Co., Seguin, Tex., is building an addition to its garage, and when completed will be 50 by 100 feet, with the repair shop, 20 by 50 feet, of fireproof construction.

WOOLER JOINS CONTINENTAL MOTOR—E. Wooler has become a designer for the Continental Motor Mfg. Co., Detroit, Mich. He was recently in the designing department of the Rolls-Royce, Ltd., a British automobile concern.

FIRE IN PHILADELPHIA GARAGE—Automobile materials and several machines left for repair work were burned recently in a fire which did damage roughly estimated at $10,000 to the building of the Empire Auto Top Co., Philadelphia, Pa.

MORE AUTOMOBILE FREIGHT CARS—Included in an order for $10,000,000 worth of new equipment now being received by the Atchison, Topeka & Santa Fe Railroad are 1,400 new furniture cars which will be used mainly in the automobile trade in the southwest.

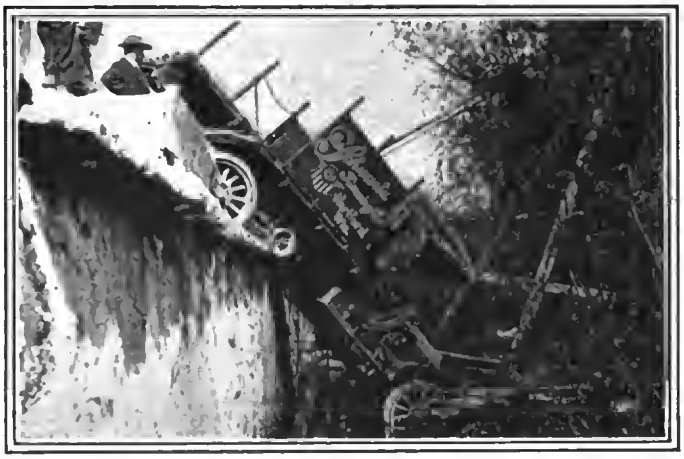
OVERLAND'S N. Y. $200,000 LEASE—C. T. Silver Motor Co., agent for the Overland car, has leased 1739 Broadway, with Nos. 237-241 West 55th street. It intends to make extensive alterations. The district has been gradually absorbed by theaters and restaurants. The lease calls for $200,000.

BOULEVARD 20 MILES LONG—After several years of effort on the part of automobile interests and good roads' advocates, the building of a boulevard connecting Indianapolis, Ind., and Noblesville is assured. The new boulevard will be more than 20 miles in length. It will be 60 feet wide.

LEAVES PEERLESS TRUCK DEPARTMENT—R. S. de Milkiewicz, Esq., who has been connected with the Peerless Motor Car truck department, Cleveland, O., has severed his connections with this firm. Mr. de Milkiewicz announces his affiliation with the American Locomotive Co., and on July 1 will be located in the New York branch of its truck department.

The group of members of the American Society of Engineers and their visitors, the delegates from the English

Service squad used in hurry calls by Bishop, McCormick & Bishop, Paige-Detroit dealers in Brooklyn, N. Y.



KisselKar truck plunged over a 10-foot stone wall with no more damage resulting than a flattened and twisted running board

HANDLING BRAENDER TIRES—The Braender tires are being handled in Baltimore, Md., by the Wyma Park Garage, with F. S. Brown as manager.

MILLINGTON RESIGNS FROM BUDD—T. H. Millington has resigned as general manager of the Detroit, Mich., plant of the E. G. Budd Mfg. Co., of Philadelphia, Pa.

THOMAS FEDERAL TRUCK MANAGER—C. K. Thomas has been appointed manager of the Federal Truck Co., of New York City, distributor of the Federal motor truck.

KLOSE RESIGNS FROM MAXWELL—O. W. Klose, district manager for the Maxwell Motor Car Co., in Minneapolis, Minn., recently resigned from that company, to go into business for himself.

BUS LINE IN CHILLICOTHE—R. M. Laird, of Athens, O., has started an Automobile passenger line between Chillicothe and Bainbridge, O., with two large sight-seeing cars capable of carrying twenty passengers.

HAYNES HOLDS CONVENTION—On June 19 and 20 the Haynes Automobile Co., Kokomo, Ind., will hold a convention at that city, the attendance consisting of advertising men, dealers and the prominent officials in the factory.

FORD'S ST. PAUL SERVICE STATION—Work has begun on the new Ford Motor Co.'s service station and salesroom at St. Peter street and University avenue, St. Paul, Minn. The building is to be three-story and concrete.

NEW BIRMINGHAM PARKING RULES—No vehicle is to be allowed to stand more than 20 minutes in the business district at Birmingham, Ala. This ruling is aimed principally at the parking of automobiles. Special policemen will see that the time limit is observed promptly.

ST. LOUIS TRUCK GARAGE—A garage for motor trucks, the first in St. Louis, Mo., is being erected in connection with the new building of the General Motors Truck Co. Space for forty trucks will be provided and entrance made so commodious that a 5-ton truck can enter without backing.

FRANKLIN'S BOSTON BUILDING—Work has been started on a three-story building on Commonwealth avenue, Boston, Mass., at the corner of Cummington street, which will be occupied by the Franklin Motor Car Co., Syracuse, N. Y. It is expected that the building will be ready for occupancy about the first of October.

DOUBLE-DECKERS FOR LOS ANGELES—The Pacific Motor Coach Co. recently placed an order for twenty-two Kelly-Springfield trucks with double-deck coach equipment in service in competition with the Pacific electric cars in Los Angeles, Cal. A 15-minute service will be inaugurated between Los Angeles and Venice and Los Angeles and Pasadena.

AUTOMOBILE BUSES IN TORONTO—The Board of Control of Toronto, Ont., has referred to the city solicitor the application for a franchise of a company to run motor buses on specified routes on the streets of Toronto. The agreement provides for the annual payment to the city of $500 per mile of street used on the routes up to the amount of $30,000.

LOWELL PAYS FOR APPARATUS—The controversy over the Knox fire automobile that was ordered for Lowell, Mass., fire department has been settled by the payment of the bill for the machine. Considerable politics were mixed up in the purchase of the machine, and before the trouble was settled the court was asked to rule upon the Lowell system of purchasing supplies.

NEW U. S. TIRE BUILDING—The United States Tire Co. has leased the lot of ground 5935 Baum Boulevard, Pittsburgh, Pa., and has broken ground for a new two-story and basement brick building, which it will use exclusively as a service station for its solid motor tire department. When finished the new building can accommodate eight motor trucks. A truck can be run into the building in the evening after the truck has finished its day's work and new tires can be applied and ready for service the following morning.

PIERCE-ARROW'S NEW RIM—The Pierce-Arrow Motor Car Co., Buffalo, N. Y., has developed a modified Pierce-Arrow-Johnson demountable rim of the quick-detachable type. Besides being of 10 pounds lighter channel than the previous type, the removable flange ring is fitted with an original form of locking device. This consists of a removable key-piece having its ends shaped to dove-tail with the ends of the flange ring, drawing them together and downward into the slot which is rolled in the rim. While the factory is now well advanced in the production of parts for the new model pleasure cars, considerable effort is also being devoted to a new commercial model that is to make its appearance in due season.

CARRYING SERVICE IN FLORENCE—There are two motor-bus lines in Florence, Italy, both of which are operated during the day only. One of these lines operates three motor buses having a capacity of thirteen passengers each, and the full length of the line is about 1 mile. A 15-minute service is in operation, and the fare charged is 2 cents per passenger. The buses are supplied by the Fiat Co., 18 to 24 horsepower, and cost about $3,250 each. The drivers receive 80 cents and the conductors 60 cents per day. The other line, which is a suburban line, 6 miles long, runs six trips per day with one bus, which is a Fiat, with a seating capacity of fourteen passengers. The fares are as follows: To Trespiano, 4.3 miles, 30 cents; to Pratolina, 6.2 miles, 40 cents. The cost of the bus was about $4,000. The driver receives $1.20 and the conductor 68 cents per day.

MEXICO'S GOVERNMENT AUTOMOBILES.—Objection has been raised to the number of automobiles kept by the Mexican government for the use of its officials. Fifty-one cars are maintained at public expense at the government offices in the capital. The cars represent a total investment of $255,000. The annual maintenance charges are estimated at $232,642. This includes the salary of the chauffeur and generally a footman. Of this number twenty-two are Packards, sixteen are Protos, seven are Fiats, five are Cadillacs and one is a Buick. This is exclusive of the cars owned by the government and assigned to military work. A number of pleasure cars are used to patrol the roads of the Federal District, while most of the higher officers in the field are using motor cars. While many of the latter are rented, the government pays the charges as well as the cost of upkeep. Altogether the Mexican government's annual bill for automobile upkeep is well over half a million dollars.

Institution of Automobile Engineers, assembled before the office of the Ferro Mfg. Co., Cleveland, O.

MACDONALD RESIGNS FROM RUSSELL—K. B. MacDonald, who for the past 2 years has been factory manager of the Russell Motor Car Co., Ltd., at West Toronto, Ont., makers of Russell-Knight cars, has severed his connection with that company.

INVENTS NEW WHEEL MACHINE—Carl D. Fisher, Jr., of Wapakeneta, is the inventor of a machine which he claims will expediate the assembling of automobile wheels by means of large air pressure. The machine weighs 12,000 pounds and has been thoroughly tested, according to the inventor.

ELKHART WANTS APPARATUS BIDS.—The board of public works of Elkhart, Ind., will receive bids for motor apparatus to replace the three-horse truck now in use. It is estimated by the board that the installation of an automobile apparatus will be a saving of at least $2,500 a year to the city.

BUSINESS ENLARGED—The firm of Edwards and Dickey, proprietors of the big Rockingham garage on Vaughan street, Portsmouth, N. H., with C. E. Hoyt, have purchased the Beacham garage business in that city also, and the 5-year lease it had on its quarters, and will conduct both places under one management.

WHITE BRANCH MOVES—The branch of the White Automobile Co. at Providence, R. I., has been moved into a new home on Broad street near Beacon avenue, formerly the headquarters of the Oldsmobile, and which several other dealers were seeking. The old quarters on Cranston street will be used as a service station.

MILWAUKEE WANTS FIRE APPARATUS—The Milwaukee, Wis., common council committee on fire department has recommended the purchase of motor-propelled apparatus costing $41,000. The purchase will consist of three combination hose, chemical, ladder and passenger cars, one tractor for ladder truck or steam fire engine, and three light delivery cars for the supply and repair department. Thomas A. Clancy is chief.

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

BAYPORT, N. Y.—W. L. Mantha Co.; capital, $1,000; to deal in automobiles. Incorporators: W. L. Mantha, N. F. Mantha.

BELLEFONTE, PA.—Bellefonte Automobile Mfg. Co.; to manufacture automobiles. Incorporators: F. Beakley, W. P. Sieg, E. A. Parrish.

BOSTON, MASS.—Britton-Stevens Motors Corp.; capital, $50,000; to deal in automobiles. Incorporators: W. H. Britton, G. D. Stevens.

CHICAGO, ILL.—Chicago Universal Motor Truck Co.; capital, $10,000; to deal in motor trucks. Incorporators: E. C. Rockwell, J. H. Dunn, C. M. Stevens.

CHICAGO, ILL.—Gloor Motor Truck Co.; capital, $25,000; to manufacture trucks. Incorporators: J. T. Devers, H. L. O'Meara, J. N. Chapman.

CHICAGO, ILL.—Krickwell Motor Co.; capital, $2,500; to deal in automobiles. Incorporators: C. W. Krick, William Capesius, H. L. Strohm.

CINCINNATI, O.—G. A. Schacht Motor & Truck Co.; capital, $35,000; to manufacture and deal in automobiles. Incorporators: Gustac Schacht, William Schacht, Charles R. Talbott, T. C. Jung, M. L. Buchwalter.

CLEVELAND, O.—Auto Carriage Co.; capital, $10,000; to deal in automobiles. Incorporators: A. E. Bernsteen, E. B. Zwirk, Samuel Solker, M. L. Bernsteen, J. Nungesser.

HAVERHILL, MASS.—Mansur Motor Truck Co.; capital, $30,000; to deal in motor trucks. Incorporators: G. B. Mansur, K. L. Moses, N. L. Furbush.

INDIANAPOLIS, IND.—American Automobile Exchange; capital, $25,000; to deal in automobiles. Incorporators: Wilbur Wynant, W. R. Luke, E. C. Brennan.

LOS ANGELES, CAL.—Mehler Motor Car Sales Co.; capital, $5,000; to deal in automobiles. Incorporators: R. W. Mehler, J. J. Bacigalupi, P. Borden, D. L. Jones.

LOS ANGELES, CAL.—Mission Automobile and Realty Co.; capital, $10,000; to deal in automobiles. Incorporators: N. Ledgerwood, J. R. Matthews, I. S. Isenogle.

LOS ANGELES, CAL.—Pacific Auto Truck Mfg. Co.; capital, $250,000; to manufacture motor trucks. Incorporators: W. S. Wheaton, A. J. Pederson, D. M. Carroll, Ellis G. Brode, W. R. Swartwood.

MONTCLAIR, N. J.—Heyer Auto Supply Co.; capital, $25,000; to do a general automobile business. Incorporators: A. P. Heyer, J. Culvert.

NEW YORK CITY—Herlihy-Scales Co.; capital, $2,500; to deal in automobiles. Incorporators: Dalton Scales, Richard Herlihy, B. A. Judd.

NEW YORK CITY—Insular Service Corp.; capital, $50,000; to deal in automobiles and trucks. Incorporators: F. H. Cox, Theodore Kirby, A. E. Carpenter.

NEW YORK CITY—Lurie Aoto Co.; capital, $1,000; to deal in automobiles. Incorporators: S. S. Rosenberg, I. R. Caplan, C. U. Baeker.

PORT CHESTER, N. Y.—A. B. C. Aotomobile Co.; capital, $1,000; to deal in automobiles. Incorporators: W. D. Sporberg, W. F. Gainey, T. F. J. Connolly.

SALT LAKE CITY, UTAH—Deseret Motor Truck Co.; capital, $50,000; to manufacture and deal in motor trucks. Incorporators: Ira Cole, Domine Burns, J. E. Fleige.

SAN DIEGO, CAL.—Clark-Lilly Motor Car and Machine Co.; capital, $50,000; to deal in automobiles. Incorporators: C. C. Clark, J. T. Lilly, Morris Blinnard.

GARAGES AND ACCESSORIES

BOSTON, MASS.—Oxford Garage Co.; capital, $10,000; to maintain an automobile garage. Incorporators: L. D. Robbins, E. L. Brown, S. B. Ingalls.

BROOKLYN, N. Y.—General Tourist Co.; capital, $25,000; to maintain an accessory store for tourists. Incorporators: S. E. Cooper, N. R. Mancill.

BROOKLYN, N. Y.—Brooklyn Auto Repair Co.; capital, $5,000; to deal in automobiles. Incorporators: L. N. Vause, H. P. Freece, C. V. Mulligan.

BUFFALO, N. Y.—Federal Sales Co.; capital, $10,000; to deal in automobile supplies. Incorporators: C. A. Hahl, J. J. Henry, H. S. Bliss.

CINCINNATI, O.—Motor Sales & Service Co.; capital, $5,000; to operate an automobile business and deal in parts and accessories. Incorporators: J. B. Minor, G. B. Jolly, Carl Lehmann, A. Majoewska, W. W. Helmholtz.

CLEVELAND, O.—Commercial Auto Body & Mfg. Co.; capital, $50,000; to manufacture automobile bodies. Incorporators: M. E. McManus, G. H. Krippenberg, F. L. Fuller, J. H. Orgill, J. E. Matthews.

CLEVELAND, O.—Kouyoumjian Electric & Mfg. Co.; capital, $100,000; to manufacture an electric generator for automobiles which will be a cooling fan and generator combined. Incorporators: Robert Williams, M. L. Long, E. K. Kouyoumjian, B. W. Brockett, C. H. Treach.

CLEVELAND, O.—Lake Shore Auto Cartage Co.; capital, $5,000; to do a general cartage and storage business. Incorporators: C. M. Handy, Charles Malouf, G. J. Klamm, John Nelisse, L. B. Handy.

ELKHART, IND.—Paxson Auto Livery; capital, $10,000; to conduct an automobile livery and baggage transfer business. Incorporators: C. E. Paxson, Samuel Gayman, Clyde Paxson.

FAIRBANKS, IND.—Pogue Garage Co.; capital, $30,000; garage business. Incorporators: James Bradbury, T. Johnson, H. Holmes.

INDIANAPOLIS, IND.—Electric Vehicle Co.; capital, $15,000; to operate a garage.

JACKSONVILLE, FLA.—Southern Tire & Supply Co.; capital, $12,000; to deal in accessories. Incorporators: Sam Dunlap, H. E. Perryman, C. H. Brown.

LOS ANGELES, CAL.—Long Beach Motor Supply Co.; capital, $10,000; to deal in accessories. Incorporators: R. F. Ingold, S. D. Weil, Edward Cooper.

MOBILE, ALA.—Hillman Taxi Service Co.; capital, $2,000; to maintain an automobile taxicab business. Incorporators: G. D. Hillman, M. F. Hillman, Rosina Hillman.

NEW YORK CITY—Alhambra Auto Painting and Trimming Co.; capital, $1,050; to paint automobiles. Incorporators: Adolph Horenstein, Max Marcus, Herman Marcus.

NEW YORK CITY—A. & N. Automobile Co.; capital, $1,000; to manufacture an automobile gas starter. Incorporators: E. C. Allison, H. B. Newins, I. M. Highbee.

NEW YORK CITY—Century Garage Corp.; capital, $1,000; to maintain an automobile garage. Incorporators: Moses Lampert, A. R. Martin, A. M. Martin.

NEW YORK CITY—Convent Garage Inc.; capital, $5,000; garage business. Incorporators: E. F. Dannemann, H. F. Dannemann, W. G. Dannemann.

NEW YORK CITY—Drenco Garage Inc.; capital, $10,000; to maintain an automobile garage. Incorporators: D. W. Driscoll, J. A. Rennie, C. Coen.

NORFOLK, VA.—Grent Garage Corp.; capital, $10,000; to maintain an automobile garage. Incorporators: W. H. Bell, A. B. Court, Julian Osborne.

PHILADELPHIA, PA.—Western Tire Co.; capital, $10,000; to deal in automobile tires.

MILWAUKEE, WIS.—Milwaukee Forge & Machine Co.; capital, $8,000; to repair automobiles. Incorporators: G. B. Pillar, A. W. Peffer, John Eckert, Charles Hartson.

SPRINGFIELD, ILL.—Springfield North End Auto Repairing and Vulcanizing Co.; capital, $2,500; to maintain an automobile garage. Incorporators: R. J. Marquardt, C. H. Hamann, Elizabeth Hamann.

TOLEDO, O.—Babcock Garage Co.; capital, $10,000; to maintain an automobile garage. Incorporators: Alonzo G. Duer, C. Wagenhausen, L. P. Wagenhausen.

CHANGES OF NAME AND CAPITAL

CHICAGO, ILL.—John Kelly & Sons; change of name to the Kelly Automobile Co.

CLEVELAND, O.—Bayne-Subers Tire & Rubber Co.; capital increased from $250,000 to $1,500,000.

CLEVELAND, O.—Bayne-Subers Tire & Rubber Co.; change of name to the Subers Fabric Co.

CLEVELAND, O.—Pharis Tire & Rubber Co.; capital increased to $50,000.

LOUDENVILLE, O.—Ohio Grease Lubricant Co.; change of name to the Ohio Grease Co.

ST. LOUIS, MO.—Brown Automobile Co.; change of name to the Peerless Motor Car Sales Co.

New Agencies Established During the Week

PASSENGER VEHICLES

Place	Car	Agent
Baltimore, Md.	Reo	W. A. Wehr
Columbus, O.	Crow	Clintonville Garage & Auto Co.
Columbus, O.	Crown	Clintonville Garage & Auto Co.
Fostoria, O.	Oakland	Nestlerode Bros.
Galveston, Tex.	Oldsmobile	Galveston Motor Car Co.
Hutchinson, Kan.	Rambler	Eaton Auto Co.
Lamartine, Wis.	Detroiter	S. E. McCumber & Son
Lamartine, Wis.	Marathon	S. E. McCumber & Son
Los Angeles, Cal.	Marion	Symonds Motor Car Co.
Los Angeles, Cal.	McFarlan	R. C. Merriam
Milwaukee, Wis.	Franklin	Sanger Automobile Co.
Milwaukee, Wis.	White	White Automobile Co.
Oakland, Cal.	Moline	C. C. Eichelberger
Pasadena, Cal.	Midland	Leonard Visner
Philadelphia, Pa.	Maxwell	Frank Fanning
Princeton, Ill.	Franklin	Evans-Coppins & Starks Co.
Racine, Wis.	Reo	Foster & Welchert
Salt Lake City, Utah	Speedwell	G. S. Holmes
San Diego, Cal.	Oakland	E. L. Peacock Auto Co.
Seattle, Wash.	American	Dr. M. A. Miller
Seattle, Wash.	Empire	C. R. Williams
Seattle, Wash.	Maxwell	Van Brunt Motor Car Co.
Seattle, Wash.	Oldsmobile	Washington Motor Car Co.
Vancouver, B. C.	Hudson	Dominion Motor Car Co.
Winnipeg, Can.	Chandler	Canadian Motor Car Co., Ltd.
Worcester, Mass.	Chandler	W. J. Woods
Youngstown, O.	Franklin	Jacob Struhldreher

COMMERCIAL VEHICLES

Place	Car	Agent
Baltimore, Md.	Lauth-Juergens	A. W. Fulton & Co.
Bakersfield, Cal.	Autocar	Short Bros.
Boston, Mass.	Dart	W. F. Magill
Export, Pa.	Vulcan	O. A. Grable
Hartford, Conn.	Blair	H. E. Putnam
Milwaukee, Wis.	White	Milwaukee Tire & Supply Co.
Minneapolis, Minn.	Dart	H. T. Heberle
Pittsburg, Pa.	Stewart	Alco Pittsburg Sales Co.
Salt Lake City, Utah	Speedwell	G. S. Holmes
Salt Lake City, Utah	Wagenhals	G. S. Holmes
San Diego, Cal.	Autocar	J. A. McCaddon
San Francisco, Cal.	Piggins	Interstate Motors Co.
Seattle, Wash.	Lincoln	Imperial Sales Co.
St. Louis, Mo.	Knox-Martin Tractor	Cabany Motor Car Co.
St. Louis, Mo.	Peerless	Peerless Motor Car Sales Co.
Tacoma, Wash.	Stewart	American Auto Co.

ELECTRIC VEHICLES

Place	Car	Agent
St. Louis, Mo.	Standard	T. J. Moss
Topeka, Kans.	Detroit	A. C. Roller

Trade Opportunities for American Cars

American Automobile Products Popular in Foreign Trade Centers—Dealers Anxious to Open Trade in Our Cars—Bus Lines Started

REPORTS from American consular officers show that the automobile and its accessories from this country are gradually getting a firm foothold in foreign lands. There is a call for electrics and motor trucks. The performance of the low-priced cars has been so good that there is quite a demand now by dealers in small cars who see a great future in the trade of such makes.

Electrical Supplies—In response to an inquiry from the United States, an American consul in the United Kingdom has forwarded catalogues and pamphlets showing the various styles of electrical supplies sold in his district. Several dealers in electrical specialties who were interviewed stated that the usual procedure is to purchase their stocks from large wholesale traders of representatives of manufacturers in London and other cities who call and solicit orders, but that practice would not deter them from purchasing direct from American manufacturers if the advantages could be shown to them. The names of three firms desirous of getting in touch with American manufacturers may be had on application to the Bureau of Foreign and Domestic Commerce. The complete report submitted by the consul, as well as the catalogues and other pamphlets forwarded, will be sent to interesed manufacturers. File No. 10989.

Motor Trucks—A motor traction company is being formed in a foreign city to handle and transport the cotton, coal, iron, machinery, and other heavy merchandise which forms an important part of the trade of the port, as it is thought the use of motor trucks will greatly expedite the supplies to the mills and the delivery of finished goods at the docks. It is proposed to commence with twenty-five motor trucks, ranging in carrying capacity from 3 to 10 tons. A number of the cars will be of automatic discharge and others will be equipped with self-contained winches for loading purposes. It is thought that most of the cars will be purchased in the United States. Further details will be given as soon as the company is organized, but in the meantime it might be well for American manufacturers of motor trucks to get in touch with the consul who furnished this information. File No. 10993.

Automobile Sundries—The Bureau of Foreign and Domestic Commerce is in receipt of a communication from an American firm manufacturing automobiles, stating that its German representative has made known his desire to get in touch with manufacturers of automobile sundries who may desire representation in Europe. The American firm writes that this representative has disposed of a number of cars for it. File No. 10775.

Automobiles and Motorcycles—A report from an American consular officer in Canada states that a local merchant of good standing is considering the purchase of an inexpensive runabout type of automobile or a first-class motorcycle. Interested American manufacturers may send their catalogues and price lists in duplicate to the consular officer in question, and one set will be handed to the intending purchaser, the other to be retained in his files for the information of any other inquirers. File No. 11131.

Automobile—An American consular officer in a European country reports that a resident of his district is in the market for an American automobile seating five persons, with a speed of 60 miles an hour, not less than 40 horsepower, of the latest design, with self-starter, electric lights, etc. Correspondence with the inquirer should be in German or French. File No. 11116. Address all communications to the Bureau of Foreign and Domestic Commerce, Washington, D. C.

Automobiles and Agricultural Machinery—An American consular officer in Western Europe reports that a business man in his district desires to enter into relations with American manufacturers of automobiles and agricultural machinery not already represented in that district. Correspondence should be in French. File No. 11107.

Electric Automobiles—An American consul in a European country reporting on the market for electric automobiles in his district states that two local business men, one of whom is agent for an American automobile, are interested in receiving offers and catalogues from American manufacturers of very cheap and light American electric cars which could be sold to the public at about $1,500. File No. 10762.

Automobiles—A report from an American consul in India states that a local motor-car company would like to obtain the agency of a light American automobile, four-seated, 4-cylinder, which completely equipped could be sold at retail for about $1,000. Catalogues, prices, and terms c.i.f. should be sent to the inquirer. File No. 11022.

Automobiles for War Use—The Ministry of War in a foreign country has appropriated $40,000 for the purchase of automobiles for the use of the local army. An American consul has forwarded the name of a business man from whom plans, prices, catalogues, etc., showing the class of machines manufactured for war purposes can be obtained. File No. 11014.

Automobile Chassis—A number of foreign dealers in motor cars, anticipating an increase in the customs tariff, desire to form prompt connections with manufacturers who are prepared to supply the chassis only. They propose to build the bodies and assemble the parts locally. Manufacturers of motor-car chassis, as well as of accessories, are requested to supply an American consular officer with about 1 dozen catalogues each, which will be turned over to the proper persons. In each case the prices f.o.b. New York, together with trade and cash discounts to dealers, and approximate weights and measurements, should accompany the catalogues. File No 10939.

Motor Buses—An American consul states that a syndicate has subscribed $125,000 and will purchase 200 motor buses this year and 350 during 1914. Some of the machines will be double deckers. File No. 11,085.

Automobile—A wealthy resident in a foreign country desires to receive catalogs and price lists of American automobiles. He has been favorably impressed with the performance of machinery and other articles of American manufacture, so there is no prejudice to overcome. File No. 11,086.

Automobile Tops—A carriage manufacturer in a city in Europe making a specialty of repairing automobiles has informed an American consulate that he desires to obtain American material used in covering automobile tops. He asks that American houses corresponding with him send samples and price lists. He is also interested in paints, oils and varnishes used in renovating automobiles. Correspondence in Russian, German or French is preferred. File No. 11,092.

Accessories for the Automobilist

SPRING Leaf Lubricator—In these days when the automobilist insists upon the utmost silence in the motor car which he drives, spring squeaks, no matter how small, are not to be tolerated. Besides, when the leaves of the springs become rusted and stick together, some of the car's resiliency is lost, because the springs become in effect the same as solid pieces of steel. But to eliminate these spring troubles in the usual way, driving a cold chisel between the leaves with a hammer, after the car has been jacked up to relieve the tension from the spring upon which the work is being performed, is no easy matter, and has the disadvantage of possible marring of the spring due to the application of the chisel and false hammer blows.

To eliminate these troubles and even the necessity for jacking up the car in order to spread the leaves to be oiled, the Spring Leaf Lubricator Co., Ann Arbor, Mich., has devised a special tool for spring doctoring. This devise consists of a simple, drop-forged clamp, Fig. 1, the jaws of which are provided with wedges for forcing in between the leaves. Fig 2 shows the method of application and one of the leaves spread for the insertion of oil.

The lubricator is made with sufficient width between its jaws for application to the widest passenger car springs now in use. For trucks, a heavier type is made which will accomodate the widest of commercial car springs. The only difference between the two types is that the latter is provided with a handle which is free to move in the hole in the end of the screw so as to afford the greater leverage necessary for spreading of the heavier truck springs.

Besides its usefulness as a leaf spreading device, the tool may be utilized as a repair clamp for clamping broken springs temporarily until they can be repaired. This application is shown in Fig. 3.

Hoffecker Electric Odometer—The Hoffecker Co., Boston, is making deliveries to builders of electric passenger cars of its electric odometer, Fig. 4, which resembles a speedometer, excepting in that it measures distances traveled, these being registered on a circular dial the same as speeds of travel are indicated on a speedometer. The dial reads to 100 miles, the reason being that the capacity of battery on one charge is generally lower than this. In the bottom of the dial space is a season odometer for 100,000 miles.

This instrument, being the first of its kind to be marketed, is a neat one, with a 3-inch dial, which is of black enamel with white letters and a white pointer or indicator hand. The bezel or casing for it is mounted on a small circular bracket screwed to the dash, the bezel threading into a socket in the center of the bracket. The casing is finished in black enamel and is 1.6875 inches thick.

The odometer mechanism is driven through a flexible shafting of standard Hoffecker construction and made up of seventeen strands of flexible piano wire. The gearing between the shaft and the road wheels is such that the shaft makes 180 revolutions per mile. As many electrics use solid rubber tires exclusively, the shafting has been mounted to not be influenced by the additional vibration.

The Hoffecker Co. is now marketing its combined speedometer-odometer and timepiece all mounted on a special oblong-shaped dash bracket 10.25 inches in length. All three of the instruments are made with a 3-inch dial, the small diameter of these being the reason for mounting the speedometer in one bezel without anything else, and the odometer with its trip and season recorders in a separate bezel. The trip odometer reading to 100 miles has the figures in a circle around the dial, with tenths and hundredths shown at each side the hand pivot and the 100,000-mile season odometer in the 6 o'clock position. Between the odometer and speedometer bezels are two buttons, the lower one a release and the top one a reset button for the odometer. The flexible shaft drive is connected horizontally at the right end from which point it is intended to be carried horizontally to the side of the body. The bezel of each instrument is finished in white nickel and carries a black porcelain dial with white enamel letters. The time piece is an 8-day Waltham movement.

Koenig's Portable Extension Battery Support—M. Koenig, chief engineer of the Central Brewing Co., New York City, has invented a most practical appliance for users of electric trucks. This device, Fig. 5, page 1286, is a portable extension battery support. It can be made to fit any truck or battery and is simple as well as effective. This support is put on in about a half a minute by simply placing two rods, extending from each end of the support, upon the channel frame, and then tightening a turnbuckle on each. There is a small extension on each end of the support, which is buckled to the battery cradle to keep the cradle from coming out when the battery is slid out for examination. The end of this extension is threaded so as to permit a variable adjustment. This battery support can be carried with the truck, which enables the driver to examine the battery with little effort.

Golden Glow Headlights—The Esterline Co., Indianapolis, Ind., is now marketing a new kind of headlight, being known as the Golden Glow, Fig. 6, on account of the peculiar light obtained with it. The latter is caused by the use of the special reflector, prepared as follows: The glass used for the reflector is shaped as a true parabola and ground to high brilliancy on both surfaces. After this has been done the surface is silvered with a relatively heavy plating and then covered with an electrolytic deposit of copper. The result is a red surface backed by silvery white, which practically equals the color of metallic gold. Due to this color, the reflector emanates a golden light instead of the whitish brilliancy produced by the incandescent bulb, and it is claimed that this light, while fully as penetrating as the white, lacks the painful quality of glaring white light. Incidentally, the claim is made by the manufacturer that the yellow light is

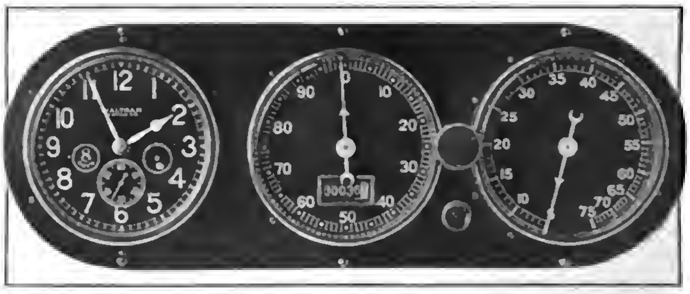


Fig. 4—The Hoffecker electric odometer

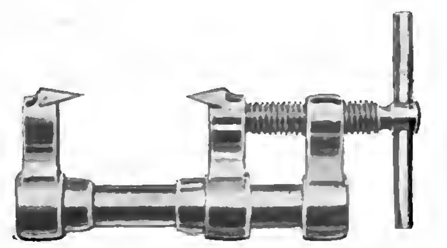


Fig. 1—Spring leaf lubricator

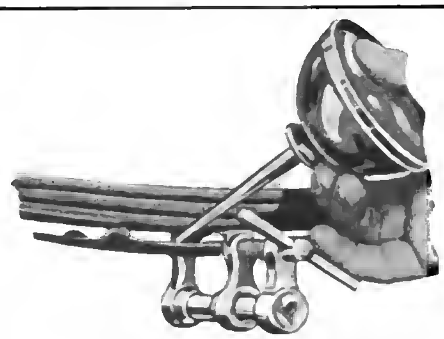


Fig. 2—Spreading leaves for application of oil

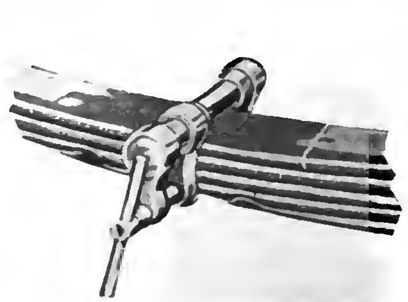


Fig. 3—As a repair clamp

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The AUTOMOBILE

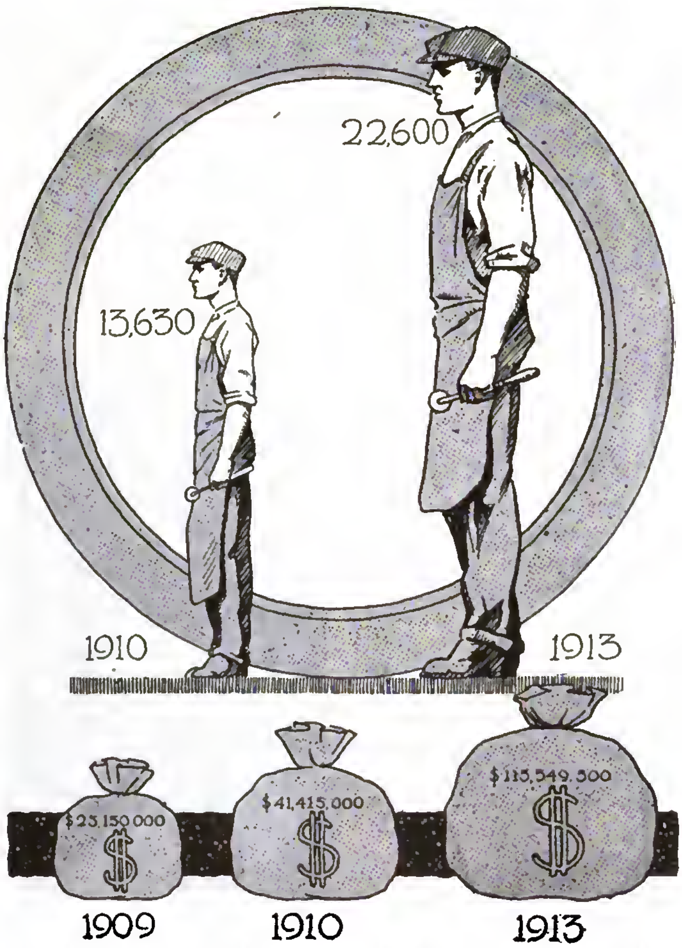
Where 20,000 Tires Are Made Daily

By L. V. Spencer

AKRON, the foremost city of the world in the production of rubber goods, gives to the automobile public 20,000 tires each day. It turns out in every 24 hours more pneumatic and solid motor vehicle tires than all the rest of the United States combined.

Considering that the average diameter of these tires is 34 inches, that is, taking into account all the different sizes, if a day's output of the Akron factories were arranged in a long line so that each tire would be tangent to both the one in front of it and the one behind—and here the statistician gets in his work—the line would measure nearly 12 miles in length. Or, going a step farther, and figuring on this production for a year of 300 working days, the line would have a length of 3,400 miles, or more than the distance across the American continent by about 1,000 miles.

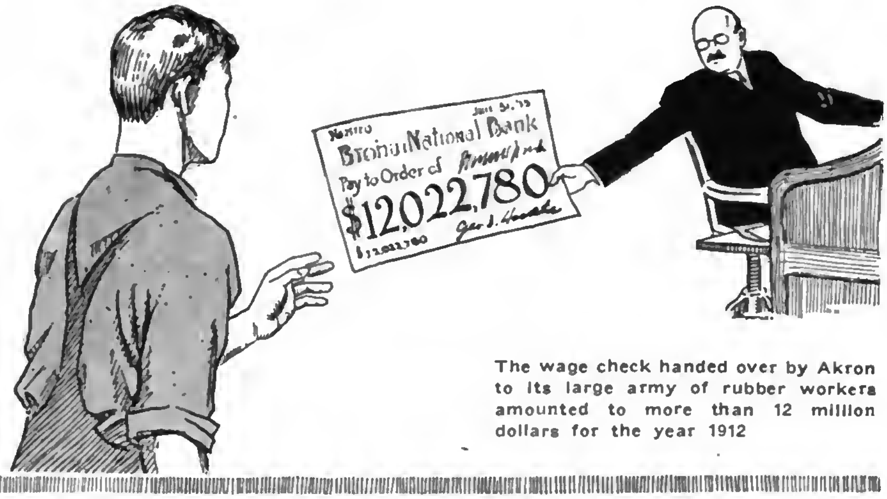
It is hard to realize that there is is a demand for such an enormous quantity of tires as that produced in Akron alone, not to mention the outputs of many other very large tire manufactories throughout the United States. Yet several of the Akron factories are laying plans for further additions to the tire-making divisions of their plants so as to materially increase their outputs. It is rather difficult to see where such enormous production will end.



Upper diagram shows enormous increase in Akron's rubber workers in 3 years. Below, total capitalization of rubber factories in Akron for 1909, 1910 and 1913. Note great increase made last year

For the making of this great line of tires, besides the daily production of an enormous quantity of mechanical rubber goods, hard rubber specialties and every other conceivable class of merchandise made of rubber, one-third of the world's total production of crude rubber finds its way to Akron, giving this thriving city of Northern Ohio a unique position in the industrial world.

Just as Detroit is looked upon as the Mecca of the makers of automobiles and their parts, as Minneapolis is noted for its flour mills, as Sheffield is linked with steel, so Akron is known the world over as the rubber goods city. Many a rubber man in far-away Ceylon or in South America knows little or nothing of the cities of the United States, but, nevertheless, the name of Akron is at his tongue's end. To him it is well nigh synonymous with his trade with the Great United States.



The wage check handed over by Akron to its large army of rubber workers amounted to more than 12 million dollars for the year 1912

There are few who have not actually visited these great rubber goods making institutions who realize the enormous scale upon which they are built. The Goodyear factory, for instance, offers employment to about 6,000 men, has a daily capacity of 6,000 automobile tires in addition to its many other lines of manufacture and has 2,000,000 square feet of floor-space. Some statistician has figured out that if the Goodyear factory were 50 feet wide and one story in height, it would be over 8 miles long.

The Firestone company is housed in the largest single rubber manufacturing building in the world. This plant covers 15 acres and gives employment to 3,500 persons. It produces 50 tons of finished tires each day.

While the rubber industry has been the chief business of Akron for a number of years, it is only within the past 10 years that it has had any remarkable growth. Although the making of tires is only one branch of the rubber-making industry of Akron, it is clear that the rapid strides which the factories have made and the proportionate increase of every branch of its commerce which is related to rubber making are due largely to the unprecedented growth of the automobile industry with its consequent demand for an enormous number of pneumatic and solid tires.

Akron must charge its steady growth and present prosperity to the automobile industry, just as Detroit has done. Ten years ago the B. F. Goodrich Co. and the Diamond Rubber Co., now combined, were the only companies turning out automobile tires in Akron. Their output was only a few hundred a day at that time. The other large rubber concerns which now have a large daily production were then not doing any automobile tire business at all. But the greatest development in the motor vehicle tire business in Akron has been within the last 5 years in parallel with the giant strides made in the production of automobiles during the last few years.

Industry Began in 1869

Forty-four years ago the rubber industry in Akron was begun. In 1869 Dr. B. F. Goodrich established a small plant for the manufacture of rubber products which was the nucleus for the present great combine which bears his name. The first building measured 40 by 100 feet, and the doctor's company was capitalized at $100,000. Little did the genial doctor dream that in less than 50 years his company would have a factory giving employment to nearly 15,000 workers and having a floor-space of about 65 acres. The present capitalization of the Goodrich combine is $90,000,000, and it manufactures about 10,000 tires daily.

Dr. Goodrich's first plant employed 25 persons. In the early days he is said to have been his own factory manager, chief engineer, chemist and traveling salesman. For several years he alternately journeyed around the country taking orders and returned to his little factory to personally see that they were filled. None of the original buildings now remains.

Since then other great rubber factories have sprung up within the city, gradually and surely advancing the small community which in Dr. Goodrich's time had a population of about 10,000 to the present thriving industrial city of 90,000 people.

There are at the present time in Akron eighteen rubber factories as against fourteen in 1909 and fifteen in 1910. These eighteen plants, having an aggregate capitalization of $113,549,500, are listed:

American Hard Rubber Co.
American Tire and Rubber Co.
Buckeye Rubber Co.
Federal Waterproofing Co.
Firestone Tire and Rubber Co.
B. F. Goodrich Co.
Goodyear Tire and Rubber Co.
Gregory Rubber Co.
Hadfield Rubber Co.
Lion Rubber Co.
Miller Rubber Co.
Mohawk Rubber Co.
Motz Tire and Rubber Co.
O'Neill Tire Protector Co.
Philadelphia Rubber Works Co.
Portage Rubber Co.
Starr Rubber Co.
Swinehart Tire and Rubber Co.

Then there is the Swinehart plant, which is turning out in the neighborhood of 10 tons of solid tires and from 300 to 500 pneumatics daily. In this plant there are 300 employees. An addition is now under way which will double the Swinehart plant in size and make it possible to increase the production of tires about three-fold.

The Miller Rubber Co. furnishes employment to 1,200, and has a pneumatic tire output of 1,000 a day. Seven hundred of its employees are connected with the production of tires, while the others are concerned with the making of rubber automobile accessories and various other rubber products. No solid tires are made by this concern. The floor-space of the Miller plant is 200,000 square feet.

In the Buckeye plant of the Kelly-Springfield Tire Co. we find about 550 men engaged in the making of 500 tires and a like number of inner tubes each day. Several new buildings are under way at the present time, and the company plans to increase its tire output this fall to 1,200 daily.

An extensive plant dealing exclusively with the manufacture of solid tires is that of the Motz Tire and Rubber Co. This company turns out a large number of special solid cushion tires particularly adapted for use on electric vehicles. Recently some improvements have been made in these tires.

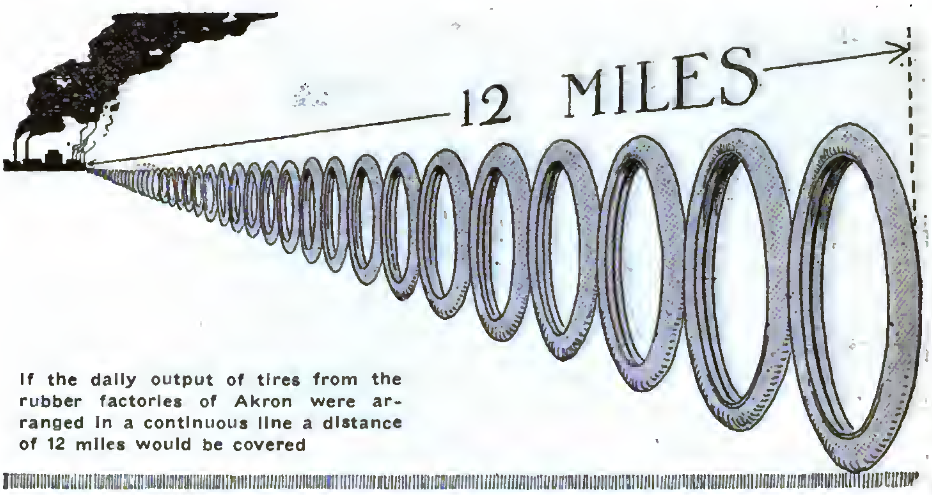
The Mohawk Rubber Co., which about 90 days ago took over the plant of the Stein Double Cushion Tire Co. and remodeled it, is making passenger car tires exclusively. It turns out 150 casings and 500 tubes per day with 75 employees. The plant extends

View in the tread-laying room of a tire factory over an area of 100,000 square feet.

Another tire maker is the Portage Rubber Co., which turns out 150 pneumatics and 200 tubes each 24 hours. Its workmen number 200, half of whom are in the tire branch, the rest being concerned in the making of mechanical rubber goods.

The American Tire & Rubber Co., with 50 men and a floor-space of 30,000 square feet, manufactures inner tubes, tire accessories and cements, besides a line of mechanical rubber goods.

Then there is the O'Neill Tire and Protector Co., which makes tire protectors, reliners, blow-out patches, air bags, portable vulcanizers and the like. It has a plant of 11,000 square feet and gives employment to twenty-four persons.



If the daily output of tires from the rubber factories of Akron were arranged in a continuous line a distance of 12 miles would be covered

The Philadelphia Rubber Works Co. is not in the tire making line, but confines its activities to the manufacture of reclaimed rubber only. Its process for the reclaiming of rubber is exceedingly extensive, and to the plant comes all sorts of rubber scrap. A large proportion of this is worn out tires, the rubber in which, though no longer of value for automobile purposes, nevertheless may be reclaimed for many other uses.

The American Hard Rubber Co., as its name implies, does not make any soft rubber goods whatever, but concentrates on the making of specialties of the hard rubber variety such as battery jars and the like.

Automobile goods are also out of the line of the Federal Waterproofing Co., which specializes on waterproof materials.

The Star Rubber Co. 2 years ago discontinued the making of automobile tires, its factory now being devoted to the production of seamless rubber articles.

The Hadfield Rubber Co. has some products for the automobile trade. These are rubber bumpers, insulators and washers. In addition, it gets out a number of specialties for surgeons' and household use. It employs about a dozen men.

A unique line is that of the Gregory Rubber Co., which is not engaged in the making of any motor car products, but makes rubber specialties and toy balloons, the latter being the larger end of its business by far. For this special line, twenty people are employed and 8,000 square feet of floor space occupied.

The Lyon Rubber Co. is also a specialty concern, making tire repair cements, repair patches and accessories.

In the sundries room, showing arrangement of tire formers

These interesting facts and figures covering Akron's plants will serve to bring home more forcibly to the average reader the extent to which this single industry in a single city has developed.

Last year Akron's eighteen rubber factories had an output valued at $94,445,000, which includes all classes of rubber goods. There are in the city 144 manufacturing concerns inclusive of the rubber factories. These have a total capitalization of $142,356,450 at the present time. Thus it will be seen that these eighteen factories, though being only 11.8 per cent. of the total number of establishments in the city, represent 79.7 per cent. of Akron's total invested capital.

Capitalization Increases Fivefold

This enormous capitalization of the rubber factories, headed by the $90,000,000 Goodrich company, has increased nearly fivefold in the last 4 years, as shown by the following table:

Total Capitalization Akron Rubber Factories

Year	Amount
1909	$25,150,000
1910	41,415,000
1913	113,549,500

An interesting feature of a consideration of any industrial community such as Akron is the number of wage earners and how that large army is provided for in the way of living facilities—always a serious problem. Over one-third of the city's present population is of the wage earning class. Or, to be specific, there are employed in the 144 establishments claiming Akron as their home 34,700 working men and women. Sixty-five per cent. of this number, or 22,600, find employment in the rubber factories, making this single industry responsible for one-quarter of the city's population.

Six Payrolls Average $12,022,780

During 1912, the six largest rubber companies had an average payroll of $12,022,780, a figure close to the aggregate bank deposits in all of the banks of the city on an average day last year. While the rubber workers are by no means all concerned in the making of tires, it is safe to say that about one-quarter of the rubber workers are employed in some operation or other connected with the making of these necessities of automobiling. It is impossible to obtain any figures which segregate the number of tire workers from the total employees in the plants, no statistics being kept along this line, owing to the continually varying conditions.

For similar reasons we are unable to go back more than 3 years for accurate statistics as to the total number of workers. However, in the past 3 years, since the automobile industry began to make such rapid strides and to demand millions of tires each year from the Akron factories, the percentage of increase of rubber workers has been 5.35 per cent. as compared with the total population of the city. The following table, which shows the

The calender room where the rubber stock is passed through the heated rolls of the huge calenders

exact figures for 1910 and 1913 brings out this point strongly:

Year	Total population	Wage earners in rubber factories	Percentage of total population in rubber industry
1910	69,067	13,630	19.75
1913	90,000	22,600	25.10

Thus it is shown that the rubber industry has probably drawn heavily upon other lines of industry in the city within the last few years, and that while these other lines have also grown to help swell the total population, the city's chief industry today gives employment to one-fourth of the people when 3 years ago it paid one-fifth for its services, although in the same period the total number of persons in the city has increased by 30 per cent.

The nature of the rubber manufacturing business and particularly most of the operations in connection with the making of tires requires the services of employees of the skilled class, though it is true that unskilled labor may be utilized for many operations. Piece work schemes seem to predominate in the Akron factories, and on this basis many of the men make good wages of from $4 to $6 each day.

There is practically no other city in the country the size of Akron where the working class has so much money per capita. A general air of prosperity pervades the community.

Erect Houses for Workers

The employers and the civic bodies of the city have not lost sight of the fact that adequate living facilities must be provided for its large industrial army. Additional workingmen's homes are being erected as fast as possible, largely through the endeavors of the Housing Committee of Akron's wide-awake Chamber of Commerce, which has a membership of about 1,200 of the city's leading business men.

There is still a great demand for small houses in the city and the Chamber of Commerce is seeking to interest outside capital along this line by various kinds of publicity. For the fiscal year ending November 1, 1912, the records of the City Building Inspector's office show that 2,372 permits were issued for the erection of houses. This is a rather remarkable showing for a city of this size, but it is believed that a still larger scale of building operations will be recorded this year, due to the rapid growth.

The factories themselves are aiding in the work of providing homes for their men. As a case in point, the Goodyear company has recently purchased a tract of land adjoining its plant where desirable homes are to be built for its employees, the properties being sold to the men on very easy long terms at cost. By this arrangement a man can own his home in from 12 to 15 years.

Besides this, this concern operates a hotel, so called, where newcomers to the city who are employed at the factory may live until they can find a permanent location. They are charged for this only a nominal sum of 15 cents a day for the first week, 20 cents for the second, and so on. This scheme is working very successfully.

These views may seem diametrically opposite to the published reports which were current at the time of the recent strike trouble in the city. That strike probably did more to rid the city of an undesirable element and to clear up misunderstandings between employers and employees than anything else could have done. Today they are closer together than ever before.

Like many another affair of its kind this strike grew from a

Each tire is buffed before the tread is put on

Scene in the curing room where pneumatic tires are given their first vulcanization

small affair until it had spread through the whole body of rubber workers of the city. Certain strike agitators then descended upon the community and made many claims against the Akron employers which were not only unfounded but malicious. It was at the instance of these agitators that the Senate of the State of Ohio sent a committee to Akron for the purpose of actually probing the labor conditions there and to determine just how many of these claims, if any, were true.

In addition to discovering that the strike instigators were advocating a system of sabotage, the committee discovered that their claims were in the main absolutely ungrounded. In its report, the committee further brought out that the testimony of the employers and employees showed that the wages paid by the rubber companies generally compare favorably with those paid in other industries and that the wages paid in the tire-building and tire-finishing departments are evidently higher than those paid in other industries where like skill and effort are required.

The Ohio Senate Committee's findings went further in stating that the buildings of the rubber companies are practically fire-proof, well-lighted and so constructed as to provide good ventilation. And in conclusion it was shown that the investigation has proven profitable and of great value to the rubber manufacturers, the employees and the general public. "The testimony has developed abuses which had crept in and grievances of which the managements of the rubber factories were not aware. Many of those have no doubt already been corrected, all of which is to the advantage of all concerned."

All of this may present the unpleasant circumstance in a different light to many as coming from an unbiased source. Many of the workers did not know what they were striking for. The cloud has completely blown over now; the factories are running with the normal number of operators; production has been put back to its normal. Akron is itself again and the better for its experience.

After cleaning, the tread is applied as shown

Banking Institutions Are Active

Always a criterion by which to judge the prosperity of any community is the activity of its banking institutions. The Akron Chamber of Commerce statistics show that, besides an increase of 89 per cent. in invested capital and 31.4 per cent. in the number of those employed for 1912 over the previous year, the Akron banks also had a prosperous year. The total deposits in all of the banks of the city on November 1, 1912, aggregated $16,648,441, as against $14,717,790 on the same date in 1911, an increase of 13 per cent. The surplus and undivided profits of these institutions also showed an increase of 8 per cent. for this period.

Akron's bank clearings of $93,378,000 for the year 1912 were 43.0 per cent. greater than they were for the previous year. This gain was greater than that of any other city of the Central States, according to the statement of R. G. Dun & Co. This is but another proof of the increasing volume of business which the city enjoys.

Akron, with its advantageous location for trade, its shipping facilities afforded by five railroads, its educational features and its offering of cheap and desirable living conditions for its workmen, has risen to its present proportions logically. The automobile industry is responsible for its rapid growth within the last few years, and just as long as that industry continues to grow, so will Akron advance correspondingly. There is no limit to its possibilities as a commercial center.

Alter Tariff Rate Bill

New Rate on Cars Submitted to Senate Caucus Calls for Duties of 30 To 45 Per Cent.

WASHINGTON, D. C., June 22—The Underwood-Simmons tariff revision bill, as agreed upon by the Democrats of the Senate finance committee, has been submitted to the Democratic caucus of the Senate and yesterday went through a full day's session of the caucus with harmonious support for most of the alterations the Senate finance committee members had made in the original bill. The new rate on motor cars as submitted to the caucus reads as follows:

"Paragraph 121. Finished automobiles, valued at $1,500 or over and automobile bodies, 45 per centum ad valorem; finished automobiles valued at less than $1,500, 30 per centum ad valorem; automobile chassis, and finished parts of automobiles, not including tires, 30 per centum"

Cheap motor cars, as necessaries of business and farming life, were the subject of much of yesterday afternoon's debate in the caucus. The finance committee democrats cut the Underwood rates from 45 per centum to 30 per cent. on motor cars valued at less than $1,500, and in the debate several democratic senators urged a further cut and recommended that the tariff be only 10 or 15 per cent on cars valued at less than $1,000. This demand was made on the ground that cheap motor cars were now commercial necessities.

The caucus did not settle the motor car controversy, but asked Chairman Simmons and his colleagues on the finance committee to investigate further. Advocates of the lower duty claim the government would lose little revenue, as the high-priced machines pay most of the tariff.

J. D. Maxwell To Build Cars

INDIANAPOLIS, IND., June 25—*Special Telegram*—J. D. Maxwell and associates have bought the plant of the T. B. Laycock Mfg. Co. here, for approximately $300,000 and will manufacture automobiles. Manufacturing and selling companies are being formed and forces organized. Details are not available now but a medium-priced car will be built. The plant is 880 feet long and 270 wide and has its own heating, lighting and water plant.

Stepney Motion Denied by Court

NEW YORK CITY, June 20—Motion made by the Stepney Tire & Rubber Co. to combine its countersuit with the suit of the Rutherford Rubber Co. was denied yesterday in Supreme Court, Special Term. The Stepney Tire & Rubber Co. has filed a countersuit of $72,000 against the Rutherford company, alleging breach of contract in supplying poor material. The Rutherford company manufactured tires for the Stepney company to be sold as an unguaranteed product. The latter company states that tires were returned that had not covered 5 miles although the contract stated that the tires were to have the same tread as the regular Rutherford output.

The suit of the Rutherford company is for a little more than $2,000 and is for moulds which they claim the defendants should continue to pay for under the contract. The Stepney company has not been actively in business for the past 2 years, according to Walter Lissberger, former treasurer.

Midland Assets Are Indefinite

MOLINE, ILL., June 21.—An examination of the books of the bankrupt Midland Automobile Co. has been held and shows that the assets of the company could be placed anywhere from $100,000 to $190,000 while the liabilities are approximately $250,000. The cause for the indefiniteness in assets is that most of the equipment is old. Originally it cost slightly over $200,000. An invoice is being made and basis on which settlement will be made with creditors will be announced soon. Edward McCullough of Springfield has been appointed receiver of the defunct company by Judge Humphrey of the federal court at Springfield. Attorney G. A. Shallberg of Moline is representing the creditors of the tri-cities.

Milwaukee Motor Co. Files Petition

MILWAUKEE, WIS., June 23—An involuntary petition in bankruptcy has been filed against the Milwaukee Motor Co., Milwaukee, Wis., by three creditors with claims aggregating about $350,000. They are: Racine Brass & Iron Co. and Standard Foundry Co., Racine, Wis., and the Standard Paper Co., Milwaukee. The petition states that the company has assets of about $350,000 and that its liabilities are about $280,000.

It is alleged that the Milwaukee Motor Co. performed an act of bankruptcy on May 19 in transferring to Ernst G. Miller, of Milwaukee, $25,000 in notes given to the company by the Imperial Motor Car Co., Jackson, Mich., which constituted a preferential payment. The First Savings & Trust Co., Milwaukee, has been appointed trustee under bonds of $10,000.

The past success of the concern, the large number of orders on its books for execution, and the energy behind the company will, it is confidently believed, result in a speedy settlement of the bankruptcy litigation. The plant is being operated at full time and the trustee will continue it in this manner.

Ford Declares $10,000,000 Dividend

DETROIT, MICH., June 24—That a cash dividend of $10,000,000 has been declared by the Ford Motor Car Co. is the report in banking circles of Detroit. It is stated that Mr. Ford, owning 51 per cent. of the stock, will get $5,800,000. James Cousins gets $1,150,000 and Dodge Brothers and the Gray estate get $1,000,000 apiece. Checks for $500,000 go to John W. Anderson and H. H. Rackham. This report comes through Detroit bankers and has not as yet been verified by any offices of the Ford company although the report is accepted here as correct.

Want Board Declared Bankrupt

WASHINGTON, D. C., June 23—A petition that the B. F. Board Truck Co., Alexandria, Va., be declared a bankrupt has been filed by a number of creditors. The petition has been made returnable July 3. The affairs of the company are now in the hands of T. C. Smith as receiver.

BUFFALO, N. Y., June 24—*Special Telegram*—Nathan W. Williams, of Evanston, Ill., began suit today in the United States District Court against the Motor and Manufacturing Co., of Dunkirk, N. Y., alleging infringement of patents. The plaintiff declares that he holds patents for a beating and ventilating system for automobiles and claims they have been infringed.

COLUMBUS, O., June 23.—The new managers of the Columbus Buggy Co., T. C. Dunlap and George W. Lattimer, have started to operate the plant on an aggressive scale. About 150 men are employed at the plant completing the jobs already started under the receiver. Steps are being taken to organize a new company to take over the assets.

Automobile Securities Quotations

Recovery of the rubber stocks is the predominant feature of the market for the past week. Firestone common, which had dropped 32 points during the past 2 weeks, regained 7 and Goodyear picked up 11. Alco preferred took a jump of 10 points while Pope preferred fell off 7 points. Outside of these facts the summer quietude of the market was undisturbed.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	110	115	155	165
Ajax-Grieb Rubber Co., pfd	90	100	93	100
Aluminum Castings, pfd	100	..	97	100
American Locomotive Co., com	42	42½	29	30
American Locomotive Co., pfd	108⅛	110	100	102
Chalmers Motor Company, com	..	..	127	137
Chalmers Motor Company, pfd	..	..	97	102
Consolidated Rubber Tire Co., com	15	18	14	18
Consolidated Rubber Tire Co., pfd	55	59	60	75
Firestone Tire & Rubber Co., com	279	281	235	245
Firestone Tire & Rubber Co., pfd	106	108	104	106
Fisk Rubber Company, com	..	..	..	..
Fisk Rubber Company, pfd	..	..	..	100
Garford Company, preferred	90	100	85	95
General Motors Company, com	31	34	26½	28
General Motors Company, pfd	74	75	72¼	75
B. F. Goodrich Company, com	79½	80½	26½	27½
B. F. Goodrich Company, pfd	107¾	108¼	90	92
Goodyear Tire & Rubber Co., com	265	275	294	300
Goodyear Tire & Rubber Co., pfd	100	102	96	*98
Hayes Manufacturing Company	..	104	..	90
International Motor Co., com	23½	25	3	6
International Motor Co., pfd	86½	88	18	25
Lozier Motor Company, com	..	..	15	25
Lozier Motor Company, pfd	..	..	..	92
Maxwell Motor Co., com	..	..	3	5
Maxwell Motor Co., 1st pfd	..	..	27	31
Maxwell Motor Co., 2nd pfd	..	..	8	11
Miller Rubber Company	160	165	..	140
Packard Motor Company	104	106	95	101
Peerless Motor Company, com	..	..	45	50
Peerless Motor Company, pfd	..	..	..	96
Pope Manufacturing Company, com	30	32	8	12
Pope Manufacturing Company, pfd	74	75½	33	38
Portage Rubber Co., com	..	..	..	40
Portage Rubber Co., pfd	..	..	..	90
Reo Motor Truck Company	9	10	..	10
Reo Motor Car Company	22½	23½	..	20
Rubber Goods Mfg. Co., pfd	..	..	100	110
Studebaker Company, com	36	38	22	25
Studebaker Company, pfd	93	95	80	87
Swinehart Tire Company	104	106	84	86
U. S. Rubber Co., com	..	..	57	58
U. S. Rubber Co., 1st pfd	..	..	101½	102
White Company, preferred	107½	108½	102	104
Willys-Overland Co., com	..	..	55	60
Willys-Overland Co., pfd	..	..	84	90

*Ex-dividend.

Bids Opened for P.O. Cars

Large Number of Bidders on Hand To Secure the Contracts for U. S. Mail Carrying Vehicles

WASHINGTON, D. C., June 21—With a large number of representatives of bidders in attendance, the purchasing agent of the post office department yesterday opened bids for furnishing twenty or more four-wheeled and twenty or more three-wheeled motor driven vehicles for use in the postal service as they may be ordered during the remainder of the fiscal year ending June 30, 1913. The specifications call for four-wheel gasoline and electric cars and three-wheel gasoline and electric machines. The detailed bids were as follows:

The White Co., Cleveland, O., four-wheel gasoline trucks: in lots of five, delivered in 21 days, $2,060 each, equipped with pneumatic or cushion tires, and the same price in lots of ten or more, delivered in 42 or 60 days, with the same type of tire equipment.

General Vehicle Co., Long Island City, N. Y., electric four-wheel cars: in lots of five, with different tire equipment, $2,090, $3,340, $2,865; in lots of ten, $2,690, $3,340, $2,865; in lots of fifteen, $2,020, $3,280, $2,805; in lots of twenty, $2,550, $3,220, $2,745; in lots of twenty or more, $2,480, $3,160, $2,685.

Walker Vehicle Co., Chicago, Ill., four-wheel electric, delivered within 60 days in lots of five, $2,962, $2,362, $2,462, $2,917, $2,317, $2,-417; delivered within 60 days in lots of ten, $2,917, $2,317, $2,417; delivered within 70 days in lots of fifteen, $2,872, $2,272, $2,372; delivered within 90 days in lots of twenty, $2,822, $2,227, $2,327; delivered within 90 days in lots of twenty or more, $2,827, $2,227, $2,327.

Missouri Motor Car Co., St. Louis, Mo., four-wheel gasoline cars: in lots of five, delivered within 30 days, $1,316, $1,350; in lots of ten, delivered within 40 days, $1,303, $1,335; in lots of fifteen, delivered within 50 days, $1,290, $1,325; in lots of twenty, delivered within 60 days, $1,277 $1,310; in lots of twenty or more, delivered within 90 days, $1,265, $1,300; three-wheel gasoline cars: in lots of five, $780, $805; in lots of ten, $772, $800; in lots of fifteen, $765, $790; in lots of twenty, $758, $785; in lots of twenty or more, $750, $780.

Ward Motor Vehicle Co., New York City, four-wheel electric cars: in lots of five, delivered within 60 days, $2,275.25, $2,037.35; delivered within 90 days, in lots of ten, $2,215.38, $1,984.13; in lots of fifteen, delivered within 90 days, $2,155.50, $1,930.50; delivered in 120 days, in lots of twenty, $2,095.63, $1,876.88; in lots of twenty or more, $2,035.75, $1,-823.75.

Atlantic Vehicle Co., Newark, N. J., four-wheel electric cars: in lots of five, delivered in 45 days, $2,350, $2,660, $3,100; in lots of ten, delivered within 50 days, $2,325, $2,550, $3,050; in lots of fifteen, delivered within 60 days, $2,270, $2,500, $3,000; in lots of twenty or more, delivered within 90 days, $2,200, $2,400, $2,950.

Baker Motor Vehicle Co., Cleveland, O., all deliveries within 60 days: in lots of five, $2,350, $2,280; in lots of ten, $2,280, $2,255; in lots of fifteen, $2,255, $2,230; in lots of twenty, $2,230, $2,205; in lots of twenty or more, $2,230, $2,205.

Mac-Carr Co., Allentown, Pa., four-wheel gasoline cars: in lots of five, delivered within 30 days, $1,500 for both pneumatic or cushion tires; in lots of ten, delivered within 45 days, $1,475; in lots of fifteen, delivered within 60 days $1,450; in lots of twenty, delivered within 75 days, $1,425; in lots of twenty or more, delivered within 90 days, $1,400.

Kissel Motor Car Co., Hartford, Wis., four-wheel gasoline cars: in lots of five, delivered within 40 days, $1,550, $1,610; in lots of ten, delivered within 60 days, $1,475, $1,535; in lots of fifteen, delivered within 75 days, $1,475, $1,535; in lots of twenty or more than twenty, delivered in 75 and 120 days respectively, $1,475, $1,535.

Brockway Motor Truck Co., Cortland, N. Y., four-wheel gasoline cars: with cushion tires: delivered in lots of five, $1,700; lots of ten, $1,650; lots of fifteen, $1,625; lots of twenty, $1,600; lots of twenty or more, $1,600; deliveries are in 60, 90 and 120 days.

Waverley Co., Indianapolis, Ind., four-wheel electric cars: in lots of five, delivered within 70 days, $1,820; in lots of ten, delivered within 85 days, $1,780; in lots of fifteen, delivered within 100 days, $1,755; in lots of twenty, delivered within 110 days, $1,735; in lots of twenty or more, delivered within 110 days at the rate of two per week, $1,725.

W. H. McIntyre Co., Auburn, Ind., four-wheel gasoline cars: in lots of five, delivered within 60 days, $1,735, $1,675; in lots of ten, delivered within 70 days, $1,730, $1,700; in lots of fifteen, delivered within 80 days, $1,682.95, $1,624.75; in lots of twenty, delivered within 90 days, $1,648.25, $1,591.25.

Kelsey Motor Co., Hartford, Conn., three-wheel gasoline cars: in lots of five to twenty, and twenty or more, deliveries within 90 days, $800 and $850.

Buffalo Electric Vehicle Co., Buffalo, N. Y., four-wheel electric cars, $1,890, $1,885, $1,880, $1,875, $1,868, $1,860, $1,855, $1,850.

Lippard-Stewart Motor Co., Buffalo, N. Y., four-wheel gasoline cars: in lots of five delivered within 60 days, $1,752.57, $1,692.59; in lots of ten, delivered within 70 days, $1,722.59, $1,692.59; in lots of fifteen, delivered within 75 days, $1,722.59, $1,692.59; in lots of twenty, or more, delivered within 80 days, $1,722.59, $1,692.59.

Public Service Motor Co., New York City, four-wheel electric car: in lots of five, delivered within 15 days, $1,660 for either pneumatic or cushion tire equipment; in lots of ten, delivery within 60 days, $1,620; lots of fifteen, delivery within 70 days, $1,580; in lots of twenty, delivery within 80 days, $1,540; lots of twenty or more, delivery within 100 days, $1,540.

Brown Commercial Car Co., Peru, Ind., four-wheel gasoline cars: in lots of five, delivery, 10 days, $1,650; L, 900; lots of 10, delivery, 20 days, $1,500, $1,750; lots of fifteen, delivery, 30 days, $1,490, $1,740; lots of twenty, delivery, 40 days, $1,450, $1,700; lots of twenty or more, delivery 40 days, $1,420, $1,670.

Atterbury Motor Car Co., Buffalo, N. Y., four-wheel gasoline cars: in lots of five, delivered within 45 days, $1,760 for either pneumatic or cushion type of tires; in lots of ten, delivery, 60 days, $1,742; lots of fifteen, delivery, 75 days, $1,724.80; lots of twenty, delivery, 90 days, $1,707.20; lots of twenty or more, delivery 90 days, $1,672.

Palmer-Moore Co., Syracuse, N. Y., four-wheel gasoline cars: ten, $1,125.

Argo Electric Vehicle Co., Saginaw, Mich., four-wheel electric cars: lots of five, delivery, 60 days, $1,750, $1,825; lots of ten, delivery, 75 days, $1,725, $1,800; lots of fifteen, delivery, 90 days, $1,700, $1,775; lots of twenty or more, delivery, 90 days, $1,700, $1,775.

Durant-Dort Carriage Co., Flint, Mich., four-wheel gasoline cars: lots of five, delivery, 60 days, $1,550, $1,575; lots of ten, delivery, 60 days, $1,453.50, $1,487.50; lots of fifteen, delivery, 60 days, $1,453.50, $1,487.50; lots of twenty, delivery, 60 days, $1,868, $1,400; lots of twenty or more, delivery, 60 days, $1,368; $1,400.

Commercial Truck Co. of America, Philadelphia, Pa., four-wheel electric cars: lots of five, delivery, 60 days, $2,170, $2,310; lots of ten, delivery, 60 days, $2,130, $2,270; lots of fifteen, delivery, 90 days, $2,065, $2,220; lots of 20, delivery, 90 days, $2,045, $2,185; lots of twenty or more, delivery, 90 days, $2,045, $2,185.

Harley-Davidson Motor Co., Milwaukee, Wis., three-wheel gasoline cars: lots of five, delivery in 60 days, $425; lots of ten, $425; lots of fifteen, delivery, 90 days, $403; lots of twenty or more, delivery, 90 days, $403.

Utility Car Co., New York City, three-wheel gasoline cars: in lots of five to twenty or more, delivery within 60 days, $500.

National Contracting Co., New York City four-wheel M. C. electric: lots of five, delivery, 20 days, $1,600, $1,750; lots of ten, delivery, 80 days, same price; lots of fifteen to twenty, or more, delivery, 60 days, $1,550, $1,700; four-wheel gasoline cars, Chase and Sanford makes; lots of five, $1,450, Chase; $1,910, Sanford; delivery, 85 days; same prices in lots of ten, fifteen and twenty; lots of twenty or more, $1,400 and $1,875.

Palmer-Myer Motor Co., St. Louis, four-wheel gasoline cars: in lots of five to twenty and above, $1,650.

Krebs Commercial Car Co., Clyde, O., four-wheel gasoline cars in lots from five to twenty and over, deliveries within 40, 50 and 60 days, $1,600.

Dart Mfg. Co., Waterloo, Ia., four-wheel gasoline cars; in lots from five to ten, deliveries, 30 and 45 days, $1,625, $1,515; lots from fifteen to twenty and over, deliveries, 45 days, $1,600, $1,490.

Autocar Co., Ardmore, Pa., any number desired, $1,800 for chassis and $200 for body.

Overland-Washington Motor Co., Washington, D. C., in lots of from five to twenty, deliveries, 60 to 120 days, $950.

Stewart Motor Corporation, Buffalo, N. Y., lots of five, delivery, 30 days, $1,850; lots of ten, delivery, 40 days, $1,775; lots of fifteen, delivery, 45 days, $1,700; lots of twenty and over, delivery, 50 days, $1,625.

C. B. B. Motor Co., Washington, D. C., in lots of five, delivery, 80 days, $1,428, $1,348; lots of ten, $1,428, $1,348.

Wagenhals Motor Co., Detroit, Mich., three-wheel gasoline cars: in any lots up to twenty, $665 and $690, delivery within 30 days; over twenty, same delivery, $625 and $650.

Kentucky Wagon Mfg. Co., Louisville, Ky., four-wheel electric: in lots of five or more, deliveries, 75 to 150 days, $1,690, $1,793, $2,104.

A. Loffler Co., Washington, D. C.: lots of five, delivery, 90 days, $1,850, $1,950; lots of ten, delivery, 90 days, $1,825, $1,925; lots of fifteen, delivery, 100 days, $1,800, $1,900; lots of twenty, delivery, 120 days, $1,775; $1,875; lots of twenty or more, delivery, 150 days, $1,750, $1,850.

Thos. B. Jeffery Co., Kenosha, Wis.: lots of five, delivery, 40 days, $1,410, $1,460; lots of ten, delivery, 45 days, $1,864, $1,414; lots of fifteen, delivery, 50 days, $1,332, $1,382; lots of twenty or more, delivery 60 days, $1,300, $1,350.

FOSTORIA, O., June 21—The stockholders of the recently-incorporated Allen Motor Car Co. have elected E. W. Allen president and W. O. Allen treasurer and general manager. J. E. Wright, formerly with the Columbia Buggy Co., of Hamilton, O., will be active in the concern. Plans have been prepared for a two-story plant, 225 by 65 feet.

Market Changes of the Week

Tin dropped this week to $43.75, a loss of $1.25 per 100 pounds. Lead was quiet, though it fluctuated throughout the week. At the close on Tuesday it was calling at the Metal Exchange at $4.35, a gain of $.02 1-2 per pound. A slightly stronger tone was developed in both electrolytic and Lake coppers. Both coppers dropped $.00 1-8 per pound. Antimony was dull, remaining constant at $.07 1-2 per pound. Beams and channels, Bessemer steel, and open-hearth steel remained unchanged. Cottonseed oil for July passed the 8-cent mark on Tuesday, but did not remain there very long, dropping back again 4 or 5 points during the later session. The advance of $.30 per barrel was hardly to be explained upon any basis in connection with the day's news developments, but the impression seemed to be growing that it was very largely the result of artificial support by the bit refining companies. Both petroleums from the Kansas and Pennsylvania wells remained firm at their old prices, $.88 and $2.50 a barrel, respectively. The rest of the products in the chemical and oil markets also remained unchanged.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.	.07½	.07½	.07½	.07½	.07½	.07½	.....
Beams & Channels, 100 lbs.	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, ton	26.50	26.50	26.50	26.50	26.50	26.50	....
Copper, Elec., lb.	.14¾	.14⅝	.14½	.14¼	.14⅞	.14⅝	— .00⅛
Copper, Lake, lb.	.14⅞	.14⅞	.14⅝	.14⅛	.14⅛	.14¾	— .00⅛
Cottonseed Oil, lb.	7.62	7.70	7.80	7.80	7.90	7.92	+ .30
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil, Menhaden, Brown	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 gals.	.22¼	.22¼	.22¼	.22¼	.22¼	22¼	....
Lard Oil, prime	.95	.95	.95	.95	.95	.95	....
Lead, 100 lbs.	4.32½	4.37½	4.37½	4.37½	4.35	4.35	+ .02½
Linseed Oil	.47	.47	.47	.47	.47	.47	....
Open-Hearth Steel, ton	26.50	26 50	26.50	26.50	26.50	26.50	....
Petroleum, bbl., Kansas crude	.88	.88	.88	.88	.88	.88	....
Petroleum, bbl., Pa., crude	2.50	2.50	2 50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	....
Silk, raw Italy	....	4.50	....	....	4 50	4.60	+ .10
Silk, raw Japan	....	3.77½	....	....	3.80	3.92½	+ .15
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb.	45.00	43.50	43.50	43.25	43.45	43 75	—1.25
Tire, Scrap	.10	.10	.10	.10	.10	.10	....

Stanolind Saves Money

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Automobilists Quick To Take Advantage of New Standard Oil Fuel —Gasoline Is Not To Rise in Price

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CHICAGO, ILL., June 21—The discovery of Motor Spirits, now known familiarly as Stanolind, has saved the automobilists of the ten states served by the Standard Oil Co. of Indiana thousands of dollars since last fall and will save them still more during the present summer through the lessening of the demand for gasoline by owners of stationary engines and tractors. Since Stanolind came on the market there has been no change in the price of gasoline by the Standard Oil Co. of Indiana, and, according to General Manager P. C. Crenshaw, the price will remain the same for some time to come—15 cents f.o.b. Whiting.

The Standard Oil Co. of Indiana is the owner of Motor Spirits and at the present time is manufacturing 100,000 gallons a day at its Whiting plant and 50,000 a day at Wood River. It only recently licensed the Standard Oil Co. of New York and the Standard Oil Co. of Kansas, so that Stanolind soon will be within reach of the majority of the motorists of the United States.

When the new fuel first was put on the market the company had no idea of using it for passenger cars, the idea being that if the owners of stationary engines, tractors and even motor trucks would use Motor Spirits it would relieve the situation in the gasoline field. However, owners of passenger motor cars took kindly to the proposition and soon it was discovered that Motor Spirits makes a most excellent substitute for gasoline. Tests made by the Stromberg Motor Devices Co., of Chicago, as reported in THE AUTOMOBILE at the time, showed that Motor Spirits gave practically the same results as gasoline, while since that time the Standard Oil Co. of Indiana has received many letters from users testifying to the efficiency of Stanolind.

The Gray Motor Co., Detroit, Mich., recently tried out three fuels—gasoline, Motor Spirits and kerosene—using a 6-horsepower 6 by 8-inch stationary engine in one test and a 10-horsepower 5¾ by 5-inch two-cycle marine engine in the other. With the former the results were: Gasoline, 1.13 pints per brake horsepower; Motor Spirits, 1.32 pints per brake horsepower; kerosene, 1.45 pints per brake hosepower. These readings were taken when the engine was adjusted to deliver the exact brake horsepower on the three fuels.

With the larger engine, the results varied from the results obtained on the four-cycle engine, showing a slight loss in power, whereas in the four-cycle the tests showed an increase of 5 per cent. in power.

The Emerson-Brantingham Implement Co., Rockford, Ill., recommends Motor Spirits to owners of Big Four engines and states unqualifiedly that Motor Spirits gives 15 per cent. more power than kerosene and that the economy is greater.

The Otto Gas Engine Works, Philadelphia, has a report from its engineer which shows that its 21-horsepower engine under full load consumes but .753 pint of Motor Spirits per horsepower hour as against .781 of gasoline.

The J. I. Case Threshing Machine Co., which makes tractors in addition to motor cars, testifies that tests made with Motor Spirits in tractor engines of various sizes show that the new fuel gives as good results as gasoline both in horsepower and economy. It also finds that the motors, if anything, will start more readily on Motor Spirits than with any commercial grade of gasoline.

E. D. Kritz, Ford agent at Charles City, Ia., writes that he has been using Motor Spirits in all Ford cars for several weeks and that it is giving satisfaction and that on new cars it works better than basoilne and gives more power. Booth & Probert, Ford agents at West Union, Ia., declare that it gives at least 15 per cent. more power than gasoline, and that after a 300-mile run an examination of the spark plugs failed to disclose any carbon deposit. O. J. C. Kenning, a Buick owner at Grand Rapids, Mich., claims greater mileage and more power on the hills.

Owners of motor trucks are even more commendatory in their remarks regarding Motor Spirits, and among those using it at the present time are Koehler & Hinrichs, St. Paul; the Peter J. Seippel Lumber Co., Dubuque, Ia.; Wyeth Hardware & Mfg. Co., St. Joseph, Mo.; Frank Reter, Clinton, Ia.; Ottumwa Bottling Works, Ottumwa, Ia.; Dennis Bros., Dubuque, Ia.; Brooks Bros., Minnesota Transfer, Minn.; Eggert Transfer Co., Muskegon Heights, Mich.; Canfield Lumber Co., Waterloo, Ia.; Roshek Bros. Co., Dubuque, Ia.; Hesse Building Material Co., St. Joseph, Mo.; Bissell Laundry Co., Chicago; Villaume Box & Lumber Co., Chicago.

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Big Increase In April Tire Exports

WASHINGTON, D. C. June 24—March automobile exports remained stationary. April figures show only a slight loss. During last April the total value of automobiles and parts exported was $3,469,891, as contrasted with $3,514,210 during the previous month, and with $2,726,500 for April, 1912. The April, 1913, total value of both automobiles and parts was $3,469,891, while the total for the same month last year was $2,726,500. Automobile tires jumped to $305,362 last April, from $194,132 in April, 1912. The tabulation of the number and value of the machines taken by the various countries shows gains in nearly every one, the notable exception being the United Kingdom, which shows a loss of 206 machines, having taken only 373, value $292,167, during last April, as contrasted with 597, value $463,560, in April, 1912.

Automobile motors showed a drop last April, only 954 motors being exported, as against 1,458 in April, 1912. The value increased, however, from $139,335 to $189,783.

A table of the exports and imports follows:

Exports and Imports of Automobiles and Parts for April and the 10 Preceding Months

Automobiles exported to:	April 1912 Quantities	April 1912 Values	April 1913 Quantities	April 1913 Values	Ten months ending April 1911 Quantities	1911 Values	1912 Quantities	1912 Values	1913 Quantities	1913 Values
France	104	$66,683	144	$99,300	230	$373,429	444	$370,836	645	$498,900
Germany	64	46,735	108	104,095	76	177,626	212	153,721	500	486,448
Italy	21	16,181	43	34,865	106	152,515	139	122,247	271	235,363
United Kingdom	579	463,560	373	292,167	1,648	1,652,076	4,716	3,765,765	3,120	2,382,752
Other Europe	169	132,093	262	224,606	441	531,693	858	715,186	1,307	1,132,207
Canada	809	1,004,638	1,048	1,326,079	3,295	3,556,243	4,424	5,181,232	5,967	7,381,109
Mexico	16	22,291	10	15,950	318	564,118	258	394,759	259	491,871
West Indies and Bermuda	43	34,415	30	28,957	232	302,247	270	282,381	370	382,515
South America	131	167,911	243	287,404	523	639,677	1,282	1,553,629	2,438	2,729,313
British Oceania	134	137,124	169	184,649	1,156	977,153	3,034	2,725,047	2,510	2,361,867
Asia and other Oceania	140	160,215	201	192,594	549	593,194	849	889,368	1,743	1,672,113
Other countries	28	28,353	135	113,558	209	228,659	321	315,976	966	912,135
Total	2,238	$2,280,199	2,766	$2,904.224	8,783	$9,748,630	16,807	$16,470,147	20,096	$20,666,593
Parts of (not including engines and tires)	...	446,301	...	565,667	...	1,875,415	...	3,296,348	...	4,153.472
Total automobiles and parts of	...	$2,726,500	...	$3,469,891	...	$11,624,045	...	$19,766,495	...	$24,820.065
Alaska—										
Automobiles	1	$500	2	$2,200	1	$850	11	$9,085	7	$10,250
Parts of (except engines and tires)	...	882	...	60	...	1,114	...	3,680	...	1,964
Hawaii—										
Automobiles	28	42,864	96	156,186	328	642,757	410	715,009	631	1,047,724
Parts of (except engines and tires)	...	3,156	...	7,073	...	51,952	...	61,096	...	92.793
Porto Rico										
Automobiles	33	41,611	20	26,371	213	436,789	342	528,995	287	356,693
Parts of (except engines and tires)	...	7,964	...	8,773	...	83,082	...	100,501	...	78,162
Philippines—										
Automobiles	73	96.786	65	73,995	286	360,168	311	422,297	410	487,835
Parts of (except engines and tires)	...	16,966	...	2,939	...	54,723	...	55,220	...	43,397
Imported from:										
France	34	74,489	14	28,069	322	666,065	339	818.564	320	749,584
Germany	8	20,075	7	20,199	83	189,180	108	240,398	82	214,372
Italy	3	7,579	10	21,866	109	204,895	115	171,706	103	175,167
United Kingdom	10	23,817	4	12,783	97	228,621	170	389,182	74	210,332
Other countries	4	7,896	9	23,151	85	195,522	113	247,650	83	190,672
Total	59	$133,856	44	$106.068	696	$1,484,283	845	$1,867,495	662	$1,540,127

Illinois for Good Roads

Legislature Has Set Aside $400,000 for State Roads Beginning July 1, 1913 — To Use Convict Labor

SPRINGFIELD, ILL., June 21—The Illinois legislature adjourned last night and one of its last acts was to enact into a law the good roads measure. It didn't pass in its original form as prepared by Representative Tice but the bill contains many features agreeable to the motorists and is regarded as a step in the right direction.

The legislature remedied the oversight which prevented the use of registration fees for road maintenance and has set aside $400,000 out of the fund for the use of the highway commission for the year beginning July 1, 1913, in the construction of state-aid roads. A similar sum was given for the previous year. Appropriations from the general fund of $300,000 each for the years 1913 and 1914 for the state highway commission to build and maintain state-aid roads were made. Sheridan road, running north to Milwaukee, was placed under control of the Lincoln park commissioners to the Wisconsin state line.

Illinois also has come out for the employment of convict labor on roads, one of Governor Dunne's administration measures. The new law provides that upon the request of highway commissioners in any township or county board the commissioners of the Joliet or Chester penitentiary or the board of managers of the Pontiac reformatory may detail prisoners for the employment on the public roads or in the preparation of road-building material.

The new road law provides for the reorganization of the road-building system of the state under the direction of three members to be appointed by the governor, the salaries to be $3,500 each per year for a 6-year term.

Keystone Governor Approves Jones Bill

HARRISBURG, PA., June 23—Governor John K. Tener has approved the Jones bill, appropriating $1,000,000 to pay the 50 per cent. bonus on cash tax in second class townships. The bill provides for the deficiency which has arisen because of insufficient appropriations by the 1911 legislature.

INDIANAPOLIS, IND., June 25—*Special Telegram*—The Severin Taxicab Co. is being organized here with $100,000 capital. It will operate twenty-five taxicabs and establish a garage with capacity for 100 cars.

Brazil Wants Automobile Factories

NEW ORLEANS, LA., June 20—Now that Brazil has made arrangement for several rubber factories, the next effort is to be directed toward getting automobile factories. A plan already is being considered by the industrial department of the government, which will provide for a subsidy sufficient to encourage the location of a branch plant of an established concern manufacturing a standard car. As the government came to the United States for its rubber manufacturers it is considered probable that preference will be shown Americans in the contemplated enterprise.

A. O. Smith Passes Away

MILWAUKEE, WIS., June 23—The automobile and motor truck industry lost a conspicuous figure when A. O. Smith, president and founder of the A. O. Smith company, passed away on June 20. Mr. Smith was 54 years old and had been in poor health for several months. L. Raymond Smith, who has been his father's right-hand man for several years, will succeed him as head of the company and general manager of its business.

Stearns Co. To Expand—Raises Capital

CLEVELAND, O., June 21—Appplication has been made by the F. B. Stearns Co., for an increase of $200,000 in its capital stock. Some time ago several parties heavily interested in the company acquired control of nearly 400 feet of Euclid avenue frontage adjoining the Stearns factory on the west and extending back to the Belt Line R. R. tracks, which circle the city. It is now advisable for the stockholders of the company to acquire this additional land to provide for extensions of the business.

An agreement has accordingly been reached whereby the company acquires control of this land by an exchange of the Realty company's securities for stock of the Stearns concern under certain conditions, $47,000 of this stock being issued for this purpose and the balance retained in the treasury. The Stearns company has increased its stock to effect this exchange and has in contemplation considerable new construction.

United Motor Chicago Co. Bankrupt

CHICAGO, ILL., June 25—*Special Telegram*—A voluntary petition in bankruptcy has been filed by the United Motor Chicago Co., formerly the Maxwell-Briscoe Chicago Co., representing the United Motors Co., before the reorganization. The liabilities were placed at $108,140.54 and the assets at $27,173.

Studebaker Strike Is Over

DETROIT, MICH., June 25—*Special Telegram*—While the strike at the Studebaker plants here was not officially called off by its instigators until last night, the big corporation has been running with a full force all week and is turning out as many cars as usual. Although the concern did not stop building automobiles during the strike period it was, of course, not running to full capacity at that time. At no time, however, were more than 2,800 men out which is only about one-quarter of the total working force so that manufacturing was not seriously crippled at all.

American Voiturette a New Small Car

DETROIT, MICH., June 24—The second of the small cars to make its debut in Detroit is one of the models to be turned out in quantities by the American Voiturette Co., a $500,000 concern which has for its backers C. B. Shaffer, President, and W. G. Houck, director of sales and second vice-president of the Keeton Motor Co., and others. The company plans to make three models, a tandem, for carrying two persons; a roadster for two side by side, and a four-passenger type. These are to sell for $495, $505 and $510, respectively.

Sixty Men Strike at Adams Plant

FINDLAY, O., June 20.—Sixty men in the machine shop of Adams Bros. motor truck works went out to-day because of the intolerance, as they allege, of two men, foreman and superintendent, imported from Detroit. The plant is turning out five trucks a week, and the new men say the output should be twelve. No violence has resulted.

Cars Not Allowed in Yellowstone

WASHINGTON, D. C., June 22—Some time ago announcement was made that Secretary of the Interior Lane had thrown open Yellowstone National Park to motor cars. Officials of the department say that is manifestly incorrect and they are at a loss to account for the wide publicity given the matter. As a matter of fact, motor cars are not permitted in the park except on that part of the road from Bozeman, Mont., to Yellowstone, Mont. The department is endeavoring to get an appropriation of $2,000,000 from Congress in order to widen the roads leading into the park.

Bretz Outing Great Success

NEW YORK CITY, June 25—The J. S. Bretz outing, which was held yesterday on Staten Island, was one continuous round of pleasure for the magazine, newspaper and automobile men who were the guests. Cricket, baseball, field sports and tennis tournaments made the time slip merrily away.

The Carriage and Wagon Industry in 1909

WASHINGTON, D. C., June 21—Statistics in detail of the carriage and wagon industry of the United States for 1909 are presented in a bulletin soon to be issued by Director Durand of the Bureau of the Census, Department of Commerce. The 5,492 establishments in both branches of the carriage and wagon industry of the United States gave employment in 1909 to an average of 82,844 persons, of whom 69,928 were wage earners, and paid $45,555,126 in salaries and wages. The carriage and wagon industry has existed in this country since early Colonial times, and its growth up to the census of 1904 about kept pace with the increase of population. The advent of the automobile, and later of the motor truck, has had a decidedly retarding influence on the industry. Many establishments in the early days manufacturing carriages have turned to the manufacture of automobiles.

The following table gives the figures in detail:

	Carriages and Wagons and Materials				
	Number or amount			Per cent. of increase*	
	1909	1904	1899	1899-1909	1904-1909
Number of establishments	5,492	5,588	6,792	—19.1	— 1.7
Persons engaged in the industry	82,944	90,751	(a)	....	— 8.6
Wage earners (average number)	69,928	77,882	73,812	— 5.3	—10.2
Capital	$175,473,728	$152,344,657	$128,961,660	36.1	15.2
Wages	37,594,919	38,362,679	33,565,313	12.0	— 2.0
Value of products	159,892,547	155,868,849	138,261,763	15.6	2.6

*A minus sign (—) denotes decrease. Where percentages are omitted, comparable figures cannot be given. (a) Comparable figures not available.

Franklin Breaks Fuel Economy Record

Covers 86.6 Miles on 1 Gallon of Gasoline—Record Was 46.1 Miles Held by 1913 Franklin

NEW YORK CITY, June 21—Yesterday a specially-constructed Franklin car broke the record for the distance traveled by an automobile on a gallon of gasoline, going a distance of 86.6 miles over Long Island roads.

The former record for an automobile was 46.1 miles and was held by a 1910 Franklin car weighing, with passengers, 2,948 pounds. The motor was an 18-horsepower type and the car carried a touring body. The car which made the present record is equipped with a sheet aluminum body in the form of a two-seated roadster with torpedo lines. The weight of the empty car in running condition is 1,695 pounds. Its total weight with the driver and passenger is 1,995. The former record was made in competition in July, 1909, while the present record was made as a test under the supervision of the Automobile Club of America.

The driver was S. G. Averill, the owner, who was accompanied by Herbert Chase, laboratory engineer of the Automobile Club of America, who acted as official observer. Mr. Averill was also the driver of the car making the record in 1909. The car he drove at that time was one of the first of the 1910 Franklins. In this competition Averill exceeded the mileage of his nearest opponent by 20.4.

Everything was done to reduce the coasting resistance of the car used in this trial for the record. Ball bearings were placed on the rear axle, a Newcomb carbureter fitted, the spring cut down so that there were but four blades in each half of the elliptic front and rear springs, the drive was taken through the springs and through one rear wheel, the other running free. One set of brakes, controlled by the hand, was used, 34 by 3.5-inch plain clincher tires pumped to a pressure of 35 pounds were fited. The brake drums were even perforated to bring the weight to its absolute minimum. Wind resistance was cut down by using the stream-line torpedo body, which carried a tapering cowl to cut the resistance.

The gasoline used was 63 Beaumé test carried in a measured copper receptacle on the dash before the observer's seat. This was fed by gravity to the Newcomb carbureter which was standard except that the easy-starting, air shut-off valve was omitted. The odometer used was a Casgrain.

The course followed was on the Queens boulevard. The car traveled from the Williamsburg bridge out Queens boulevard to Hillside avenue, Jamaica, swinging left to the Jericho turnpike which was followed to the hamlet of Jericho where a turn was made across the island and then back over the same roads to the starting point. On the return to the starting point it was found that a little better than 60 miles had been covered and that some gasoline still remained. The remaining 20 miles was covered by a trip out Jackson avenue, and back and then another out the same route and nearly back to the starting point, so that the car went up practically every grade that it went down, although at times it seemed as if the car was fairly coasting up grade, so easily did it run.

Country passed through on the Franklin test was fairly level with an occasional 2 or 3 per cent grade. The test lasted six hours, which makes an average speed over the entire distance of 14.5 miles per hour on regular touring speed. The driver would open his throttle until he had attained a speed of close to 20 miles an hour and then would stop the motor and coast.

It has always been a fascination to determine what mileage can be secured from a gallon of gasoline. A motorcycle has traveled 190 miles on 1 gallon and 10 ounces. This was done by S. A. Baker, September 13, 1907. The average accomplishments, however, of stock models with regular bodies fall far below these record tests. The average gasoline automobile travels from 15 to 20 miles on a gallon, although some touring cars go as low as 4 miles to the gallon and others as much as 28. The average steam automobile goes 10 miles to the gallon. The average aeroplane 10 miles to the gallon, but with its fuel mixed with lubricating oil. The average motorboat of corresponding horsepower to an automobile goes about 12 miles to the gallon, while a single-cylinder motorcycle will average better than 75. The strength of gasoline may be fully appreciated from the fact that it has been stated that could the entire energy contained in 1 pound be utilized it would lift a 1-pound weight 15,941,220 feet.

Elgin Entry Blanks Now Ready

CHICAGO, ILL., June 23—Entry blanks for the fourth annual Elgin road races, scheduled for August 29-30, were issued today by the Chicago Automobile Club, providing for two races only, the 300 and under class for the Cobe cup the first day and the 450 and under for the Elgin national trophy the second day. Hardly had the blanks been out before the first entries were made. E. C. Patterson, general manager of *Collier's Weekly*, nominating two Mercedes six-cylinders for the second day's race. One of these will be driven by Victor Hemery and the other by Theodore Pilette, the two foreigners.

Many Entries for Columbus Races

COLUMBUS, O., June 21—Entries for the 200-mile sweepstakes automobile race to be held at the Columbus Driving Park, July 4, under the auspices of the Columbus Automobile Club, are coming in fast. The contest committee of the Columbus Automobile Club has received word of the entry of De Palma in a Mercer, Spencer Wishart also in a Mercer, Fritsch in a Cino, Rickenbacher in a Mason, either Ralph Mulford or Houpt in a Mason, Whalen in a Schacht and others. In order to furnish sufficient seating capacity the committee has arranged for 8,000 circus seats to be placed to the south of the grandstand which will increase the seating capacity to about 20,000.

Ohio Wins Special Match Race

CINCINNATI, O., June 21—A special match race between Johnny Raimey in an Ohio "99" and Horace Heisey in a Buick "40" supplied the feature of an otherwise tame program in the annual hill climb of the Cincinnati Automobile Dealers' Association today. Heisey won by negotiating the course in 0:29 3/5 on his first attempt. Both dare-devils got two trials. On his second spin up the hill Heisey was slow, 0:33 3/5 being his time. Raimey's best was 0:29 4/5. Both are local drivers. The course is 100 yards less than a half mile.

The entry list was a small one. In some races only one car went up the hill. No outside drivers of note could be induced to come here for the meet. Over 10,000 people thronged the course, which was in splendid condition. The weather was very hot. The only accident during the day occurred in the second race, when H. D. Shane in a Metz swerved in going around a curve and bumped into a tree.

L. I. A. C. To Hold Run for Jordan Trophy

NEW YORK CITY, June 24.—The Long Island Automobile Club will hold a 3-day run to the Berkshires for the Jordan trophy, Friday, July 4, to Monday, July 7. There will be 2 days of actual running. Penalties will be imposed for taking on water, gasoline or oil between the controls, Poughkeepsie, Pittsfield and Waterbury. The club will also hold a secret time run to Babylon, L. I., July 4, for the Major cup.

COLUMBUS, O., June 21—After parleying around for several weeks, the Ohio State Journal Reliability contest which had been postponed several times, was officially called off by the contest committee of the Columbus Automobile Club. This was done after it became too hot for the race to be run with comfort.

Franklin car which broke fuel economy record

Zuccarelli Killed in Practice Run

Driving at 100 Miles Per Hour on Grand Prix Course, Hits Wagon—Mechanician Dies

PARIS, FRANCE, June 19—*Special Cable*—Paul Zuccarelli, one of the Peugeot drivers who recently returned from the 500-mile race at Indianapolis, was killed outright and his mechanician, Fanelli, was mortally wounded today when the racing car in which they were practicing for the French Grand Prix collided with a farmer's wagon, which suddenly emerged from a side road between Nonancourt and Evreux.

Zuccarelli's car was speeding at nearly 100 miles an hour when the accident occurred, the automobile driving straight through the cart but overturning on top of the occupants.

PARIS, FRANCE, June 13—Jules Goux, winner of the Indianapolis 500-mile race, and his team-mate Paul Zuccarelli, landed at Havre this week, where they were met by Georges Boillot and the European representative of THE AUTOMOBILE. Stepping off the gangway of La France, Goux saluted Boillot in military style and said "Boss, you sent me to America to win the first prize; I've won it."

In conversation with THE AUTOMOBILE representative, Goux expressed himself as delighted with the treatment he had received at Indianapolis. "There was absolutely no favoritism, the Peugeot victory was well received, and the officials gave us every assistance. Carl Fischer and C. W. Sedwick were particularly attentive, and A. C. Newby, of the National Motor Car Company, placed his factory at our disposition. I doubt if it would be possible to find any maker in Europe who would do as much. It is almost certain that I shall run at Savannah next fall, and I shall be disappointed if I am not one of the starters in next year's race at Indianapolis."

Jules Goux declared he had never seen such magnificent organization in connection with an automobile race as that at Indianapolis. "There is nothing in the world to approach it. I consider the management perfect in every detail. The track is not fast, compared with Brooklands, for instance, and had it not been for the impossibility of taking the turns fast, consistent with the life of tires, I should have shown a much higher average. I consider that I had an easy win, and from the moment the start was given I felt confident that the race was in my hands.

"I was handicapped by being geared too high. My ratio was 2 to 1, which was the ratio adopted for road work with a cylinder bore of 110 mm. We had cut the bore down to 108 mm. and not changed the ratio. I found that in order to make my right rear tire last a reasonable length of time I could start my turns at 85 miles an hour, but had to finish them at not more than 73 miles. After being cut out on the bends the straightaways were not long enough to get the motor up to its highest number of revolutions. The fastest I could get on the straightaways, without considering the life of tires, was 99 miles an hour; with a suitable gear ratio I could have done 112 miles an hour. In consequence of this the motor was always running at a lower number of revolutions than that for which it was designed. At first I did my laps in 1.40, and could have kept to 1.45 throughout the race if it had been necessary. When I had got a couple of laps lead on my nearest competitor I considered there was nothing to be gained by going faster than 1.50 per lap. I broke last year's records up to 200 miles and could have broken them for the entire distance if there had been anybody really dangerous behind me. I hope that in next year's race the cylinder capacity will be reduced still more. With smaller motors and lighter cars it will be possible to get the same average speed as this year. I hope to prove this with our present season's Grand Prix racers."

National Tour Promises Success

MINNEAPOLIS, MINN., June 23—With several entries already filed for the A. A. A. national reliability tour, Twin Cities-to-Glacier Park, July 11-19, others promised, and more than 100 interested applicants for information from all over the United States the outlook for a big field is said by Dr. C. E. Dutton, chairman of the tour, to be excellent. A meeting was held Tuesday noon, this week, at the Commercial Club between the Civic & Commerce Association tour committee, the general entries committee of the Automobile Club of Minneapolis, and the Minneapolis Automobile Trade Association at which the project was given a big push. The Mitchell Moose pathfinder, which has just completed laying the route to Glacier Park station with Frank X. Zirbs as driver and C. A. Stedman as pathfinder, will return at once to get ready to become pilot in the tour. David Beecroft of the contest board has been appointed referee.

The entries to date are:

Louis W. Hill, St. Paul, Packard 30, 1909 model, four cylinder runabout, 5 by 5½ inches, two passenger, Anderson trophy.

C. H. Metz and H. W. Metz, Waltham, Mass., G. H. Voter, Boston, Metz ears, 1913 model, A. A. A. trophy, Glidden trophy.

H. F. Legg, Minneapolis, Stutz, 1913 model, four cylinder runabout, 4¾ by 5½ inches, two passenger, Anderson trophy, and with Premier and Reo to be entered, the Anderson trophy.

H. W. Automobile Company, three Krit cars, 1913 model, four cylinder runabout, 3¾ by 4 inches, Glidden and Anderson trophies.

Dr. Clinton A. Smith, Devils Lake, N. D., KisselKar, 60, 1912 model, four-cylinder runabout, 4.5 by 4.75 inches, Anderson trophy.

Fawkes' Automobile, 60, Minneapolis, Premier, 1913 model, six-cylinder, 4.25 by 5.5 inches, Glidden, A. A. A. trophies (team with Stutz and Reo car to be entered).

Indiana Makers Tour Ready to Start

INDIANAPOLIS, IND., June 23—Final arrangements for the Indiana-Pacific tour, under the auspices of the Indiana Automobile Manufacturers' Association and to start from here July 1, were made at a meeting held in this city last Tuesday night. The tour will start at 2 p. m. from University Park and there will be a large escort to the city limits. A letter has been sent to the mayor of each city through which the tourists will pass by Mayor Shank. Tourists are to wear khaki and puttees. Equipment will include an extra oil tank, a Compac sleeping tent, a suit case rack and a kitchen and lunch hamper. There are now twenty-two formal entries and may be more before the start.

Franklin Wins in Watson Cup Run

SYRACUSE, N. Y., June 21—Edward F. Sparks, driving a Franklin car, won the secret time sociability run of the Automobile Club of Syracuse. The official time was 2:57:30 and Mr. Sparks was just 12 seconds distant from it, covering the route in 2:57:18. This gives him possession of the Watson cup for a year, and the plan is to have Mr. Sparks and the three previous winners of the cup hold a contest next year, the winner to retain the trophy permanently. Mr. Sparks also won 5 gallons of Monogram oil by coming nearest the secret time. The other winners, taking various automobile merchandise, in their order and cars, follow: Simon Rosenblood, Haynes; A. J. Conine, Buick; Louis Leonard, Krit; G. F. E. Meistering, Abbott-Detroit; C. A. Lawton, Franklin; Edward C. Heise, Cadillac. Miss Edith Gere won the women's prize of a camera outfit, also the Ford prize of a thermos bottle and case.

Wisconsin Tour Pathfinder Starts

MILWAUKEE, WIS., June 23—The Mitchell 1914 6-60 pathfinder for the fourth annual Wisconsin reliability tour, under auspices of the W. S. A. A. left Milwaukee Saturday, June 21, to blaze the 800-mile trail which will be followed by the contestants in the run from August 18 to 22, inclusive. M. C. Moore, who will again do the pathfinding, has made some changes in the route, which at present is as follows: First day, Milwaukee to Appleton, 151.7 miles. Second day, Appleton to Marshfield, 191.5 miles. Third day, Marshfield to LaCrosse, 166.4 miles. Fourth day, LaCrosse to Madison, 150.2 miles. Fifth day, Madison to Milwaukee, 151.7 miles.

Keeton Challenges Indianapolis Winner

DETROIT, MICH., June 23—Wm. G. Houck, director of sales and second vice-president of the Keeton Motor Co., has posted a check for $10,000 with the *New York World* as a challenge for Jules Goux, winner of the 500-mile race at Indianapolis on May 30, to race Bob Burman in the Keeton car, which also competed in that race. Goux is now in France preparing for the Grand Prix on July 15, and it is doubtful if he will accept the challenge.

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Gasoline Price Is Not To Rise

THAT "necessity is the mother of invention" has been well demonstrated in the automobile fuel field. On January 1 of this year the weekly supply of gasoline was approximately meeting the demands, but manufacturers were uneasy, they feared that demand might exceed supply and that the consequent increase in prices would result. At that time one of the large gasoline producing companies was working on a new fuel, motor spirits, now known as Stanolind, which has since its entering the market a few months ago practically eased the fuel market so that last week it was learned that there is no danger of any immediate rise in the price of gasoline. This is welcome news, particularly when it is remembered how there was a 50 per cent. increase a year ago and how at present the price in several European countries is going up steadily.

Motor spirit must be given much credit for the present stationary prices, because by means of it the amount of fuel from a gallon of crude has been practically doubled, the refinery getting the regular quantity of gasoline and an equal quantity of Motor Spirit from a gallon of crude, which has more than doubled the available supply.

While motor spirit was originally intended for farm tractor and stationary engine work and perhaps motor trucks, it has really been taken up quite extensively by the light car owners.

Quality Is Wanted in Tires

KEEPING step among the various departments that go to make up the motor car has been one of the factors largely instrumental in the phenomenal growth of the industry. Had the body building department lagged behind that of chassis design slower progress would have been made; so, too, had tire makers fallen in arrears the general progress would have been impeded. Tire makers have been particularly active, and although at one time the price of crude rubber rose so as to give rise to uneasiness, the prices are today back into normal channels; and so great are the improvements in rubber culture that there is little, if any, danger of any shortage in spite of the increasing number of motor cars and motor trucks being used.

Tire manufacturers have a difficult rôle to play because of the guarantee feature, and further because they have suffered badly due to poor roads as compared with other countries. A few years ago the tire cost per mile was much in the public eye, but with the increased price of fuel and other added costs to motoring the tire factor has moved slightly out of the limelight. The recent cuts in prices have had something to do with this, but it is questionable if price cutting is going to produce the looked-for results. Price cutting will be welcomed by the entire motor fraternity if quality is maintained, but it is a point for argument if improving the quality of the tire and retaining the price might not be a more desirable course.

If there is any part of the car in which maximum quality is looked for it is in the tire field. The continual demand for tire fillers and other protective measures against punctures and blowouts proves that the tire nightmare is still with many motorists; and while demountable rims, power air pumps and other conveniences have done their part, there are still looked-for improvements. If a better grade of fabric can be used in tires it will be welcomed; and if there are better methods of vulcanization, or improvements in any of the processes of tire building, the car owner would welcome everything possible by way of adopting them.

The use of larger tires must be looked upon as a step in the right direction and there are still today cars that are undertired. With several car builders the car weight has increased during the last two years. Batteries for motor starters have been added, motor starters have increased the weight. Demountable rims have added a few pounds; and the full dinner pail equipment has added weight. In some cases the car builder has been fitting the same size of tire and when vehicles have been weighed both tire maker and car maker have acknowledged that the tires were not adequate to the load. It is poor policy for both car maker and tire maker to send out an undertired machine. It is sure to give trouble and particularly in these days of road improvements, when harder road surfaces are coming into vogue and when average speeds along the highways are on the increase. Car owners are already finding that the hard, flinty roads work rapidly on tires by way of making small surface cracks and cuts, which cuts must receive early attention or otherwise the water and dirt entering these openings will soon ruin the fabric.

American vs. European Salesmen Abroad

By John L. Poole, Resident European Export Manager for the Hupp Motor Car Co.

ABOUT the first thing a manager of the American company thinks he must have when he contemplates going abroad into the export trade is a salesman "from abroad," one who can speak at least two or three different languages besides English.

In a number of such cases men were brought over and after 2 or 3 months at the factory returned to Europe to represent an American motor car. In each and every case of this kind, such salesmen have proven a complete failure.

Their ideas of conducting a foreign campaign are by the usual old time European methods; and with a line of American motor cars, success is out of the question. Up-to-date ideas are required over here for American automobiles just as much as at home. Good, wide-awake salesmen are required—men who will work and not sit around cafés and smoke cigarettes all day; men who have confidence in themselves; men with nerve and sand who will not permit any European to "run in a bluff" on them; men who are loyal to their employers, their goods and their country. Such men from Europe for an American motor car company are not be found at any price.

It is not absolutely necessary for the bright American to speak foreign languages, but it would be of great assistance to him to know French and German.

If I wanted a dozen salesmen today I would not engage a single European to represent an American company—not but that they may be all that is necessary for an European maker, they are not suitable to do business and represent an American manufacturer. The American worker is the man—even if he can speak only English. He can do business all around the best men in all Europe for American goods. He has his own way—and it's the good, American way, too. That in itself will gain him an opening and he is always ready to take advantage of such opportunity. He thinks and acts quicker; he has confidence in his ability, and above all, he is a far better judge of his customer.

Furthermore, it is absolutely necessary to have men over here who are able to act at all times, independently, and not be compelled to cable for instructions every time some important matter must be decided quickly. You can not find men in Europe who are capable of acting in this manner very easily. This is due to their business training. They are brought up to be dependent—not independent like our Americans. There is always over here an Over-Director, or Manager, and to him the European salesman must first obtain his consent in everything before he can act, and the Over-Director must obtain the Master's consent and so it goes on and on.

In other words, I claim that the salesman over here is far behind the times—as far as his use to an American firm is concerned. The American salesman on his first trip must be careful. He soon "catches on," however.

Remember—you can't rush things over here. There are no "one-night stands." It is usually a week and sometimes 2 before you find your man. Remember—Rome was not built in a day, and for that matter, no export business either. Don't get discouraged too quickly; study the conditions of each country carefully; get to know your customer on a friendly basis, and above all, do not over-estimate your business. Remember, that nearly all of these men have friends in the United States of America who can give a line on what you are doing at home. Be careful and make no mis-statements. Whatever you promise, fulfill to the very letter. Above all, do no knocking, especially against your American competitors. A case of this kind took place not long ago. A new man from the United States called on a firm in Vienna and on this firm asking the young man if he knew the Hupmobile car and your correspondent, he had little if any good to say, for either the car or its representative. It is not necessary to say who made the deal.

I must add I have never seen the young man, but I know his firm quite well, and I am also glad to say that cases of this kind are rare over here.

My advice I know is old and well known to the good American salesman, but some of them forget when they cross the Pond and get so far away from home and all the things and people to which they are accustomed.

Personally, I am glad to see the boys from home no matter whom they represent. There is room for us all, and I trust that the American makers will send their own countrymen over here when they do decide to take up the export business.

Co-operation of Truck Makers and Buyers

By J. M. Lansden, Second Vice-President of the General Motors Truck Co.

IT is to be regretted that many motor trucks now in operation have been sold to meet the buyer's personal ideas—not his needs. But the shrewd investor in motor vehicles today is beginning to appreciate more and more the wisdom of working with a competent motor truck man to ascertain the type and size of equipment to best meet his requirements.

Foreign buyers believe in this method of purchase to such an extent that certain companies in France and England, known as "transportation engineers" make a business of studying delivery and haulage problems, undertaking to buy and install for clients such equipment as their experience and training teaches them is most efficient for the work in question.

In the past it has been customary for the buyer to tell the truck manufacturer or representative that he wanted a gasoline truck or an electric of such and such a size. If, after the vehicle or vehicles had been placed in operation, the installation did not show sufficient earning on the investment, the buyer was prone to say that motor trucks were unsuccessful in his business or that horses were cheaper. Rarely did he express the belief that the trucks purchased were not properly fitted to his service.

The results of this sort of buying have been in many cases so unsatisfactory that both large institutions and small ones are beginning to take the position that it pays to entertain the recommendations of a reliable company who are not prejudiced for commercial reasons in favor of one type or size of vehicle. At the direct factory branches of many of the truck companies men are stationed who are equipped to advise with prospective installers and co-operate with them in the selection of equipment which represents the utmost in efficiency and economy for their particular needs. And when we stop to consider, this policy is strictly in line with the methods employed by men who are selling many different kinds of commercial units.

The Engineering Digest

Change-Speed Transmission By Compressed Air, with Direct Drive, Likely to Make Devotees of Hydraulic Devices Sit Up and Think—Sigma Again on the Tapis

Fig. 1—The locomotive with automobile motor and variable-speed transmission on the Hautier system, which has been in use in yards of Schneider works in France for one-half year and found very efficient — Radiator and condenser on top of the engine cab — All wheels driven

COMPRESSED-AIR Transmission on the Hautier System.—Since the advent of motor-starters, with the small electric or compressed-air auxiliary power plant which they necessitate, the idea of operating the change-gear mechanism by the same plant, perhaps automatically, has advanced beyond the speculative stage, and it now engages the attention of the research engineers who have in mind the improvements to be incorporated in models for 1915 or 1916. At the same time the problem of producing unabusable gasoline motor trucks, and these, by the way, suitable for being operated with kerosene, benzol or other cheap fuels as well, if needs be, and also special trucks for slow work—whose operation and maintenance must be particularly inexpensive—suggests hydraulic clutches and drives or else electric or compressed-air devices from which it may be possible to bypass a little power when it is wanted for some of the incidental necessities of motor traffic. These two tendencies work hand in hand and are already setting fruit in different inventions, some of them coming from quarters not directly identified with automobile manufacture and perhaps therefore more likely to view the requirements of the immediate future in a free-minded perspective. As examples may be mentioned the Breslauer electric speed-change mechanism of reduced weight (as compared with previous types of gas-electric equipment serving the same purpose) which was recently described in *The Electrician* and the Wells hydraulic clutch described in *Power.*

A remarkable system for power transmission which comes within this class has recently been tried in France in connection with an internal-combustion locomotive built for use in the yards of the Schneider works at Creusot where it has been in service since December 1912. The fuel used for the motor is crude naphtaline for normal operation and benzol or gasoline for starting. The motor develops up to 72 horsepowers, at 1,000 revolutions per minute, and is of the automobile type with thermo-siphon cooling adjusted to allow the water to steam freely, but the radiator which is arched crosswise over the roof of the locomotive returns the condensed steam to the water system, these dispositions assisting in operating the motor so hot that the naphtaline can be melted from the waste heat even if the motor is running very slowly. The locomotive weighs 19 tons and the tractive pull required of it reaches a maximum of 3,500 kilograms, at starts on grades, while the normal pull is about 750 kilograms. The maximum speed is 23 kilometers per hour. It passes daily through a tunnel separating the two portions of the Schneider works which are located respectively at Le Havre and at Harfleur, and it was the necessity for this subterranean passage which suggested a smokeless power system.

The Hautier transmission system admits of varying the torque and speed of the driving wheel axle progressively and continuously and also stores in a special tank, S in Fig. 2, the compressed air by means of which the motor is started. The illustration shows the arrangement of this transmission diagramatically, and the mode of operation is made plain by including the control levers in the chart.

To the shaft O which is turned directly by the prime motor there is keyed the spur-wheel B which meshes with pinions C, these being mounted upon stubshafts extending from the cross-beam E fixed upon the transmission shaft F. A drum H containing these parts is journaled upon both O and F and provided with an internal gear ring (not shown) meshing with pinions C, and a spur-crown I formed externally upon the hub of drum H meshes with pinion I′ which is mounted upon the shaft of a four-cylinder single-acting air-compressor K.

A socalled starting lever D admits of holding the suction valves of this compressor open, when the lever is in the "stop" position, thereby causing the compressor to run idle.

Oppositely to the compressor, with reference to shaft F, there is arranged a four-cylinder compressed-air motor whose shaft carries pinion P in mesh with spur-crown P′ which is keyed on shaft F. The camshaft of the air-motor can be displaced longitudinally by means of lever A, so as to vary the admission and expansion of air in its cylinders.

The discharge ports of the compressor are connected with the admission ports of the air-motor and also with the tank S, the pressure to be reached in the latter being limited by a check-valve T.

When the vehicle is at rest and the prime motor running, the levers D and A are in the positions indicated in Fig. 2. Spur-wheel B tends to rotate pinions C and therefore, by the action of the planetary gear, also the shaft F which at the other end controls the driving wheels of the vehicle, but the rotation cannot be materialized unless the pinions C are resisted by the internal gear teeth in drum H, and, under the condition assumed, this drum presents practically no resistance to rotation, as the valves of the air-compressor are held open; and therefore no force is applied to rotate shaft F and move the locomotive. In order to make the vehicle start it is sufficient to move the lever D to the position "On." The compressor valves are then rendered operative and the work of the compressor creates a resistance to the rotation of drum H while sending at the same time air to motor N. The motor-torque of pinion B is decomposed into two portions, through the intermediation of the planetary gear: The portion acting upon the beam E tends by direct action upon shaft F to advance the vehicle, and the portion taking effect on drum H works according to the adjustment of the compressor.

In proportion as the air pressure is increased—by admitting more air from the compressor to the air-motor—the reaction from the compressor work is transmitted back through the planetary gear so as to increase the torque acting through shaft F, while reducing its speed, and at the same time the air-motor develops a certain torque which is transmitted through pinions P and P′, also to shaft F, reinforcing the turning moment directly applied to it. Under the influence of these forces the locomotive starts very gradually, tautening the trailer couplings entirely without jerks.

As soon as the vehicle is barely moving, the operator pulls lever A so as to reduce the period for admission of air to the air-motor, thereby increasing the resistance against the functioning of the compressor and reducing its speed. And, through the action of the differential gear (the planetary gear in connection with beam E constituting a differential) this slowing-up of the compressor produces at once a more rapid rotation of shaft F and consequently an acceleration of the vehicle.

On a grade the operator determines readily the position of lever G which is most suitable for utilizing the whole power of the prime motor at any throttle adjustment. On level ground he pushes lever A completely to the left, at which adjustment air-motor N takes no more air and forces the compressor to stop working; this stops drum H from rotating and the transmission between prime motor and driving-shaft is now "direct", the speed reduction being determined only by the ratio of the intervening gears, B, C and H. The power continues, however, to be applied through the interposed air-cushion in the compressor cylinders.

The quadrant for lever A has four notches of which No. 1 corresponds to an air admission of 90 per cent to the air-motor (for starting the vehicle), No. 2 to 30 per cent., No. 3 to 8 per cent. and No. 4 to complete closure (for direct drive).

To stop the vehicle with the motor running it is sufficient to set the throttle on "slow" and lever D on "neutral", while for a prolonged stop of the locomotive the motor is brought to rest by operating lever G. Finally, in order to start the motor again, lever G is pushed back to a position causing the air-motor to be actuated somewhat, and the petcock V is opened, which admits air from tank S to the combustion chambers of the prime motor. The air-motor can be made to function as a compressor for braking purposes, acting like reverse steam in a steam locomotive, by placing lever A in a special notch. The braking effect is in that case graduated by means of a relief cock. The locomotive is, however, also equipped with an air-brake operated with air from tank S.

The reverse is obtained by having at the end of shaft F a bevel pinion in mesh with two idler pinions mounted upon a transverse shaft. A coupling sleeve controlled by lever D' admits of the clutching one or the other of these pinions to this shaft, thereby determining the direction of its rotation. The transverse shaft, in the actual construction of this locomotive, drives another transverse shaft through the gearwheel R, and from this the vehicle wheels are driven by a walking-beam connection. The front and rear wheels are coupled together, so as to get the benefit of the entire weight of the structure for adhesion and traction.

The efficiency of the whole vehicle mechanism, from prime motor to wheel rings, was found at public tests to range from 67 to 93 per cent, according to load, trailer load (maximum 125 tons) and road gradient.

The report of the testing engineers dwells upon the possible applications of the Hautier transmission system to railless transportation and street cars, for which purposes they hold that it offers unusual advantages.—From *Le Génie Civil,* May 31.

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THE Co-efficient Sigma.—The following letter has been received and explains itself:

DEAR SIR:—In your issue of June 5, in noticing my article on "The Coefficient Sigma," which recently appeared in *Internal Combustion Engineering,* you remark that the formula I propose does not disclose in what manner the volumetric efficiency of the motor and the qualities of the carburetor have been set aside and eliminated from consideration.

If you will refer to the article in question, you will note from the equation 1 that the total volume of the cylinders is taken into consideration. Later on, this equation (No. 4) is modified to give the total displacement per ton mile, this being the standard of comparison for the car's performance. In other words, it is assumed that the motor is capable of drawing its full capacity of gas into the cylinders at every revolution, which, of course, is never achieved in practice. That is to say, the volumetric efficiency of the motor is assumed to be one hundred per cent. If the volumetric efficiency of the motor fall off very much, it is obvious that the horsepower will diminish and the use of a lower gear will be necessary. Consequently, the g which appears in the formula takes care of this indirectly.

Again with regard to the carburetor, I have stated that 15 pounds of air per pound of gasoline are required. If the carburetor is imperfectly adjusted to get too rich a mixture, the number of miles per gallon will diminish because more gasoline is consumed. Consequently, the more perfect the carburetion and the greater the number of miles per gallon, the higher will be the value of sigma.

I hope that I have made this matter clear.

H. KERR THOMAS.

June 13, 1913.

The explanation given by Mr. Thomas in the above letter represents exactly the understanding of the matter which the reviewer had arrived at and had aimed to express in his note. It may then be assumed now that the purpose of co-efficient sigma

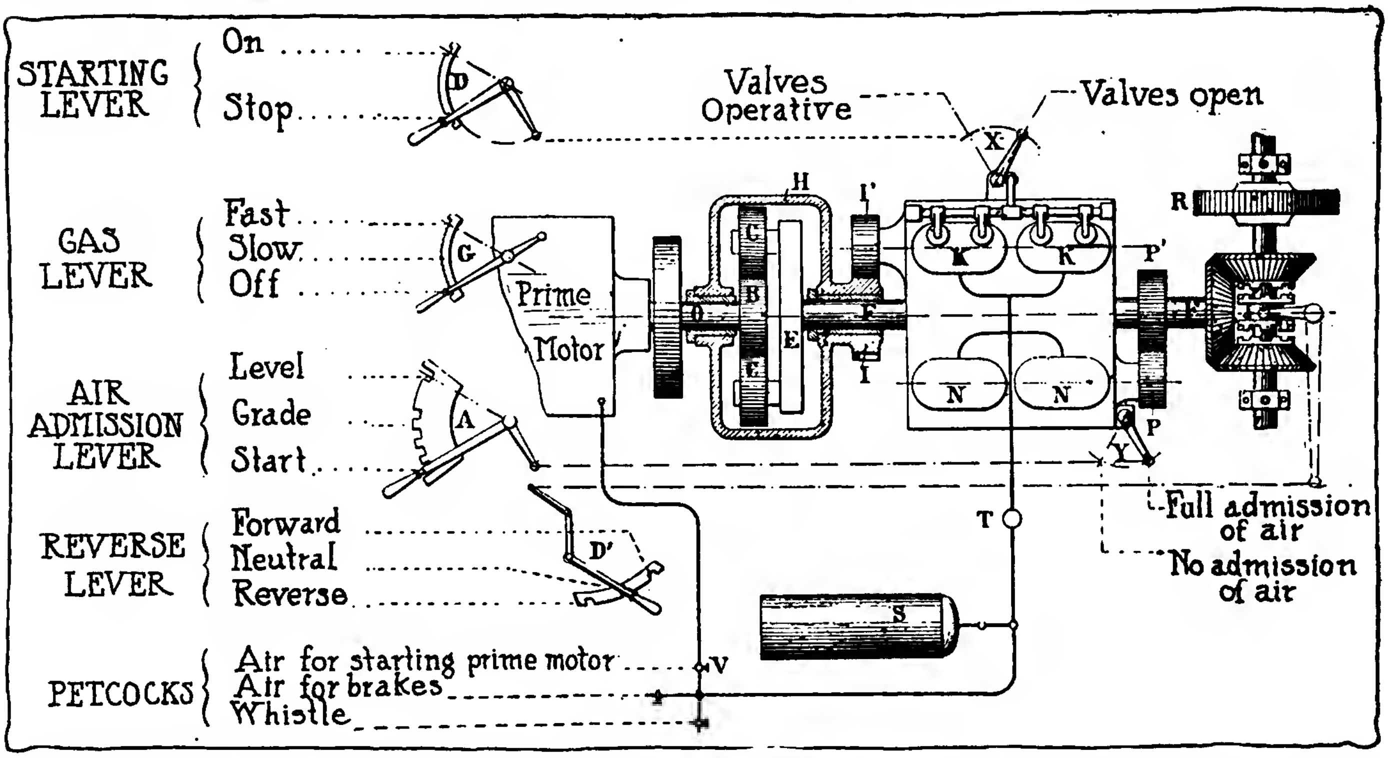

Fig. 2—Diagram of the Hautier system for power transmission at variable speed by means of air pumps, now applied to yard locomotive and suitable for motor trucks and omnibuses of large size

is to present a means for determining whether the fuel efficiency of a car falls short of the highest contemporary standard or not and that volumetric efficiency and the quality or adjustment of the carbureter DO enter indirectly, for their proper share among other factors in determining what value co-efficient sigma shall reach in each case.

The misunderstading must then have consisted in believing that Mr. Thomas had expressed himself to the contrary in his original article, where he wrote about the combination of factors entering into sigma: "This [the combination] not only takes into account the size of the motor and its volumetric efficiency, but also the state of perfection to which the carbureter has been brought." This sentence can be interpreted in diametrically opposite manners, by reason of the use of the indefinite term "takes into account". The tangle of understanding in the realities and misunderstanding of words can scarcely be unravelled now without extensive repetition.

If, however, the day should come when manufacturers would announce the co-efficient "K" and the co-efficient sigma of their cars, as they now announce their horsepowers on the basis of either formula or test or both, it would become important indeed to know that a low sigma—meaning a high fuel consumption—might be charged up against the carbureter, the size of the valves or the shape of the combustion chamber just as well as against sluggish wheel bearings, inaccurate gears and other sources of mechanical friction. A movement to popularize "K" and sigma in public announcements would, for that matter, be a very pleasing innovation and might perhaps lead to interesting results in the way of setting up rivalries of a new sort not only between manufacturers but also between car owners. The horsepower formula is widely understood; why not "K" and sigma? They are no more intricate to a veteran motorist than the tax-horsepower formulas of France or Germany are to a tyro.

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INDUSTRIAL Applications of the Spray Method for Producing Metallic Coatings.—A number of corporations have recently been formed in Europe to exploit the Schoop metallizing process, from which fast of record it may be inferred that certain advantages of this method have been demonstrated, but it is not yet clear whether these advantages are the same as those which should interest the automobile industry. It is claimed (1) that the spray method is much cheaper than electroplating mainly because it is far more expeditious, (2) that the coating produced by it is firm and workable in any desired thickness and (3) that an aluminum coating is as readily produced as one of copper, zinc, lead or tin. These are among the results of the process which would appeal to automobile and accessory manufacturers if thoroughly substantiated. The possibility of cheapening and lightening motor castings by spraying the water-jackets into a paper form, afterwards cementing the joints likewise, and that of building radiators by spraying a strong and conductive metal upon a thin stamping of easily fusible material, representing what is going to be the hollow spaces and to be melted out, are attractive in theory.

The information relating to the whole process which was given at a lecture delivered in Berlin recently by a Dr. Lach may contribute to a sound estimate of the probable practical probabilities, and is reproduced in condensed form in the following:

The first patented spray method for metals dates back 30 years in Germany. Superheated steam was used for siphoning and atomizing molten metal. The Schoop method was begun on the same principle. The main progress was that heated gas as well as steam could be used and that much higher pressures were employed, causing a firmer coating to be produced. A portion of the gas or steam current was also used to force the molten metal by direct pressure into the path of the main current. The second stage was reached when it became understood that rapid expansion of the strong gas current in the atmosphere cooled the molten metal so effectively that it really was no longer in a liquid state when striking the surface to be coated, and that finely powdered metal therefore could be used just as well as molten metal. The melting of the metal could thus be dispensed with, which meant an important simplification of the apparatus. The third stage is technically and practically the most interesting, though it consists in abandoning the pulverizing of the metal and returning to a melting process, but this time an instantaneous one taking effect only the moment the metal is wanted and in proportion to the requirements of the work. The improvement was borrowed from the oxy-acetylene welding and metal-cutting practice developed independently in the meanwhile.

Glass and metal of high fusion point can after this last improvement be handled with almost the same facility as the baser metals. The apparatus now consists of three concentric tubes spaced apart. The inner one contains a wire, of the metal to be sprayed, which can be fed out gradually, and the other tubes serve as conduits for hydrogen and oxygen, respectively, both under high pressure, so that they flow out with great velocity. They are lighted, and the flame so formed melts the end of the metal wire which projects from the inner tube, atomizes this material and projects it with great force. If the heat of the oxy-hydrogen flame is insufficient, an oxy-acetylene flame can be produced instead, or an electric arc can be used by first melting the metal in it and allowing the drops to fall into the path of the gas current close to the nozzle. In practice the feeding of the wire to the flame is accomplished by actuating a small air-turbine by the gas, and the turbine then pushes the wire forward in proportion to the capacity of the flame for melting it, since the speed of the turbine and the heat of the flame both depend upon the gas pressure.

Whether the metal is blown upon porous material such as wood or paper or against a metallic surface, it is found that it enters in a very close union with the receiving surface, even to the extent of forming a metallic alloy in the contact zone. According to the nature and the preparation of the surface the coating can be made adherent and permanent or removable. The thickness can be varied, according to the duration of the exposure, from a few thousandths of a millimeter to 10 millimeters. Among the industrial applications of the process it may be mentioned that it has been found possible to produce a porous lead coating for storage battery plates. For the galvanizing of finished structures, such as bridges, and for objects with sharp corners where ordinary galvanizing does not adhere or get too thin, the advantages are obvious, the process taking the placing of painting in many instances by virtue of the hardness and permanence of the coating.

The electroplating work which can be done in one hour by the electric current the spray method can duplicate in one minute and without raising any question of the materials. Especially, coatings of aluminum which it has been found very difficult to precipitate by electroplating can be handled with precision and lasting results. Celluloid and balloon cloth can be metallized. The wood in ships can be protected against decay and insects. Explosives can be sealed up hermetically, which is of considerable importance, in the case of modern smokeless powders and other explosives, for the preservation of their properties and to avoid danger in their transportation on shipboard. Through the fact that removable coatings can be produced, the process attains a considerable importance in the art industries and for reproducing phonographic records, electrotypes for the manufacture of seamless tubes—the latter by spraying paper tubes with steel or any other metal of which it is desired to make the product. By twisting two wires of different metals together or by sending the spray from two apparatuses against the same object at the same time it is possible to produce alloys for experimental purposes in a very handy manner which admits of accurate variations.—From *Dingler's Polytechnisches Journal*, June 7.

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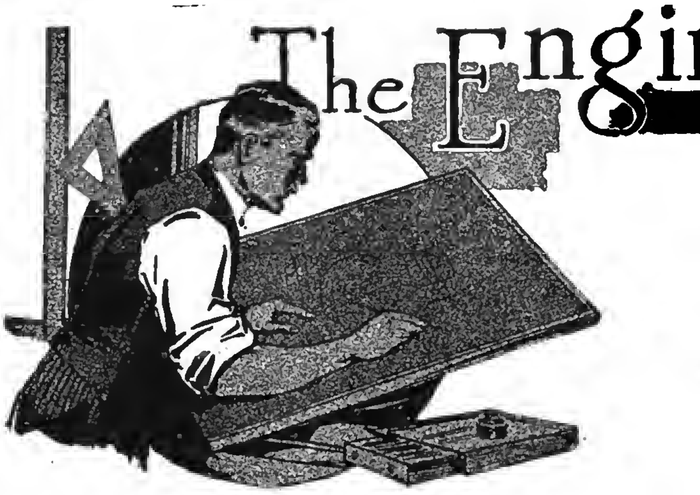
Automobile Statistics of the German Empire are presented in *Der Motorwagen* of May 31 giving the distribution of the different classes of vehicles in all of the states and provinces for the years 1907 to 1913 inclusively.

The Engineers' Forum



Defects in Springs

Part II

Emphasizes Shortening of Tire Life by Imperfect Spring Suspension

SEVERAL more interesting communications have been received on the subject of Defects in Springs, the discussion of which was opened by the comments of several engineers on the article by G. H. Baillee in THE AUTOMOBILE for May 29. Most of these communications, however, are too long to permit of publishing them this week. They will appear in the Forum in succeeding issues.

Good Springing Saves Tires.—Sturgis.

OAKLAND, CAL.—Editor THE AUTOMOBILE—We have read with much interest in your issue of AUTOMOBILE for May 29, the article on Defects in Springs.

The writer has personally been on the tire end of the game for about 10 years and during this time has seen a few changes in tires, but have not noticed any radical changes in the springs other than the difference in the metals used and less breakages at present than in the early stages.

As it is to-day the pneumatic tire has to absorb by far the largest of the shocks, and consequently the life of tire is comparatively short. It has come under my personal observation a number of times that cars with the stiffest springs are those that the tires wear out rapidly on, and necessarily, of course, give the greatest amount of trouble.

The tire man would welcome more flexible springs or pneumatic suspension of the chassis. As it is to-day, the tire man has his troubles, and plenty of them.—V. K. STURGIS, Pacific Leather Works.

Why Not Hold Accessibility Contests?—Duryea.

SAGINAW, MICH.—Editor THE AUTOMOBILE—I have read the remarks of Lee Day in the Engineers' Forum, regarding accessibility and demountability, with much interest. I second his attitude strongly. It does seem odd that the public pays so little attention to such vital features. The only explanation that seems to be in sight is that the makers dare not submit their cars to tests of accessibility. They make a big talk about reliability, and more or less about accessibility, but an accessibility contest has not been held so far as we know. It is a well-known fact that the factory cost of a repair part is generally very small, but the cost of getting it into the vehicle is a very expensive item. The public in time learns this. but has no real method of knowing whether the next rig it buys is any better or not, and so long as attention is not given to these points neither the public nor the makers do much toward making them better. There is a big hullabaloo about many details of no particular importance, but this one of accessibility for purposes of attention and repair is sadly neglected.

There are enough experienced users of automobiles in the world to-day to make an accessibility contest a very interesting affair. These experienced men know something about the troubles of adjusting and repairing, or replacing any given part, and if our various exhibitions or contests should include one or more accessibility trials, the good to the industry would be immense and immediate. It would accentuate for the maker a valuable feature, and it would certainly please the user. Each contestant should be allowed to furnish his supply of tools, but they should be listed, and their weight, bulk and selling price stated. The vehicle should be driven and inspected so as to know that it is in running shape, all parts being present. Then in the presence of the spectators, and previously unknown to the contestants, a certain repair stunt should be required. That is to say, remove the power plant, or remove the piston, or any other vital part that in actual practice may require removal. The time required to accomplish this should be taken, and also the time required to replace it. Then the car should be again driven and inspected.

The maker does not see this thing from the user's standpoint. He is prepared with appliances for lifting off the body or separating certain parts of the car, that the user does not have, and to his skilled men a job that may be inherently difficult does not strike them as being such, but when this work must be done away from the factory with few appliances, and generally with but one or two men, the problem becomes entirely different. A task that was not disagreeable on a brand new machine, perfectly clean, and with every appliance, becomes a very disagreeable problem when performed as the user performs it on a dirty machine, and without the necessary tools, as often must be done.

While suggesting contests, I would like to further suggest coasting contests. In these days of high-priced fuel everybody should be interested in economical running, and the car that runs most easily is the car that requires the least fuel. Of course different size cars should require different quantities of fuel, and therefore the best test available is the one which will select the most easy running car in proportion to its weight. This a coasting contests shows at once. If every user could select a hill on which he can frequently test his car as to its coasting ability, he could always know whether it was running with its accustomed freedom or not, and therefore know whether he was burning more fuel than he should, or not. A dragging brake band is responsible for much engine trouble, and a coast over a known surface will show whether or not the brakes are as free as formerly. The same thought applies to bearings that may not be properly oiled, or that may be badly worn, to tires that are not properly inflated, and many other points. The coasting contest has the elements of a contest in it, and the public like to see one rig surpass another, so it could be made an interesting thing, possibly in conjunction with a hill climbing contest. For actual test purposes, however, some sort of towing test would serve the same purpose. Every owner should know how many pounds are required to tow his car on a floor or level road, and by occasional testing he could know its running condition. It is a sad commentary of our modern automobiles when three or four men are required to push one about in a garage, as is frequently seen to be the case. It should be evident to anyone that if this much power is necessary, the unfortunate engine must use much fuel in order to overcome a lot of needless resistance.—CHAS E. DURYEA, President Duryea Motor Co.

Keeping Track of Tires

Sales Records and Other Forms Help Dealers To Keep a Record of Cost, Use and Other Items

TIRE manufacturers have devised special cost-keeping systems for their dealers, not only in the matter of repair work, if such is done by the dealer or a factory branch—which, however, is a rare state of affairs—but also for making exact records of all sales of tires. To avoid all misunderstandings from the beginning, let it be said here that this is not done to record the owners of a casing number so and so, but merely in order to keep up-to-the-minute statements of the companies' business on hand and to keep the factory posted on how the sales organization is progressing, thereby giving it a direct opportunity of gauging the future requirements of a certain territory.

A number of the sales record forms used by the New York representatives of some very prominent tire makers are here shown, these being the Goodyear, Firestone and Michelin concerns. The sales record Fig. 1, of the Goodyear Tire & Rubber Co., 10.5 by 6.5 inches, is filled out by the salesman closing a tire sale, and two carbon copies are made at the same time with the original record. The original is light blue, the duplicate yellow and the triplicate pink. All three copies bear the same number, each set of three forming part of a series of consecutively numbered blank sets.

In making out this record, the salesman fills out the names and addresses of the parties ordering and receiving the goods, the terms on which they are sold, his name and the class of the customer, that is, consumer, dealer or special dealer. This having been done, the three copies of the order are sent to the stockroom, where the foreman sees that they are properly filled, after which goods and order proceed to the shipping department, the person who took the goods from stock having signed the order under "Assembled By." The shipping clerk also signs the order and notes on it the number of the invoice and the bill of lading or receipt obtained when the goods were sent out.

Then the set of three copies is sent to the office of the manager, where the blue original is filed with preceding originals, in numerical order, while the yellow copy is filed in a folder marked with the buyer's name, all folders being arranged alphabetically. Thus a cross indexing scheme is operative between originals and duplicate orders and it is easy to get at one or the other, provided the name of a customer or the number of the order is known.

The pink triplicate, which is only 7.5 by 6.5 inches, is sent to the Akron factory. On its reverse side are spaces to be filled out if the order is filled by and by, these spaces being for the date of the shipment, the invoice number, quantity, size and weight of the goods and the name, that is, casing, tube, inner liner or what else it be.

A different form serving the same purpose is used by the Michelin Tire Co., Fig. 7. This form is 11 by 7 inches and is made out in four copies: White, original; yellow, duplicate; red triplicate, and white, quadruplicate. The use of these blanks is peculiar, due to the fact that all large shipments are made not from New York but from the Milltown, N. J., factory, and that the blanks are used not only in case of sales made at the branch and filled there, but also when orders are to be filled from the factory or goods are to be shipped to the Metropolitan branch. In this case, the original is sent to Milltown, without any prices marked on it, while the duplicate, upon which prices appear, remains in the book of the branch. The triplicate, destined to be given to the customer when the order is taken, is not used but destroyed when the branch orders stock from the factory. The fourth copy is sent to Milltown with prices marked on it. The factory files the unpriced records in order of the

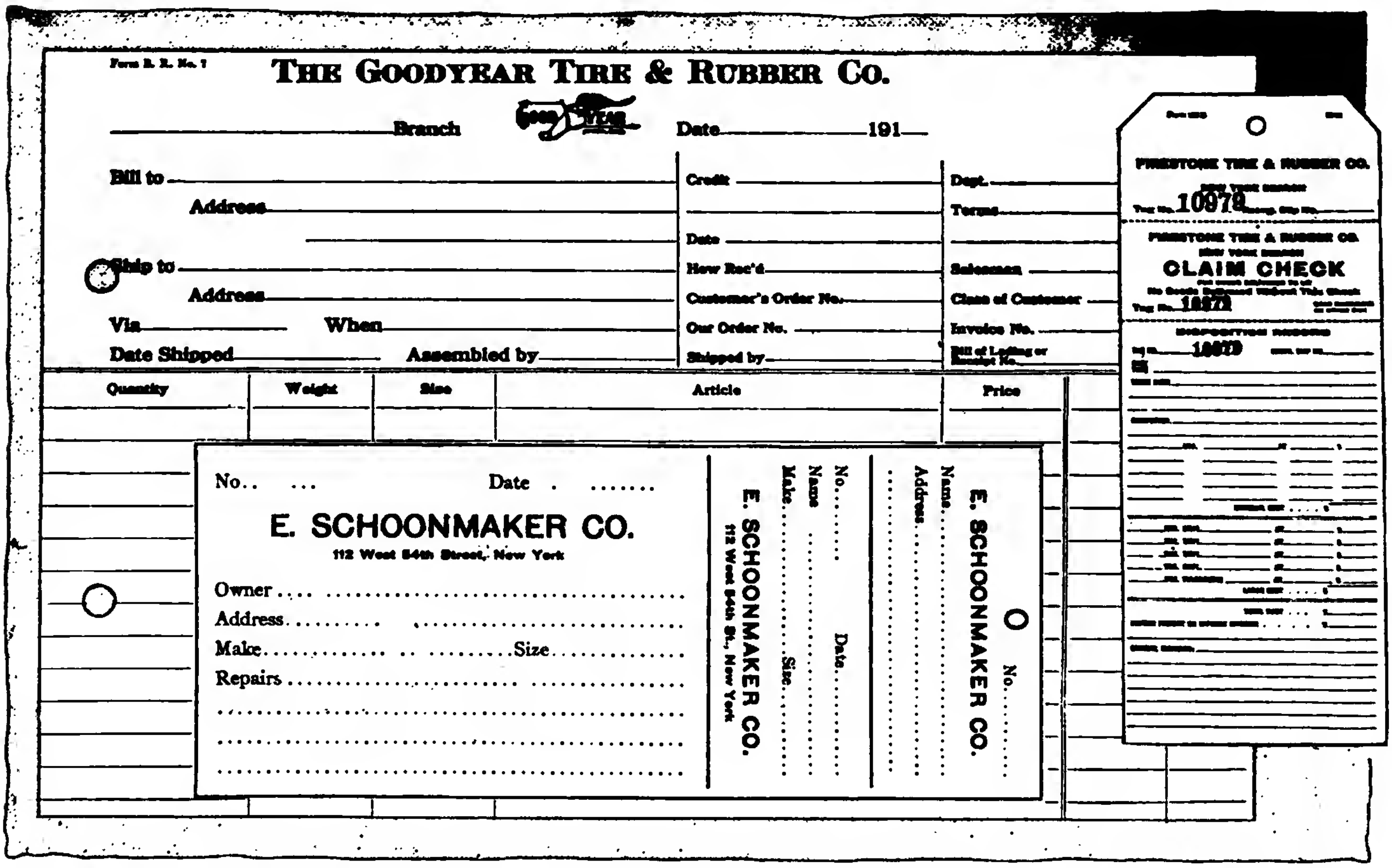


Fig. 1—Sales form of the Goodyear Tire and Rubber Co. Fig. 2—Work order, claim check and adjuster's slip of the E. Schoonmaker Co. Fig. 3—Adjustment form of the Firestone Tire and Rubber Co.

dates and the priced ones according to names of the customers.

When a sale is made and filled at the branch the stock clerk retains the first copy as a receipt for the goods issued, the priced duplicate remains in the book in the office, the triplicate is priced and delivered or mailed to the customer and the quadruplicate is returned by the shipper to the branch billing department.

The Firestone Tire & Rubber Co.'s form is shown in Fig. 8. It is 8.5 by 11 inches, and is issued in triplicate, being numbered. The yellow original, when all spaces have been duly filled in, is filed under the customer's name, in the same way as in the case of the Goodyear system; the white duplicate is filed under the number and the triplicate, printed on thin cardboard is packed with the goods at the time of shipping.

The repair room systems vary with the companies using them. It must be said in this connection that the majority of companies represented in New York City have no repair departments, but send all repair work to be done to reliable outside shops and charge the customer with cost. Among the few exceptions which have their own repair shops, is the Firestone concern. Fig. 3 shows the form used by this company in handling its adjustments. The form consists of a tag composed of three sections and 3.3 by 8.5 inches in size. All three sections are stamped with the same number. The top section serves as receiving slip, filled out by the adjuster with a serial number when the tube or casing is received for repair. On the bottom section the work to be done is named with all the necessary detail, and space is provided for recording the work spent on the repair job. The middle section or so-called claim check is given to the customer bringing in the tire and it is taken from him in exchange for the repaired product when the latter is delivered to the owner. The receiving slip is filed away by the adjuster

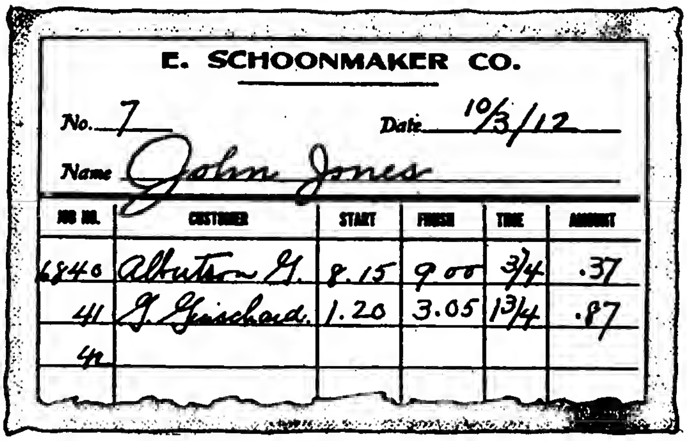


Fig. 4—Workman's time distribution card used by the E. Schoonmaker Co.

under the customer's name as soon as the repair has been completed. When the tire had been delivered, both work order (bottom section) and claim check, which are fastened together, are filed away under the customer's name.

As the example of a large company doing contract repair work for big tire dealers in the Metropolis, the E. Schoonmaker Co. may be mentioned here. Its system uses three forms, a time distribution record, a materials-used record and a card serving the same purpose as the Firestone card just described. Fig. 4 shows the time-distribution record used daily by each workman. On the form he enters the number of the repair job, the name

(Continued on page 1311)

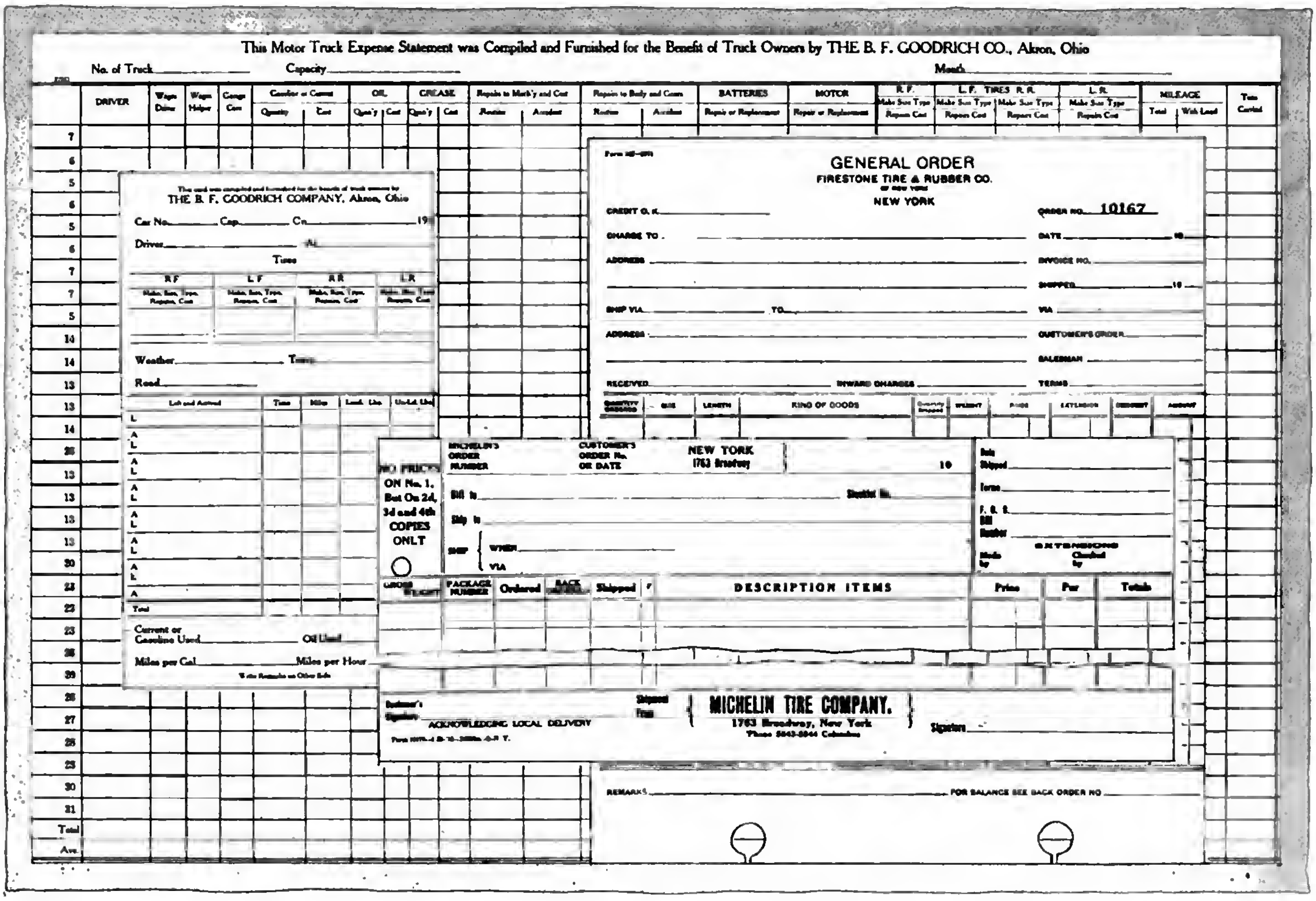


Fig. 5—Goodrich record system for owners to be used on trucks equipped with Goodrich tires. Fig. 6—Driver's daily report card used in the Goodrich cost-keeping system. Fig. 7—Sales form used by the Michelin Tire Co. Fig. 8—Corresponding form employed by the Firestone Tire and Rubber Co.

General Inspection

From Paper Read Before the S. A. E. and Visiting Engineers by E. F. Roberts

THERE is no more positive evidence of the general desire among American manufacturers today to deliver to the buying public a dependable product, honestly made, than the general interest in inspection methods. There should be no more satisfying proof to the buyer of a motor car that the vehicle represents the utmost possible limit of safety for himself or his family than the knowledge that its construction has been safeguarded at every step, from raw material to finished assembly. The progressive manufacturer realizes that the only assurance of permanent prosperity lies in the excellence of his product; and eternal vigilance is the price of excellence. Inspection, close, constant and rigid, is thus imperative to maintain the quality in the product and, although when adequately inforced, one of the most costly features of a motor car organization, it must be recognized as one of the most vital. Realizing structural strains at the average speed of a powerful car and the gravity of possible flaws or breakage, it is obvious that to the purchaser the most essential consideration is the certainty that every detail of material and construction has been subjected to the most severe and searching test that skill can devise for his protection. Absolute interchangeability of parts is also an essential for rapid and economical production and modern inspection with quick-acting gauge systems constitute the indispensable factor of attaining this result.

In large industries, perhaps the first feature that should be considered in an inspection system is the relation of its personnel to the rest of the organization. To secure the determined and inflexible adherence to the standards of quality and workmanship laid down by the management, members of the inspection department cannot be in any degree subject to the control of any shop foreman or any executive directly producing. Evidence to this effect is so common to the experience of all factory executives that the principle scarcely needs mention, but its expression is justified by the fact that in spite of this, scores of organizations either through ignorance of their own situation or indifference permit such conditions to remain. It is an emphatic axiom that the average workman thinks of his job first and duty afterward; and an inspector refusing to pass defective work for a foreman who can discharge him is, commercially, an imaginary quantity.

Six Divisions

For convenience of administration the Packard plant is organized into six productive divisions designated as Chassis, Body, Truck, Forge, Foundry and Service Divisions. Each division constitutes a unit in itself, not only as regards productive organization, but also as concerns its inspection force. Each division's inspection corps is in charge of a general head and over all the divisions extends the authority of the chief inspector. This executive is responsible directly to the general superintendent, is personally a thorough and experienced mechanic, familiar with general engineering practice, standards and limits, and also an expert as regards manufacturing conditions, gauge systems, tool design, etc. With his assistant and through the division heads and foremen inspectors in charge of buildings and, in some cases, large departments, he is in direct control of every inspector in the plant. Foremen inspectors may to a limited extent perform actual inspection work, but their duty is essentially that of maintaining the efficiency of the men and methods under their supervision. They must be actively watchful of the care used in checking parts, must see that all parts brought up are handled promptly and that gauges and instruments are properly used, and, above all, kept continuously in first-class condition. Through their personality the policy and standards of the entire inspection system must be impressed upon every individual in it and the quality of their department output is a standard for which they are directly responsible. Regular department foremen may report infractions of discipline by inspectors and have prompt action taken by the chief inspector, but individual inspectors in departments are wholly free from any constraint in criticizing poor workmanship. Every operation and every part is passed or rejected absolutely upon its conformity, or lack of it, with the blueprint. There are large placards conspicuously posted in every department warning inspectors that immediate discharge will result from passing work on any other basis, except written authority of a general executive. Every possible means is thus employed to impress upon the inspectors that their sole responsibility is the maintenance of quality, and that their positions depend upon this and nothing else. An inspecting force, although necessarily recruited from various sources, should consist mainly of men of previous experience and training in other mechanical departments of the plant. All inspectors should further, when first assigned to this duty, be placed in company with an experienced man and their work carefully watched for a number of days before giving them individual assignments. Special care should be exercised in selecting and examining them, they should be well paid and every possible effort made to hold satisfactory men permanently on the line of work in which they have become expert. A graphic organization chart is herewith given to indicate the relations of the various branches of the Inspection Department.

Limits

The function of an efficient inspection department should begin even before the drawings are approved in the engineering department. The chief inspector should be *ex officio* chairman of the limit committee, whose duty it should be to pass on all drawings to determine whether the limits assigned by the designer are commercially practicable, thus ensuring the elimination of many possible sources of later friction and delay. After the drawings for a new design are approved and signed by the limit committee, and not until then, they should be issued to the various functional divisions, the set in which the inspection department are interested being those sent to the tool room. These, of course, should be checked over to determine the new tools and fixtures required—and also on the inspection department's behalf—to determine the new gauges necessary, preparation thus being under way for the inspection of the finished product, in some instances, even before the raw material is ordered.

Material

Material, as will be noted from the chart, should be for inspection purposes divided into raw stores, including bar, tubing and sheet metal; car parts rough, comprising castings, stampings and forgings; body parts rough, such as lumber, leather, glass, trimming fabrics; and car parts finished and semi-finished. To insure uniformity of composition and quality all metals should be bought on the basis of standard analytical specifications, developed by the engineering department through laboratory test and research. Supply firms, before making up an order, should send in sample test pieces for approval, insuring in this way almost invariable conformity with the specifications and eliminating delays and arguments. In the case of ordinary bar stock, as soon as a consignment is received and checked in as per invoice, it should be inspected for size, limit snap gauges being used and each end of each bar being checked. Straightness also should be noted, as occasionally a bar may be found that would not pass readily through the machine collets. A bar should then be selected at random and a test piece 3 or 4 inches long sawed off. This should be tagged with the date, amount of consignment, grade of metal and the purpose used for, and forwarded to the laboratory for analysis.

The laboratory is exceptionally complete and well equipped for analytical and physical research. It is in charge of a chemist and engineering specialist of wide experience; and every imaginable determination required in industrial engineering can be covered in this department from the crystalline structure of the antimony content in crankshaft bearings to the tons of pressure required for the breakage test of a front axle. Special rush service can always be had from a laboratory of this description in 12 hours, although ordinarily 2 days are allowed. As soon as the test piece has been removed, each bar should then have the grade number and date stamped on the end and the consignment should be placed in the regular rack pending receipt of the laboratory release. After analysis the duplicate stub from the specification tag will be removed by the laboratory and returned to the stock department, thereby either releasing the consignment for factory use or rejecting it as unfit. If the analysis is satisfactory, the stockkeeper should then paint the ends of all bars in this lot with the standard color for that grade, indicating its readiness for use. To ensure this method being given proper attention, personal instructions must be issued, and as a further precaution, signs be posted warning the men that painted ends must never be cut off and that all bars must be placed in the racks, painted ends out. If the laboratory analysis shows the sample below grade limits, the stock department should notify the purchasing department and arrangements should at once be made either for the return of the consignment or is substitution for any other use for which it may still be fit. Bar stock intended for special use, such as piston pins, universal joint pins, etc., or selected stock, should be kept in special separate bins.

The same general method should be followed in the inspection of tubing except that it must be checked for inside diameter or thickness of wall, as well as outside diameter, and also for eccentricity. Standard sheet metal, aluminum, brass, copper, steel galvanized sheets, etc., from established firms need ordinarily be checked only for gauge and general appearance and accepted without analytical test. In the case of stamping stock, however, a test strip 1.5 by 12 inches should always be submitted for analysis and tensile test. In such instances the same procedure would be gone through with as in the case of bar stock, except that a different method of marking (surface stamping) must be used.

For ensuring the correctness of forgings the regular practice should be to submit a lead proof for a preliminary check before the dies are hardened. The lead as soon as received should be delivered to the purchasing department for record and forwarded by them to the engineering department for general checking as to design specifications. If satisfactory it should then be transmitted to the tool department, where it must be laid out and carefully gone over in detail with the drawing, and this opportunity should also be improved for comparing it with the design of any fixtures and gauges relating to this part. As soon as this check is completed the tool room inspector should immediately advise the purchasing department as to approval or rejection. If approved, as soon as delivery of forgings begins, a few of the first may be selected at random and again checked over in every detail to cover any possible deviation on the dies or negligence on the part of the operator. Important parts subjected to heavy stresses, such as axles, steering levers, steering knuckles, steering worm, transmission gears and parts, should invariably pass the analytical test for every consignment also before being released.

Checking of Patterns

Patterns for castings should in every instance be closely checked by a special inspector before being released for use, thus eliminating chance of error as much as possible, in the initial state. As soon as the first casting from any pattern is completed it should be at once forwarded as a test sample and submitted to the same inspection and detail checking as that given forgings and the same routine may be followed in rejecting or accepting it and approving delivery. In the foundry test bars are run from every melt and regularly analyzed and tested for physical properties. Individual castings are inspected in detail as received, although not laid out for every operation. In general casting inspection cored holes and bosses should, however, be checked to discover any possible variations due to core shift and the entire casting should also be carefully scrutinized for sand or blow-holes. Doubtful places must be tapped with a hammer, or, to determine leakage, tested with gasoline. The scleroscope test may also be employed in case trouble is experienced on account of excessive hardness. Stampings should be covered by an initial inspection practically the same as that given forgings, except as regards tool work, since they are usually a finished product when received, requiring ordinarily only a polishing, enameling or similar operation. Such exceptions as do require machining to any extent must be given the same thorough checking and testing that the forgings are subjected to.

Body stock should be also inspected, the lumber being scaled and examined for quality and soundness, while leather, cloth, glass, etc., should each be checked over by experts in these lines. Paints, oils and varnishes should be bought both on analytical and weathering tests and a year's exposure to sun, wind, rain and sleet is none too strenuous a test for body varnish. The passing of all finished parts, from miscellaneous supplies and tools to occasional car parts bought finished, should also be within the jurisdiction of the inspection department and conducted with the same unvarying fidelity to standard quality and specifications as observed in regard to all other items. The essential features of an efficient material inspection are, first, that nothing must be left to the individual judgment or opinion of the inspector. Every specification should be based on the most thorough engineering or mechanical research and embodied in drawings or written instructions. The second and equally important consideration is that the inspectors must absolutely be under no constraint as regards considerations of production. However badly the factory may need material or parts, the receiving inspector must recede in not the slightest degree from his standards. He is paid and must be held responsible for the maintenance of quality alone. Production to him should be a matter of absolute indifference.

The foregoing methods and regulations for the inspection, analysis or test of all stock and parts entering a plant are intended to and, we believe, do guarantee the quality and fitness of every item of material comprised in the car. Perfect material is, above all else, the requisite of first importance. Poor workmanship may spoil good material, but no amount of good workmanship can ever redeem poor material.

Factory inspection of parts in process in a large organization can be best conducted almost entirely on a departmental basis. In a small plant a central inspection department possesses certain advantages, but with the growth of any business, the time required for trucking and handling must eventually make this method obsolete. In each department a central location should be selected, well-lighted and convenient, and here at inspection plates should be installed the head inspector and his assistants. The inspection plates used in the Parkard factory are of cast iron, 24 by 57 inches, and of massive and rigid construction. They are planed and finished on top to an accurate surface and carefully used and looked after, being covered every night with a coating of oil and frequently tested for trueness. At these sit the inspectors, provided with blueprints covering every part handled in the room and with standard or special gauges for checking every operation; and to them are brought all the various lots of parts as fast as completed in each operation.

Gauges

The greatest factor in quick and thorough inspection is an efficient system of gauges. There is no more common fallacy in manufacturing than the assumption that a correct set of gauges once issued insures accuracy of workmanship. And a pretty general fallacy is the assumption of correctness for the gauges themselves. Ordinarily the micrometer is accepted as the standard of measurement. When, however, it is remembered that the average micrometer will alter merely by the heat of the hand to an extent of two ten-thousandths, it is obvious that the court of final appeal for accuracy must be a higher one. There can be no more absolute precision standard than the Johannson system of gauges. A set of these gauges consist of eighty-one blocks, increasing in size by graduations of one ten-thousandth of an inch. They are manufactured in Sweden, the completion of a single set requiring about five years and the surfaces when finished being so perfect that atmospheric pressure will hold a dozen of them suspended in a cluster from one held between the fingers in the same manner as though magnetized. In addition to their almost infinite accuracy they are so impervious to variations of temperature that one of them may be carefully checked in a warm room with the most sensitive instrument possible and then after being laid on ice again checked without showing the slightest variation. These gauges may be accepted as the final source of authority on the accuracy of all manufacturing dimensions. They should serve as the check for all master gauges, which in turn check the shop sets. Special gauges, of course, must be designed in the tool draughting room as soon as the original design of a new model is issued. Standard gauges, however, are required in such large quantities and the efficiency of any inspection system is so dependent upon their immediate accessibility that standard blanks for snap, plug and ring gauges should be carried in stock at all times. These may be made up rapidly and at low cost principally on automatics, leaving only sizing and finishing operations for the toolmaker. This method renders gauge equipment so readily accessible that there is no incentive or excuse for negligence in this respect. All rough stock sent into the factory in dimension lengths should be cut to gauge in the stockroom. The workman who machines it should have a gauge for his operation which is a duplicate of the inspector's. The inspector's gauge is thus a check on the accuracy of the workman's, and all the inspector's gauges should be in turn checked at regular intervals with the master gauges held in the tool room. Too much emphasis cannot be placed upon the importance of properly checking and caring for the master gauges. The set should be at

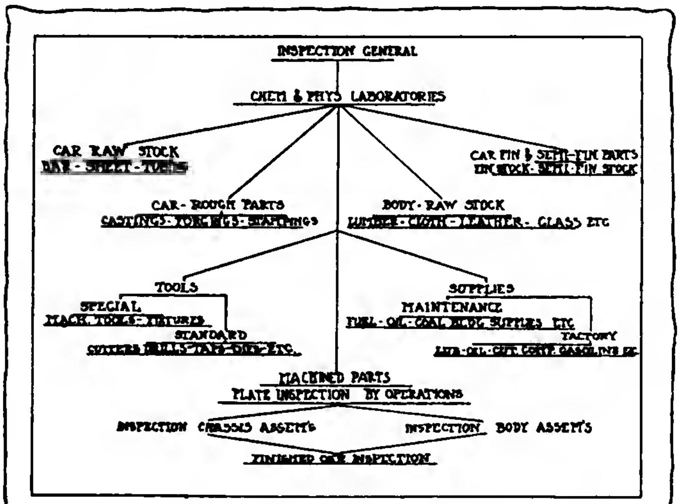


Diagram illustrating the general scheme of inspection least sufficiently complete to cover every important part. They should be given not less than three different checks with the Swedish master blocks by three different inspectors and these separate readings reconciled before being approved for use in the first place. They should be kept in vaults under lock and withdrawn only on fixed occasions or by some executive's order and then only by the man or men regularly assigned to the duty of handling them. No attempt should be made to use them indiscriminately for checking shop gauges, as their function should be the control of the inspectors' gauges only. Every gauge in every department should be turned into the tool-crib at the close of working hours. Some of the more important ones must be checked daily before issue and very few should be permitted to be used unchecked for more than a week. Limit thread gauges in particular must be checked with the master gauges every few days for accuracy of dimensions and depth of thread.

Gauges Must Be Sized

All gauges must be sized to the limits shown on the print and only parts coming inside these limits passed. Parts outside the limit, except where the defect is a nominal one only, such as oversize, may be sent at once to a central checking station. All parts received here should be examined daily by the chief inspector or his assistant and the division superintendent or his assistant. The reason for the defect should be clearly determined and if tools are at fault the proper correction at once made. If, as is usually the case, the cause is negligence on the part of the operator, the foreman's attention must be called to it and both he and the operator warned against a repetition. In the department itself, the inspectors, as soon as a defective lot of parts appears, should issue to the foreman a written "stop-notice" or warning that a certain operator or certain machine is producing work below standard. This will insure immediate attention, as it puts the responsibility squarely up to the foreman. When all the operations on a given part are completed in one department, the inspector's O. K. should be again required before they can be forwarded to the next one. There is no possibility under the Packard method of any lot of parts accidentally escaping inspection. The operator's pay, for every lot and every piece worked on, is absolutely contingent on the inspector's O. K. and every workman for this reason is continuously watchful to prevent negligence on the part of his department inspector. Even dishonest inspection has little incentive since the time-slips on file bear so complete a record that the responsibility for such work may be very easily determined. Thus at every step in the progress of a part it is possible to so check and safeguard it as to ensure its conformity to the standard of quality. To illustrate in detail a thorough method of supervising the maintenance of inspection standards, we may follow the development of a typical forging, the bevel driving gear, as carried through its various operations in the factory. In one respect this gear is given special inspection by receiving a supplementary analytical material test. The steel from which it is forged is given the regular laboratory analysis before being released to the Forge Division, but, in addition to this, because of the importance of the part in regard to both strength and quiet running, a material test is taken on each lot of forgings received. Chips are removed from a sample, and analyzed, and the whole lot are held until the result of the analysis is known. The blanks after release are heat treated and then sent to the lathe for boring and reaming the larger opening for the differential casing and turning the face of the web. The blank is then sent to the plate and the dimensions and surfaces checked. The piece is next taken to the milling machine and the four slots for the differential spider are cut. For the second time it goes to the inspector, to determine whether the slots are central, at right angles to each other, square with the surface of the web and true to size within a limit of one half-thousandth plus or minus. Next the outside diameter is rough-turned and the face angle finish-turned, making necessary the third trip to the inspection plate. Again the blank is sent to the lathe for finish-turning the outside diameter and the back angle and sizing the width of the tooth plane. This makes necessary the fourth inspection, after which, if passed, it is sent to have the face of the tooth-plane ground to the correct angle with the web. For the fifth time an inspector checks it before it is passed on to have the back of the web surfaced preparatory to copper-plating for hardening. After plating the teeth are rough and finished cut, which makes necessary inspection No. 6. The gear is next sent to the heat-treating department and first pack-hardened or carbonized. In the carbonizing pot along with each lot of gears is placed a test piece of the same material as the gears, about 6 inches long and .5 inches square. After the specified interval for this grade of steel, the gears and test bar are removed, cooled and reheated for hardening. After hardening they are cleaned and the test bar is broken and checked for depth of case, fineness of grain and general structural appearance, as an index of the internal condition of the gears. The gear is now ready for the most important of all its inspections, the strength and hardness test. Hardness is measured by the scleroscope, which compares the condition of the part with that of a standard established by the Brinnell testing machine. Between thirty and forty readings are taken from each gear. Strength is determined by the hammer test, a device which permits the concentration of a heavy blow of known force on a single tooth, each gear being given this test on at least four different points in its periphery. These tests may be considered as inspections Nos. 6 and 7, and are immediately followed by inspection No. 8, which is the test applied by a special fixture for determining the amount of possible distortion due to heat. This inspection is rigorous and minute, covering every tooth of every gear; and the gear that checks two-thousandths of an inch eccentric on the pitch circle is rejected. The diameter of this circle is 13 inches, but the limit of variation that any gear can show and pass is only one and one-half thousandths of an inch.

When successfully past this inspection the gear is ready to be ground on its outside diameter and on the face of the teeth and this in turn leads to inspection No. 9. Another grinding operation on the back and face of the web and again an inspector must check the accuracy of operator and machine, this time permitting a limit of variation of only one-half-thousandth. The final grinding is the finish of the opening for the differential case, which is followed by inspection No. 11. The last machining operation is the drilling and reaming of the differential casing bolt holes, which, in inspection No. 12, are checked for size and spacing. Absolute conformity to specifications is the standard for this operation, no variation being permitted. Not yet, however, may the gear be released as a finished part, as it may still fail on No. 13, the final inspection. This consists of a test on a special fixture again, for checking the correctness of the tooth-bearing and smoothness of roll, and but little less than perfection is required of the gear that is finally passed through. As a finished product it is obvious that a large percentage of the cost of the gear is due to the continual supervision of the inspector, but it should also be equally obvious that the result is an article as near to the ideal of mechanical perfection as the best of equipment, skill and scientific testing can achieve.

Assembly Inspection

In addition to the parts inspection, which should cover every item purchased or made for the car, all assemblies from the gasoline tank draincock to the motor should be checked in detail, both for accuracy of relation of their parts and for operation. The minor assemblies must be checked by themselves and then later as parts of large assemblies will again be inspected for location and function. This progression should follow through all the various stages of assembly, culminating in the motor, for instance, in the motor test room, where the engine, speeding under its own power, may be checked for every phase of construction and efficiency by its showing in operation under full service load. As a part of the chassis assembly it is again due to be checked, along with the others, for perfection of adjustment in the chassis road test. Bodies should be inspected—in the beginning, part by part—wood, glass, leather and cloth. Before entering the paint departments every one must again be gone over inch by inch and every minor defect, whether dent in aluminum or check in wood, sought out and corrected. Another inspector will pass it from the paint shop into the trimming department, and an expert trimmer's inspection O. K. should be required to get it from this department back into the finish varnish room. Before it is sent down to be attached to the chassis it must be given a last careful scrutiny for any possible defects of finish or workmanship, and in the finished car assembly department meet a chassis, which has come through only after a similar ordeal in its own paint department. After the car is assembled it should be inspected and checked with the specifications on the sales order for completeness and workmanship before being passed to the finished test department. Preparatory to the road test the motor is to be tuned up to the finest possible pitch of adjustment and inspected for quietness and flexibility before being turned over to the driver. As this test covers road performance it should be entrusted only to men of long experience and special aptitude and judgment. If passed, there remains only the attaching of any special equipment or accessories and the formal checking out of the car before submitting it to still another inspection, the most severe and critical of any it has endured. The sales department should have charge of this feature and their attitude should represent as nearly as possible that of the buyer. Not being subject to the control of discipline of the manufacturing department in any degree, they are free to exercise their judgment without fear or favor on every detail of construction, operation and finish. Their decisions are positive and final, and the car that, in their eyes, falls short of the desired perfection is rejected until brought up to this ideal.

Weaver Opens Discussion

The discussion was opened by E. W. Weaver, Peerless Company, who stated that he has given considerable study to this phase of manufacturing. In connection with that part of the paper dealing with selected stock, the question was asked as to whether this referred to the Packard company's own inspection or to the fact that the stock was bought selected from the steel maker. The latter was meant.

Henry Souther touched upon the inspection of material and pointed out that such inspection is a very important part of the manufacture which must not be dropped out no matter what other inspections are eliminated. The greatest damage is done by the purchasing departments in not ordering their materials far enough ahead so as to get proper inspection. If the stock is received enough in advance, it is possible to hold it up until its exact identity can be determined, thus preventing any inappropriate material from being used for the various parts.

F. E. Moskovics asked as to what relation the physical laboratory plays to the inspection methods, to which Russel Huff, Packard, replied that this laboratory has been practically turned over to the manufacturing department. The whole plant depends upon this laboratory for its specifications for materials for different purposes. These specifications are spread around the factory for the different departments in such a way that all materials are ordered in accordance with them. There is a regular form for handling the inspection in a routine manner. In this way all departments know just what kind of material is in a carload, as to its carbon content, and so on.

C. F. Fuller, Wayman and Gordon Co., emphasized the importance of testing for the physical properties of bar stock materials and forgings. He cited an example of a broken steering knuckle which came to his attention. Although the material of which it was made had the proper chemical constitution, its physical properties were absurdly deficient. This shows that it is necessary to test whatever you get, for although manufacturers can furnish the properties desired, they very often furnish materials which do not meet the requirements.

Wheels for Commercial Vehicles

From a Paper Read Before the S.A.E. and I.A.E. by Arthur J. Slade

THIS paper is the outcome of the writer's temerity in offering a suggestion to the Commercial Car Wheels Division of the Standards Committee, that, in considering the standardization of metal wheels, along lines similar to the standardization of wood wheels, certain practices, as to material and design, should be recommended for the benefit of the motor truck designer.

A precedent has been established by the Iron and Steel Division of the Standards Committee, in recommending good engineering practice; as for example:

"Steel castings for axles, crankshafts, and steering spindles are used only at a great risk."

The chairman of the Commercial Car Wheels Division, and the secretary and general manager of the society, did not, however, view the proposal with approval, but suggested a paper for presentation at this meeting, with a view to bringing out available information as to suitable material and designs for truck wheels, through those members best qualified by experience to express themselves on the subject with authority.

It is perhaps natural that wheels built of wood should have been developed to a high state of perfection in this country where such a large and varied supply of wood is available. The rapid development of the West called for vehicles of rugged and sturdy type for the pioneer's use in opening up a country without roads of any sort. Later the transportation companies, operating stage coaches over roads little more than trails, as new sections were settled, and eventually the agriculturist, who even now often operates his farm wagons over roads unworthy the name, demanded the highest quality of wheels.

The majority of the motor trucks built in this country have been equipped with wooden wheels; the earlier wheels conforming closely to the design of horse-drawn wagon wheels, especially with regard to size of spokes, but also, in some instances conforming to wagon-wheel practice even to the extent of wooden hubs. Some of these wheels, dating back perhaps 10 or 12 years, are still in service on motor trucks in New York City.

Development of Wood Wheels

The first radical improvement was in the substitution of metal for wood hubs, primarily to make possible the use of anti-friction bearings. Next came a radical change in the matter of spokes. When it is considered that a wagon wheel on a 5-ton capacity vehicle seldom has a tire exceeding 4 inches in width, whereas the tires on the 5-ton motor truck will usually total from 10 to 12 inches in width, it becomes obvions that the wide felloe on the truck wheel should be supported by a spoke of much greater width than the narrow felloe of the wagon wheel. Since 1907, when the importation into America of one of the most successful European trucks began, the improvement in the design, as well as construction, of wood wheels has been very marked. At that time one of our leading wheel builders undertook to practically duplicate these European wheels with spokes about 5 inches in width, flaring at the onter end so as to form an adequate support for the felloe, and also of sufficient cross-section to insure a good shonlder on the end of the spoke against the inner surface of the felloe. Ever since that date the wheel builder in question has been manufacturing wheels, from designs similar to this, with great success; and, although some other wheel builders contended at the time that it was not feasible to procure wooden billets of a size suitable to finish spokes of such unusual dimensions, the majority, if not all, of the wheel builders catering to the motor truck industry are now building wood wheels of this general type.

Early Metal Wheels

It must not be assumed, however, that the practice of motor truck builders in this country has been confined exclusively to wooden wheels. As far back as 1858 and 1862 motor trucks are reported to have been built, in an experimental way, with steel wheels. In the years 1903 and 1904, when the motor truck industry in this country was making a definite commercial start, the Gibbs Engineering & Manufacturing Co. equipped trucks with cast steel and steel disk wheels. The cast steel wheels were similar to those now being advocated by several manufacturers, having hollow spokes integral with hubs and felloes. They were made of crucible steel and used a tire constructed from a combination of wood, steel and rubber. About twenty 5-ton trucks were built and the wheels were found to be on the whole satisfactory. The disk wheels were made of boiler plate, riveted to cast steel hubs and to a steel tire band. These wheels were also said to have given satisfactory service, but the company building the trucks in question no longer exists. One of our members who was identified with the production of these vehicles will, it is hoped, contribute some discussion on this paper.

In 1905 the Couple-Gear Freight Wheel Co. brought out a line of trucks equipped with wheels made up of steel plates. In the interior of the wheels an electric motor was mounted, and this same construction has been followed by that company up to the present date. At about the same time the Four-Wheel-Drive Wagon Co., of Milwaukee, brought out 5- and 10-ton capacity gasoline trucks equipped with wheels on which the tires were segments of rock elm and the side plates were steel disks. This company is not now in existence.

In 1906, a metal wheel, known as the "Indestructible Steel Wheel," was introduced to the market in Chicago. These wheels were built of side disks of steel, reinforced inside with structural shapes; the various members of the wheel being riveted together. They were used on trucks built by the Reliance, Commerce, Rapid, Plymouth, Grabowsky and Packard companies, of which all but the latter have discontinued manufacturing, and the Packard company only used a limited number. The Rapid company is said to have continued their use the longest, covering a period of about 2 years. The severe strains and shocks due to irregular road surfaces are reported to have loosened the rivets holding the various members together, and the wheels were not found to be permanently satisfactory. It is hoped that some member of the society present may have had personal experience with this type of wheel and can give us information regarding its value.

In 1908 the Morgan truck of 5-tons capacity was brought out with a disk type of cast steel wheel which proved unsatisfactory and was superseded in 1910 by a cast steel wheel with spokes of the general design with which we are familiar.

In 1909 the White company introduced steel wheels on the larger sizes of their commercial vehicles. It is understood that modification of the design of these wheels was necessary to eliminate breaking of the spokes near their point of union with the felloe, and their present design seems comparatively free from breakage. The A. O. Smith company on their heavy gas trucks have used cast steel wheels since 1911. The same is true of the Locomobile company on their well-known trucks.

From time to time trucks have been imported from abroad equipped with steel wheels, notably the Orion, Bussing, Gaggenau, etc. However, the best known European trucks coming into this country are equipped with wood wheels, notably the DeDion and Saurer. I wish to acknowledge my indebtedness to Mr. Charles E. Stone, member of this society, for his assistance in compiling the above facts.

Current Practice

It will be noted that comparatively few well-known truck builders in this country are at present using metal wheels and those who are using them have not previously used wooden wheels.

There is one notable exception, however, the Pierce-Arrow Motor Car Co., on some of whose trucks I have recently seen cast steel wheels, although since the introduction of the Pierce 5-ton truck on the market wooden wheels have been standard. It is hoped the engineers of that company will give us the benefit of their experience and their reasons for making this change.

The majority of motor truck manufacturers, including those whose product dates back to the beginning of the motor truck industry in this country, have used wooden wheels consistently, improving their design from time to time, but not abandoning a material for wheel construction which has on the whole proved entirely satisfactory.

Through the courtesy of Mr. George R. Wadsworth, member of this society, I have been furnished with reports on the mileage and condition of the wood wheels on a large group of gas trucks of 3-, 4- and 5-ton capacity, which show that in some cases the mileage covered approaches closely to 70,000. On the assumption that the tire mileage secured on these trucks is 10,000 miles per tire, this would mean that some of the wheels have been subjected to six tire changes. The report states, regarding these wheels, that "they were all in first-class condition and not a moment's inconvenience or delay has been caused by them and there is not the slightest indication of trouble in the near future." These wheels, it is scarcely necessary to say, are of modern design, are accurately constructed of suitable material, and are carefully inspected for conformation to the accepted S. A. E. motor truck wheels standards. The contention that wood wheels get out of round and present difficulties in tire application does not seem to be substantiated in this case.

As pointed out in papers on wood wheels, presented by Mr. Bert Morley and Mr. C. B. Hayes at the January, 1912, meeting of this society, there is no question as to the adequacy of the supply of wood for wheel manufacture. The experience of many of our members with wood wheels on motor trucks, extending over periods of years, indicates that the truck manufacturers in this country are not being forced by necessity to adopt metal wheels, so that if the truck manufacturer who has been using wood wheels satisfactorily for many years is to be influenced to adopt a metal wheel, it is essential that he should be shown that some practical advantage would be gained by the change.

When this society visited our British fellow engineers, several members of the American party made inquiries regarding the service rendered by metal wheels, in both England and France, and the results of the investigation were set forth in a short report which I made to the society at the January, 1912, meeting. Briefly, it was found that cast steel wheels were being used in England in a variety of forms. Also that structural steel wheels were preferred by some. Further, that the consideration of wood wheels had not been abandoned, even by those using steel wheels as a standard, and that some truck manufacturers preferred wood to metal, and used the former as standard. In France the wood wheel appeared to be the standard to the practical exclusion of metal wheels.

More recently Mr. L. C. Freeman, a member of this society, submitted a paper on "Tendency of Foreign Motor Truck Design" at the January, 1913, meeting in which he made the following statement: "While cast steel wheels seem to give very good results under certain conditions, they do not appear to be a universal panacea for all wheel troubles. One user who has operated a great many trucks of many different makes said that cast steel wheels were all right until the tires wore thin. In this statement I think there is food for a great deal of thought. A built-up wheel of structural steel was giving him excellent service and almost no trouble." Doubtless some of our British fellow engineers present at this meeting can supply us with up-to-date information on the status of the metal and wood wheel in Great Britain.

Claims for the Metal Wheels

At the present time there is undoubtedly a general effort being made by manufacturers of parts for motor trucks to add metal wheels to their product; and with the exception of one manufacturer, who proposes to build wheels of malleable iron, all of them are building their wheels of cast steel.

What, then, are the specific advantages offered by metal wheels which should influence a motor truck designer to specify metal construction rather than wood? The advantage must be such that it can be proved to the purchaser of the truck that he will secure an actual financial gain by the change which the engineer proposes, because to the purchaser the prime questions are the expense of operating and maintaining the truck over a period of years and the earnings or savings which the vehicle will effect. Theoretical considerations, unless borne out and proved in practice, are unavailing. Practical service conditions count with the hard-headed business man—not laboratory or experimental tests and calculations.

First, it is claimed by one of our members, who is chief engineer of a company about to place cast steel wheels on the market, that: "It is now conclusively proven that there is a distinct saving in tires on steel wheels. Some of the largest tire manufacturers guarantee as much as 30 to 40 per cent. longer life on steel than wood." Inquiry made of the leading tire manufacturing companies, verbally or by letter, has failed to verify that statement. The opinion of several tire company officials seems to be personally in favor of metal wheels for the one reason that they are likely to be made more accurately to size, but the tire companies positively decline to guarantee an added mile or to even express the opinion that added mileage can be expected.

As to the question of accuracy of workmanship, it is entirely feasible for the wood wheel manufacturers, under the present S. A. E. standards, equipping the wheels with S. A. E. bands, to work within the necessary tolerances and provide wheels which will have the accuracy required. Accuracy in workmanship is a question of care in construction and careful inspection and the manufacturer who insists upon accurate wood wheels conforming to S. A. E. standards has no trouble in securing them.

Another claim made for metal wheels is that their strength is greater than wood wheels. Assuming the cast steel wheels to be free from defects, and to have the chemical and physical characteristics recommended by the Iron and Steel Division, these wheels certainly develop marvelous resistance to shocks. I witnessed a test of such a wheel recently which was subjected to the impact of a weight swung as a pendulum against the side of the felloe and the wheel was deformed beyond the semblance of a wheel and even then did not show any fracture. At the same time, as has been pointed out by the Iron and Steel Division, steel castings can not be inspected against blow holes, and had the wheel in question contained some concealed defect, failure in testing would probably have resulted. The difficulty in securing uniform steel castings free from defects and conforming to the S. A. E. standards is generally conceded and several of the foundries making cast steel wheels in this country, at the present time, are having difficulty in making steel castings of other motor truck parts which will pass the inspection of some of their customers. As to the strength of well constructed and properly designed wood wheels, the front wheel of a truck manufactured by one of my clients came in contact recently with a road obstruction with such impact that the strain broke the steering gear, but the wheel was uninjured, and on another truck a rear wheel was subjected to such an impact that the axle spindle was bent without injury to the wheel. Therefore, on the question of strength, that of the high-grade wood wheel is entirely adequate for commercial purposes.

The contention is also made that the metal wheel will dissipate heat more effectively than the wood wheel. There has come under my observation no case in which a truck tire on a modern motor truck has been injured by lack of heat radiation under service conditions. I assume that the heat developed in a solid rubber tire is due to the deformation of the rubber and this is greatest near the surface of the rubber which comes in contact with the ground. This surface is in contact with the air and I should expect that the heat would be radiated through the air more easily than transmitted through the base of the tire to the wheel and hence radiated by the wheel, felloe, and spokes.

Cost and Weight

The fourth point in considering the relative merits of wood and metal wheels is the comparative cost and weight. From information received from one of my clients regarding wood wheels being regularly manufactured and used on this company's trucks, and from information received from the chief engineer of one of the companies which is bringing out cast steel wheels, the following comparison of weight and cost has been made:

Set of wheels for 3-ton truck to take 36-inch by 5-inch tires, front; and 40-inch by 4-inch dual tires, rear; wood wheels equipped with S. A. E. band and Timken hubs and flanges—steel wheels having band and hubs integral—

	Wood	Steel	Increase of Steel over Wood
Weight			
Front	122 lb. each	151 lb.	12.4%
Rear	212 lb. each	373 lb.	76.0%
Set	668 lb.	1048 lb.	57.0%—380 lb.
Cost			
Front	each $20.00	$26.80	34.0%
Rear	each 30.00	52.10	74.0%
Set	each 100.00	157.80	57.8%—$57.80

Information obtained from a European manufacturer of cast steel wheels indicates that their weight is substantially the same as American cast steel wheels, but the price is 25 to 50 per cent. higher, thereby placing the steel wheel at a still further disadvantage as far as cost is concerned. Consequently, it would appear that the cast steel wheels are both costlier and heavier than the wood wheels. The burden of proof seems to rest with the metal wheel manufacturer, that they have an economic advantage over the wood wheels, resulting in a financial saving to the owner of the truck equipped with metal wheels.

Drop Forgings

There is one type of metal wheel which might overcome the disadvantage, real or fancied, of the wood wheel, and which would at the same time eliminate the element of risk always existent in a casting, and also the criticism of the built-up structural steel wheel, the loosening rivets. This is the drop forged wheel. Drop forgings of high-grade steel, which after suitable heat treatments, develop extraordinary physical characteristics, would, in my opinion, be an ideal construction, unless their first cost proved prohibitive. I hope we may hear something from the drop forgings experts among our membership in regard to the feasibility of such a construction for motor truck wheels.

As stated at the outset of this paper, its purpose is to stimulate discussion and secure additional data, by which the motor truck designer may be benefited and assisted in his work. I trust it may accomplish its purpose.

Letters Begin Discussion

At the conclusion of this paper several letters from engineers who had been invited to comment on the paper were read. Pertinent remarks on the subject were made in these letters. H. D. Church, Packard company, stated that, in his opinion, the steel wheel would not stand up under difficult service with the certainty of other types of wheels. He advanced it as his belief that a better wheel would be developed than the metal wheel now on the market, that this wheel would be of metal but that the wood wheel would be used until that time.

A. M. Robinson, Locomobile company, stated in his letter that he thought the opinion of the London bus company would be most valuable since they were the largest users of commercial cars in the world. In reply to a letter which he wrote them stating that he understood that they were using the steel wheels on more than 2,000 buses they replied that this was the truth and that they further intended putting them on all their new buses. Mr. Robinson expressed the opinion that the use of the steel wheel increased the tire mileage to a considerable extent and that the difference in resiliency between the metal and the wood wheel amounted to practically nothing.

Benjamin Jerome stated that the Couple Gear company had had success with the structural steel wheel and that there are now in use by this company's cars, wheels of his type which have been in continuous service for 7 years.

Phineas Jones, the wheel manufacturer, stated that while a wood wheel man he did a large amount of repair work on wheels of all types. He stated that in his opinion the two main faults in the wheels which found their way into the repair shop, speaking of wooden wheels, were in workmanship and design. The main fault in workmanship was that the rims were not properly shrunk on and the main fault in design was that the wheels did not have enough spokes.

H. W. Alden, of the Timken company, stated that the paper hit the nail squarely on the head. He said that in his opinion it is too early to predict the ultimate wheel but under the present conditions the wood wheel did not do well in a dry country and that in this work there were many trucks with cast iron wheels that were giving the best of satisfaction. He stated that the tubular construction was the strongest and had the best appearance, the hollow box rim being best for the S. A. E. tires. In Mr. Alden's opinion the malleable castings are cheap and the box rim is the coming practice.

Ralph L. Morgan said in his letter that welding costs ran up so high that he found it cheaper to use the cast iron wheels. The difficulties of plate cracking he said, were chiefly connected with the lighter wheels.

Mr. Powers stated that the engineer naturally and instinctively looked for a metal to use as a material in the manufacture of wheels. He further stated that our attentions should be directed towards the British experiments with these wheels as they are much more complete and conclusive than any carried on in this country. Endurance is the vital consideration and our attentions would be directed towards this. The motor truck wheel industry is new and is progressing rapidly. The first thing that had to be done was to break away from the practice of the wagon builder which was at first followed. We have an ample timber supply here for several years and when that is taken into consideration with the fact that the wood acts as an absorber of vibration, the good effects on other parts of the mechanism are apparent.

Mr. Farrel, as a manufacturer of steel castings, stated that he believed that nothing in the way of steel casting manufacture offered any easier field than did the manufacture of the steel wheel. Referring to the statement in Mr. Slade's paper in which he stated that the wheel that was tested was not noted for defects, he stated that the particular wheel had many visible as well as invisible defects. He further stated that it would be easy to manufacture steel wheels on a competitive basis if they were ordered in anything like the quantities that wood wheels are ordered.

J. E. Hale said that as a tire manufacturer he had found that many of the troubles he had found were due to the fact that the wheels are out of round. He also stated that a well-built and well designed wood wheel was a rigid proposition and did not differ much from the steel wheel in that respect. The opinion was also advanced that there were many instances where the tire makers were not holding to all the S. A. E. specifications.

Mr. Clarkson, of the I. A. E., stated that he believed the weights furnished by Mr. Slade were too high. Taking the example of the London bus company, the wheels were 487 pounds per set lighter than those Mr. Slade had specified. Forged wheels in English practice weigh 440 pounds per set for a 3-ton truck and cost about $80 more than the wood wheels. He stated that none of the wood wheels they could get would stand 60,000 miles of London road service or an equivalent of 2 years.

Mr. Courtley stated that he had had considerable experience with wheels made from electric furnace steel and that this material had given exceptional results. The absence of blowholes is a strong point.

Keeping Track of Tires for Automobiles and Trucks

(*Continued from page 1305.*)

of the customer, the time of starting and finishing work on the job, the total time spent on it and the amount due to him for this work. The materials-used card is not shown here. It is marked with the number of the job and the name of the customer, and on it every bit of material used in connection with the repair is recorded. The tri-section card, Fig. 2, consists of. a work order, a claim check and an adjuster's slip which is attached to the tire with a string, being fitted with an eyelet for this purpose, the same as the Firestone blank.

Record System for Users

The activity of tire makers, however, does not stop with the record of sales and repair work. The proof of this statement is that the B. F. Goodrich Co. has devised a users' record system to be used on trucks equipped with Goodrich tires. This record system consists of a twelve-page book, each page representing a monthly expense sheet giving an opportunity of recording every bit of the expense of operating and maintaining the truck. Reference to Fig. 5 shows the exactness used in the drafting this form, and it may well serve as a simple and fundamental blank for truck users to keep their costs on.

The basic card in the Goodrich cost system is the driver's daily report card, Fig. 6. This card, 7 by 4 3-4 inches in size, is printed on thin, tough stock and is designed to give not only the usual information presented on a driver's report, but also full particulars in regard to the tires used.

Across the top of the card are written the number of the vehicle, its make and the date. The driver signs his name and inserts the time the report was turned in or made out below the above-named items.

These essential details having been disposed of, the remainder of the card is devoted to the information pertaining to the vehicle and its operation. Tires are classified according to the wheels on which they are carried, particulars covering the right front tire being given under the caption R F, etc. Here the tire make, size, type and repairs and cost are to be inserted in each case.

Next come data covering the day's work of the car, the weather, temperature and road conditions being given first place.

Below the space for this information, the card is divided by horizontal and vertical lines into spaces for the recording of details concerning the operation of the vehicle. At the left, under "Left and Arrived" the driver notes his destination in each case giving. below "Time," the time of his arrival at, or departure from, a loading or unloading point. The mileage covered to and from each point follows, with the number of pounds of load taken from the loading point and the number of pounds unloaded at each stop. There are spaces for data covering six trips on each card.

At the bottom, a heavy, black line is printed across the card. dividing the totals of each column from the detailed information given in each column.

The bottom of the card is left for the notation of data such as the amount of current or gasoline used, the amount of oil used, the number of miles per gallon of gasoline and the speed of the vehicle in miles per hour.

The driver is instructed to report on the back of the card any irregularities in the operation of the trucks that he has noted during the day or any mechanical or other troubles he has had in making his truck operate to its greatest efficiency. Delays at unloading or loading point should be reported by the driver as well as all mechanical troubles, for the former influence the efficiency of a commercial vehicle fully as much as the latter.

To Reduce the Expense per Mile

All these systems show the endeavor of the tire makers to give their customers efficient and economic service. The idea is to reduce the expense of each user per mile, so that he can obtain a maximum of mileage from every tire used, and the consequent expense of the adjustment department is considered as indirect advertising expense. This is to be understood as follows: prompt service must necessarily satisfy the user who gets his benefit, and any man informed by his neighbor that such-an-such a tire company is very liberal about making adjustments and informing the user how to make cheap repairs himself and helping him in every way to increase the mileage received from his tires will buy from the company thus recommended to him by a responsible acquaintance. This shows the truth of the oft-quoted adage, "Nothing counts like service."

The Rostrum

In which Letters from Readers Are Answered and Discussed

Gearbox Discussion Attracts Comment

Oil in Cylinder Due to Bad Piston Ring—High Compression Makes Motor Difficult to Crank—Ether and Kerosene Recommended for Carbon Remover

EDITOR THE AUTOMOBILE:—A gearbox in unit with the motor enables the clutch to be inclosed, giving a very neat appearance; it is easily, and therefore cheaply, manufactured. Regarding simplicity, this depends upon the design of the unit, as some cars using unit power plants are readily accessible, while others are anything but accessible. Regarding flexibility, this type of construction can be hung so as to be undisturbed or thrown out of line.

The amidship position is very good for heavier and higher-powered cars, when used without a sub-frame. However, the manufacturing expense is greater, and the extra universal joints, while no doubt in many cases trouble-proof, require lubrication from time to time. This construction insures a good distribution of the weight on the frame.

The rear axle location is one that requires much more thought and study than the average designer who has attempted this design has given it. The drawback is not the additional unsprung weight, but the absolute necessity of swinging the propeller tube and gearshift levers from the same point. If this is not followed out, one of the most simple laws of mathematics is not taken into consideration and undue, and to say the least, unnecessary, wear is imposed upon the transmission gears. The fact that practically all of the manufacturers of all rear axle gearboxes, as well as the manufacturers of cars having rear axle gearboxes, have found it necessary to make changes from time to time and to add gear locks and to change the location of the gearshift lever goes to show that they have been having more or less trouble. Then, again, on account of the fact that the distance between gearbox and gearshift lever calls for long shifting rods and connections, there is bound to be play sooner or later in these linkages, which means that when the gearshift lever is in its proper place the shifted gear is not. In other words, the two foregoing statements prove that the gears are not having a fair show as they are transmitting power when only partly in mesh.

It is granted that by placing a universal joint between the differential and rear axle gearbox these disadvantages can probably be overcome; but why not use either the unit or amidship construction and thus do away with this unnecessary wear and tear on the gearbox gears, one of the most delicate parts of the modern motor cars?

New York City. M. H. POTTER.

¶*In answering this question car owners are directed to the fact that one of the leading arguments advanced against rear axle location is that of increased axle weight and consequent tire damage. Definite information on this line would be in order.*

¶*Those not in favor of the amidship location have urged against it lack of accessibility.*

¶*The gearbox as a unit with the motor has been criticised in that it is not suitable for a heavyweight car because of the fact that too much weight is placed in front.*

Oil Leaks Past Piston Rings

Editor THE AUTOMOBILE:—I am having some trouble with one cylinder in my model 10 Buick. Starting out with clean spark-plugs I can run for 15 to 20 miles without a skip. then the plug in this particular cylinder begins to miss fire and the engine skips badly. This particular plug will be covered with soot and by cleaning it will run about the same distance again when the same trouble begins. I have ground the valves and compression is as good as in the other cylinders. I have used Rajah, Champion and have now put in a new Wizard plug with the same result. The plugs in the other cylinders run for a month without cleaning. Do you think this trouble is due to poor piston rings, which let the oil suck up into the combustion chamber? Would new rings remedy this trouble?

Slatersville, R. I. E. O. C.

—Your diagnosis of your trouble is no doubt the correct one. It might be though that, instead of your rings being faulty in that particular cylinder, the joints have lined themselves up and allow the oil to pass through the channel thus provided. In either case you will have to take down the motor and if you are careful in taking it down not to change the position of the ring, you will be able to ascertain to what the trouble is due.

Has Hard Time Starting Car

Editor THE AUTOMOBILE:—I have a Lion car 1911 model, 40 horsepower. It was overhauled this spring, all looked over and the old wires taken off and new wires put on, as I was bothered some with short circuits. The engine was in good condition and I was not obliged to take it down at all. It has good compression and it would be impossible to spin it when cranking with the coil. The magneto has been looked over and put in first-class condition and the car is running well. It will take lots of spark before it will knock, but a man would have to be a horse to crank it to make it fire and the hotter the engine the harder it starts. I prime it every time I undertake to start it. It cranks on batteries and my batteries are good; not under 20 amperes. When I first got the car it would crank on batteries that tested 5. It will go every time as soon as it is primed. Very often if I am on a grade and I get tired of cranking I let it run down the grade with my clutch out when under fairly good headway. It will start on either magneto or batteries. I have a new Stromberg carbureter this spring. There is no skipping or back firing. I presume you will say it is the gasoline as all trouble at the present time is laid to carbureter or gasoline, but the gasoline I am using tests 65 the same as last year. I have a tester and test it myself. Could I put a Gray & Davis starter on my engine to overcome my starter troubles?

My spark-plugs burn off clean. They do not soot. They are of a reddish color. By rubbing your finger on the sparking points they will brush off and are as bright as if sand papered.

Sanquoit, N. Y. W. H. C.

—The reason that your motor is hard to crank is naturally on account of its high compression. As this is a desirable feature in an engine, it is difficult to suggest a cure except fitting a starter. This will not make the engine easier to crank, except that you will not have to do the cranking. The Gray & Davis starter is entirely a manufacturer's proposition and cannot be fitted very well to a car that is already in use, unless you go to an extremely high expense. There are many of the electric starters, however, which can be fitted to the car after it is out of the manufacturer's hands, or if you do not desire an electric starter particularly, an acetylene starter or one of the spring type can be fitted. If your motor runs well and shows no tendency to overheat there is no use in making any changes in the motor itself.

Wants Two Sets of Dry Batteries

Editor The Automobile:—I want a diagram for connecting up dry batteries in two separate sets for a two-way switch. The wiring I want to know about is this, to wire a car without a magneto so I can have two sets of batteries, so that I can use either number one or two. C. A. L.

Thompson, Pa.

—The outfit you desire will simply consist of two sets of batteries instead of one, no duplication being necessary on the coil or timer. The two battery sets should have a single ground as shown in the wiring diagram given in Fig. 1. The other terminals of the battery sets are connected with the two-way switch. so that either one can be thrown into circuit with the primary terminal of the coil. With this method of wiring one ground connection will suffice for the whole system In Fig. 1 is shown the regular coil for two sets of batteries as put on the market by Splitdorf.

Believes Valve Stems Worn

Editor The Automobile:—In looking over L. E. Grant's troubles with a Ford T 1911 and your answer for this fault I think you have missed it. I had this trouble with a Ford myself and found the cure, or a great help, in this trouble to be had by putting in a new set of intake valves. The stems of these valves wear, and when the engine is throttled down to low speed a vacuum is formed in the manifold around these stems, causing raw or fresh air to rush into the manifold, making the mixture too weak to fire.

Poplar Bluff, Mo. T. G. Van Sant.

—On page 1178 of The Automobile for June 5 L. E. Grant speaks of having trouble with his car, in that it misses fire and jerks at low speed. As the car has been run only 2,650 miles, the possibilities are more in favor of wear on the valve seat than on the stems. Since there is certainly an air leak in the car it would be well to look at both parts of the valve.

Ether as a Carbon Remover

Editor The Automobile:—About a year ago a friend suggested as a method of removing carbon from the cylinders of an automobile, to allow the motor to suck in a mixture of ether and kerosene through the carbureter or through a petcock in the manifold just above the cabureter, Fig. 2. His plan was to introduce both liquids in a mixture of equal parts with a dash of lubricating oil. Do you think that such a combination would be effective in removing carbon? Kerosene itself should answer the purpose, but how about ether or the concoction made through the mixture? Could any harm be done by using this, say once every two weeks? My friend said that this was a secret method used by some garages which charged $25 for importing the method by which the cylinder cleaning was done. I should like to see this discussed in your columns.

New York City, N. Y. H. D. Martin.

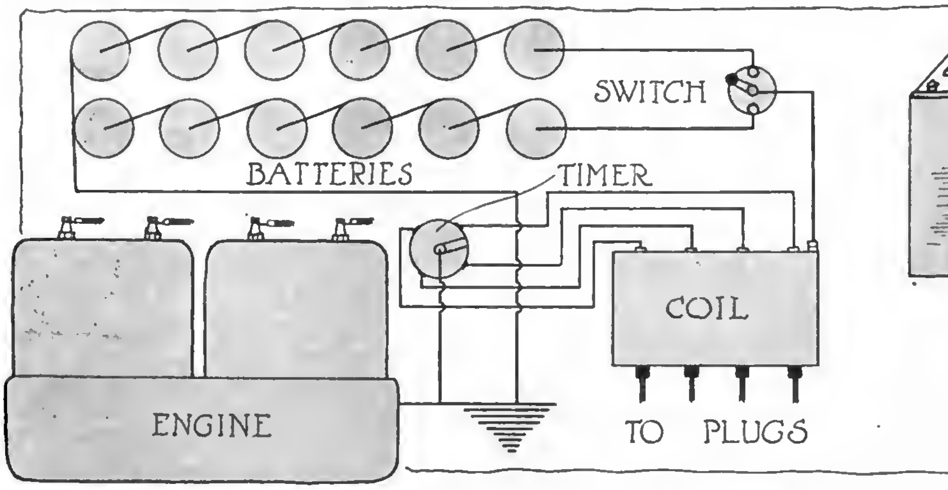
—Ether is a very powerful solvent and no doubt would be a very active agent in ridding the cylinder of carbon deposits. Kerosene also is effective and has been used in the way you mention for some time. It seems reasonable therefore that the mixture of the two should work out very well. If any readers have experimented with it The Automobile will be very glad to learn of the result obtained in actual practice.

Touring Adirondacks and White Mountains

Editor The Automobile:—I would like to have you plan an automobile trip for me, taking in Lake George from New York City, Saratoga Springs, Lake Champlain via Burlington, Vt., to Bretton Woods, N. H., White Mountains, taking in the Adirondacks.

Baltimore, Md. J. H. W.

—You can cover the country briefly outlined in a very interesting tour which will combine mountain scenery with some very pretty stretches of undulating country. Leaving New York and following closely along the course of the Hudson River, you pass straight up Broadway to Ossining, 29 miles from Columbus Circle, New York City. Here you come to the end of the road and you turn to the right on Highland Avenue, swinging



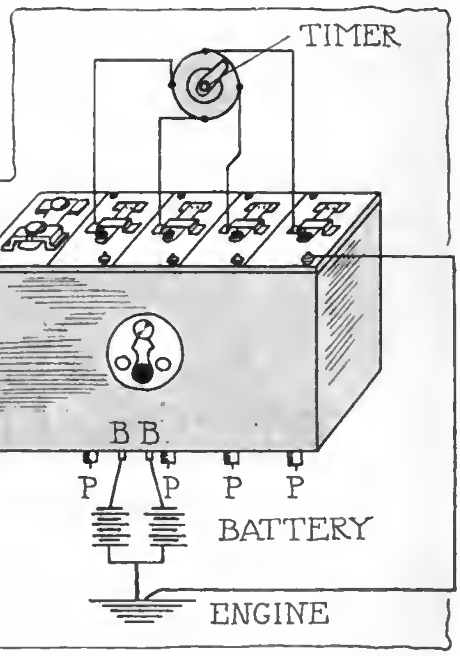


Fig. 1—Wiring diagram with two sets of batteries and Splitdorf coil arranged with two-point switch

ıd finally following the
5 miles from Columbus
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› Lake George over the
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by way of Schenectady
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A Corliss valve type
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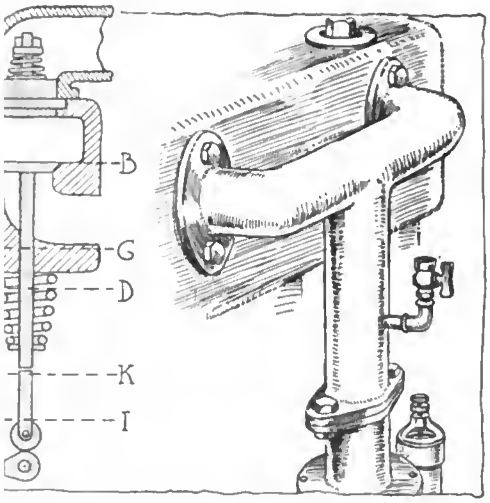
produce no power, but

rather consume power. Consequently this one power stroke must not only be equal to the work to be done, running friction, etc., but also give the flywheel mass sufficient momentum to carry on the work during the other three strokes and the compression—something the steam egine does not have to contend with. Consequently, it is not throttled down so closely and has higher compression, in a four-cylinder more power, less power per stroke, closer throttling, greater loss than in a single cylinder, a six being a continuous power, increased throttling with greater loss than a four.

For greater elucidation of this loss, take the sketch, Fig. 2, which is an illustration of an ordinary L-head engine, also a modification of it. Take it first as an ordinary type. Say the piston stroke is from the line A B to the line C D, say 4 inches, and for easy consideration say this space is equal to 2 pints. The compression space above the line A B is equal to one-third of the 2 pints, or 2-3 pint would give 50 pounds compression pressure. Now, on the exhaust stroke the piston can shove the foul gases from the line C D up to the line A B, but above this line the expelling power of the piston ceases. Consequently, the next charge drawn in, if a full one, is handicapped with one-third its volume of foul gases to retard its ignition and combustion. If not a full charge, it is greater than one-third fouling. Also back pressure by the muffler has the same effect. When the fresh charge is drawn in these remnant foul gases are driven down on top of the piston, and at the end of the suction stroke theoretically occupy the space between the lines F A and C D, or one-quarter the space of the cylinder volume.

In W. C. Marshall's description of the O'Kill pressure indicator in The Automobile for May 29, he describes an engine of similar proportions having a compression pressure of 50 pounds per square inch, giving an explosive force of 212 pounds per square inch, yet which, when throttled down, gave only 7 pounds compression and 10 pounds explosive force. An indicator card taken from an air compressor that used water to fill the clearnace spaces shows that a charge must be compressed to about 72 per cent. of its volume to make 7 pounds compression. Two-thirds pint at 7 pounds compression would require a little over one-fourth pint addition to give it volume at atmospheric pressure. The difference or loss is, roughly speaking, with throttling, one-seventh of the compression and one-twentieth of the explosive force, but using one-eighth if the amount of explosive mixture, the mixture being handicapped with nearly three times its volume of foul gases to retard the sparking and explosion.

The slower-burning mixture giving such a reduced explosive force is what puzzles the steam user and prompts the query. Now, as a remedy for this loss, compare the second type of the sketch, which is a representation of Patent No. 1,062,494, using the same length of suction stroke, compression, etc. But instead of the piston ending its stroke at the line C D it continues on down to the line H I, twice the length of the former power stroke or with twice the crank leverage for the application of the explosive force, and also twice the expansion utilizing the heat that was formerly thrown out in the muffler. This extra expansion dispenses with the necessity of a muffler. This is one phase of the reclaiming of the loss. As the piston reaches the line H I, the slide valve begins to open. As the piston starts on its exhaust stroke it shoves the burnt gases through the now wide-open slide valve port until it almost reaches the line C D. The exhaust valve E then begins to open and the exhaust is continued through it to the end of the stroke (meanwhile the slide valve running at crank shaft speed, but 90 degrees



L-head motor—Petcock on manifold

late, has closed its port), the valve E remaining open, the piston on beginning its suction stroke draws in air through it until the piston has reached the line C D, the valve E closing. The mixture is drawn in through the inlet valve until the piston has reached the limit of its stroke, the line H I. Here the remnant foul gases occupy the same position in relation to the piston between the lines H I and J K, the slide valve again opening the piston on its return or compression stroke. Now it will be noted that the foul gases occupy the space between H I and J K, air between J K and F G, and above F G the fresh mixture, two valves at the top being closed. The piston shoves on the foul gases, these on the air, and the air on the mixture. The air, being at the slide valve, port is forced out through it as the piston comes up, the foul gases being the last forced out, thus obtaining complete scavenging. Also observe that the action forces a compact filling of the upper or explosive end of cylinder, peculiarly fitting it for a high-speed engine, fresh air occupying the space (which in the first type was filled with foul gases) on top of the piston, increasing the explosive force by greater oxidation. In a recent issue of THE AUTOMOBILE was reported a discussion by the S. A. E. in which Howard Coffin was credited with saying that "A quantity of air on top of the piston would create an explosive force the present type of engine would be unable to withstand." Here we have a simple and practical embodiment of this noted engineer's idea, but further economy by further expansion. The mixture intake stroke being 2 pints, would not go below the line F G, no loss through slide valve port, for a lighted torch held there gives no flame. Having no throttle, a light power stroke is obtained by pushing the angular end of the push rod into contact with the nose of the cam, holding the valve E open longer, taking in more air, less mixture. Now if 2 pints containing a certain number of heat units compressed to 50 pounds compression gave an explosive force of 212 pounds, why one-eighth of 2 pints of mixture having one-eighth the heat units ought to give one-eighth the explosive force under the same compression, or over 26 pounds per square inch. But the increased oxidation, as Mr. Coffin states, would give more over 30 pounds. A single cylinder engine of this type but with a leaky piston running between 300 and 400 r.p.m. drove a lathe doing work for 7 hours, using 3 pints of gasoline and 1 pint of kerosene in an engine 3 by 8 inches, no attempt being made as to economy, no regulator or governor, but the time set of the valve E and the set of the carbureter needle valve. This engine, with a flywheel of less than 100 pounds, ran at 80 r.p.m. and drove an idle lathe, and with this low compression has burnt high and low test gasoline, benzine, alcohol, kerosene, turpentine and crude oil, one after the other, with no alteration but a slight change in the set of the carbureter, needle valve, turpentine and kerosene giving highest engine speed with a certain set of the carbureter needle valve, benzine and crude oil next, etc. In over 2 years' running there was no carbon deposit. With perfect scavenging I think this upholds my contention that the loss by heat radiation is far-fetched.

Scavenging vs. Compression

An automobile equipped wtih a six-cylinder engine of this type of engine would then run as economically as a single-cylinder, but with the smoothness of constant torque, and could crawl through the congested city streets at a snail's pace on high gear or suddenly "hit her up" with anything that "came down the pike." This type of engine with added appliances of small construction cost would enable each piston on its every upstroke to be an air compressor with a variable air release at end of stroke requiring no extra valves, a four having four compression strokes and a six having six at every revolution of the crankshaft, making a braking force that would allow a car to float down a gentle decline or come to a stop on the steepest hill without recourse to brakes.

It will be seen that this type of engine possesses superior advantages, its perfect scavenging admits of lower compression, the present type with its retention of foul gases and also throttling requiring high c

The motor and mot
the planet Neptune wa
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book and his pleasur
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Brandenville, Pa.

Speed Va

Editor THE AUTOM
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above?

Brooklyn, N. Y.

—With every other
driven sprocket remai
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to be 15 miles an h
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the car would be 19 m

Rout

Editor THE AUTOM
Targa-Florio race? D
McKeesport, Pa.

—The accompanyin
in reality establishes a belt around the island of Sicily. While not exactly following the sea, the route often takes the tourist within sight of it and also through the larger towns.

Fig. 3–

ation Means Long Tire Life

the Impression Generally Prevalent, There ion for Decreasing the Pressure in Summer

ation. Most tires are
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Akron, O., herewith
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14.7)
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temperatures, respec-
nal pressures, respec-

suppose that a 34 by
er square inch, is run
ns on a day when the
ees Fahrenheit. The

temperature will increase in a test of this kind about 35 degrees, this being determined by experiment.

"Applying the above formula T' equals 67 degrees, P equals 72 pounds per square inch and T equals 32 degrees. Therefore, the final pressure or P' equals

$$\frac{(67 \text{ plus } 460) \times (72 \text{ plus } 14.7)}{32 \text{ plus } 460} = 14.7 = 78.1$$ pounds per square inch.

"You will note that the increase in pressure in the tire due to the heating of the tire in this specific case is 6.1 pounds per square inch.

"Again, suppose that a 34 by 4 tire is run as above, but on a day when the thermometer is at the mean temperature, or 62 degrees Fahrenheit; then the increase in temperature of the tire would be slightly less than 35 degrees, possibly 34 degrees, this being due to the greater radiation of heat by the tire at the higher atmospheric temperature.

"Applying the above formula again, the final pressure in this case would be 77.6 pounds per square inch, an increase of 5.6 pounds, due to the heating of the air. Similarly, the pressure in the tire run as above on a day when the thermometer stands at 90 degrees Fahrenheit, would increase from 72 pounds per square inch to 77.2 pounds per square inch, an increase of 5.2 per square inch.

"This information can be more readily grasped at a glance from the following table:

Atmospheric Temp. or Initial Temp. of tire	Pressure in the tire before run	Increase in Temp. due to run	Increase in pressure due to run	Final pressure
32 degrees	72 sq. in.	35 degrees	6.1 sq. in.	78.1 sq. in.
62 degrees	72 sq. in.	34 degrees	5:6 sq. in.	77.6 sq. in.
90 degrees	72 sq. in.	33 degrees	5.2 sq. in.	77.2 sq. in.

"As a matter of fact, the increases in pressure would be very slightly less than those noted above. due to a slightly greater

'ront and Rear Tires of Various Sizes by Several of the Leading Tire Makers

J.

Front	Rear
65	75
75	90
80	100

ron, O.

80	90
90	95
90	95

. J.

70	80
70	85

Mass.

75	85
80	90
85	95

I. Y.

90	90
100	100
110	110

ken, Pa.

80	80
90	90
100	100

Mohawk Rubber Co., Akron, O.

Size	Front	Rear	Size	Front	Rear
3	60	60	4.5	90	90
3.5	70	70	5	100	100
4	80	80	5.5	110	110

Ajax-Grieb Rubber Co., Trenton, N. J.

3	60	60	4.5	90	90
3.5	70	70	5	100	100
4	80	80	5.5	110	110

Diamond Rubber Co., Akron, O.

3	54	54	5	90	90
3.5	63	63	5.5	99	99
4	72	72	6	108	108
4.5	81	81			

Racine Rubber Co., Racine, Wis.

2.5	50	50	4	80	80
2.75	55	55	4.5	90	90
3	60	60	5	100	100
3.5	70	70	5.5	110	110

Federal Rubber Mfg. Co., Milwaukee, Wis.

2.5	50	55	4.5	75	80
3	60	65	5	80	85
3.5	65	70	5.5	85	90
4	70	75			

Goodyear Tire & Rubber Co., Akron, O.

2.5	50	50	4.5	90	90
3	60	60	5	100	100
3.5	70	70	5.5	110	110
4	80	80	6	120	120

Overloading Ruins Solid

Average Truck Driver Ignores Fact That M
and Speed Are the Prime Essentials of Ti

THE average truck driver does not know of the dangers due to overloading and over-speeding. A solid rubber tire seems to all intents and purposes proof against injury, which fact is one of the greatest dangers. Does he know of the wear and tear on these tires caused by overloading, hard, quick braking, over-speeding, skidding, bad roads and neglected cuts? The question of attention and repairs they should receive during use is another important point to consider.

Speed is the most important of all the deteriorating influences to which tires are subjected. It has been determined that an average of 12 miles an hour, the life of a solid tire, approximates 10,000 miles, while at an average speed of 20 miles an hour it would be a candidate for the scrap heap at the end of about 4,000 miles.

The B. F. Goodrich Company, Akron, Ohio, says that the dangerous effect of overloading cannot be ovverestimated. Tires are constructed to carry certain loads which, if exceeded, will result in premature failure of the tire unit. Rubber compressed beyond its safe limit of elasticity will break down just as any other material will do.

The Goodyear Tire & Rubber Company, Akron, Ohio, says that skidding, starting and stopping, tractive effort, are in the nature of natural causes of wear. In truth, are causes of ordinary abrasion under practically normal conditions. Habitually running in car tracks has its invariable ill result in a similar manner. For the edge of the tire, the small portion which runs on the rail is carrying the load intended for the whole tire. A further shearing effect is produced, too, that is most injurious to the tire's fastening.

An improvement has been made upon the Motz cushion tire. This tire is constructed with undercut sides which form slant-

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have been constructed v
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The solid tire is esse
States Tire Company,
than from 15 to 18 mi
bound to suffer. In the
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Either the rubber trea
ber base or the whole
foundation, rendering i

Solid tires are design
weight and when the
it is a case of overloadi
the tire completely. I
from the steel base. T
and dual tires are rec
companies:

B. F.

Wheel	Single
3	590
3.5	1,375
4	1,750

United Sta

2.5	650
3	950
3.5	1,375
4	1,750

expansion of the tire itself caused by the greater pressures.

"The point of this whole discussion is that the increase in pressure, due to the heating of the tire, is not nearly so great as is commonly supposed, but for a given run is less on a hot day than on a cold day.

"Of course, this heating of a tire is injurious to it, but whenever the pressure in a tire is decreased, the heating of the tire is increased, rather than decreased, on account of the greater bending of the tire and consequent greater friction and generation of heat.

"From the above it should be clear that the pressure in a tire should not be decreased on a hot day as is commonly supposed, for the simple reason that it is impossible to obtain an increase in the pressure, due to the heating of the tire in service, sufficiently to in any way injure it."

The Racine Rubber Co., Racine, Wis., says that "at least 75 per cent. of the tires in use are ruined directly or indirectly through lack of proper inflation. A tire is built to the exact shape it should assume when put into service, and inflated to the proper pressure, but when this pressure is not observed the tire is constantly running under an unnatural strain, which, in a short time, causes the fabric to crack, due to the excessive flexing caused by under-inflation.

"A great many car owners do not observe proper tire pressures until after they have weakened the inner walls of the tire

through under-inflation,
flated it gives out, due
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Inflation above that f
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Those who wish to
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in proportion to the value of the suggestion. These prizes are a standing offer, and little boxes are fastened to the walls in various parts of the factory in which to drop notes and sketches dealing with the suggestions. The boxes are visited regularly and the ideas offered are given careful consideration. Besides, the employees thus have a means of communicating any alleged wrongs direct to the heads. The scheme has worked very well, and has been the means of effecting several valuable improvements in machinery, and in the plants as a whole. For a certain attachment to one of the machines which eliminated one hand operation, one man not long ago was presented with $100 and a promotion.

The Goodyear Company maintains a fully-equipped emergency hospital off in a quiet wing of one of the buildings. This is in charge of an able physician and surgeon paid by the company, who does nothing but its work. In addition, trained nurses are employed day and night. THE AUTOMOBILE representative was given an opportunity to inspect this feature of the plant, which is a model of its kind. Kept in immaculate condition, this hospital has the most modern of surgical equipment. It includes an operating room where the most difficult of emergency operations may be performed.

In addition, there is a sick ward containing half a dozen beds where injured men may be quartered for any necessary length of time under the best of care. There is also a similarly-conducted women's ward. Although accidents are carefully guarded against, nevertheless, they will sometimes occur, and this one feature of the welfare work has many times helped sick or injured men to quick recovery who at their homes would not get proper care. The company assumes no responsibility for the consequences of injuries not immediately reported at the hospital.

Directions Well Posted

Everywhere throughout the factory buildings, signs and arrows are posted directing to the hospital by the shortest route, so that in case of an accident, no time will be lost in reaching the doctor and his assistants. These signs are simply small metal affairs with the arrow and the words "to hospital" on them. They remind one of the signs along the highway directing to the different towns. Each corridor, hallway and turn is thus placarded every few feet.

The restaurant or lunch room is also an important feature. It is located on the top floor at the end of one of the main buildings, and serves four meals each day. Breakfast is provided from 5.30 to 7 a. m., noon lunch from 11.30 to 12.30, supper from 5 to 6 p. m., and midnight lunch for the night force from 11.30 to 12 p. m. The lunch room is not operated for profit, but aims to work on a cost basis, so that a workman can get a very good meal for an exceedingly small outlay.

It is, of course, next to impossible to fix up the prices so that

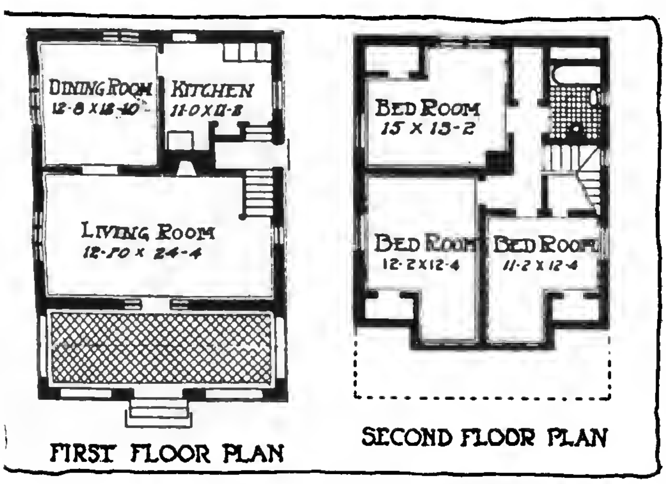
Type of cottage which the Goodyear company is building to furnish its workmen and their families 'estaurant will run exactly even, so that whenever the finan-report issued every four months, shows a profit or a deficit, prices are reduced or increased slightly to overcome the :rence. For the four months ending March 1, a deficit of 39.39 was shown, and the price was therefore slightly raised :over the loss. For the previous quarter year a profit had ı shown which had resulted in perhaps too great a reduction. ast April another idea which had been contemplated for e time by the Goodyear Company was matured. "Hotel ›dyear" was opened to accommodate new employees of the ıpany, affording them temporary quarters until they could find :manent residences in the city. A building adjoining the plant ; purchased and the upper floor fitted up for living purposes. 'artitions were erected dividing the space off into four large ms and some smaller ones. Three of these rooms are used sleeping rooms, while the fourth is set aside for a reading m, where magazines and newspapers are furnished. Here the n may spend their spare time if they wish. Two of the eping rooms will hold fourteen men each while the third has ›m for twelve, so that the "hotel" offers accommodations for ·ty men. There are shower baths, and each man is provided :h a locker. Beds, bed clothing and the like are furnished by : company. The sleeping rooms are kept quiet at all times, r the accommodation of both night and day men.

As the hotel is intended primarily to afford a cheap and com-rtable living place for newcomers, they are expected to find a rmanent location in the city as soon as possible so as to make om for later arrivals. To aid them, the employment office eps a record of all rooming houses, so that it should not take man over a week to become located. With this end in view, nominal sliding scale of prices for lodging at the hotel has :en fixed. Thus, 15 cents a day is charged for the first two eeks, 20 cents for the next week and 25 cents thereafter.

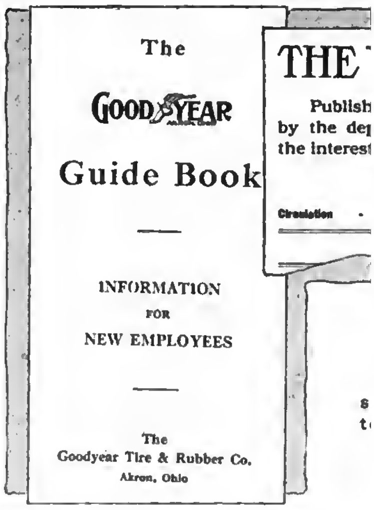
The hotel so far has proven an immense success, and the men ıve eagerly taken to the idea. The accommodations afforded :e really better and cheaper than they could find elsewhere, and is sometimes a hard matter to get the men to move after ıey have been there for some time, in order to make room for thers.

Another plan for the benefit of the Goodyear employees must ot be overlooked here. This is a scheme for allowing the ›orkers to purchase attractive homes from the company. A ırge tract of land across the street from the factory and in a eautiful hilly section with a commanding view of the town has ›een purchased by the Goodyear interests and is now being di-·ided off into streets. Water mains and sewers are being put n. In fact, all the streets in the section where the first hundred ıouses are to be built have been graded and are ready for build-ng operations.

The company is to divide this property off into lots, and on :ach an attractive house is to be built. Each will be individual



Plans of first and second floors of the cottages being erected for workers in the Goodyear plants


The

GOODYEAR

Guide Book

INFORMATION
FOR
NEW EMPLOYEES

The
Goodyear Tire & Rubber Co.
Akron, Ohio

THE

Publish
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the interes

Circulation

and unlike the rest. Mann & M York, have been engaged to draw small house plans which will be fo ment. The company is to sell thes employees at cost and on very lo a few hundred dollars will have man can own his own home in fro

Free Factory Library

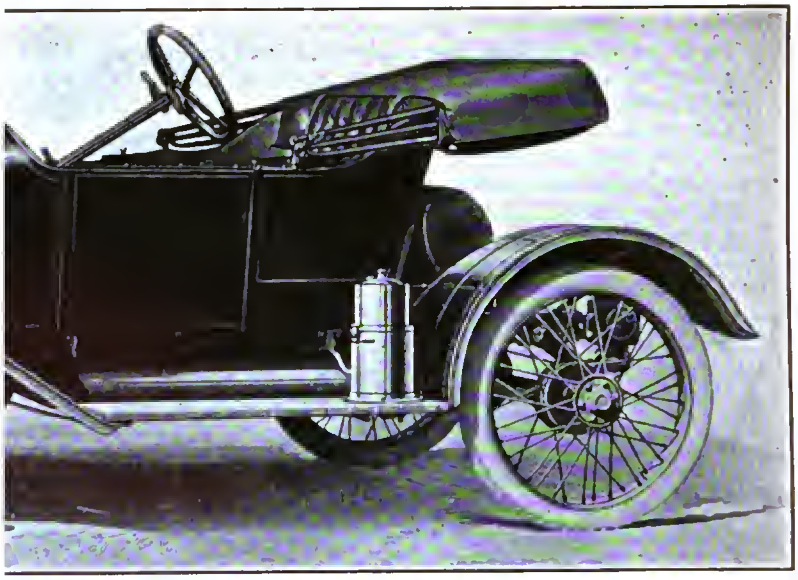
The Goodyear Company encoura ties which will benefit the employee ball team, swimming team and so and are body builders which are only desirable but necessary.

There is a strongly organized rel which pays a sick and accident bene case of death of a member pays $1 bers. The initiation fee is $1 while t inal sum of 25 cents. At the present 1,000 members, so that, for $3 a yea accident, and carries about $1,000 w ing once joined this association, an keep up his membership even tho with the company, provided he do County.

Then too, there is the factory Clan," which is published on the fi month by the Department of Effici terest of every Goodyear employee brim full of news of the doings of t year products. It tells of the pro interesting accounts of doings amo chronicles the results of the games and, in short, acts as a medium fo factory heads and the men. Whene tells the reasons attached thereto. the doings of the Goodyear family, lation of 7,000 copies.

On the same floor with the lun library where the men are free to sentative array of technical works nals and the like. There are reading ments of a well-equipped library. I to write in their spare hours, if th paper office is located in this librar

Another feature of note is the Go which is given to each man when company. It gives information as t plant, directions for reporting time. tures so that the newcomer will th with the plant and feel at home.



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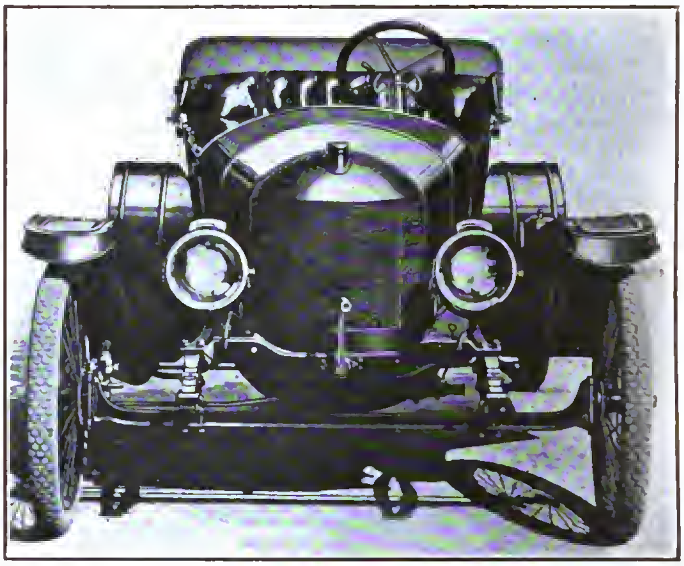


Front view of the new Grant car, showing radiator

thus making for simple production. The horsepower is given at 16 on the block at a speed of 1,600 revolutions per minute. The crankshaft is carried on two main bearings, the rear bearing being carried in an end plate which covers a hole through which the crankshaft may be removed. Although the crankcase is all one piece, it is easy to inspect the connecting-rod bearings through a long plate bolted to the bottom of the crankcase.

The manifold construction is also a simplification of general motor practice. Referring to the view of the engine herewith, it will be seen that all manifolds are cast integral with the cylinder casting. The inlet manifold connection is below the flanged exhaust duct on the right side. Still lower is a cover plate, the removal of which gives access to the valve mechanism. The location of the inlet manifold below the exhaust makes it possible for the gas to be heated by the exhaust before it enters the cylinders. The valves of the regular poppet type, have a diameter of 1 5-16 inch and their lift is 5-16 inch.

On the right side are also the Mayer carbureter and the Bosch magneto, the former being at the back while the magneto sits forward, so that there is no congested condition of these two necessaries. Timing gears are located forward and enclosed in the usual way. As an aid to silence they are helically cut instead of being of the straight spur type. From the magneto shaft, the fan is driven through pulleys and belt. Adjustment of the belt

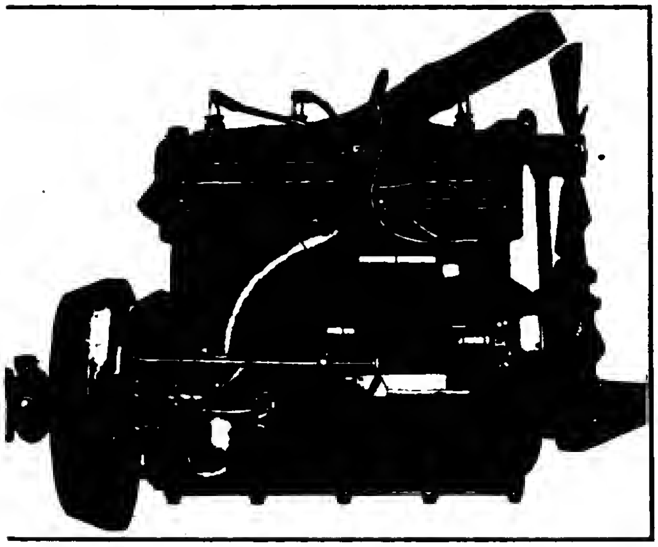
›n is accomplished through a take-up bracket and integral the top plate.

special note in connection with this specially designed small ›r is the plate at the top which forms the cylinder heads. is removable by the taking out of fourteen bolts and it es the spark plugs, priming cocks and water outlet con- on.

oling is by thermo-syphon which lessens weight by eliminat- water pump. The radiator is of the rounded type as seen in chassis view. It is of tubular construction, and the rounded :t is in keeping with the general stream line appearance of whole.

ıbrication is by the splash system, the oil being carried in a art reservoir, in addition to which there is a vacuum oiler nted on the left side of the motor and having a capacity of ıarts which makes up for any deficiency in the splash when motor is running.

ack of the motor the power is transferred through a cone ch to a propeller shaft fitted with a ball joint at its forward and enclosed in a torsion tube. The change-gear which affords two speeds forward and a reverse is in unit



The Grant car uses a four-cylinder block motor

with the rear axle. The latter is three ries two sets of brakes. These are t external expanding variety and the di 7 1-2 inches, while their width is 1 run from the forward end of the tors of the axle as a further bracing feature to 1 on high.

As to the spring suspension, there is spring in the rear which supports the its center. The front springs are elli while the rear are 47 1-2 inches long.

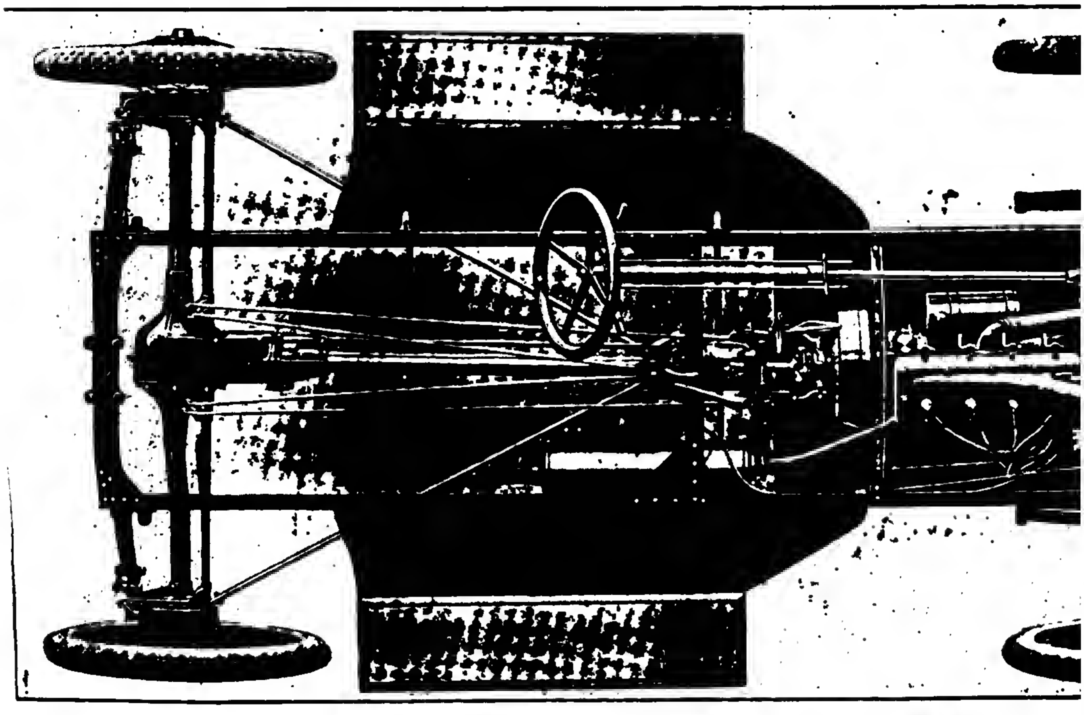
The drive is on the left side, while the center. There is ample room in t persons. The weight is about 1,000 p dition, and the maximum speed possib hour according to the makers. The under the cowl and has a capacity of

As would be expected, very high mil fuel. On the average, from 30 to 35 m gallon. The car has made several te nomical showing in this respect. In 8 3-4 hours duration, the mileage per other test was made from Detroit to I —a distance of 58 miles over fairly goo this time the car requiring 1 1-2 gallons

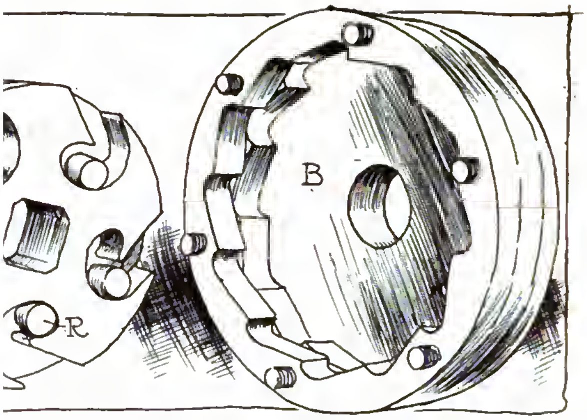
The price has been set at $495 with f

Keep Garage Entran

One case of nuisance which often re of time on the part of automobilists i entrances by other cars. As most plac with but one entrance, such a state of waste of time for all who want to pa large cities, where many cars pass thr rapid sequence, it would pay for most doorman watching for this and let him entrance clear out of the way. It is one feelings to sit behind a motor and to h because someone is in the way, especia necessary. Undoubtedly, there are qu such a city as New York, where peop and taken up another on account of d



Plan view of the chassis, showing motor mounting and arrangement of drive



-Showing two rows of teeth for ratchet and pawl

:est on the Market

it to Push Invention
f the New Concern

ie forward drive roller, the engagement of which we-
ady seen. Thus the connection for turning the ratchet
:erse direction is made. As there are two sets of these
one on either end of a jackshaft or axle, both act
ously when the direction of rotation is changed.
tion of the clutches is thus clear for straight motion
hicle forward or back. In making a turn, the outside
scribing the greater circle, moves faster than the other
: propels the clutch ratchet to which it is interconnected
espondingly faster speed. Since the inner member or
cannot revolve faster than the slower moving ratchet
'ot wheel, its ratchet (that of the outer wheel) revolves
n this outer wheel driving member and the roller which
the connection is scooped up, freeing the two members.
culiar construction of the runways and sockets causes
s to be hold out of, or let into, engagement at the proper
, so that there is no possibility of any roller, which
on reverse drive, reaching the ratchet so as to interrupt
sed speed in making a turn on forward drive or vice
1 the type shown here, which has five runways and
adaptable for cars up to 3-ton capacity, one end of the
is squared 36 degrees ahead of the other, so that the
and reverse runways in one pawl-cam become opera-
mediate, relative to the corresponding runways in the
hus, in starting forward or backward, a roller in one
the other is always ready for immediate engagement.
logical advantages over differential gearing are claimed
evice. Since there is no possibility of one wheel alone
while in a rut or on soft ground, the elimination of
e slippage is a factor in tire economy. No lubricant is
within the clutch mechanism, as any grease or oil
nd to cause sticking of the rollers, preventing their
tion in the runways. There is no wear between the
arts as there is no sliding or rolling contact. Stalling
otor, skidding when brakes are suddenly applied, and
ng are also reduced to the minimum necessarily. It is
ned that an axle embodying the releasing clutch costs
nanufacture than does a rear unit equipped with the
nal form of differential.
ew type of differential has passed the experimental
are told by the makers, and is even now being used
car manufacturers as standard equipment, while half a
her prominent makers are experimenting with it on
cars.

Cycle-'

FOR several y
waukee, Wi
experimentin
the result of
three-wheeled deliv
The truck is design
driver, and has an
tread is standard, 56
standard body is 2 1
2 feet 4 inches high,
handles easily in co
conditions. It is equ
gear, which gives a r
10 to 1 on low speed
With a maximum
or snow and on hea
inches deep it was po
than 25 miles an hour
of last spring and of
every day.
The value of this
states it is against th
running when he leav
to crank his automobil
the number of delive
tion. As a result, in r
two men where many
Power transmission
always in mesh thoug
gear is being used. T
front of the saddle an
illustration.
The braking is done
vantage incorporated ir
brake pedal easily conv
The brake can be lo
ience when the motorcy
is 7 inches in diameter

Three-wheeled tr

ycle-Truck the Newest in the Commerc

Harley-Davidson Company Announces Two-Speed Vehic with a Nominally-Rated Carrying Capacity of 600 Poun

ЭR several years the Harley-Davidson Motor Co., Milwaukee, Wis., manufacturer of motorcycles, has been experimenting with various types of light delivery vehicles, the result of this work being the introduction of a light wheeled delivery truck driven by a two-cylinder motor. ruck is designed to carry 600 pounds in addition to the , and has an overload capacity of again as much. The is standard, 56 inches, and the wheelbase is 76 inches. The ird body is 2 feet 10 inches wide, 3 feet 6 inches long and 4 inches high, with the doors opening in front. This truck es easily in congested traffic and under all kinds of road ions. It is equipped with the Harley-Davidson two-speed which gives a ratio of 5 to 1 on high speeds and a ratio of 1 on low speeds.

h a maximum load the truck can be started easily in mud ow and on heavy grades. In light fluffy snow less than 6 deep it was possible to attain speeds of considerably better 5 miles an hour with a maximum load. The slush and mud t spring and of a year ago did not interfere with its use day.

value of this feature cannot be overstated: In many it is against the law for a chauffeur to leave his motor ig when he leaves the car. To expect the driver of a truck ık his automobile 150 or more times a day—depending upon imber of deliveries made—is, of course, out of the ques- As a result, in motor truck delivery it is necessary to have en where many stops are made.

er transmission is through a Harley clutch, the gears being in mesh though they are not running except when low being used. The gear-shifting mechanism is directly in of the saddle and above the clutch lever, as shown in the ition.

braking is done with either pedal. In addition to the ad- e incorporated in this feature, the driver has an additional edal easily convenient to his right foot.

brake can be locked in any position, a necessary conven- hen the motorcycle truck is stopped on a hill. The brake hes in diameter with a face .875 inch wide. Well-designed mudguards protect the driver so this tr spective of weather conditions.

The chassis is constructed of pressed st under the body and side stays to the fram so that the strains of the load are evenly sis follows generally the practices of auto struction. The steering knuckles have b and bottom.

The truck is equipped with 28-inch whe forty heavy spokes and large hubs especi structed for this work.

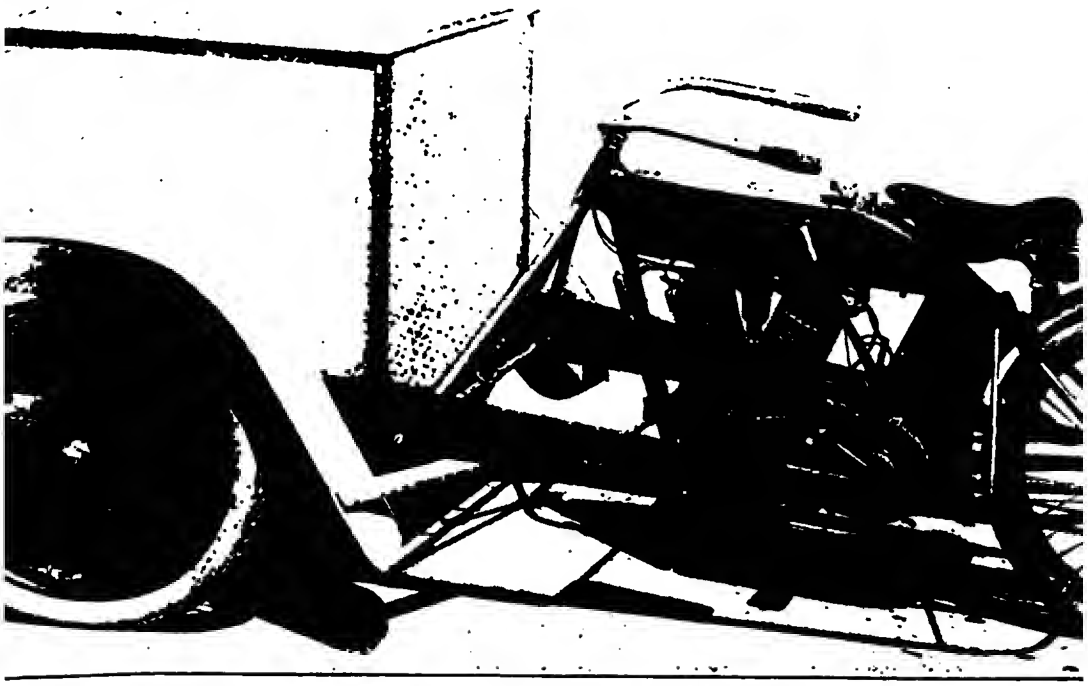
Three-inch tires are used on all three wl gravity is obtained with the underslung cient clearance is provided for even the in Wisconsin in January and February. T the car is carried on semi-elliptic spri Hardened steel bushings and pins are use

In a test by D. C. Owen, postmaster of of 14.2 miles, 4.5 hours were required as time when deliveries were made with a hor the motorcycle truck made fifty-three sto regular parcel post man was carried on although in actual service, of course, this a not have to be carried.

The motorcycle trucks now in service h when used for long runs, they make fro gallon of gasoline. The gasoline consump tion given for the benefit of the postoffice was a trifle less than half a gallon. Fig with an oil consumption of 250 miles per g seen that the operating cost of a motorc cents a day for a 10-hour day, covering 75

The makers state that with a motorcycle the work of two men with two horses a

At the request of the government, on trucks has been sent to Washington for i department. This particular truck has a ance with the suggestions of postal officials



Three-wheeled two-speed cycle-truck brought out by the Harley-Davidson Company for light deliver

al Treads Prevent Cut Shoes

the tire field for protecting tires have
ılts to the motorist who has found it
ıem in his long trips over poor roads.
serve him in rainy weather when there
Nearly all of the tire manufacturing
ctors to fit all needs. The following
r idea of a few of the protectors being

s, Oakland, Cal.—This company
protectors. The Type C is designed
no-rim-cut, and plain side, or Fisk
of this tread is hand-built of the com-
re-fabric securely vulcanized together.
r enough to come into the clinch along
of Pacific leather is superimposed and
ıable leather is placed on the inside of
s are then clinched together with "dia-
a 2-ton pressure, three rows of the
nd six rows of slow-wearing studs on
ıre traction. Punctures are impossible,
ıt. This device is guaranteed for 5,000

rookings, S. D.—The Brictson de-
made to meet the needs of heavy cars
the city or country. This type com-
ire and is applied to the rim in exactly
gular tire or shoe. The tread has air
retaining the buoyancy of the rubber
e also obviates the possibility of the
ıg out the tire. The tire is made as
layer of specially tanned, extra-pliable
tread part, outside of this leather, is
eather, which entirely covers the tread
the road. Next to these two thick-
e layers, to prevent the tread from
five layers is another layer of chrome
ter layer of chrome leather and then
tire fabric, the large beveled head steel
driven. These studs and rivets are
of leather which immediately follows
ıd then there is yet another layer of
ers the clinched ends of the studs and
rom coming in contact with the rubber
ıther, which extends between the tire
ere they are placed between the rubber
it easy to tuck the leather into its

or Co., Akron, O.—Standard Tire
treads which fit over any pneumatic
from the same material as goes into pneumatic tire treads. They are made of several layers of S
Island cotton fabric, and a compound of pure Para rubber. Th
protectors are made with either a plain or non-skid tread.

The Colorado Tire & Leather Co., Denver, Col.—The pr
tector produced by this company is of the straight-side a
clincher type, made to fit all sizes and styles of pneumatic tir
It is built of water-proof, non-hardening, non-cracking, special
tanned leather. The successive layers of non-cracking leath
are held securely together by a series of rivets, having large st
heads for contact with the road, which are riveted upon the i
side and separated from the tire by the body portion of t
protector; the number of rows of rivets are regulated by t
size of the tire, ranging from three to six rows, dependi
upon the diameter and width.

Triple Tread Mfg. Co., Chicago, Ill.—This company ma
ufactures a protector which is used for tires which have su
fered blow-outs or rim cuts. This protector when vulcaniz
to these blown-out tires renders them absolutely puncture pro
and non-skidding. The old casing is used as a foundation up
which to build, covering it entirely with tough, wear-resistir
water-proof French chrome leather. A guarantee of 3,500 mil
is given

Leather Tire Goods Co., Niagara Falls, N. Y.—This cor
pany makes the Woodworth tread, which is a steel-studd
leather covering, for use over automobile tires to protect the
from punctures, cuts, wear, or other outside injuries. The
protectors are made of two plies of chrome cow-hide leath
having between them on the middle part of the tread a reinforc
ment of tire fabric, which, being practically inelastic, preven
the treads stretching in circumference. The steel studs a
clinched entirely through this material so that they are he
very firmly in place and prevent any danger of the plies of mat
rial separating. The outer ply of leather in these treads
treated by a secret process which fills the pores with rubber-li
gums that prevent moisture and dirt from getting into the fibr
and so keep the leather soft and tough.

Among the other companies manufacturing tire protectors
various kinds are:

Buffalo Rubber Mfg. Co., Sussex Ave. & Erie R. I
Buffalo, N. Y.
Davis Rober & Armor Co., Chicago, Ill.
Economy Tread Co., New York City.
Republic Rubber Tire & Shoe Co., New York City.
Maplebay Mfg. Co., Crookston, Minn.
Chas. E. Miller, Anderson, Ind.
Queen Leather Works, Oakland, Cal.
Sampson Tire Protector Mfg. Co., Grand Island, Neb.
Slama Tire Protector Co., Kansas City, Mo.
Twentieth Century Tire Protector Co., Midlothian, Te
Universal Tire Protector Co., Angola, Ind.

ory of Automobile and Motor Truck Tire Manufacturers

res

ı, N. J.
ı. N. J.
N. Y.
ew York City.
N. Y.
City.
Bloomfield, N. J.
New York City.

J.
City. (Importers)
lls, O.
ıukee, Wis.
Akron, O.
ls, Mass.
ıffalo, N. Y.
City. (Importers)

ıkron, O.
nshohocken, Pa.
Belleville, N. J.

Mass.
Fire Co., Jonesboro,

York City.
ton, O.
hocken, Pa.
st Palestine, O.
assaic, N. J.
Mansfield, O.
yahoga Falls, O.
J.
J.

Mohawk Rubber Co., Akron, O.
National Co., Chicago, Ill.
New Jersey Car Spring & Rubber Co., Jersey City, N. J.
Patterson Tire & Rubber Co., Lowell, Mass.
Pennsylvania Rubber Co., Jeannette, Pa.
Pharis Tire & Rubber Co., Columbus, O.
Portage Rubber Co., Akron, O.
Prince Tire Co., New York City.
Quaker Rubber Co., Philadelphia, Pa.
Racine Rubber Co., Racine, Wis.
Republic Rubber Co., Youngstown, O.
Russian Tyre Sales Co., New York City. (Importers)
Rutherford Rubber Co., Rutherford, N. J.
St. Louis Tire & Rubber Co., St. Louis, Mo.
Seamless Rubber Co., New York City.
Swinehart Tire & Rubber Co., Akron, O.
Thermoid Rubber Co., Trenton, N. J.
Tyer Rubber Co., Andover, Mass.
United States Tire Co., New York City.
Walpole Tire & Rubber Co., Walpole, Mass.
Zee Zee Tire & Rubber Co., Philadelphia, Pa.

Solid Tires

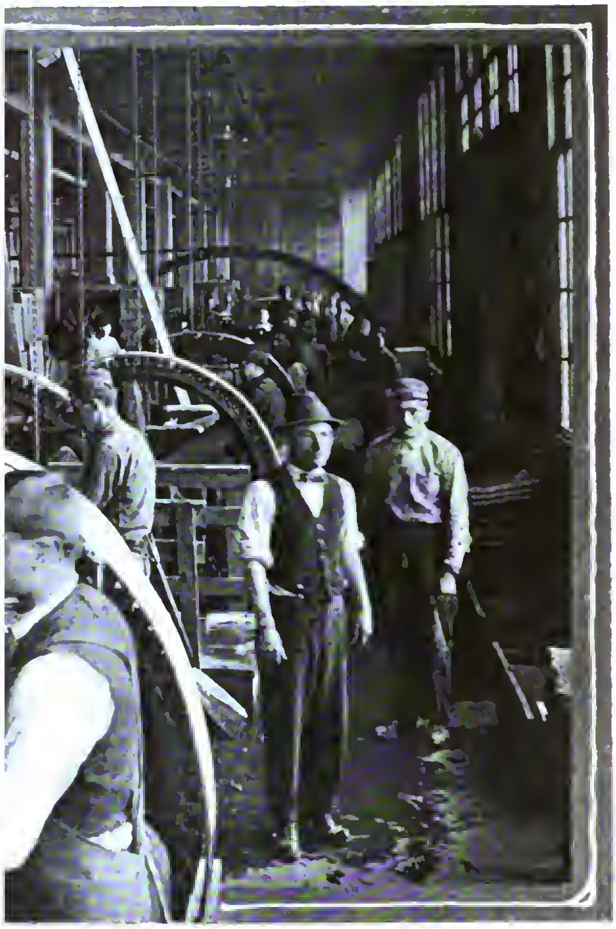
American Marine Equipment Co., Boston, Mass.
Diamond Rubber Co., Akron, O.
Firestone Tire & Rubber Co., Akron, O.
Gaulois Tire Corp., New York City. (Importers)
Gibney Rubber Co., J. L., Philadelphia, Pa.
Goodrich Co., B. F., Akron, O.
Goodyear Tire & Rubber Co., Akron, O.
Kelley-Springfield Tire Co., New York City.
Milford Rubber Works, Milford, Ill.
Motz Tire & Rubber Co., Akron, O.
Pennsylvania Rubber Co., Jeannette, Pa.
Polack Tyre & Rubber Co., New York City.

Portage Rubber Co., Akron, O.
Republic Rubber Co., Youngstown, O.
St. Louis Tire & Rubber Co., St. Louis, Mo.
Swinehart Tire & Rubber Co., Akron, O.
United States Tire Co., New York City.
Victor Rubber Co., Springfield, O.

Special Tires

American Automobile Specialty Co., Chicago, Ill.
American Rubber & Fabric Co., Philadelphia, Pa
American Spring Tire Co., Chicago, Ill.
American Wood Tire Co., Chicago, Ill.
Carboni Co., Albany, N. Y.
Carhart Laminated Tire Co., San Antonio, Tex.
Cleveland Puncture Proof Tire Co., Columbus,
Davies-Bach Mfg. Co., Cleveland, O.
Dayton Rubber Mfg. Co., Dayton, O.
Favary Tire Co., New York City.
Fudge Bros. Mfg. Co., Marion, Ind.
Indianapolis Tire Co., Indianapolis, Ind.
Lee Tire & Rubber Co., Conshohocken, Pa.
McNaull Auto Tire Co., Toledo, O.
Motz Tire & Rubber Co., Akron, O.
National Auto Spring Tire Co., New York City.
Overman Tire Co., New York City.
Perfect Tire Sales Co., Philadelphia, Pa.
Pioneer Steel Block Tire Co., St. Louis, Mo.
R. & S. Tire Co., Detroit, Mich.
Reason Tire Co., Pontiac, Mich.
Roberts Rubber Mfg. Co., Trenton, N. J.
St. Johns Rubber Tire Co., New York City.
Stahle Mechanical Tire Co., Boston, Mass.
Steel Cushion Tire Co., New York City.
Swinehart Tire & Rubber Co., Akron, O.
Torkington Tires Co., New York City.
Trautman's Air-Rubber Tube Co., Brooklyn, N. Y.

Miscellany



Goodyear Tire and Rubber Co.

the rubber is broken down sufficiently in the cracker, it is then run
another washing machine, similar to the cracker except that the
rs are grooved. The cylinders of this machine work very close to-
so that the rubber is finely ground and run into a thin and com-
ely smooth sheet. Water also flows upon the rubber during this
, which takes out anything foreign that might have slipped through
cker. This continues until the rubber is thoroughly cleaned. After
un to a certain thickness the rubber is ready for the drying room.

rious concerns since being abandoned by the carriage
iny.

ablished Portable Garage Department—The Milwaukee
gating Co., Milwaukee, Wis., manufacturing all kinds
rrugated metal goods, roofing, etc., has established a
tment for the manufacture and marketing of portable
es.

ablishes Kenosha Plant—The K. & F. Mfg. Co., or-
d recently by Chicago, Ill., and Kenosha, Wis., capital,
stablished a plant on Exchange street, Kenosha, for
nanufacture of metal and glass containers, measuring
s, caps, etc.

n Brown's $100,000 Plant—The contract for a new plant
e J. W. Brown Mfg. Co., Columbus, O., maker of auto-
e lamps, has been awarded. The plant will be erected
site recently acquired and will be 100 by 400 feet, two
s high, to cost about $100,000.

Extend Plant—Two additional stories are to be added
e one-story Denver, Col., assembling factory of the
Motor Co., Detroit, Mich. The two stories are to have
ntage of 42 feet and a depth of 77 feet. The addition is
of reinforced concrete and will cost $60,500.

Buick C
Mich., is
West. Fo
Morgan
Marshall
has again
tory buildi
Opens I
Co., Milwa
irons, spar
has opened
Force Inc
force of 115
to 250 tires
record of the
Goodyear
Company, Ak
6,200 automo
7,100 tires. S
a year ago.
New Detroit
pany, Ltd., 272
ing automobile
on contract. I
new machine to
Champion S
story and base
the Champion
been drawn by
60 by 121 feet, a
New Site Giv
Business Men's
negotiations by
porary buildings
locate there. Th
tained by lot sale
Velie Buys Tr
of manufacturing
Motor Vehicle Co
that work under t
the Velie Engine
erected at Moline,
Haynes Agents
gathered at the fac
21, to talk over the
one. The Haynes
225 by 212 feet, sc
erect a new plant
creased business. T
structure of concrete
Ford's Proposed
Company, Detroit M
Houston, Tex., desp
when the proposal
ment filed for recor
in that city, in which
Company for $27,500.
It is understood that
assembling plant ther
the south over Houst
Stearns to Enlarge
land, O., has increased
quire control of nearly
on the west and runnin
Line. Owing to the in
ness during the past f
stockholders to acquir
extensions. An agree
whereby the company
change of the realty c
Stearns company unde
has in contemplation co
which are not yet ready f
Plant Supplies Mount
new Ford Motor Compa
at Denver, Colo., will soo
be four stories high, wit
The building will be rea
The plant will not be use
ent, but will be equipped f
chines to be shipped there
is to be made the distributi
tire Rocky Mountain region
occupied, virtually all the
sembled in that city. A lar
quired to turn out the mach
ing business of the compan

ıtemplating Building—The Buick Motor Co., Flint, guring on building an assembling factory in the Scott, Kan., is trying to coax it to that town.

& Marshall Again Building—The Morgan & ubber & Tire Company, East Liverpool, Ohio, iven out plans for the construction of three fac- gs.

ıctory Garage—The Milwaukee Auto Specialty ıkee, Wis., manufacturing storage batteries, tire plugs and other appliances, parts and devices, a large garage in connection with its plant.

reased by 105—From a force of ten men to a men in 1 year, and from a capacity of from 1 a day from May 1, 1912, to May 1, 1913, is the e Mansfield Tire & Rubber Co., Mansfield, O.

Increase Output—The Goodyear Tire & Rubber ıkron, Ohio, has increased its daily output to obile tires and 900 motorcycle tires, a total of Sales in May showed a gain of 18 per cent. over

oit Factory—The Goodspeed-Detroit Mfg. Com- 72 Harper avenue, has been organized for mak- iles and doing machinery work on automobiles It has a factory, 48 by 154 feet, equipped with tools.

Spark Plug's Building—Sketches for a two- ısement factory building, to be constructed for on Spark Plug Company, Toledo, Ohio, have by the architects. The building will measure t, and will be designed to add two more stores.

Given to Tire Company—The East Palestine n's Association, East Palestine, Ohio, has closed by which they give a new site and provide tem- ings for an automobile company, the second to The fund for financing the industry was ob- sale.

Truck Plant—In order to facilitate the work ıring its line of commercial vehicles, the Velie le Company, Moline, Ill., has decided to conduct der the direction of a separate company, called ngineering Company. A new plant has been oline, adjoining the present pleasure car plant.

gents at Factory—Haynes agents and salesmen he factory in Kokomo, Ind., on June 19, 20 and er the past season and lay plans for the coming aynes company has purchased a tract of land, eet, southeast of its present factory, and will plant building to meet the requirements of in- ess. The building will be a modern fireproof concrete and steel.

posed Houston Plant—That the Ford Motor troit Mich., may locate an assembling plant in x., despite difficulties which were encountered oposal was first made is indicated by a docu- r record in the County Clerk's office recently in which a tract of land was sold to the Ford $27,500. This land contains about 5¼ acres, ood that the Ford Company will erect a large ant there and distribute its cars to all parts of r Houston's railroads.

Enlarge Plant—The F. B. Stearns Co., Cleve- increased its capital to $400,000 in order to ac- of nearly 400 feet of land adjoining the factory nd running back from Euclid avenue to the Belt to the increase in the Stearns company's busi- he past few years, it seemed advisable to the to acquire this additional land to provide for An agreement has accordingly been reached company obtains control of this land by an ex- e realty company's securities for stock of the oany under certain conditions. The company ıplation considerable new construction, plans for yet ready for announcement.

lies Mountain Region—The first story of the tor Company's automobile assembling station lo., will soon be completed. The structure will s high, with a floor space of 172 by 130 feet. will be ready for occupancy about August 1. l not be used for manufacturing, for the pres- e equipped for assembling the parts of the ma- shipped there from the main factory. Denver the distributing center of Ford cars for the en- ountain region, and as soon as the plant can be ually all the cars in this region will be as- ıt city. A large force of workmen will be re- out the machines to meet the steadily increas- f the company in the west.

The Automob Calendar

Shows, Conventions, Etc.

October 13.........Philadelphia, Pa., National Fire Pre Philadelphia Fire Prevention Comn
December 9-12.....Philadelphia, Pa., Annual Convention Builders' Association.

Race Meets, Runs, Hill Climbs, E

June 25-28.........Chicago, Ill., Non-Motor-Stop Reli Boston, Chicago Automobile Club.
July 1.............Indianapolis, Ind., Tour of Indiana facturers' Asso. to the Pacific Coa
July 1-16..........Winnipeg, Man., Motor Plow Comp Bell, Manager.
July 4.............Panama-Pacific Road Race, Western
July 4.............Columbus, O., 200-Mile Track Ra Automobile Club.
July 4.............Taylor, Tex., Track Meeting, Taylor
July 4.............Washington, D. C., Track Races, N torcycle Club.
July 4-5...........Sioux City, S. Dak., Track Meetings mobile Club and Speedway Assn.
July 5-6...........Tacoma, Wash., Road Race, Monten bile Committee.
July 8-16..........Winnipeg, Man., Midsummer Exhi mett, Manager.
July 11............Twin City, Minn., National Reliabil
July 20............Seattle, Wash., Track Races, E. A.
July 21-25.........Grand Rapids, Mich., Auto Club To
July 27............Grand Rapids, Mich., Tour, Grand
July 27-28.........Tacoma, Wash., Tacoma Road Race
July 28-29-30......Galveston, Tex., Beach Races, Ga Club.
Aug. 5.............Kansas City, Mo., Sociability and E Kansas City to Colorado Springs, Automobile Assn.
Aug. 12............Kansas City, Mo., Reliability Tour, Assn.
Aug. 18-22.........Milwaukee, Wis., Fourth Annual W Tour, under the auspices of the W mobile Assn.
Aug. 29-30.........Elgin, Ill., Elgin Road Races, Elgin
Aug. 30-Sept. 6....Chicago, Ill., Reliability Run, Chicag
Sept. 1............Columbus, O., 200-Mile Track Ra Club.
Sept. 9............Corona, Cal., Track Race, Corona A
Oct. 4-11..........Chicago, Ill., Around Lake Michigan tor Co.
Nov. 24............Savannah, Ga., Vanderbilt Cup Race ing Company.
Nov. 27............Savannah, Ga., Grand Prize Race, America.

Foreign.

June 23-28.........London, England, International Rc
July 12............Amiens, France, Grand Prix Race.
July 13............Paris, France, French Grand Prix
July 15-30.........London, Eng., Olympia Heavy Mot
July 18-26.........London, Eng., Imperial Motor Tran
Aug. 28-30.........Ghent, Belgium, Institute of Metal Meeting, Ghent International Exh
Sept. 21...........Boulogne, France, 3-Litre Race.
Sept. 25...........Isle of Man, International Stock Ca
October ....Paris, France, Automobile Show, Gr
November ....London, Eng., Annual Automobile

Aluminum plant of the Anderson Electric Car C

e Industry

rman Garage

ısed on locomotive principle

CREASED—During the first 2 months of 1913 Belgian mobile chassis, completed cars, and spare parts 3,880, against $693,816 last year. Imports totaled 503.

DUCTION DUTIES—Robert Perkins has resigned from . Detroit, Mich.

OTOR TRUCKS—Hamilton, Ont., is in the market for use in hauling gravel in public works.

BUY CARS — The Inside Electrical Workers of ve purchased four Hupmobile touring cars for the ff. The cars were bought from the H. J. Koebler Co.

IUPP—A. B. Barkman has resigned from the Max-Detroit, Mich., to go to the Hupp Motor Car Co., becomes western sales manager and will make his rancisco, Cal.

OLDS—N. W. Barton has been appointed assistant nager of the Olds Motor Wks., Lansing, Mich. He the department supervising all traveling mechanics the details of the Olds service to users.

VAY PREMISES—The King Motor Car Co., Detroit, entire ninth floor at 244 to 252 West 54th street, a frontage of 125 feet in 54th street and 100 feet e feet, which will be used for service and storage by).

ACING AGENCIES—The Mohawk Rubber Co. has now kron, O., running, and has started to fill orders for impaign for dealers has been started, the company n each town. The agency plan embodies giving each itory, and thus protects him as much as possible.

ICAN FIRE APPARATUS—The fire department of Hali- New York a La France combination hose carriage st motor fire apparatus, horse-drawn engines baving It has a triple combination engine, pumping capacity An expert accompanied the machine and has nd instructions to the men who will operate it.

-An effort is being made by the Dallas Automobile ,000 which has been allotted by the Federal govern- ration in north Texas. The club is ready to pledge ach $1 spent by the government. The club bas see that sign posts are erected on the portion of f highway which passes through Dallas county.

E GARAGE—The biggest garage in Fort Wayne, Ind., e city to be absolutely fireproof will be erected this e has already been leased by the Soest Bros. Elec- uilding is to cost $17,000 and will be one story in by 150 feet in size. It will be of concrete and ughly fireproof throughout. One of the features of dies' rest room.

CLUB HOME—Radical changes in tbe clubhouse of e Club, Chicago, Ill., are to be made during the been made and approved for a substantial enlarge- e addition of a new ladies' parlor to the clubhouse remodeling of the fifth floor. The garage will be ı height, affording room for storing 60 per cent. erations include the enlarging of the turntables and rooms and accommodations.

BATTERY STATION IN HARTFORD—The Ha & Snpply Co., Hartford, Conn., has open street.

AUTOMOBILES DECREASE HARNESS IMPORT fancy harness and saddlery into Argentina nse of automobiles.

TATE ELECTRIC CHAAGING STATION—The charging station and electrical garage in that at least thirty cars will be housed.

GABRIEL SNUBBER AGENCY TAKEN—An s shock absorber bas been taken in Indiana of Indiana, which is located in Indianapoli

GRAND TRUNK'S AUTOMOBILE SERVICE— considering the advisability of installing a falo, N. Y., and Bridgeburg, Ont., for Sun

RITTENHOUSE DETROIT DIAMOND MANAGE made manager of the Detroit, Mich., hranc Akron, O. He was former Boston, Mass.,

BUS LINE IN ST. LOUIS—A plan to use Louis County, Missouri, is under way, and between the courtbouse in St. Louis and Louis Connty, is preparing to ask the city fo

CHAPMAN RESIGNS—Frank E. Chapman ha the serviee and repair department of the Ma Co., Newcastle, Ind. He will be succeeded Detroit, Mich., former director of the claim

AUTOMOBILES FOA FIRE CHIEFS—An appro quested hy the Board of Safety of Indianap used to buy automobiles foı the second and chief and first and fourth assistants now being chief, says it is no longer possihle for assista horse-drawn vehicles.

WILLARD RESIGNS FROM FIAT—Richard D. Motor Sales Co., Poughkeepsie, N. Y., an branch of that company, has resigned, having in the concern. Willard has not yet announ is expected be will take a hrief vacation trip several offers that bave been made to him.

BUILD AUTOMOBILES AT SCHOOL—Two au respect serviceable machines and capahle of nearing completion in the machinery shop of of San Francisco, Cal. Practically every part and their accessories to the chassis and wheels of the school in the practical application of course.

TRUCKS IN GETTYSBURG CELEBRATION—T making preparations for the semi-centennial Gettysbnrg, to be beld at Gettysburg, July Autocar motor trucks. In the transportatioo stores and the baggage of the veterans the used, and in tbe intervals when not engaged in for sightseeing purposes over the battlefield.

INVENTS HYDRAULIC LIFTING JACK—Capt. J. Wis., inventor of a new type of water pump compound lever principle instead of suctioo manufacture bydraulic devices of all kinds. two-way bydraulie lifting jack especially ada and this will be turned out in large numbers. tons and may be used either in horizontal or v

LEASES FIVE-STORY BUILDING—To keep abrea accessories business, Fred Campbell has lease 1109 Locust street, St. Louis, Mo., for five yea are completed he will move his stock into the o and retail business will be taken care of at th the main downtown automobile route, but wi the wholesale trade, the retail trade being ha West End brancb at King's Highway and Deln

FROEHLICH REPORTS GOOD BUSINESS—Jesse Fr Times Square Automobile Co., New York City, the past six months has far exceeded the great lich reports that this company expects to offer that it has ever offered on high-grade runabo $690. By special arrangement with the manu to advertise the name. Work will be starte stories on its present building at 56th street an

A 15-ton load of lumber

TION IN HARTFORD—The Hartford Electric Storage Battery Hartford, Conn., has opened a battery station on Wells

DECREASE HARNESS IMPORT—Decreases in the imports of and saddlery into Argentina are attributed to the growing iles.

IC CHARGING STATION—The Tate Electric Co. is opening a and electrical garage in Montreal, Que. It is estimated irty cars will be housed.

BBER AGENCY TAKEN—An agency for the Gabriel Snubber has been taken in Indiana by the Cadillac Automobile Co. ich is located in Indianapolis.

K's AUTOMOBILE SERVICE—The Grand Trunk Railroad is advisability of installing automobile service between Buf- l Bridgeburg, Ont., for Sunday travel.

DETROIT DIAMOND MANAGER—L. K. Rittenhouse has been of the Detroit, Mich., branch of the Diamond Rubber Co., was former Boston, Mass., manager of that company.

ST. LOUIS—A plan to use automobile buses to develop St. lissouri, is under way, and a company to operate bus lines rthouse in St. Louis and Clayton, the county seat of St. preparing to ask the city for a franchise.

GNS—Frank E. Chapman has resigned as superintendent of repair department of the Maxwell-Newcastle Manufacturing Ind. He will be succeeded July 1 by E. A. Richmond, of ormer director of the claims office of the Flanders Corp.

FOR FIRE CHIEFS—An appropriation of $3,400 has been re- loard of Safety of Indianapolis, Ind. The money is to be mobiles for the second and third assistant fire chiefs, the d fourth assistants now being so equipped. Charles E. Coots, o longer possible for assistant chiefs to cover the city with cles.

NS FROM FIAT—Richard D. Willard, secretary of the Fiat , Poughkeepsie, N. Y., and manager of the New York mpany, has resigned, having disposed of all his interests Willard has not yet announced his new connection and it ll take a brief vacation trip before taking up with any of t have been made to him.

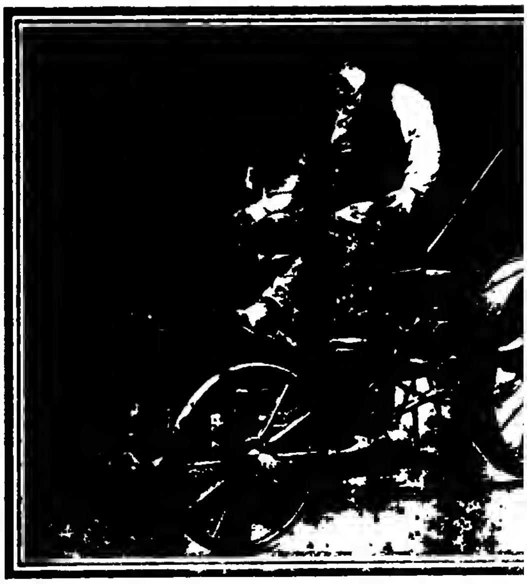
BILES AT SCHOOL—Two automobiles, small but in every machines and capable of making 25 miles an hour, are n in the machinery shop of the Polytechnic High School Cal. Practically every part of the cars, from the engines ies to the chassis and wheels, were built by young students the practical application of their work in the machinery

ETTYSBURG CELEBRATION—The Federal Government, in ns for the semi-centennial celebration of the Battle of held at Gettysburg, July 1 to 4, has engaged fifteen eks. In the transportation of camp supplies, commissary ggage of the veterans the Autocars will be extensively ntervals when not engaged in such duties will be employed rposes over the battlefield.

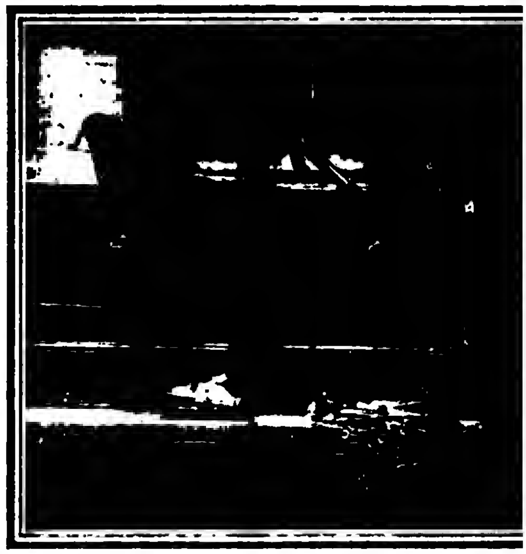
LIC LIFTING JACK—Capt. J. Lee Knight, of Fond du Lac, a new type of water pump or hydraulic lift, using the rinciple instead of suction, is forming a company to ulic devices of all kinds. Capt. Knight has designed a lifting jack especially adapted for motoring purposes rned out in large numbers. The jack has two lifting pis- sed either in horizontal or vertical positions.

Y BUILDING—To keep abreast with his fast-growing auto s, Fred Campbell has leased the five-story building at St. Louis, Mo., for five years and as soon as alterations ill move his stock into the new quarters. Both wholesale will be taken care of at the new location, which is on n automobile route, but will be principally devoted to , the retail trade being handled, where possible, at the t King's Highway and Delmar Boulevard.

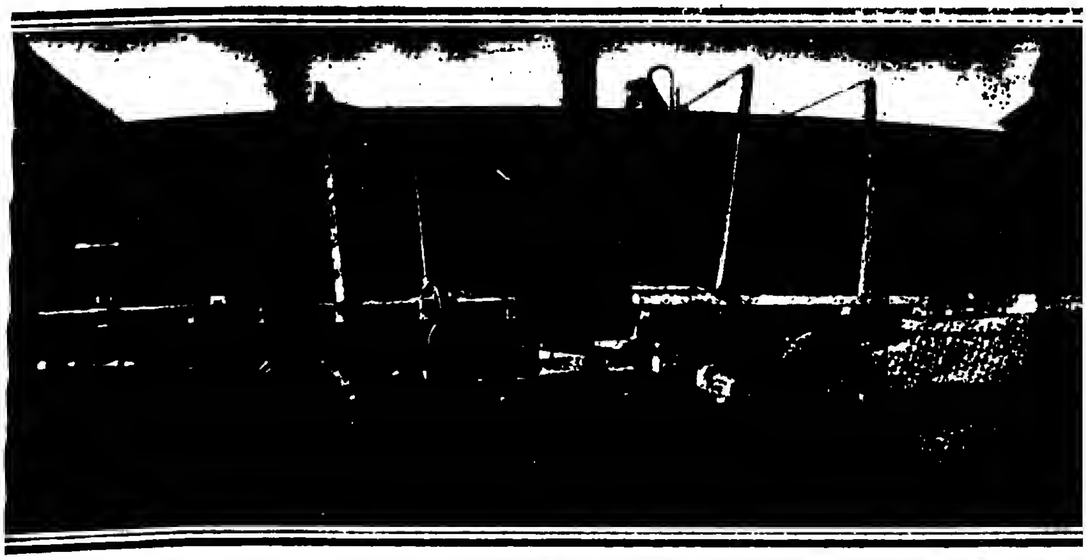
TS GOOD BUSINESS—Jesse Froehlich, vice-president of the mobile Co., New York City, reports that its business for has far exceeded the greatest expectation. Mr. Froeh- is company expects to offer the greatest sensation yet fered on high-grade runabouts in the near future, for rrangement with the manufacturers, it has agreed not ame. Work will be started soon on two additional t building at 56th street and broadway.



Farm tractor built at Hartford, Conn. This m with a two-cycle Motorette engine, the crankshaf which are equipped with pulleys for transmission



New Lozier construction. Several compartments con are designed to carry all tools



A 15-ton load of lumber being drawn on a La France gasoline hydraulic truck in New York City

Hudson Motor Car Co., Detroit, Mich., ılicity manager to connect himself with hicago, Ill.

Another addition has been made to the cars, this time the Fiat. The F.I.A.T. p all its cars with the shock absorber .o., Jersey City, N. J.

ın—Zanesville, O., is to have a new was recently made by the Common that he would immediately advertise not be let for at least two weeks.

G—G. L. Smith, Franklin dealer in into his new fireproof building at the The building will be three stories and l floor space of 35,500 square feet. Hughes has become designer and will employed by Carden Green and J. B. srs. Green and Levy are wealthy oil nents to build an automobile factory ndianapolis, Ind., his temporary head-

LINE TANK—Although there are no Chippewa Valley Auto Co., Chippewa installing a 10,000-gallon gasoline tank ty of Eau Claire, Wis. After the tank underground installation made, and he state fire marshal stepped in and however, that tanks of 10,000 gallons e State Legislature and several local rictive ordinances.

ıobile Field

ACCESSORIES

Repair Co.; capital, $5,000. Incorp- eece, C. V. Mulligan.
ne.; capital, $800,000; to manufacture ıcorporators: Clarence Winter, F. E.

o Supply Co.; capital, $5,000; to deal rs: J. S. Lilly, A. B. LaFar, G. R.

ine Starter Co.; capital, $1,000. In- B. Newins, Ira M. Higbee.
lorp.; capital, $1,000. Incorporators:

Supply Co.; capital, $10,000; to manu- corporators: Paul Knopf, Carl Knopf.

l, $10,000. Incorporators: W. Hunter

l-Service Co.; capital, $1,000. In- West.
Garage Co.; capital, $3,000; general Mark, Robert Romanelli, E. E. Goller.
Car Co.; capital, $600,000; to manu- erated by a gasoline engine as a part

Mfg. Co.; capital, $150,000; to manu- . combustion engines and a kerosene on gasoline engines.
and Oil Co.; capital, $60,000; to 00 gallons daily.
tal, $10,000; to carry on a general J. Tierney, M. C. Heiford, Geo. T.

ıpital, $10,000; to handle automobile onso G. Duer, C. Wagenhausen, L. P.

IE AND CAPITAL

Machine Co.; capital increased from

& Auto Co.; capital increased from

o.; change of name to the Detroit

capital increased from $50,000 to

.; capital increased from $750,000 to

ile Parts Co.; capital increased from

Mfg. Co.; capital increased to $1,-

change of name to Auto Puncture

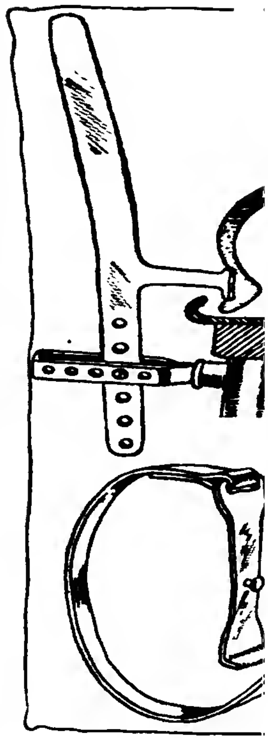
r Co.; capital reduced from $2,100

Co.; capital increased from $100,000

g the Week

Agent
.......Newmastic Tire Co.
.......C. H. & J. Scott
.......The Coburn Motor Car Co.
.......A. E. Rea Co.
.......Evans-Coppins & Stark Co.
.......Woodward Carriage Co.
.......J. M. Armstrong Auto Co.
.......Knight Advertising Agency
.......Jacob Strubldreher

VEHICLES
.......Hotchkiss Motor Car Co.
.......Western Machine Mfg. Co.



Tire

TO make a tire tedious problem while this is d design of the tire itse. given to the wonderfu cilitate these repairs ar

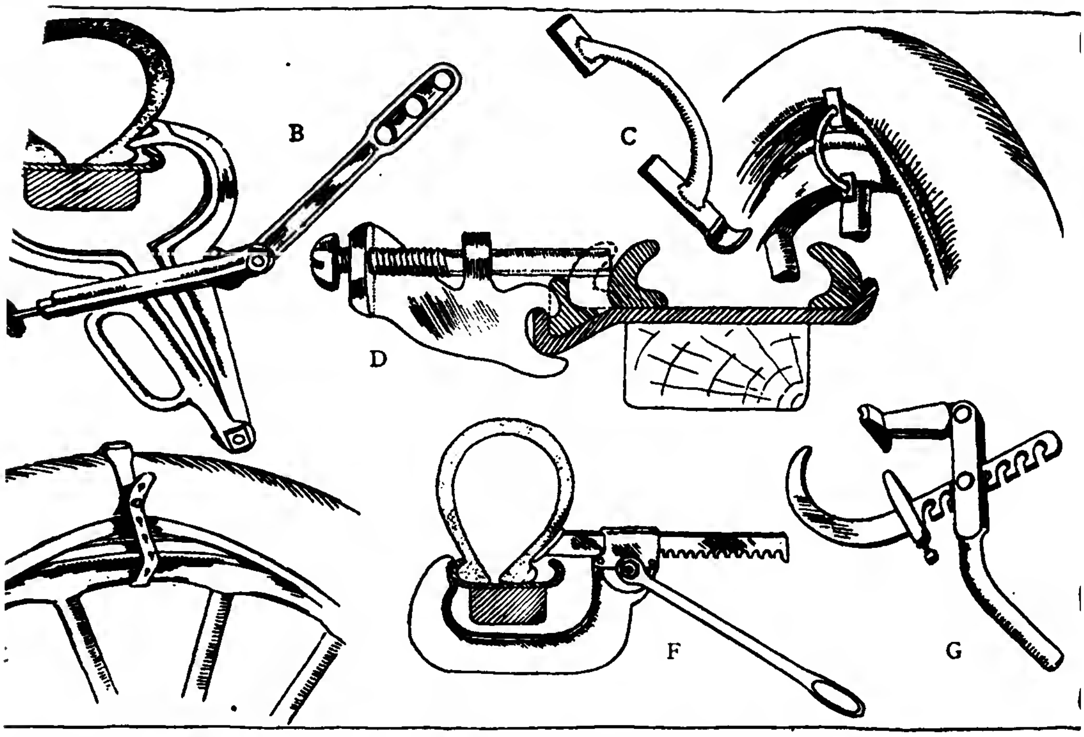
A few of these lever at random are shown i vided with means of adj be dealt with.

Rudolf Tire Tool—Th tially of two simple hing can easily be applied to ing the smaller part ove equally useful for the r clincher tires and can be

The outfit includes an socket-end so that it car where special force is req into a length of 18 inches complete is $2.50 and the r burgh, Pa.

Eclipse Tire Tool—The introduced a tool that will to 5 inches and can be used detaching one or both sid lustrated at B, in which i caliper-like hinged jaws wi the narrow part at the mid such a way that the inner the jaws, bringing them bo is positioned below the rim, for removing lock rings or tire at the same time it is ap of the jaws surrounding the t and costs $3.

Becco Tire Grip—When p trouble is always experienced out over the rim while lever render the repairer independe nection the small tool shown a illustration shows the method inserted into the rim, the curv as a lever, after which it is si on the felloe, effectually holding



ıdolf. B, Eclipse. C, Becco. D, "Q. D." E, "2nd Man." F, L. & M. G. Morris

ɔols That Facilitate Repairs

ıir today is not the difficult and . was only a few years ago. And in a large measure to progress in a great deal of the credit must be levelopment of the tools which fa- changes.

and other handy repair tools taken the above illustration. All are pro- ıstment whereby any size of tire can

ıis tool, shown at A, consists essen- ;ed parts so arranged that great force the side of the tire by simply hook- er the nearest spoke as shown. It is removal or replacement of rims or ıe applied at either side.

another simple lever formed with a can be used as an extension handle required. The whole folds compactly ches and weighs 5 pounds. The price the makers, the Rudolf Tire Co., Pitts-

The Shawyer Co., Springfield, O., have ŧ will fit any size of tire from 3 inches ȝ used for relieving lock rings as well as th sides of a clincher tire. This is il- hich it will be seen to consist of two ıws with an adjustable link surrounding he middle, to which a lever is hinged in ȝ inner end bears powerfully on one of hem both together. As shown, the tool the rim, that is, between the spokes, but rings or easing both sides of a clincher e it is applied outside, the curved portion ding the tire. This tool weighs 4 pounds

—When putting on a clincher tire much ɛperienced in preventing one part creeping while levering in at another point. To ɾ independent of extra help in this con- ɩool shown at C will be found useful. The the method of application. The nose is rim, the curved handle meanwhile serving which it is simply turned down and bears ɩtually holding the bead at that point. It is equally applicable to wood or wire-spoked wheels. Manufactured by the Michigan Motor Specialties Co., Detroit, Mich., and listed at 25 cents each.

"2d Man" Tire Tool—Another handy little tool for th same purpose is shown at E. This consists of a steel hoo to which is attached a leather strap for passing around th tire. After inserting the hook between the tire and rim th free end of the strap is pulled tight and buttoned to th tool. These are manufactured by B. Morgan, Newport, R. I and sell at 50 cents.

Q. D. Rim Remover.—A remarkably simple tool to facilitate the removal of quick detachable rims is shown at D This is stamped out of sheet steel and in use the bod portion is hooked over the outer edge of the tire rim wit the nose occupying a position between the ends of the locking ring. Then by turning the screw the rim is easily move over and the locking ring exposed for removal.

It will be noticed that one of the conditions necessitate by this tool is that the ends of the locking ring be far enoug apart to allow the entry of the hook, and the maker advise that if this space is insufficient the ends should be filed t suit.

The manufacturer is William L. Tobey, East Boston, Mass Nickel-plated and casehardened this tool sells for 65 cents

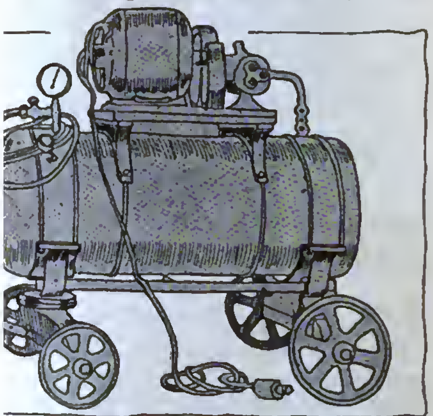
L. & M. Tire Loosener—The tool shown at F, manufactured by the Adam A. Long Machine Works, Rocheste N. Y., operates on the rack and pinion principle, producin a parallel motion of the jaws by turning the handle. By th nature of its construction this tool is applicable to a wid range of tire sizes providing the same leverage in all case As shown, the tool is in use as a shoe loosener on a clinche rim but it can also be used for removing the tire from Q. D. rim. In this case the movable jaw is passed righ over the fixed one, a semi-revolution of the removable handl being required. It is made of malleable iron and steel i two sizes, No. 1, for all tires up to 5 inches and No. 2 fo 5.5 to 6 inches.

The handle is detachable so that the tool occupies a sma space. The prices are $2 and $2.50.

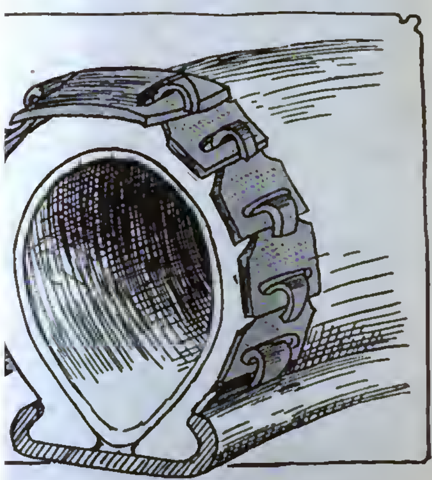
Morris Tire Tool—The principal feature of this tire remover shown at G is the means for rapidly adjusting t any size of tire without removing any parts or turning screw The lever is divided at the fulcrum and the fixed portion i notched to receive the hinge pin. This tool sells at $1.50 an is the product of the Wm. E. Pratt Mfg. Co., Chicago, Il

ze of inner tube is to be used. A 37 by 5
ss a 36 by 4.5 inner tube. The makers
its for 15,000 miles within 1 year of sale.
s—In Fig. 3 are shown two pump
1 Mfg. Co., Chicago, both being of the
) any make of tire valve.
right angle connection is automatic in
pushing it over the tire stem the valves
re opened, permitting a free flow of air
ve in the nipple is of regular Schrader
cheaply renewable. The body is a cast-
or screwed cap. The stem also is deeply
ng of the tube under pressure.

ment—A new tire treatment has been
t by Smalley Daniels, Detroit, under
ra. It is intended for injection within
leakage of air caused by punctures or
pes, such as porous tubes, small leaks
compound comes in powder form and
a proportion of about one can to 1.5
it has been mixed thoroughly it is in-
th a grease gun, the valve having been
ve stem before. The compound does
air in any way, but in case of a punc-
ely to the place of the leak and stops
mount of air can escape. The air pres-
the solution to the point of escape. The
ntain no acids or alkalis and is market-
le combination, which will do no harm
in cans of two sizes, one can No. 2 will
3.5 inches in sectional diameter; two
tires 4, 4.5 or 5 inches, and four cans
5.5 or 6 inches in section.
of The Automobile was afforded an
this tire treatment. A 34 by 4.5-inch
ts normal pressure and the required
e injected into the inner tube with a
alve had been removed from the stem.
hich the tire was mounted had been
to spread the treatment completely
ife was stuck through the casing and
bout 3/8 of an inch long. After an in-
the leaking ceased immediately. On



ortable electric tire-pumping outfit



ipples. Fig. 4—Kimball steel armor

ans Something to Hav

R·I·V

Ball Bearings

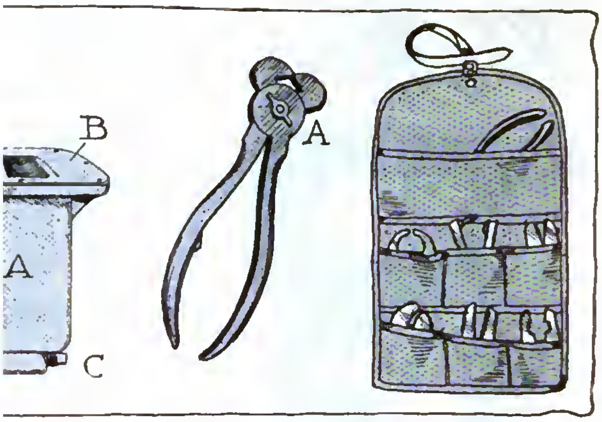
UALITY

our Cars

? You Incorporated Them

our Design and Specificati

For 1914?



·. Fig. 6—Koeth's interchangeable tool

er Co., which has its headquarters at Ft. Worth, Texas.

rlocks—A device for increasing tire mileage and re- the danger of blow-outs is being marketed by the Double Co., Auburn, Ind., under the name Interlocks.

tire-saver differs from general practice in inner pro- in that it is not a shoe but a complete inner tire, which s a position between the outer casing and the inner tube, hening the casing and protecting the tube from punctures. mufacturer claims that their use does not affect the resil- o any appreciable extent.

ver Automatic Oiler—An auxiliary oiler for attach- o Model T Ford motors has been brought out by the A. C. Co., Providence, R. I. The views in Fig. 5 show the and the method of applying it to the base of the crankcase. be seen to consist of a flanged chamber A, drilled to fit the existing bottom plate B of the crankcase, and a pipe P ng from it to the lowest point of the flywheel casing. way a complete circulatory system is obtained, the oil aised from its lowest point by the flywheel.

pplying the device it is only necessary to remove the plug base of the flywheel casing and drill a hole through the ise cover between the second and third connecting rod dips insertion of the short standpipe S.

ltale T is fitted to the side reading from 3 to 8 quarts. rmal filling is 7 quarts and this is poured into the breather the ordinary way of oiling. In passing from the flywheel is conveyed through a copper pipe, not shown, to the gear before flowing into the crankcase. The oiler cham- neasures 12 inches long by 5 inches deep and is an alumi- sting. Clean-out plugs C are provided at the base and the the connecting pipe. The device can be put on a car in · and is listed at $12.

h's Interchangeable Tool—This tool, shown in Fig. sts of a set of pliers, pincers and shear tool jaws with a common to all. It is supplied with six heads for various s. In the set for automobilists the jaws include a com- i plier with cutter, a close cutting nipper for cutting light l, a pincer head for heavy work, a leather punch, tinner's and Weed chain plier.

llustration shows a handy roll of strong duck with sep- ockets which forms a convenient way of carrying this re tool kit. It is also supplied in a compact wood case, e for either being $3.

taching the various tool heads it is only necessary to a thumbnut on the center bolt. The head shown fitted andle at A is that for use in connection with Weed chains. esigned to open the links easily and at just the correct ·. The maker is the Currier-Koeth Mfg. Co., Couders- 1.

Hoover Auxiliary Spring, shown in Fig 8, is remark- iong shock absorbers for its extreme simplicity. It will that it consists of what is in reality a miniature spring l on the same lines as the conventional main spring and directly underneath it. The illustration shows the prin- action of this device. When the car is carrying a light is running over smooth road and the main spring is con- ly at its greatest curvature as at A, the tips of the auxil- ring are free. The car is therefore riding on the main alone. But as soon as an unusual strain is encountered main spring is flexed the auxiliary comes into action as at B, supplying the desired additional support.

maker is the Hoover Spring Co., San Francisco, Cal., device is supplied in five widths, 1.5, 1.75, 2, 2.25 and 2.5 espectively, at prices for each set of four from $14 for ll size to $18 for the largest.

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Packard 1909 30 Touring
Peerless 1912 6/48 Touring
Alco 1911 40 5-passenger
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1581 BROADWAY, NEW YORK.

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A Renewed Peerless will give you greater service than any other new car at the same price. Write for renewed car catalogue.
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Newark Branch, 37 William Street.

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A few real bargains in rebuilt cars—all types of bodies.

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STANLEY STEAM CAR

Will sell at a sacrifice Stanley runabout; no reasonable offer refused.
E. R. Tiemeyer,
1784 Bway., N. Y., Room 1210.

TRUCKS FOR SALE, TO REDUCE equipment; two 1¼ ton and two 5 ton WHITES; also one KNOX-MARTIN TRACTOR with 7 ton wagon attached. Burr Bros., Inc., Coal Merchants, Brookland, D. C.

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IN EVERY CITY OF OVER 15,000 POPULATION
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We Buy and Sell Used Cars for Cash.
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Satisfied Customers Are Our Advertisements.
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Satisfaction and Low Prices
MILLER-BRISBEN CO.
STORAGE MART.
Largest Used-Car Export House in America.
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10 TAXICABS IN RUNNING CONDITION at $300 each. Splendid opportunity for someone wishing to start in this money making business, requiring but a small investment. The White Co., 2635 Wabash Ave., Chicago Ill.

STODDARD DAYTON "50," SEVEN-PAS- senger touring car, with all the equipments, such as windshield, speedometer, with trip and season register, mohair top and side curtains, tire extras and repairs, and tire pump operated by the engine; dual ignition system—in fact, everything necessary for a tour, ready for the road at a moment's notice; a bargain for cash. Bourg Bros., Watson, Colo.

UNUSUAL CHANCE
Owner will sacrifice 7-passenger Packard 30 for quick sale. 1909 model, in splendid condition. One coat varnish will make it look like new. Price $750. P. O. Box 1166, Atlanta, Ga.

Cars Wanted

AUTO WANTED—35 TO 70 H.P., FULLY equipped, 2 to 5 passenger, in exchange for 80 acres of Kansas land valued at $2,200. Address E. M. Bussinger, Hutchinson, Kan.

Parts and Accessories FOR SALE

A.—BIG CAR LOAD OF RIMS RECEIVED. Continental Demountable old type. Continental Demountable new type. Wedges, nuts and bolts for all makes of UNITED RIM CO. rims. We are the Largest Individual Dealers in rims and rim parts in the United States. State size rim when ordering rims or parts. Circular on request. Kastner Tire & Rim Co., 2112 Michigan Ave., Chicago, Ill

Acetylene headlights..........per pair $4.90
All-brass windshields.............each 7.50
Windshields for Ford Cars......each 7.50
Swiss Magneto, strictly high tension, new and guaranteed...........each 30.00

Send for our Special Bargain Sheet.

AUTO PARTS CO.

513-31 Jackson Blvd., Chicago.

AMERICAN LAMP WORKS.
Mfgrs. Auto Radiators and Lamps, Gasoline Tanks, Hoods, Mud Guards, Mufflers, Windshields, Floor Pans. 253 W. 47th St., N. Y.

A BUELL HIGH DUTY WHISTLE IS guaranteed for life. Screws in cylinder-like spark plug. Most practical and simple horn on the market. Guaranteed to produce a much greater volume of sound than any other signal. Ford type $6, others to $8. A fine proposition for agents. Write for circular. Buell Auto Co., 6053 Cottage Grove Ave., Chicago, Ill.

A FEW MORE FORD SPECIALTIES

	Reg. Price.	Our Price.
Anti-rattling Ball Sockets	$3.00	$1.25
Electra Horn (electric)	4.00	2.90
Ford Oil Gauges	1.00	.35
Rajah Spark Plugs, ½"	1.50	.85

Write for "Alphabet of Accessories"—Ford Edition.
Globe Auto Specialty Co.,
Dept. A. 1775 Broadway, New York.

ALL AUTOMOBILE OWNERS.
Send your name for a copy of our 1913-14 cut price illustrated catalogue. Delivery in 3 weeks.
Liberty Tire & Rubber Co.,
No. 102 Chambers St., New York City.

APPLY BOYER'S AUTOMOBILE RE- finisher to your car and it will look like new. One application lasts a year. "The Wonder of the Automobile World." For dull Hoods, Fenders and Bodies. Particulars free. Boyer Chemical Laboratory Co., 14 East Michigan Street, Chicago.

TOPS

r and recovered, excellent materials vorkmanship. W. H. Newton & Son, 5 Elm St., Cortland, N. Y.

Tires

AUTO TIRE BARGAINS.

g recently purchased a quantity of

FACTORY SECONDS,

osed largely of Shawmuts, Continen- etc., we offer as follows:

	........$6.00	34x3½	........$8.75
	.... 7.00	36x3½	........10.00
	.... 8.50	34x4	........10.00
	.... 8.00	36x4½	........12.00
	.... 8.50	38x4½	........15.00

te us if interested in other sizes. about half price. We are leaders price goods. Always have the largest We have entire building at 49th St. roadway. 10% deposit required on all .

AKRON TIRE CO., INC.,
1612 Broadway, New York.

AINS IN TIRES. WRITE FOR for your car.

ANGLO TIRE CO.,
237 W. 49th St., New York.

FORD OWNERS, ATTENTION.
Special Tires adapted to use on Ford are Guaranteed for 3,500 Miles, and ving the service.

		Special Empire Red Tubes
3.............	$10.75	$2.90
3½...........	14.75	3.90

discount on all orders accompanied ck or money order. required on all orders sent C. O. D. r money back if tires are not satis- y on receipt of same. Empire Red are Guaranteed for Two Years.
echel Tire & Rubber Co., Dept. A.
roadway New York City

NON-SKID TIRES.
standard makes at the following :

	Price.	Size.	Price.
	......$14.50	34—4½	......$27.00
	...... 16.00	35—4½	...... 28.00
	...... 20.00	36—4½	...... 29.00
	...... 22.50	36—5	...... 31.50
	...... 24.50	37—5	...... 32.50

not carry any but standard make or deal in inferior brands. I will ship ze tire listed above to any part of the upon receipt of 10% of order, balance D.

M. C. MORAN
Amsterdam Ave., New York City

REAL BARGAINS IN TIRES

tires we sell are not second-hand. re not recovered tires with an alleged ntee. Every tire we sell is a second nished casing of the best makes only, as Century, Diamond and Michelin.

Round Tread	Tubes		Round Tread	Tubes
$8.00	$1.85	36x4	$21.00	$4.00
8.50	2.05	34x4½	25.25	4.75
9.10	2.15	35x4½	25.75	4.75
12.60	2.75	36x4½	27.00	5.00
13.50	2.85	37x4½	27.25	5.00
14.50	3.10	34x5	30.80	5.40
18.50	3.50	35x5	31.80	5.60
19.15	3.65	36x5	32.50	5.70
20.00	3.75	37x5	33.60	6.00
20.50	3.85	37x5½	40.00	6.65

ship any size tire listed above to any the U. S. upon receipt of 10% of or- lance C.O.D. subject to examination. Firestone Tires 10% Higher.

H. V. DODGE,
310 Broadway, New York City.
Bedford Avenue, Brooklyn, N. Y.

TIRES TIRES

sell you good wrapped tread clincher eaper than any one in the United New 1913 stock. Write for prices.
D. Ogden,
Columbus, Ind.

TIRE BARGAINS.
28x3, $7.20; tubes, $2.40; 30x3, $7.85; tubes, $2.50; 30x3½, $11.00; tubes, $3.35; 32 x 3½, $12.00; tubes, $3.55; 34x4, $17.25; tubes, $4.60. Tubes guaranteed. Other sizes accordingly. Get price list. 10% with order, balance C. O. D. Examinations allowed.
PARA AUTO TIRE CO.,
1415 Michigan Ave.,
Chicago.

TIRES TIRES TIRES TIRES

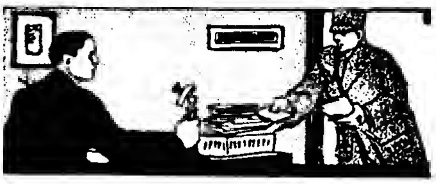
3500 MILES GUARANTEED!!!
50% TO 75% OFF!!!
Every Standard Make, Every Size, Fresh Clean Stock. We Guarantee 3500 Miles. You will get that and more—Your Money's Worth. We adjust in proportion to price and mileage. These prices are the lowest ever for our grade of tires. Send us an order today—NOW!

28x3...........	$7.00	35x4...........	$14.75
30x3...........	7.75	36x4...........	15.00
30x3½.........	9.00	37x4...........	16.00
32x3½.........	10.50	34x4½.........	17.00
34x3½.........	10.75	35x4½.........	17.50
32x4...........	12.50	36x4½.........	18.00
33x4...........	13.50	37x4½.........	18.50
34x4...........	14.00	35x5...........	19.00

TUXEDO AUTO TIRE EXCHANGE,
896A Eighth Ave., New York.
Near 53d St. Tel. 2947 Columbus.

Motorcycles .

PARTS AND ACCESSORY MAKERS— The Motorcycle field is well worth your attention. 105,000 new machines in 1913. Leading medium, "Motorcycle Illustrated," 51 Chambers St., New York. Paid Circulation over 11,600.



An advertiser writes:

"Your columns are certainly pulling. So many orders ahead that we must cut out advertising."

Garages for Sale

FOR SALE—L. CONLY GARAGE, OF Herkimer, N. Y.; best location in town; fine stand for transients. Electric sign, air compressor and tank; tools of all kinds; doing fine business. Best of reasons why I must sell. Population of 20,000 within 5 miles.

Auto Instruction

AA1 IS HOW OUR STUDENTS STAND with auto owners. Our school is the oldest, best equipped, most practical and successful in America. Write, 'phone or call for particulars. Auto School of America, Dept. A., 1600 Michigan Ave., Chicago. Tel. 1088 Cal.

A. L. DYKE'S AUTO INSTRUCTION—A new idea of instructing you to care for and repair automobiles—with working models (from London), charts, etc., indorsed by all leading authorities. Send for free 32-page illustrated and interesting booklet. A. L. DYKE, Box 22, Roe Bldg., St. Louis, Mo.

AUTOMOBILE INSTR tical overhauling, r taught thoroughly. Easy payments. Investi Practical Chauffeur's tablished 1905. Interna mobile Engineers, 147 E

AUTOMOBILE INST vidual road work and Day and evening. Ar of-town men. Send fo Y. M. C. A. Auto Sch New York City. Tel.

GREER COLLEGE Opposite Coliseum, 145 cago. A practical edu biles, 2 entire floors; and evening classes. Calumet 327.

WANTED — MEN while you learn; old the United States; free no classes; open year time offer.
Mack's Auto Scho

Mailing

AUTOMOBILE M

13,191 Automobile Deal
9,627 " Gara
5,681 " Repa
3,541 " Supp
Neatly typewritten, sh ing in dollars of each States and Towns, 19 Ask for certain State all.
877,000 Automobile Price on Application. Ask for our "Silent 2,000 other lists, etc. Send check

TRADE CIRCULAR
166 West Ad
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Established 1880.

Auto Storage

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Automobiles bo
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AUTO LISTS—OWNE State. S. H. Carrol

NEW ENGLAND AUT ist includes weekly Owners, Garages, Dea selected N. E. routes a yearly. 138 Pearl St.

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PATENT FOR SALE door opening and cl automobiles. Sold che ately. C. A. Sivon, Painesville, O.

Propo

PROPOSALS FOR Army Building, Whi City, May 7, 1913. triplicate, will be receiv July 7, 1913, and then from one to ten motor upon application. M. Q. M.

Miscell

OWNERS DESIRING cars by month or sea chauffeurs, apply, givi Motor Rental Bureau,

The Clearing House

me, $4.50; 2" one time, $8.75; 3" one time, $13.00; 4" one time, $16.75. Write for rates of larger spaces a

Buyer's (

3 times, $8.00; one twenty-fourth

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TO CO.
HICAGO
12 Michigan Ave.

S LARGEST
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Automobiles
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FOR OUR
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S. R. O.

Leading and Oldest European

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Write for particulars and list of users

MARBURG BROS., Inc.

Sole Importers

DETROIT 1790 Broadway, NEW YORK CHICAGO

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Detachable Wire Wheels

......fitted with......

Houk (Quick Detachable) Rims

Guaranteed the Best in the World

Geo. W. Houk Company
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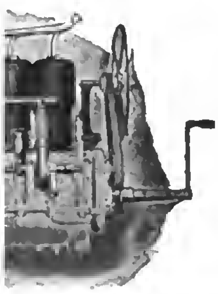

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CARBURETOR

More power – Less fuel – Wider range

FINDEISEN & KROPF MFG. CO.
21ST & ROCKWELL STS., CHICAGO, ILL.

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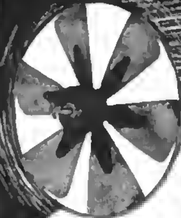

Patented

Manufacturers of 1913 Models

Don't omit a SPARKS-WITHINGTON Fan from your 1913 specifications. Our One-Piece blade, ball-bearing, radiator fan assemblies cool the motors of more high-class cars than any other fan on the market. There's a reason. SPARKS-WITHINGTON Fans deliver the greatest volume of air with the least H. P. consumption of any fan obtainable. Furthermore, their one-piece construction is positive insurance against blades which loosen, become detached and fly off. Undoubtedly one of our ten standard models is just what you have been looking for. Catalogue and detailed blue-prints on request. Get in touch with us.

The Sparks-Withington Co.
JACKSON MICHIGAN — WALKERVILLE CAN.

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Self Starting

Pass.— $2300
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LAUTH-JUERGENS'

One, Two, Three and Five-Ton Trucks

"Guaranteed for Life"
"Guaranteed Service"

The Lauth-Juergens Motor Car Co.
FREMONT, OHIO

TIONAL MODELS

- - - - - $ 750
(4 cyl.) - 1100
(4 cyl.) - 1775

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CTURING CO.
A

Is There a

PAIGE

Dealer In Your Territory?

If not, write or wire us today. The Paige "36" at $1275 and the Paige "25" at $950 are the leaders in the popular price field. You want them, if you can get them.

PAIGE-DETROIT MOTOR CAR CO.
303 Twenty-First Street, DETROIT, MICHIGAN

RUCKS

vehicles—all type
Reserve power,
onomical service

, 5 ton trucks.

operating costs.
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re., Hartford, Wis.

MARMON

"The Easiest Riding Car in The World"

MARMON "32"
Four cylinders, 32-40 h.p., 120-inch wheelbase, electric starting and lighting system, left-hand drive, center control, nickel trimmings, with newest body types to meet every requirement and corresponding equipment—

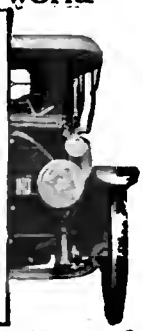
$2,850 to $4,100

MARMON "48"
Six cylinders, 48-80 h.p., 145-inch wheelbase, electric starting and lighting system, left-hand drive, center control, nickel trimmings, with body types to meet every requirement and corresponding equipment—

$5,000 to $6,350

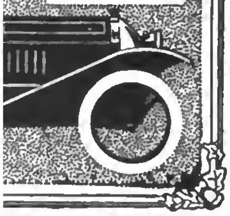
Detailed Information on Request.

Nordyke & Marmon Company
Indianapolis (Established 1851) Indiana



"Sixty Years of Successful Manufacturing"

Four & Six Cylinders
$1000. to $3000.
Write for Literature



18TH YEAR

FIAT

THE MASTER CAR

6 Cyl., 50 H. P., $5000
4 Cyl., 55 H. P., $4500
4 Cyl., 35 H. P., $4000

POUGHKEEPSIE **F.I.A.T.** NEW YORK

Take Care of Your Motor Insist Upon— America's Leading Lubricants

HARRIS

TRADEMARK REG. U.S. PAT. OFF.

OILS

Motorists who demand the right oil preserve their motors. HARRIS OILS have been right for 28 years.

"A Little Goes a Long Way and Every Drop Counts"

If your dealer does not sell HARRIS OILS, send us 80 cents for 1 gal. can, or $3.75 for 5 gal. can, and we will send same prepaid.

A. W. HARRIS OIL CO.

326 S. Water St., Providence, R. I.
143 No. Wabash Ave., Chicago, Ill.

J-S-L

U-S-L

Takes the Place of the Fly-Wheel

The U-S-L Electric Starter and Lighter is a combination motor and generator that takes the place of the fly-wheel. The armature of the motor-generator is bolted directly to the engine crank-shaft.

The U-S-L doesn't add a single extra moving part to a car.

No gears or chains	No extra clutches
No added weight	Starts at a push of foot-button
No bearings to oil	Supplies ample current

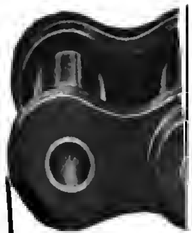
Adopted by
Rambler, Overland, Garford,
Edwards-Knight, Moyer, S. G. V.

Write for Bulletin 501

The U. S. Light & Heating Co.

General Offices: 30 Church St., New York

Branch Offices and Service Stations—New York, Boston, Buffalo, Cleveland, Detroit, Chicago, St. Louis, San Francisco.



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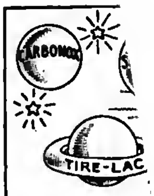
), 122 So. Michigan Blvd.,
IVEN, Rochester, N. Y.
Mission St., San Fran-
:HMIDT, 416 Broadway,
SHIRLEY BOYD, 903
Boston, Mass. AUTO
Denver, Colo.



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The red and gold trade-mark sh
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Light and flexible, yet tough and du
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THE NEW K

The Only Really Dust-Proof and

on the market. The edges lock together-
anywhere. A rubber tubing at bottom
forms to any irregularity or give in top
oughly protected in any weather. Wate
over top with patent spring-swivel nuts.
opening. See it at your dealers or write t

booklet. We'
on approval
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THE KA

236 Broadw

When your hands are all greasy and grimy from work, you revel in a wash-up with

For autoists, machinists, painters, printers and others whose hands get dirty.

SHOFO, the Hand Cleanser

It is a wonder-worker for all who get dirty hands. Shofo reaches the oil and dirt in the pores. Gently scours the fine lines. *Cleans* the hands. Keeps the skin soft and smooth. Shofo is compounded of pure castile soap, pulverized pumice stone and rich, green olive oil. Sold in pound and half-pound cans.

Try it—FREE

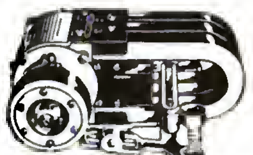
If you can't buy Shofo, send your dealer's name and address and we will send you Free Sample and booklet.

JOHN T. STANLEY, Maker of Fine Soaps
664 West 30th St., New York City

IMPROVE THE APPEARANCE AND EFFICIENCY OF YOUR CAR BY INSTALLING THE

K-W Electric Headlight Outfit, $40

Complete Outfit, Generator, Head Lamps, Switch, Wire and Bulbs



EASY TO INSTALL ON ANY CAR having exposed flywheel or other place to drive the Generator.

LIGHT WEIGHT Generator weighs but 18 lbs. Compare it to the heavy, complicated and costly charging outfits. If you have the Electric Head Lamps, get the K-W Electric Generator, only $25. Can be used for Ignition in connection with Timer and Spark Coil.

HANDSOME MADE-FOR-THE-PURPOSE HEAD LAMPS. The Reflectors are set in the door against a felt ring to keep out dust and moisture. They are made of correctly formed brass heavily silvered and highly polished on the reflecting surface. Lamps alone $15 and $17. No extra charge for black finish.

K-W Ford Electric Headlight Outfit, $15

For Ford Cars With Flywheel Magneto

The successor to the gas tank. The most successful electric headlight outfit for Ford Cars, because it is especially designed and engineered to work in connection with the Ford Flywheel Magneto.

THE K-W IGNITION CO.
2833 CHESTER AVENUE CLEVELAND, OHIO, U.S.A.

We make the famous K-W Master Vibrator
THE STANDARD BY WHICH ALL OTHERS ARE JUDGED

Cable-Struc

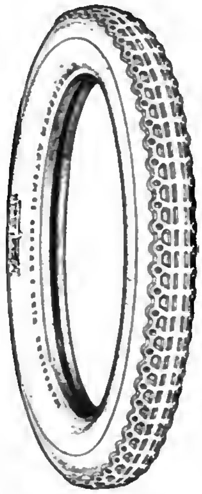
Tires—& W

Dealers, your business success d your service to customers, doesn't it chandise you sell must give satisfa lose trade. That law holds true in al can't afford to sell any tire but Mansfield Cable-Structur is that tir the reasons WHY it is best and SHOULD SELL CABLE-STRUCT

Unlimited in Quality

First we build unlimited quality into Cable-Structur tires. We use only the highest quality materials. Only fabric that will test at least 325 pounds per square inch, and this fabric is so woven as to permit of complete impregnation of new rubber.

And we use only the finest new rubber. This is given greatest endurance by our secret formula.



Unbreakable Base

24 endless, no-stretch steel wires, 12 on each side, are vulcanized into the semi-hard rubber beads. This gives the most logical tire base—and absolute safety.

These 24 wires give a tensile strength of 16,800 pounds.

Saving Rim Ruin

This basal construction makes a hooked base unnecessary. So the flange hooks are turned from the tire. Therefore no rim-damage is done if the tire is run soft, from any cause.

More Carrying Power

This compact Cable-Structur base gives greater air space. That gives the tire greater carrying power, that saves blowouts and their costs.

Careful Hand Building

Our careful hand building insures utmost exactness. Every inch of fabric is applied with unvarying precision. That means uniform strength.

Built Slowly

Cable-Structur tires are built very slowly. It costs

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The Mansfield Tire & Rubber Co., M

Please mention

Ought to Use
h Plugs

ςs were designed with a degree of perfec-
ıl to that of the Bosch Magneto, the most
ꞏd ignition source in the world.

.ch Plugs it is the intention to provide the
ꞏpark plug that can be made; one which
.te every doubt as to its worth; a spark
cially appeals to post graduate motorists,
w and buy accordingly.

ıgs are $1 00 EACH at all good dealers

GNETO CO., 220 West 46th St., New York
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ICIAL DISTRIBUTORS IN ALL IMPORTANT CENTERS

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The Cross Section shows the standard system of measurements. The dimensions are taken from the center of the joint to the outer edge of the leaf.

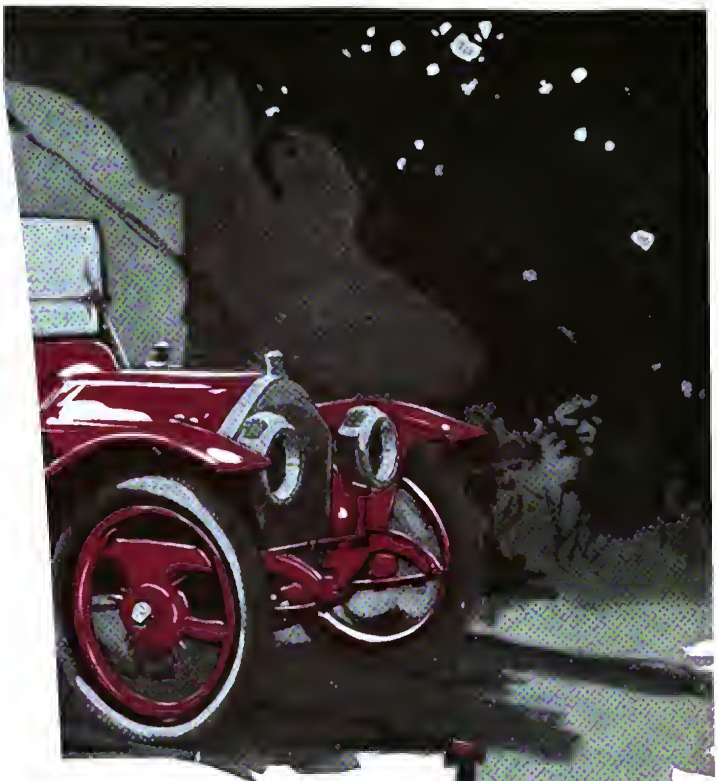
Special Shapes Produced to Order

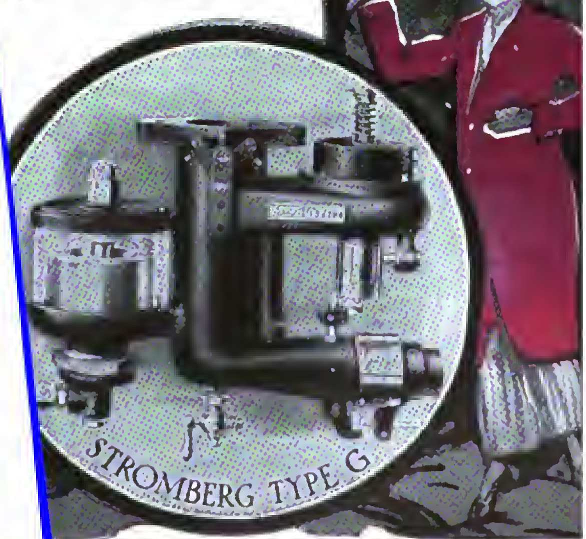
Offset pattern

Straight pattern

Reversed Joint
Semi-Concealed Barrel

These Hinges are particularly suitable for use on closed cars.

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ST FIFTY-FOURTH, NEW YORK.

June 26, 1913

Please n

At Camp Week-End

Third of the Hupmobile Outdoor series now appearing in the national advertising—and giving Hupmobile dealers a new sales lead.

A huge sales organization with one definite aim

Our aim is to make every Hupmobile dealer an integral part of a huge sales organization—not let him remain merely an automobile dealer.

We believe thoroughly in co-operation.

We want the co-operation of every Hupmobile dealer, naturally.

But, what is vastly more important to the dealer himself, we want him to accept and avail himself of our co-operation in his own territory.

We want the Hupmobile dealer to be as close to the factory as those members of the sales department who are inside the factory.

He should be, in fact, a member of the Hupmobile sales organization—working along definite lines, with a very definite purpose to accomplish.

And we can materially aid and assist every Hupmobile dealer who imbues himself with this spirit, as the majority of our dealers have learned.

A car with a reputation, and the quality to maintain its good name; a widespread and continuous advertising campaign; a home journal for Hupmobile dealers and no one else; sales suggestions of real and definite value.

These are the Hupmobile dealer's privileges and prerogatives—the things that link him closely and securely to the factory.

These are advantages beyond the power of every motor car manufacturer to offer.

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The BRAENDER TIRES are the only tires that went the entire distance in the g Decoration Day race without a change. These were STOCK TIRES—the same kind that *you can* and *do* buy through any dealer selling BRAENDER TIRES.

This is the most wonderful record ever made by tires of any make.

The BRAENDER TIRES after the race were capable of several hundred miles c tional service. The only sign of wear was on the right front—a cut from running over part dropped from another car.

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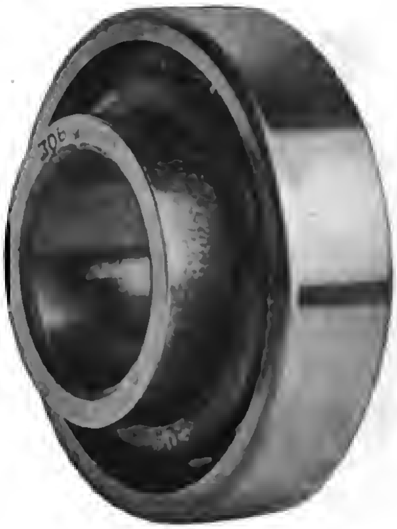

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fills a distinct want that has never been
[he Gurney Radio-Thrust Bearing carries either
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The gain is in simplified construction, reduction of fric-
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made in the regular sizes for annular bearings either

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In another year o
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No matter how long your motor has been standing or what the temperature may be, you can turn it over instantly by one pull on the handle located on the dash. You can't afford to be without this starter. Write us for prices.

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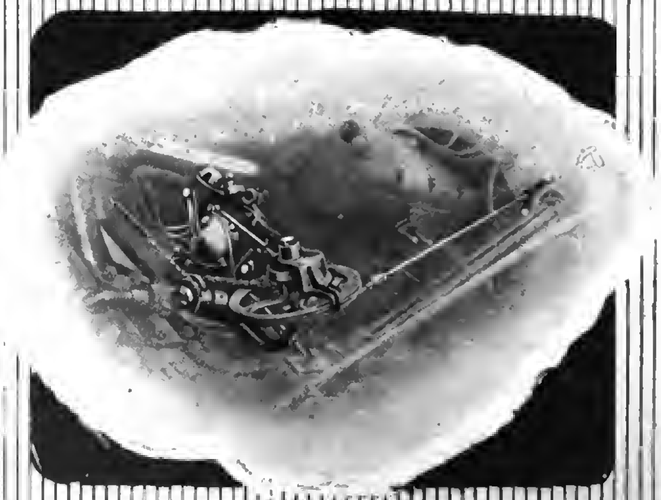

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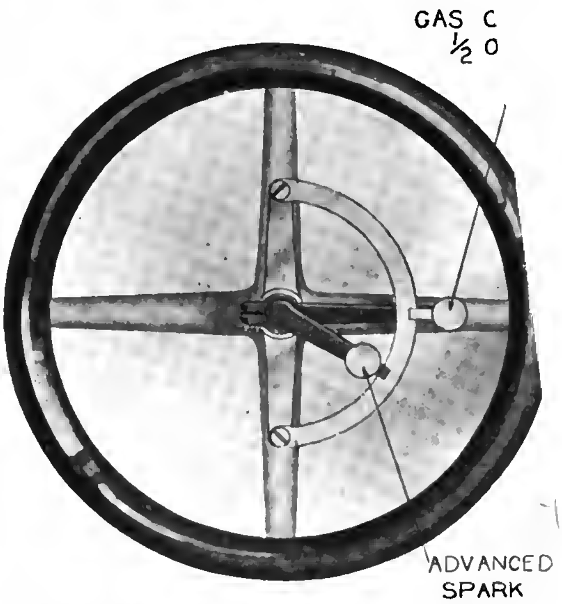

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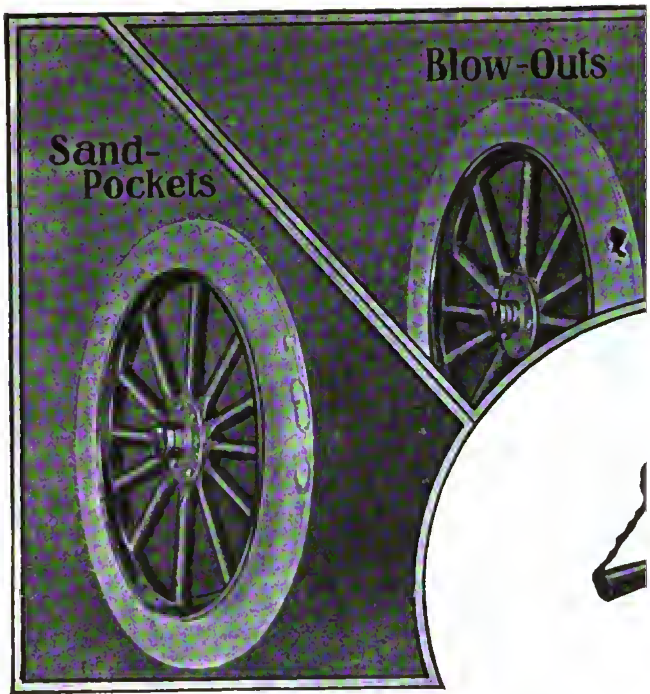

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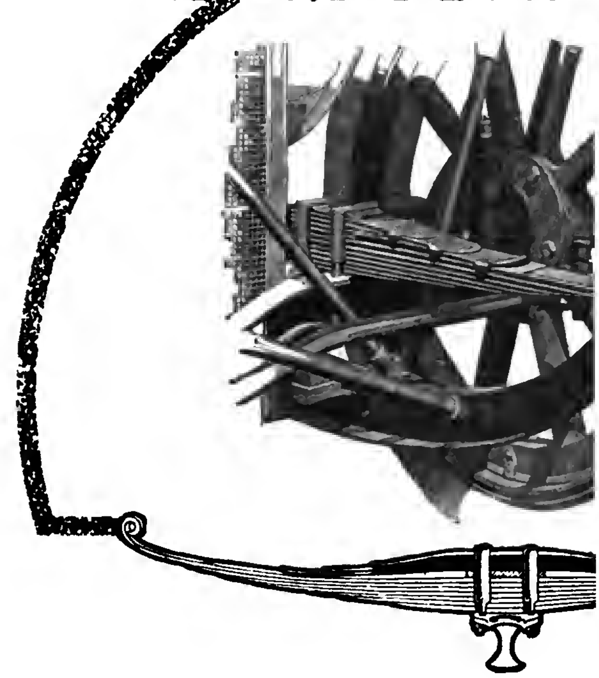

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Inasmuch as every motor operates within certain inflexible mechanical limits, and inasmuch as every oil possesses certain inflexible chemical tests, the selection of the best oil is merely a question of selecting the one with the best tests. Nothing more.

There are different tests, but a very simple one is the gravity test, which shows how much carbon an oil contains.

It is a well-known scientific fact, for instance, that carbon in a motor oil is objectionable—and that the oil with the least carbon will (other things being equal) be the best.

June 26, 1913

It is an equally well-known scientific fact that the amount of carbon in an oil is proportionate to the weight or "gravity" of the oil. The lighter the gravity the less carbon the oil will contain. *Even those who are only superficially familiar with these things know that gasoline with a light gravity contains less carbon than gasoline with a heavy gravity.*

It is not difficult to find out which of any two oils has the lightest gravity and contains the least carbon. Simply take two samples of oil in glass bottles (Invader Oil and any other) and pour the other oil into the Invader Oil. *The other oil will sink to the bottom.*

... carbon, and carbon is the thing that causes trouble.

Of the many oils being called to your attention, Invader Oil has the lightest gravity. It contains the least carbon. It is the best because its tests are better.

I-O-C GEAR OIL is the only oil ever manufactured especially and exclusively for the lubrication of Automobile Transmission Gears. Write for prices and descriptive booklet.

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If she stalls in the mud

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ı of mud and the desire to get out into the country

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